

ANNUAL REPORT

2013-14



Guru Angad Dev Veterinary and Animal Sciences University

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Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana

(Official Publication of GADVASU)

Website: www.gadvasu.in

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Printed at :

FOIL Printers, 2051, Gobind Nagar, Ludhiana - 141 001, Punjab, India
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Annual Report

2013-14



**Guru Angad Dev Veterinary and Animal Sciences University
Ludhiana (Punjab) India**

PREFACE

Year 2013 was another fruitful year as evident from generation and dissemination of technologies to the farmers and entrepreneurs. During last seven and a half years of establishment of the university, it has shown phenomenal growth and has its presence felt globally. We have added College of Dairy science and Technology, College of Fisheries, Veterinary Polytechnic, School of Animal Biotechnology, School of Public Health and Zoonoses, a Centre of Wild Life Studies and Research, three Regional Stations and three KVKs. To strengthen the veterinary human resource development, Punjab Government has decided to establish a New Veterinary College at Rampura Phul, Bathinda.

Human resource development received higher focus. Three ICAR sponsored 21 day training programs were conducted by the Departments of Veterinary Gynaecology & Obstetrics, Veterinary Surgery & Radiology, and Veterinary Medicine. A scientist from Sudan is undergoing three months training as a Visiting Scientist under DST funded C V Raman International Fellowship. Four scientists were deputed for 4-6 months advance training abroad. Eight doctorate students have been awarded with DST funded INSPIRE (Innovation in Science Pursuit for Inspired Research) fellowship. Ten graduates from Dairy Science and Fishery colleges qualified the ICAR All India Entrance Examination for admission in Post- graduation program. The corpus fund created for Human Resource Development today is Rs 112.53 lacs (81.43 lacs from NRIs and 31.10 lacs from faculty). More efforts are needed to increase corpus to Rs 500 lacs in the next few years.

MoU have been signed with National Dairy Research Institute, Karnal, (Haryana), National Research Centre on Camel, Bikaner, (Rajasthan) and I.S.F. College of Pharmacy, Moga, for collaborative research and academic programs.

The University has earned 18 extramural research projects from various funding agencies and a FIST



The University touched the lives of farmers of Punjab and paved the way for significant improvement in animal health and production. Future focus would be on generating technologies/processes/value added products and practices for improving livestock productivity with efficiency and better economics.

program from DST. The University transferred three main technologies for egg jam, ready-to-eat meat snacks viz. meat cutlets, meat croquette, meat samosa and emu meat products viz. pickle, burger patties, nuggets, balls/koftas to four budding entrepreneurs. An edible protein film for packaging and extending shelf life of milk and meat products has been developed. Herbal teat dip for prevention of bovine mastitis and herbal ointment for wound management in animals have been tested successfully.

Brackish water shrimp 'Vannamei' (a variety of shell fish) were reared successfully for the first time in inland salt affected waterlogged waste lands and these attained an average weight of 20g in three months culture period. Two crops of Vannamei can be produced annually with an average productivity of 15 t/ha/crop with net profit ranging from 10-15 lakh/ha/crop.

Training component was strengthened by organizing animal welfare camps and training programs on dairy, poultry, goat and piggery for the farmers and feed manufacturers. Pashu Palan Melas at main campus and at RRTC Bhatoli, Talwara were organized.

State Awards have been given by Chief Minister to Consortium Partners in NAIP project, Unati Cooperative Processing-cum-Marketing Society Ltd. Talwara and a Women-SHG (Sada Shiv Modern SHG) based at village Ramgarh Sikri. Women-in-Agriculture Day was also organized at Ramgarh Sikri.

University always tried its best to inculcate cultural values in the students and employees to promote the heritage for social cause. It organized Inter-College Youth Festival, 7th annual athletic meet and the first

sports meet of non-teaching employees. The students participated in various events at all India level and brought glory and success. NCC week was organized under aegis of 1 Punjab R&V Sqn NCC. NSS volunteers participated in Pre-Republic Day Parade Camp.

We are making headway in developing new infrastructure for the university. The construction of Scientists' Guest House and Farmers' Hostel has been completed and these are being furnished. The construction work for the College of Dairy Science & Technology, Girls Hostel, Modern Dairy Sheds and KVKs is in progress and these would be ready towards the end of 2014.

In a short period of its establishment, the University has achieved status of one among the best Veterinary University in the country. Vision 2030 document was released which specifies programs and activities to accomplish the mandates of this University. The future thrust would be to further achieve our goals and objectives through job oriented quality education, need and problem based research, establishing and strengthening close linkages with livestock and fish farmers, and related industries for increasing income through productivity enhancement, value addition and ensuring quality and safety of animal based foods while protecting environment using sustainable production systems.



(Vijay Kumar Taneja)

Vice Chancellor

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EXECUTIVE SUMMARY

Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) was established on 9th Aug, 2005 at Ludhiana and started functioning from 21st April, 2006. During last seven years of its functioning, the university has shown phenomenal growth and has its presence felt at National level. To produce highly efficient and skilled human resource for giving boost to activities of livestock and fishery sectors in Punjab, the GADVASU has created College of Fisheries, College of Dairy Science and Technology, School of Animal Biotechnology and Veterinary Polytechnic. To address issues of Zoonoses, Food safety and environmental pollutants, through research and collaboration with various agencies, the university has established School of Public Health and Zoonoses. Three Regional Livestock Research and Training centres at Kaljharani (Bathinda), Talwara (Hoshiarpur) and Booh (Taran Taran) have been established for catering to the specific needs of the area. Three Krishi Vigyan Kendras have been established each at Taran Taran, Barnala and Mohali districts of Punjab for technology assessment, refinement and demonstration. The University got recognition from the University Grants Commission (UGC) in order to receive central assistance under section 12 (B) of UGC Act, 1956. GADVASU got accreditation from UGC and ICAR and has been admitted as a regular member of Association of Indian Universities (AOIU).

Financial Report

Allocation of ₹11182.11 lacs was made under various schemes/projects during 2013-14, which included ₹ 8645.01 lacs received from various funding agencies and unspent/revalidated amount of ₹ 2537.1 lacs. The total expenditure for the year 2013-14 was ₹10439.08 lacs which included ₹ 5744.74 lacs for State NPV Schemes, ₹ 547.85 lacs for State Plan Schemes, ₹ 86.57 for other State Schemes, ₹ 895.43 lacs for ICAR Schemes/Projects and ₹3164.5 lacs for other schemes.

Faculty profile

Total present faculty strength in the constituent colleges of the university is 203, out of which 59 are professors or equivalent, 31 associate professors or equivalent and 113 assistant professors or equivalent. About 114 faculty members are in the teaching schemes, 59 in the research schemes and 30 in the extension schemes. On university basis, 21% of the faculty are female, 83% faculty holds doctoral degree and 67% faculty are from Punjab.

Student profile

The present strength of students in various programs of the constituent colleges is 970, out of which 59% are in undergraduate courses, 19% in postgraduate courses, 9% in doctoral program and 13% in diploma course. The percentage of male and female students in the university is 71% and 29%, respectively.

Teaching

Admission in various undergraduate programs was strictly on the basis of Common Entrance Test (CET) conducted by the university. The total number of students admitted for the session 2013-14 was 307 which included 80 in B.V.Sc. & A.H., 20 in B.F.Sc., 29 in B. Tech. (Dairy Technology), 88 in M.V.Sc./M. Sc./ M.F.Sc., 23 in Ph.D programme, 5 in PGDIF and 62 in Diploma in Veterinary Science and Health Technology. A total of 203 students successfully completed their degrees in different disciplines (53 - B.V.Sc. & A.H., 10-B.F.Sc., 24 – B.Tech, 73 - M.V.Sc./M.F.Sc./M.Sc., 08 – Ph.D. and 35-Diploma). After completion of course work in nine semesters, 48 B.V.Sc. and A.H. students of 2008 Batch were registered to the six months compulsory internship programme.

All India Study Tour of 15 days for final year B.V.Sc. and A.H. students was organized during Jan. 2014. Students of 2009 batch visited various veterinary colleges, national institutes, laboratories and wild life sanctuaries at Mumbai, Goa, Bengaluru, Chennai and Hyderabad. Students of final year of B. Tech. (Dairy Technology) programme attended

the study tour programme in Jan. 2014 and visited various dairy plants in Gujarat, Rajasthan and Delhi. Students also visited SMC College of Dairy Science and Technology at Anand. All India Educational Tour of 15 days was conducted for five students of PGDIF and 11 students of B.F.Sc. final year from Jan. 16, 2014 to Feb. 01, 2014.

The university awards merit scholarships to students for academic excellence. During 2013-14, University Merit Scholarship was given to 80 undergraduate, 31 postgraduate and 16 Ph.D students. Junior Research Fellowship of ICAR was awarded to 11 M.V.Sc. students and Senior Research Fellowship to one Ph.D student. ICAR Scholarship (NTS) was given to four undergraduate students.

Four students of College of Veterinary Science participated in various equestrian activities during Republic Day Camp and Prime Minister Rally 2014. Cadets brought laurels to the institute by getting the rank of Senior Under Officers and Under Officers. The Cadets of GADVASU participated in various activities during 2013-14 like painting competition and tree plantation program. Cadets attended Combined Annual Training Camp and appeared in Certificate 'B' and 'C' examinations.

The students of College of Fisheries and College of Dairy Science & Technology participated in Summer Camp on the theme "My Plant, My River, My Animal, My City" w.e.f. July 12-18, 2013 and participated in the seminar on "Disaster management during flood and drought". The NSS Unit also organized the plantation drive and blood donation camps. Twelve NSS volunteers/students selected for participation in 4th Indian Student Parliament during January 10-12, 2014 at Pune. NSS volunteers also took part in environment awareness rallies, road safety rally, sanitation, health & hygiene awareness and supported the Jamia University Cycle Rally-2013 on the theme "Building India Safe for Women."

Department of Veterinary Surgery and Radiology conducted an Advanced Training Course on "Cutting edge technologies in diagnostics and surgical procedures for veterinary patients" and Training on Radiographic Interpretation in Small Animals. Department of Veterinary Gynaecology and Obstetrics organized 21-day Training Course: Updates on male infertility semen technology and quality oocyte production. ICAR summer school on "Advances in diagnosis, therapy and prevention of Emerging and re-emerging diseases of livestock" and Training programme on "Canine Diseases: diagnosis, prevention and treatment" was organized by Department of Veterinary Medicine. Trainings on "Diagnosis of Animal Diseases" for Veterinary Officers of Punjab State were also conducted by the department. University also organized 'Animal Husbandry Officer's Workshop', 'Dairy and Fisheries' Officer's Workshop, and Food Festival.

Faculty participated in international and national conferences, symposia and workshops and presented research papers. The faculty won several awards and honours and published about 174 research papers.

Teaching and diagnostic laboratories in various departments of constituent colleges have been strengthened and were made fully operational. Two new modern dairy sheds of capacity to accommodate 300 animals are under construction. A nanotechnology laboratory has been established in the Department of Veterinary Gynaecology and Obstetrics.

Research

Undertaking need based research on different aspects related to production and health of various livestock species, poultry and fisheries forms an integral part of the mandate of the university. During the year 2013-14, a total of 28 new project proposals were submitted to various funding agencies. A total of 215 research schemes were operational in the university, which included 63 non plan/ plan schemes, 13 ICAR schemes, 4 revolving fund schemes, 69 RKVY schemes and 66 miscellaneous schemes. A total of 73 new project proposals were submitted to various funding agencies.

Improvement and conservation of cattle and buffalo germplasm

Genetic improvement of crossbred cattle and Murrah buffalo in terms of milk production traits maintained an upward trend at university farm. In elite herd of crossbred cattle, the complete lactation yield was 7,531 kg and 34 kg was

peak yield, whereas, elite herd of Murrah buffalo had complete lactation yield as 3,658 kg with 16.3 kg peak yield. Under Nili Ravi buffalo conservation project, university has increased herd strength to 95 with 56 breedable buffaloes. In this herd, the peak performer has produced 5,105 kg milk in complete lactation with 19.5 kg peak yield.

Genetic improvement of crossbred cattle and Murrah buffalo was continued in Punjab state by supplying 33 breeding bulls/bull calves, 65,460 doses of frozen semen and 4,186 doses of chilled semen to farmers and other state dairy development agencies.

Poultry production

Rhode Island Red birds perform well on a comparatively lesser management input and are hardy and dual-purpose which can lay 260 brown eggs/year with an average weight of 54 g. The commercial broiler (IBL-80) has the potential to attain 6-week body weight of 1700 g with less than 5% mortality. Egg production till 52-week age has improved significantly. Quails are less susceptible to poultry diseases. The egg weight of Punjab White Quail was 12 g and these eggs are used for pickle preparation. The hatchery operators and farmers can procure fertile/hatching eggs, day-old chicks and parent stocks from university hatchery.

Aerobic composting was developed as a suitable waste management technique for poultry farmers. The mixing of poultry manure with carbonaceous wastes not only reduces ammonia loss but also solves the disposal problem of poultry carcasses, litter and agricultural waste products.

Feeding strategies

Nutritional evaluation of spent wheat-rice straw suggested their use for livestock feeding. The nutritional evaluation of pelleted feed containing waste potatoes or maize grain suggested that during potato glut waste potatoes could be used as a replacement of maize in cattle feed. During lean period, supplementation of UMMB with wheat straw can maintain optimum microbial fermentation in rumen, thus improving nutrient utilization.

For Beetal kids, indigenously prepared mineral mixture containing Zn and Cu lysine chelate was at par with inorganic mineral mixture with Zn sulphate and Cu sulphate. Moreover, a crop residue-based feed block with adequate DCP was developed for Beetal kids for their maintenance and growth requirements under stall-fed conditions. Supplementation of bypass fat or amla powder in heat-stressed goats can ameliorate adverse effect of heat stress on general health and reproductive performance. Supplementing diet with soybean oil for two months and by-pass fat for three months can reduce the weaning stress after birth in Beetal goat kids. Supplementation diet with Babul can increase digestibility and nutrient utilization in goat kids. In goats, silage DM intake, cellulose digestibility, TDN intake and nitrogen retention was higher with HQPM maize silage, whereas, net gas production, OMD%, NDFD% and microbial biomass production% was similar to J10006 maize silage.

In broiler production, litter amendments with sodium bisulfate (25 g/foot²) effectively controlled pH and microbial load. Dietary manipulation with yucca supplementation improved weight gain, feed efficiency and carcass characteristics. Moreover, supplementation of garlic and cinnamon improved the growth performance of broilers.

Meat processing and value addition

For extending the shelf life of meat-based products, chitosan-based bioactive edible films were developed. Incorporating nisin, lemon grass oil, cinnamaldehyde potassium sorbate and eugenol further enhanced their bioactivity. Edible films can also be developed from whey protein concentrate based upon different physio-chemical parameters of film. Chicken meat lollipops wrapped in chitosan-based edible films were successfully stored for 35 days under modified atmosphere-packaging (MAP; CO₂:N₂, 50:50) at refrigeration temperature. Antimicrobial activity of coumarin, nisin and eugenol was assessed in edible films.

Hurdle treatment along with MAP storage under refrigerated conditions improved quality and increased shelf life of chicken meat croquettes by 15 days compared to aerobic packaged samples. The shelf life of goat meat bites can be

extended by using edible coatings (25% liquid egg white) and natural antioxidants (3% aloe vera gel). The developed enrobed goat meat bites were successfully stored under aerobic packaging conditions for 35 days and 45 days under MAP conditions at refrigerated temperature. The developed enrobed goat meat bites had commercial significance due to low-calorie product at lower cost for better marketability.

Pesticide toxicity mechanism and acaricide multi-resistance in ticks

Lemon grass oil treatment in rats for 45 days showed protective effects on quinalphos-induced oxidative damage. Oxidative stress was one of the important mechanism in cypermethrin, fenvalerate, carbendazim and quinalphos-induced toxicosis in buffalo calves. Oral subchronic exposure to quinalphos can alter pharmacokinetic properties of lincomycin, an antimicrobial agent, without any change in dosage regimen.

Canine mammary tumor (CMT) cases had high serum estradiol, and their mammary fat/tissue/serum was positive for pesticides viz, dieldrin, heptachlor and γ -HCH. Correlation between ER α and aromatase indicated the role of insecticides in CMT through conversion of androgens into estrogens.

Rhipicephalus microplus exhibited level-II resistance against amitraz and deltamethrin, level-I resistance against fenvalerate and malathion, whereas, ticks were susceptible to cypermethrin. In other areas of Punjab state, resistance of *R. microplus* to cypermethrin and deltamethrin varied between level-I and III. *Hyalomma anatolicum* showed susceptibility to cypermethrin and level-I resistance against deltamethrin.

Acaricidal activity of ethanolic extracts of leaves of *Cymbopogon winterianus* against synthetic pyrethroid resistant engorged females of *R. microplus* was highest. Treated ticks had reduced egg mass weight, reproductive index and oviposition. The complete inhibition of hatching was seen in eggs laid by ticks treated with ethanolic extracts of leaves of *Vitex negundo* and aqueous extracts of leaves of *Withania somnifera*. Treatment of deltamethrin resistant *H. anatolicum* with ethanolic extract of leaves of *C. winterianus* exhibited highest tick mortality, whereas lowest mortality was observed with ethanolic extracts of leaves of *V. negundo*.

Surveillance of diseases, toxicities and deficiencies

Outbreaks of different bacterial (Hemorrhagic septicemia), viral (Classical swine fever, Pestes Des Petitis Ruminant, Rabies, Bovine Herpes Virus) and parasitic (Anaplasma, Coccidiosis) diseases and toxicities (Nitrate, Oxalate) were attended and controlled.

Screening (comparative intradermal test and Gamma Interferon assay) of bovines and small ruminants for tuberculosis revealed 15.95% and 0.64% positivity, respectively. Screening (RBPT and competitive ELISA) of bovines and small ruminants for brucellosis revealed 7.88% and 6.51% positivity, respectively. In case of brucellosis in bovines, the positivity was 35% (RBPT) and 33.5% (ELISA) positivity was respectively.

Sero-prevalence of CSF in non-vaccinated pigs was 34.62%, whereas in vaccinated pigs only 35.21% had CSF antibodies. Sero-prevalence data for porcine parvovirus, circovirus, pseudorabies and PRRS virus indicated 36.82%, 25.94%, 6.69% and 0.0% positivity, respectively.

Seroprevalence of bovine trypanosomosis was much higher (39.34%) by card agglutination test for *Trypanosoma evansi* compared to blood smear examination (2.18%). Seroprevalence of *Babesia bigemina* was 30% in Punjab state, with highest seroprevalence in undulating plain zone (39.6%) and lowest in western zone (10.5%).

For nitrate toxicity testing, out of fodder samples tested, about 25-30% had >2000 ppm nitrate and napier bajra was associated with oxalate toxicity. In semi-arid Mansa and Ferozepur, >92% dairy animal population was affected by subclinical fluorosis, thus leading to various health and reproductive problems. In central zone of Punjab (Ludhiana, Nawanshahr and Fatehgarh Sahib), prevalence of Ca, P, Mg, Cu, Zn and Mn deficiency varied between 7.63-37.29%

in cattle and 2.46-34.43% in buffalo, thus affecting their general health and reproduction. Mycotoxins were reported in 59.13% animal and poultry feed samples and aflatoxin B2 had maximum prevalence.

Molecular and serological diagnosis of diseases and phage therapy

Brucella was isolated from foetal stomach content of buffalo and pig. On *Brucella* selective agar media, gram-negative coccobacilli were grown and identified by catalase, oxidase, urease and nitrate reduction test. Isolates were positive for agglutination reaction with *Brucella* positive serum. Isolates were further subjected to PCR using B4/B5 primers and confirmed as *Brucella spp.* Isolates were confirmed as *Brucella abortus* with Bruce ladder PCR. For genome sequencing of *Brucella spp.*, DNA has been submitted. Molecular heterogeneity/typing of *Brucella* has been carried out and SSCP has revealed highest discriminatory ability among all typing techniques.

Therapeutic efficacy of brucellaphage, phage adsorbed *B abortus* S19, phage associated lysin (PAL) extracted from brucellaphage and PAL lysed *B abortus* were tested using mice and maximum reduction in bacterial load was observed in *Brucella* infected mice that were treated with PAL lysed *B abortus*. Therapeutic potential of bacteriophage therapy for salmonella infection revealed that phage administration via intramuscular route was most effective in broiler birds. The growth of *Pasteurella multocida* under iron limiting conditions emphasised the significance of increased pathogenicity of *P multocida* when growing in host under natural state of iron starvation stress.

Super-agglutination test was developed for brucellosis, which had higher sensitivity (95.88%) and negative predictive value (95.83%) than RBPT, STAT, ELISA and CFT, and specificity (89.32%) and positive predictive value (89.42%) higher than RBPT and STAT. A multiplex agglutination test was developed for FMD, which detected antibodies against all 3 serotypes in sera of 93.66% animals, thus, antiglobulin aided multiplex agglutination may be more sensitive by minimizing false negative results. A novel loop mediated isothermal amplification for the detection of *Pasteurella multocida* was developed with sensitivity 10⁴ fold higher than PCR. Faecal samples detected positive for *Mycobacterium avium subsp Paratuberculosis* by ZN staining exhibited 56.25% specificity, whereas, faecal culture and faecal PCR exhibited 60% specificity. For *Johne's disease*, faecal PCR was more sensitive than culturing. Immunohistochemistry can be used as diagnostic tool for IBD, MD, NCD and CRD. For Marek's disease, ELISA was developed using viral antigen in tissue homogenates. For individual as well as simultaneous detection of bovine herpesvirus-1, *Brucella* and *Leptospira*, the PCR and multiplex PCR assays were developed and evaluated.

For detecting latent trypanosomiasis in horses and mares of Punjab, the card agglutination test (CATT) applied on blood samples in comparison to PCR revealed that CATT had 100% sensitivity and 92.1% specificity with respect to PCR. Thin blood smear from tick-infested cattle revealed 15.83% positivity for *Anaplasma marginale*, 89.16% for *R. microplus*, 7.50% for *Hyalomma anatolicum anatolicum* and mixed infestation as 3.33%. Molecular characterization of *A. marginale* based on 16S rRNA gene was more sensitive. Blood smear examination detected acute *Anaplasmosis* in 13.58% samples and by indirect ELISA in 25.54% samples. Blood smear examination was suggested as erroneous for acute *Anaplasmosis* and ELISA had low sensitivity to detect infection in acute phase. For detection of *Theileria annulata*, real time PCR could present a quantitative status, while nested PCR could reveal only qualitative status of infection.

Canine Ehrlichiosis was detected in 4.21% samples using *E. canis* specific PCR assay, whereas the blood smear revealed morulae in 2.34% samples. Nested PCR in conjugation with primary PCR increases sensitivity in detection of *E. canis* infection. Examination of peripheral thin blood smears revealed 0.93% samples positive for *Babesia canis* and 6.54% for *B. gibsoni*, whereas PCR assays detected 13.55% samples positive for *B. canis*, and 15.42% positive for *B. gibsoni*. Out of rectal swab samples collected from dogs suspected for canine *parvovirus*, 8.23% were positive by PCR and 45.88% were positive by nested-PCR. Fifty-two isolates of bacteria associated with various respiratory tract infections in chicken were isolated.

Clinical interventions

Culture sensitivity pattern of clinical mastitis revealed the most prevalent organism as coagulase-negative staphylococci followed by *Staphylococcus aureus*, whereas drug sensitivity revealed ceftioxone-tazobactam as most and ampicillin as least effective drug. Use of Mastilep gel for udder massage and Masticare powder p.o. along with antibiotics in bovine mastitis can reduce the average days under treatment. Use of herb viz, *O. sanctum* leaf powder in subclinical mastitic quarter was able to decrease CMT score and SCC by day 28 post-treatment. Use of Ipecac plus a rationale antibiotic cured galactorrhoea with 5 ± 2 days under treatment.

Area specific mineral mixture supplementation for 6 months in mineral-deficient central zone of Punjab improved milk yield and body condition score of dairy cattle and buffaloes. Blood biochemical and mineral status of crossbred cows was evaluated around parturition.

The diagnostic and critical care facilities for domestic animals have been strengthened at GADVASU with the use of blood pressure monitoring unit, electrocardiograph and endoscope. Feeding of high grain diet was associated with an increase in severity of foot lameness in dairy cattle, which can be controlled by supplementation of Zn sulphate along with Na bicarbonate and Mg oxide buffer.

Equine referral cases with various gastrointestinal and other disorders were successfully treated. Various prognostic indicators were established for the therapeutic management of equine colic and pleuritis. Horses with heart rate < 80 bpm, TLC $> 8600/\mu\text{L}$, PCV 30-35% and blood lactate below 2.8 were suitable candidates for equine colic surgery through ventral midline celiotomy. Inside-out continuous suture pattern using poly-p-dioxanone monofilament absorbable suture material to repair third degree perineal laceration was effective and quick method of suturing in equines. Polypropylene mesh hernioplasty was the procedure of choice for valuable animals with large hernial defects and with suspected suture line tension.

Various oral surgery procedures for canines such as resection of oral swellings, dental scaling and orthopedic wiring and bone plating for mandible and maxillary fractures were carried out successfully. Ultrasonographic topography of reticulum and omasum was established in pregnant and non-pregnant cattle and buffaloes as well as in cases of diaphragmatic hernia and omasal impaction. Ultrasonography can be used for reliable diagnosis of tendon rupture/affections, pelvic fractures and other subtle bone lesions.

Enhancing reproductive efficiency

Melatonin treatment has the potential to induce ovarian cyclicity (overt or covert estrus) as well as increase conception rate in buffaloes through gonadotropin stimulation and selective up-regulation of anti-oxidant enzymes. The polymorphism of melatonin receptor MT1 gene in buffalo may be associated with seasonal reproductive pattern of buffalo. The presence of functional CL at the start of FTAI protocol or the size of largest follicle at the time of FTAI had no influence on pregnancy outcome in buffaloes.

A cytobrush has been fabricated and cytobrush technique to collect uterine samples for the diagnosis of clinical and subclinical endometritis has been standardized that has confirmed the incidence of endometritis in dairy cows as 22.2%. Anti-sperm antibodies (ASA) were detected in blood and cervical mucus of inseminated or non-inseminated heifers/cows using immunological tests such as immunoperoxidase assay (IPA), Sperm mart test, ELISA, immunofluorescence and immunoblotting. Sub fertility/infertility in 22.2% of tested animals may be due to ASA against sperm specific proteins in serum and cervical mucus. Supplementation of cholesterol-loaded cyclodextrin in buffalo semen improved sperm motility, viability and minimizes capacitation like changes during cryopreservation.

Progesterone radioimmunoassay using indigenously raised polyclonal progesterone antiserum is being employed for the reproductive status evaluation of dairy cattle and buffaloes of Punjab State as well as by the veterinary institutes located at Srinagar, Jammu and Hisar.

Reproductive diseases associated with sows, in decreasing order, were abortion, repeat breeding, anestrous and retention of placenta. Diseases associated with piglets, in decreasing order, were death at young ages, stillbirth, weak litter and mummified fetuses.

Anatomical studies of buffalo ovary during prenatal stage revealed that with an advancement of fetal age, area occupied by ovarian cortex increases as the ovigerous cords become more extensive, convoluted and elongated, ultimately, there is regression of ovigerous cords and interstitial cells resulting in formation of primordial follicles. Microscopic studies on buffalo oocytes were carried out to generate their 2D and 3D images, which were helpful in oocyte grading. Immunolocalization of progesterone receptor in buffalo oviduct and estrogen receptor alpha in buffalo uterus was observed in various cells.

Animal biotechnology and nanotechnology

Application of adult mesenchymal stem cells (MSCs) for bone and tissue regeneration is under the process of standardization as the isolated cells have showed osteogenic, chondrogenic and adipogenic differentiation potential.

Expression profiling of genes viz, ErbB and Hsp 90 was five folds higher, while that of MamB was six fold higher in canine mammary tumor compared to healthy mammary tissue.

Proteome analysis of *Brucella* spp by 2D electrophoresis detected a total of 380, 392 and 365 protein spots for *B. abortus*, *B. melitensis* and *B. suis* spp, respectively. In response to heat stress, few new proteins (from 30-70 kDa) were synthesized. Iron chelator inhibited the synthesis of few proteins in the bacteria.

Cloning and sequence analysis of Dicer I (Ribonuclease III) cDNA was done in Indian buffaloes. Primers were designed from whole sequence of Dicer from *Bos taurus*. The PCR products were custom sequenced in order to confirm results and were submitted to NCBI site for publication.

Calcium carbonate nanoparticles with mean diameter of 110 nm was synthesized by low cost technique for its possible use as oral calcium supplement with better efficacy.

Food safety and zoonoses

Collaborative Research and Training Experience (*CREATE*), a project was started with University of Saskatchewan and Free University, Berlin, that will provide exposure to post-graduate students of School of Public Health and Zoonoses to International teaching and research.

Seropositivity of brucellosis by ELISA kit was detected in 20% of the population which is in direct contact with dairy animals. For brucellosis, the sensitivity of PCR was 100% using STAT as gold standard.

Seroprevalence of *Taenia canis*, *T. spiralis* and *T. solium* was 22.13%, 5.73% and 11.47%, respectively. The prevalence of *T. solium* cysticercosis in pigs was 4.23%. In India, huge economic losses are being encountered due to cystic echinococcosis and human hydatidosis related losses. The prevalence of multi-drug resistant *L. monocytogenes* was recorded among bovines.

The pooling of milk samples decreased the residue levels of enrofloxacin and oxytetracycline below MRL values recommended for antibiotics. Pesticide residues in 5% chicken samples exceeded MRLs for endosulphan sulphate, cypermethrin and malathion. Chlorpyrifos was the most frequent contaminant in both chicken and chevon. Application of cooking methods reduced pesticide levels by 22-60.9% in chicken and 23-60.1% in chevon. About 25% human milk samples were positive for pesticide residues with cyfluthrin as leading pesticide. The levels of HCH and DDT in human milk samples were reduced by 15 and 12 times, respectively compared to previous studies in Punjab. Endosulfan and Endosulfan sulphate was detected in blood samples of sprayers indicating past exposure. Ethion, chlorpyrifos, endosulfan sulphate and parathion residues were detected in vegetables, soil, feed and water collected from villages.

Dairy science and technology

Technology for the manufacture of Mozzarella Cheese and Functional Doda burfi after enrichment with phytosterol has been standardized. Functional Doda burfi was made from germinated wheat, sugar and milk, and can be kept for 10-12 days at ambient temperature.

The project entitled, "Economics of Milk Production and its Regular Monitoring in Punjab" brought out that variable cost constitute 87 per cent of total cost of milk production. Milk yield/milch animal was higher on large sized dairy farms and lower on domestic and small sized farms. In the current scenario of higher input cost, to make dairy farming sustainable, efforts should be done in feed and fodder development, to reduce losses due to animal health, emphasis on dairy processing, genetic improvement to reduce cost per litre and to encourage more and more farmers to join organized marketing set up.

The survey on cows milk Fat and SNF is also being conducted under the project. The data will be taken from all the zones for the ten months.

Enhancement of fish productivity

Fresh water carp poly-culture trials of various species combinations were conducted in salt affected waterlogged area in district Fazilka. For the first time in the state, a successful culture trial of brackish water shrimp 'Vannamei' was conducted in inland saline water ponds, thus providing an ample scope of taking up Vannamei culture in zero earning salt affected waterlogged wastelands for 'Aqua Industry'. About 40% higher net profit was given by integrated fish cum duck farming in inland saline water ponds as compared to fresh water carp poly-culture. About 50 acres of salt affected waterlogged waste-land was converted into fish ponds in district Fazilka after witnessing successful aquaculture trials of university.

Induced breeding trials of catfish (Singhi) were conducted in indoor catfish hatchery and 2.6% hatchlings survived during indoor rearing for a week. Further rearing was carried out in outdoor flow through FRP troughs for 3 months, which lead to 66% survival from hatchling to fry and 92% from fry to early fingerling stage. Three-month-old fingerlings were stocked in earthen ponds for further rearing, thereafter advanced fingerlings were harvested with 99% survival and average body wt of 34 g.

The scope of breeding and seed production of a priced murrel species (Saul) was assessed under captive conditions. Yearlings and brood stock of Saul were collected and reared in an earthen pond with surface floating and submerged aquatic plants. After natural breeding of fish, the young ones stayed with mother for 3 weeks and then reared in outdoor flow through FRP pools for 30 days. Thereafter, the fry were shifted to cemented ponds till fingerlings stage.

Higher biomass of carps and more net income was recorded from ponds integrated with murrel culture in cages as compared to ponds without cages. Pond cage aquaculture technology was also successful for a high value catfish (Pangas).

The use of *Azolla* compost in aquaculture compared to traditionally used cow dung lead to better water quality and higher plankton population along with higher fish growth. Culture technology for duckweed species viz, *Lemna minor* and *Lemna gibba* was standardized under local climatic conditions and the use of poultry droppings and the combination of cow dung and poultry droppings (1:1) lead to highest duckweed biomass production. This production was recorded for both species during different months of a year and *L. minor* survived and *L. gibba* completely vanished during winter. Culture technology for live food (*Artemia*) production for larval development of freshwater prawn was standardized.

Probiotic (*P. polymyxa*) feeding for 80 days can be used as growth promoter for carps for better-feed utilization through improved digestive enzyme activity and better non-specific immune response. Fish productivity from fish-cum-duck farming unit was enhanced by increasing water depth, enhancing fish-duck stocking densities and by additional feeding

of fish. Higher growth and survival rate of Rohu was observed following their rearing in tanks provided with bamboo poles as periphytic substrate. Carp poly-culture productivity in fishpond of bioremediation unit was enhanced with technological interventions. In semi-intensive carp poly-culture, higher net profit was seen in duckweed fed system.

Value added gold fish with enhanced colour pattern was developed with beat root incorporation in farm made feeds. The value addition was promoted by preparing gelatin (from Rohu), crunchy-fried brackish water shrimps (Vannamei), fish pickle and fish meat analogue products with paneer, soya bean and chana dal. Pearl production was started in freshwater mussels and implanted mussels were successfully reared in net bags suspended from bamboo frame.

Toxicity of heavy metals viz, mercuric chloride was assessed in catfish which led to respiratory distress, loss of balance and rolling movement. The survey of fish markets in the state revealed that highest demanding fish species, quantity wise, was Rohu and the highest priced fish and shellfish from capture fishery in state was respectively as Saul and Scampi.

Extension

In order to transfer the new technologies evolved by the university, training courses/programs (45) were organized for the farmers, field veterinarians and scientists from other universities. Faculty published about 160 extension publications in various magazines, journals, news papers etc. in order to disseminate information important to farmers. The faculty members of different departments delivered 27 TV talks and 54 radio talks on the topics assigned by the Directorate of Extension Education. It constitutes a very good medium to educate farmers and is very popular among farmers.

Animal welfare camps (20) were organized in the rural areas of Punjab for treatment of animals. Farmers and field functionaries were advised/made aware of the recommended animal health practices. The faculty members delivered extension lectures to the farmers in collaboration with the other animal welfare agencies of the state like Department of *Animal* Husbandry, Fisheries and Dairy Development, Govt. of Punjab, Fish Farmer's Development Agencies, Punjab, Nestle, Smith Klime Beecham, Punjab & Sind Bank and in the trainings organized by the Krishi Vigyan Kendras and Department of Extension Education, PAU, Ludhiana. On these occasions, demonstrations regarding the collection, dispatch and transport of clinical material like blood, mucous discharge and faeces from the animals, correct method of milking, teat dip, computation of ration, silage making, acaricide drug application and heat detection were carried out in the field for livestock farmers.

Two Pashu Palan Melas were organized in the months of March and September in the university campus. Various departments of the university exhibited new technologies /innovations for use in livestock and poultry farming. On this occasion, other government and private agencies involved in animal welfare work also displayed their exhibits of importance to the farmers. University faculty also participated in the Kisan Melas at Regional Research Stations of PAU for the benefit of the Livestock farmers. To give a push to the livestock farming, GADVASU regularly confers Chief Minister Award to progressive farmers of the state.

Training courses and awareness camps were organized by Regional Research and Training Centre, Kaljharani, Bathinda, Regional Research and Training Centre Bhatoli, Talwara, Regional research and Training Centre Booh, Tarn Taran and Krishi Vigyan Kendras, Barnala and Booh at different places in the adjoining areas.

University provided information services through preparation as well as sale and distribution of the university publications like Package of Practices for Livestock Health Management, Vigyanak Pashu Palan (Monthly Punjabi Magazine), Hand book on Infectious Animal Diseases, Veterinary Punjabi Shabad Kosh, Dairy Farming, Goat Farming in Punjab (English & Punjabi), Fish Farming and GADVASU hand-book. Services for fisheries included Free pond water testing for fish farmers, on-campus and off-campus consultancy for Carp culture, Carp breeding and seed production, post-harvest processing and value addition, ornamental fish breeding and seed production and farm visits to address farmers problems related to water quality management, feeding, breeding and disease outbreak.

National Agricultural Innovation Project, (NAIP) project on Sustainable livestock based farming system for livelihood security in Hoshiarpur District of Punjab

During 2013-14, deliverables like mineral mixture, dewormers, uromin licks for the livestock and good quality seed of crops, pulses, oilseed for improvement in livestock and agriculture fields have been made available. Animal welfare camps, animal welfare days, women-in-agriculture day and agriculture camps were organized at different places in the area to transfer modern technologies to the farmers. Agro-forestry was strengthened in the operational area by supplying orchard, medicinal and agro-forestry plants. Farm women were given skill training in Fruit and Vegetable Preservation, Stitching and Embroidery, and Knitting. A women's SHG (10 members) based at village Koi (Block Bhunga, District Hoshiarpur) is earning on an average Rs 3,500-4,000 per month through stitching and embroidery. Similarly, another SHG (20 members) based at village Asifpur (Block Hajipur) is earning Rs 4,000 per month through same activities. Both these groups are also engaged in extending their skills to other village teens. The State Govt. provided a grant of Rs 235 lakhs to a women-SHG (Sada Shiv Modern SHG) created under NAIP four years ago at village Ramgarh Sikri (Block Talwara) for the establishment of a processing Unit. The civil work of the Unit got completed. The necessary machinery is being installed now and the processing will start in near future. The SHG will procure the produce from the beneficiary as well as non-beneficiary farmers directly. After processing, the products will be sold by the SHG in the local market. Some of the products will also be exported. Visits of beneficiary farmers were arranged to Pashu Palan Mela and Zonal Kisan Mela to create awareness among people of *Kandi* area.

Library and Networking

The University Library is central to the academic, research and extension activities of GADVASU. It has state-of-the-art infrastructure and ultra-modern facilities supporting the goals of the University through collection, organization and dissemination of information and knowledge. The Library is fully automated in its operations using LSEase (Libsys) Library Management Software.

The library provides a single platform to access various e-resources through its website i.e. Cybrary through out the campus. The library provides access to about 3400 journals through the Consortium for electronic Resources in Agriculture (CeRA). Access has been provided to Krishi Prabha, a database of doctoral dissertations and theses submitted to Agricultural Universities in India. In addition links have been given to various open access electronic information resources. The Library provides the facility of Online Public Access Catalogue (OPAC) not only inside the library but throughout the campus vide intranet.

The university library organizes book exhibition every year. This year 31 book publishers and book sellers have participated in the book exhibition and around 700 books were purchased during this exhibition.

Library has established a Campus wide Network connecting all buildings and offices of the University with more than 600 access nodes. Library provides SPSS Statistics 22.0 software on network based version for statistical analysis

Sports and Co-curricular activities

During the period under report, university has created enough facilities to promote the sports activities among the students. Large number of students (both boys and girls) from constituent colleges has shown keen interest in sports activities. 8th Annual Athletic meet of the university was organized on Feb. 24-25, 2014. The students from constituent colleges of GADVASU participated in various events of North Zone/All India Inter-Varsity Tournaments.

During the period under report, GADVASU 4th Inter College Youth Festival – 2013 was successfully conducted from Oct. 05-10, 2013. The university cultural contingent also participated in 29th North Zone Inter Varsity Youth Festival held at BBAU, Lucknow from Nov. 15-19, 2013. The Cultural Activities Wing of the University also organized functions to celebrate Independence Day (15 Aug., 2013), Republic Day (26 Jan., 2014) and *Parkash Utsav* of Shri Guru Angad Dev Ji on April 23-25, 2014.

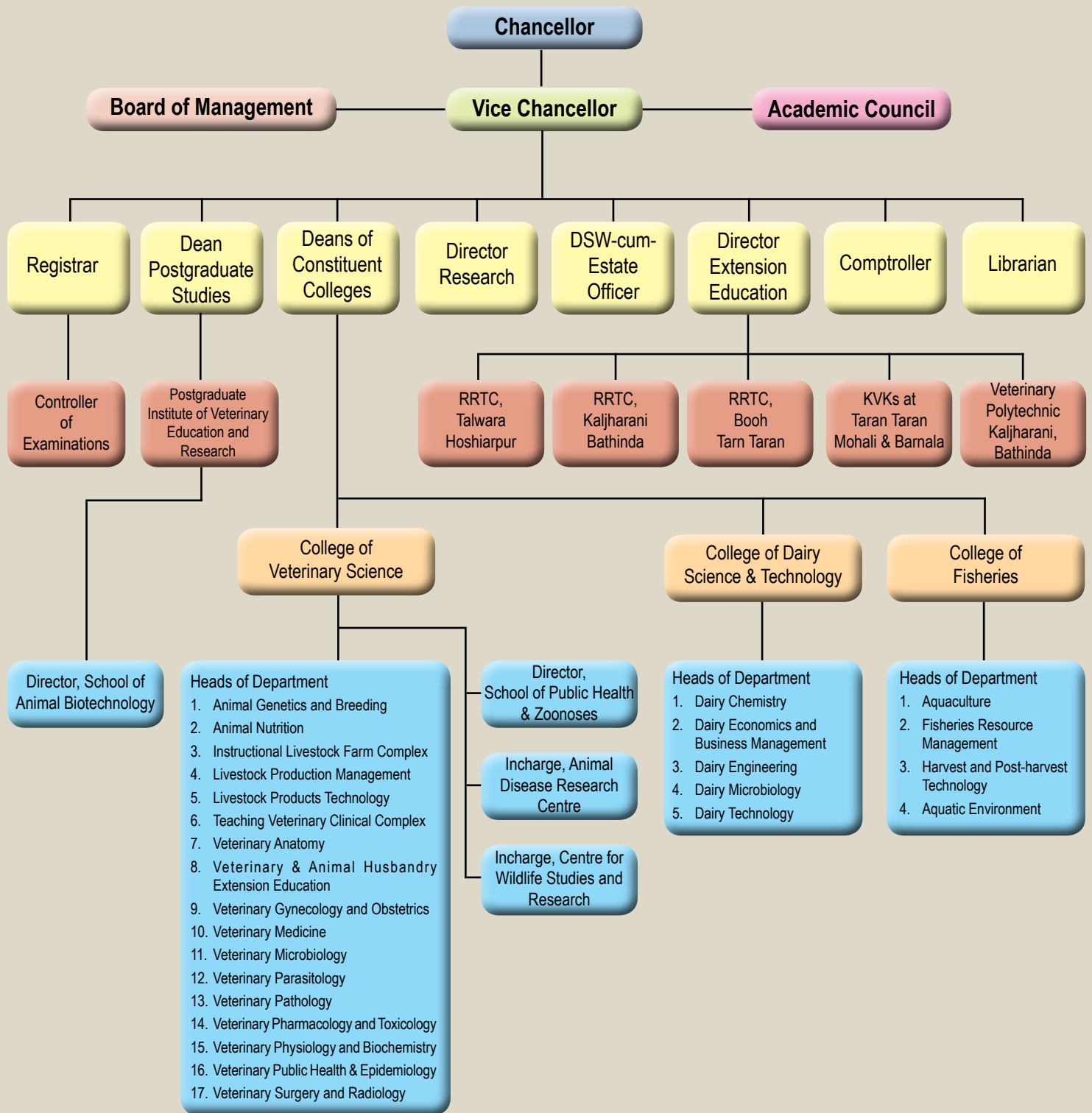
ABOUT THE UNIVERSITY



Guru Angad Dev Veterinary and Animal Sciences University started functioning on 21st April, 2006 at Ludhiana, as per Punjab Act no. 16 of 2005 to serve the society by promoting the livestock production, health and prevention of the diseases through integrated teaching, research and extension programmes. The University was established with the following goals and objectives:

- To provide adequate supply of trained veterinary professionals including Master's and Doctorate level specialists capable of handling livestock health and production aspects according to the needs of the State Government and allied agencies.
- To undertake research work in selected areas and wherever applicable following multi-disciplinary approach.
- To provide opportunities for continuing professional education in veterinary science.
- To provide consultancy and specialist services to livestock owners, government, semi-government and allied agencies.
- To run "Referral" hospital for specialized treatment of the livestock patients and to provide clinical training to the students.
- To provide technical expert opinion to different government and other agencies.
- To foster faculty development by providing them opportunities to participate in appropriate training programmes, conferences, workshops, seminars, symposia etc. and avail opportunities in exchange programmes.
- To encourage cooperation and collaboration with other departments, colleges, universities and industries both national and international.

ORGANIZATIONAL SETUP

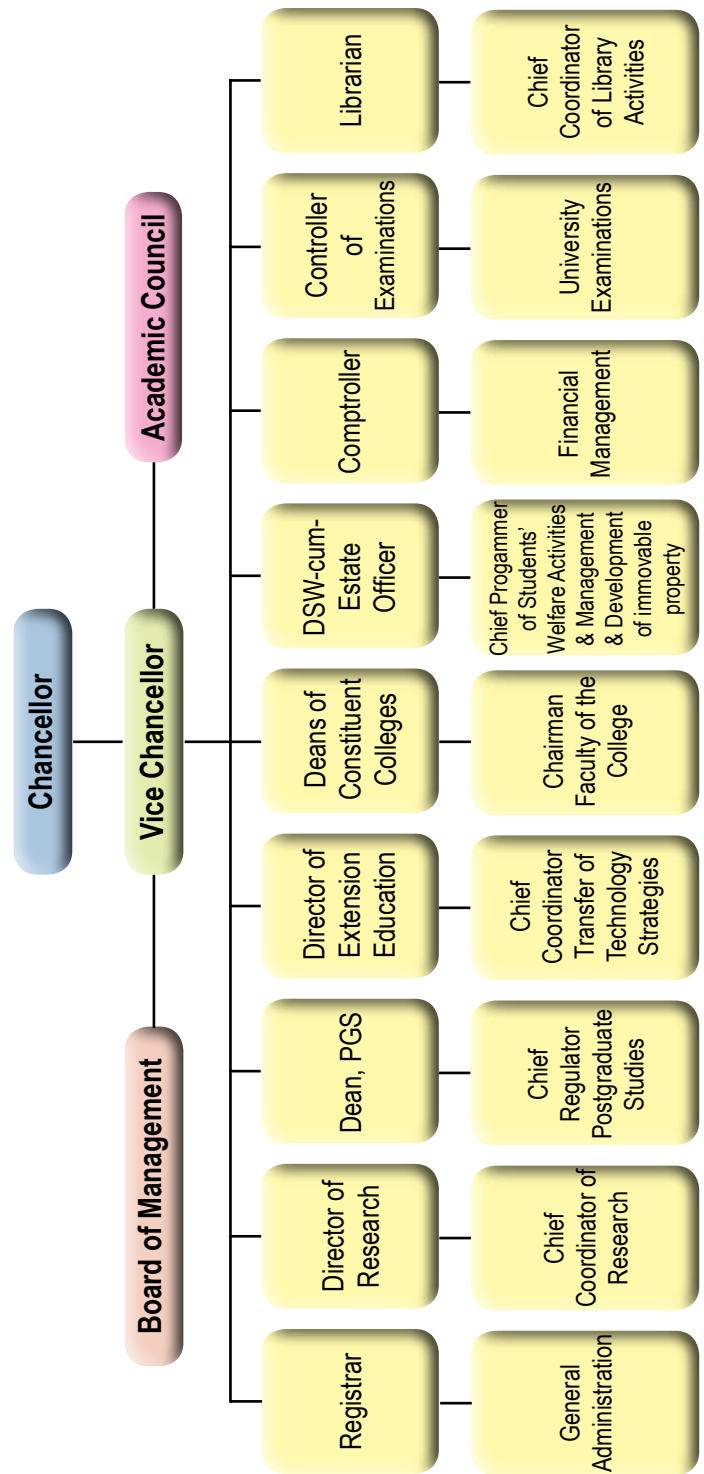


The functioning of the university is governed by following bodies focused at education, research and extension activities:

- Board of Management
- Academic Council
- Committee on Student's Welfare
- Research Advisory Committee
- Extension Education Advisory Committee
- Resident Instruction Committee
- Postgraduate Committee
- Board of Studies

The Board of Management is the highest administrative body which controls the finances and assets of the university, appointments of all officers and teachers and provides overall guidance on running of the university. The Academic Council administers the academic functions of the university and is responsible for maintenance of standards of institution, education and examination. Committee on students' welfare regulates various students' activities. Research Advisory Committee regulates the allocation of funds for research, conditions for accepting grants and other matters regarding research programmes of the university. Extension Education Advisory Committee coordinates university extension programmes with the state and the center and devises ways and means to implement university extension education programmes. Resident Instruction Committee makes recommendations to the Academic Council concerning the new curricula and arrangement, alteration and abolition of existing curricula. Postgraduate Committee examines the courses and curricula for postgraduate students recommended by the Board of Studies before submission to Academic Council. Board of studies proposes to the Academic Council through Resident Instruction Committee, the courses of study and curricula for various teaching programmes. Board also reviews from time to time the standards of teaching and evaluation of students.

FUNCTIONAL CHART



ADMINISTRATION

BOARD OF MANAGEMENT

Honorary Chairman

- **His Excellency Sh. Shivraj Vishwanath Patil**, Chancellor and Governor of Punjab, Chandigarh

Working Chairman

- **Dr. V.K. Taneja**, Vice-Chancellor, Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana

Members

Ex-officio Members

- **Sh. Rakesh Singh**, IAS, Chief Secretary to Govt. Punjab, Chandigarh
- **Sh. Suresh Kumar**, IAS, Financial Commissioner Development & Principal Secretary to Govt. Punjab, Department of Agriculture, Chandigarh
- **Sh. D.P. Reddy**, IAS, Principal Secretary to Govt. Punjab, Department of Finance, Chandigarh
- **Sh. G. Vajralingam**, IAS, Financial Commissioner, Department of Animal Husbandry, Dairy Development & Fisheries, Punjab, Chandigarh
- **Dr. Harjinderjeet Singh Sandha**, Director of Animal Husbandry, Punjab, Chandigarh
- **Sh. Inderjit Singh**, Director of Dairy Development, Punjab, Chandigarh
- **Sh. B.K. Sood**, Director and Warden of Fisheries, Punjab, Chandigarh
- **Dr. Gaya Prasad**, Assistant Director General (Animal Health), ICAR, Krishi Bhavan, New Delhi
- **Dr. Harpal Singh Sandhu**, Dean, COVS, GADVASU, Ludhiana

Non-official Members

- **Dr. A.S. Nanda**, Former Animal Husbandry Commissioner, Department of Animal Husbandry Dairying and Fisheries, Ministry of Agriculture, Govt. of India, Krishi Bhavan, New Delhi
- **Dr. Parampal Singh**, Incharge, Semen Bank, Kothi No. 1, Government Bhupindra Dairy Farm, Jail Road, Patiala
- **Sh. Hakam Singh Jawanda**, Chairman, Bhai Gurdas Group of Institutions, #85, Punia Colony, Opp Satsang Bhawan, Dhuri Road, Sangrur
- **Sh. Sukhharpreet Singh Rode**, V.P.O. Rode, Teh Bagha Purana, Moga
- **Sh. Sanjeev Nagpal**, Engineer, Arya Samaj Road, Fazilka
- **Sh. Ravinderpal Singh**, 15 Snelling Avenue Gravesend, Kent, DA11- 7E.H. England
- **Dr. Baljit Singh**, Professor and Associate Dean (Research), Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, Canada
- **Smt. Paramjit Kaur Landran**, Village Landran, Teh. & Distt. Ajitgarh, Mohali

Special Invitee

- **Dr. B.S. Dhillon**, Vice-Chancellor, Punjab Agricultural University, Ludhiana
- **Dr. V.K. Gandotra**, President, GADVASU Teacher's Association

Secretary

- **Dr. P.D. Juyal**, Registrar, GADVASU, Ludhiana.

ACADEMIC COUNCIL

Chairman

- **Dr. V.K. Taneja**, Vice-Chancellor

Members

- **Dr. S.N.S. Randhawa***, Dean Postgraduate Studies
- **Dr. S.N.S. Randhawa**, Director of Research
- **Dr. H.S. Sandhu**, Dean, College of Veterinary Science
- **Dr. Asha Dhawan**, Dean, College of Fisheries
- **Dr. S.P.S. Sangha***, Dean, College of Dairy Science and Technology
- **Dr. R.S. Sahota***, Director of Extension Education
- **Dr. Meera D Ansal**, Head, Department of Aquaculture
- **Dr. Amrit Lal Saini**, Head, Department of Livestock Production Management
- **Dr. (Mrs.) Neelam Bansal**, Head, Department of Veterinary Anatomy
- **Dr. S.S. Sikka**, Head, Department of Animal Nutrition
- **Dr. N.S. Sharma**, Head, Department of Veterinary Microbiology

Special Invitee

- **Dr. S.P.S. Sangha**, Director Student Welfare-cum-Estate Officer
- **Dr. Sushil Prabhakar**, Controller of Examinations
- **Dr. V.K. Gandotra**, President, GADVASU Teacher's Association
- **Dr. Ramneek**, Director*, School of Animal Biotechnology

Secretary

- **Dr. P.D. Juyal**, Registrar, GADVASU, Ludhiana.

OFFICERS OF THE UNIVERSITY

Chancellor	Sh. Shivraj Vishwanath Patil His Excellency Governor of Punjab
Vice-Chancellor	Dr. V.K. Taneja
Registrar	Dr. P.D. Juyal
Director of Research	Dr. S.N.S. Randhawa
Director of Extension Education	Dr. R.S. Sahota*
Dean, Postgraduate Studies	Dr. S.N.S. Randhawa*
Dean, College of Veterinary Science	Dr. H.S. Sandhu
Dean, College of Dairy Science and Technology	Dr. S.P.S. Sangha*
Dean, College of Fisheries	Dr. Asha Dhawan
Director of Students' Welfare-cum-Estate Officer	Dr. S.P.S. Sangha
Comptroller	Dr. P.D. Juyal*
Librarian	Dr. S. Prabhakar*

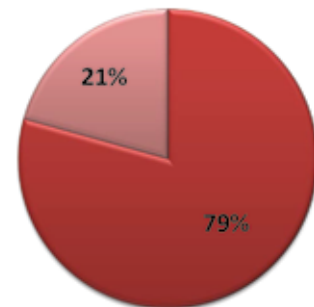
*Additional Charge

FACULTY PROFILE

Institution	Professor	Associate Professor	Assistant Professor	TOTAL
College of Veterinary Science	54	26	66	146
College of Dairy Science & Technology	0	0	11	11
College of Fisheries	2	1	10	13
School of Animal Biotechnology	2	1	7	10
Veterinary Polytechnic	1	1	2	4
Krishi Vigyan Kendra's and Others	0	2	17	19
TOTAL	59	31	113	203

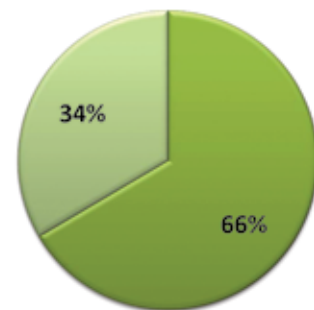
Gender-wise distribution of the faculty

■ Male Faculty ■ Female Faculty



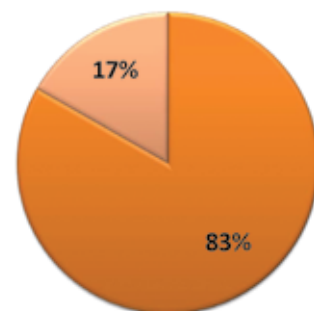
Domicile based distribution of the faculty

■ From Punjab State ■ From Outside States

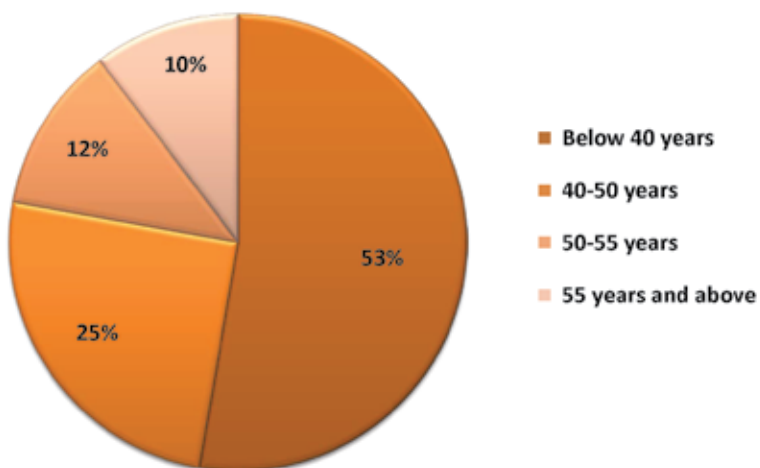


Faculty with doctorate degree

■ Faculty with Doctorate Degree ■ Others

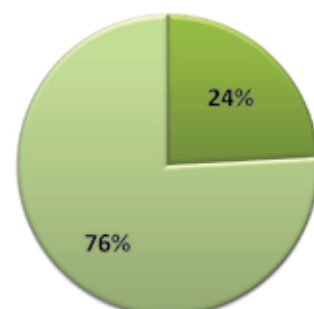


Age-wise distribution of the faculty



Training based breakup of the faculty

■ Faculty Trained in Foreign Institutes ■ Others

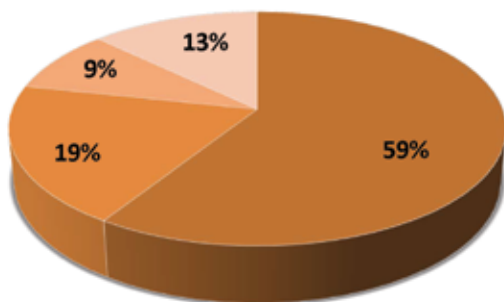


STUDENT PROFILE

Programme	Boys	Girls	Total
B.V.Sc. & A.H.	286	116	402
B.F.Sc.	25	33	58
B. Tech. (Dairy Tech.)	97	16	113
M.V.Sc./M.F.Sc./M.Tech./M.Sc	103	79	182
Ph.D.	50	35	85
PG Diploma in Inland Fisheries (PGDIF)	1	4	5
Diploma in Veterinary Science and Animal Health Technology	125	0	125
Total	687	283	970

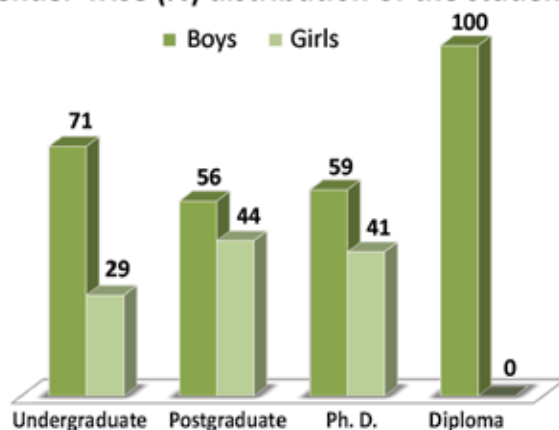
Student on roll during 2013-14

■ Undergraduate ■ Postgraduate ■ Ph. D. ■ Diploma

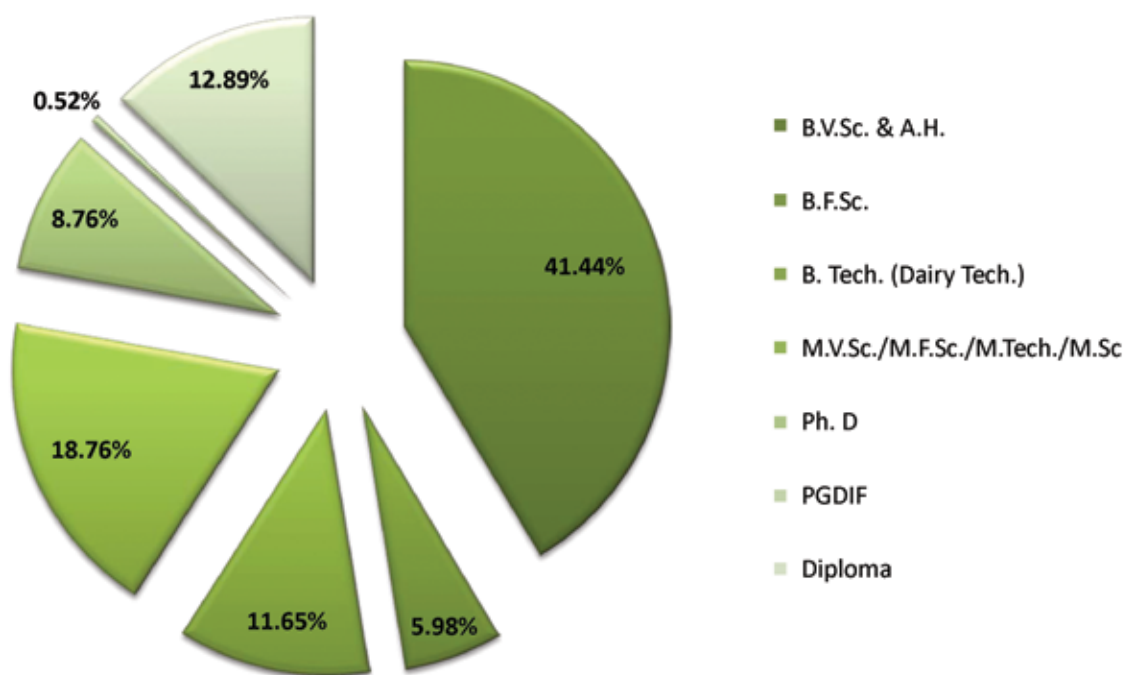


Gender-wise (%) distribution of the students

■ Boys ■ Girls



Distribution (%) of students in different programmes

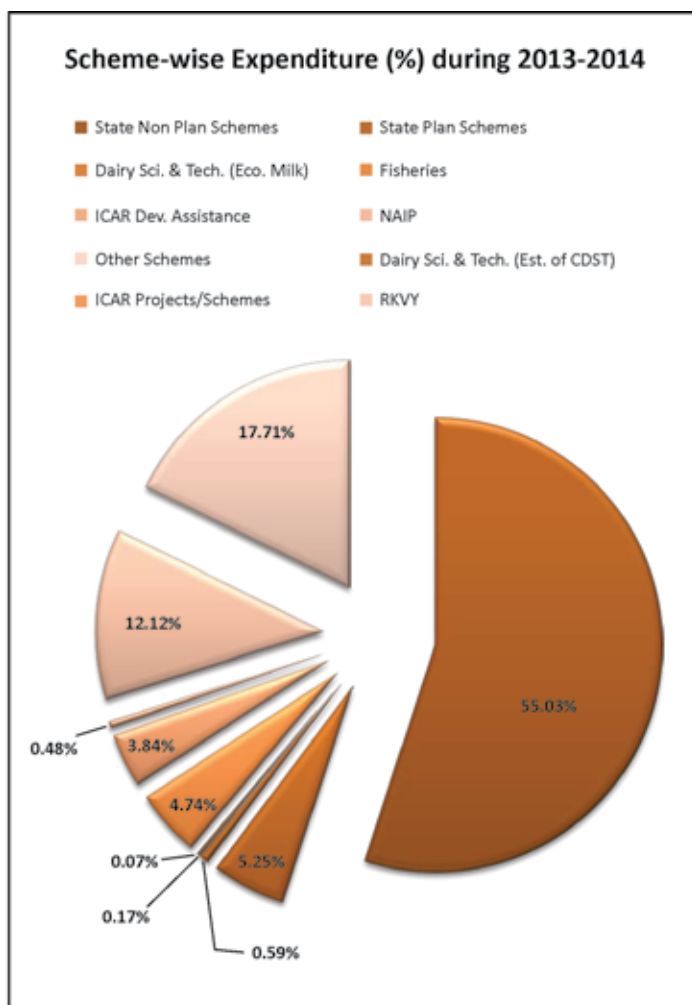
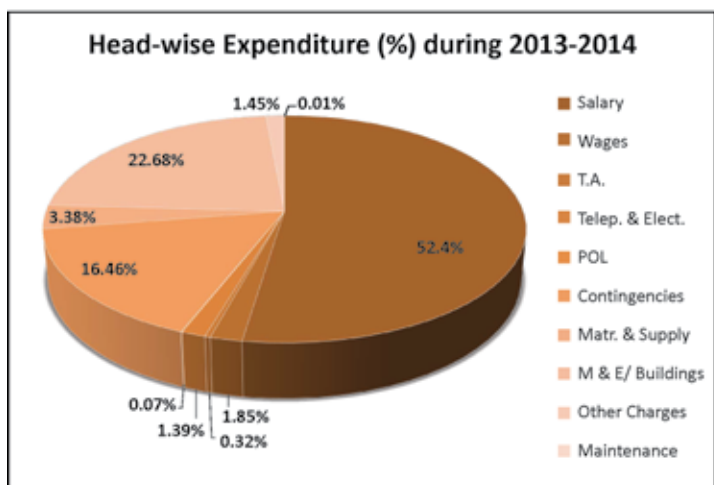
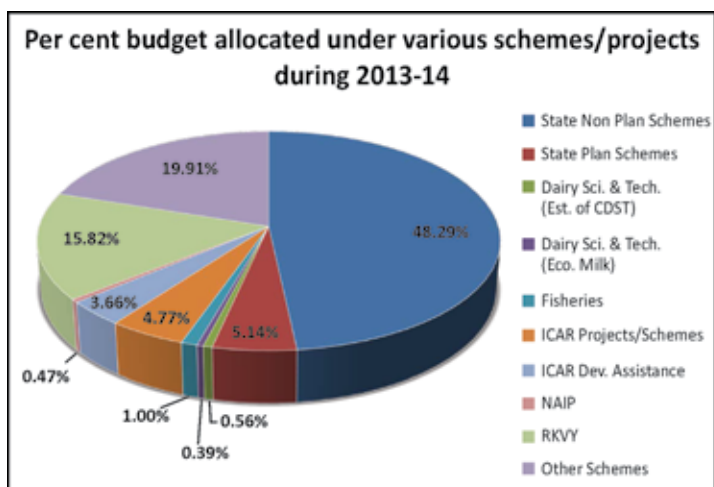


FINANCIAL REPORT

Financial statement indicating budget allocated and amount spent (₹ in lacs) under various schemes/projects during financial year 2013-14

Schemes	Budget Allocated for 2013-2014	Expenditure*				
		Salary	Wages	TA	Contingencies & Others	Total
State Non Plan Schemes	5400.00	5203.78	134.86	8.94	397.16	5744.74
State Plan Schemes	574.62	0.00	0.32	0.00	547.52	547.85
Dairy Sci. & Tech. (Est. of CDST)	62.46	0.00	6.57	0.03	54.83	61.42
Dairy Sci. & Tech. (Eco. Milk)	44.13	13.27	2.17	1.74	0.52	17.71
Fisheries	111.58	0.00	4.55	0.00	2.89	7.44
ICAR Projects/Schemes	533.2	167.44	4.78	4.91	317.53	494.66
ICAR Dev. Assistance	408.79	0.00	0.00	3.44	397.33	400.77
NAIP	52.22	14.05	6.49	0.34	29.52	50.39
RKVY	1768.71	48.98	8.70	0.71	1207.06	1265.46
Other Schemes	2226.40	21.93	24.16	13.75	1788.80	1848.65
Total	11182.11*	5469.45	192.60	33.85	4743.17	10439.08

*Includes grant of ₹ 8645.01 lacs received from various funding agencies during 2013-14 and unspent/revalidated amount of ₹ 2537.1 lacs.



ACADEMIC UNITS

There are three constituent colleges, viz. College of Veterinary Science, College of Dairy Science & Technology, College of Fisheries, which are imparting undergraduate and postgraduate teaching in various discipline. Besides, the university has established School of Animal Biotechnology and School of Public Health & Zoonoses to generate scientific expertise and address various health and environment related issues. Three Regional Livestock Research & Training Centres at Kaljharani (Bathinda), Talwara (Hoshiarpur) and Booh (Taran Taran), and three Krishi Vigyan Kendras at Booh (Taran Taran), Barnala and Mohali are established to cater to the area specific requirements of the livestock owners.



COLLEGE OF VETERINARY SCIENCE

College of Veterinary Science

The College of Veterinary Science was set up in 1969 as a constituent college of Punjab Agricultural University, Ludhiana. Now, this college is a part of Guru Angad Dev Veterinary and Animal Sciences University. The college was created to be a centre of regional, national and international excellence in teaching, research and learning in animal health and production. It carries out teaching, research and extension education programmes pertaining to livestock production and health and has been instrumental in ushering in an era of 'White Revolution' in the State.

The college has highly competent and experienced faculty members who have made significant contributions in research on animal health and production and won various national and international awards. The college is recognized by the Veterinary Council of India and has obtained accreditation from the Indian Council of Agricultural Research (ICAR) in the year 2004. The Minimum Standards of Veterinary Education Degree Course (B.V.Sc. & A.H.) Regulations, 1993 of Veterinary Council of India (VCI), subsequently revised in 2008, have been implemented in the college. External examination system for B.V.Sc. & A.H. programme was introduced from the year 1998 onwards. Two ICAR Centres of Advance Faculty Training in the Departments of Veterinary Surgery & Radiology and Veterinary Gynaecology and Obstetrics exist in the college.

Programmes	Intake Capacity
B.V.Sc. & A.H.	60 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	10 - VCI (based on entrance test conducted by VCI)
	2 - Kashmiri Migrant (based on CET merit)
	12 - NRI (merit based on qualifying exam)
M.V.Sc. in 16 subjects	108 (merit based on qualifying exam)
Ph.D. in 15 subjects	34 (merit based on qualifying exam)

The College of Veterinary Science has 17 departments having excellent laboratory facilities and adequate infrastructure for the undergraduate and postgraduate teaching and research, a well-equipped teaching veterinary hospital to cater to the needs of large and small animal health care. In addition, the college also has an elite dairy herd and poultry farm for teaching and research.

School of Public Health and Zoonoses has been established after upgradation of Department of Veterinary Public Health and has the mandate for teaching and research on diagnostic and prevention of zoonotic diseases; food safety and quality control; environmental hygiene and pollutants; and food borne pathogens and their toxins. School of Public Health and Zoonosis thus would be instrumental in developing strategies for control of zoonotic diseases, recommending food safety guidelines through novel research in the area of food safety, food production and processing practices prevalent in the region. The School has well equipped laboratories for Residue Analysis, Zoonoses, Food safety and quality control, Water testing and Brucellosis diagnostics. International collaborative research project with University of Saskatchewan, Canada under International Partnership Fund Programme to study impact of environmental pollutants on human and animal health is also operational in the school. The School of Public Health and Zoonoses has initiated a Collaborative Research and Training Experience on infections disease, food safety and Public Policy funded by Natural Science and Engineering Research Council, Canada in collaboration with University of Saskatchewan, Canada and Free University, Berlin.

The college offers the following programmes of study:

- B.V.Sc. & A.H. (5-year programme)
- M.V.Sc.
- Ph.D.

The programme leading to the award of the B.V.Sc. & A.H. degree is designed to equip graduates with the knowledge and skills essential to a veterinary career. The programme is divided into three phases. The pre-clinical phase, undertaken in years one and two, provides education in basic sciences such as anatomy, physiology and biochemistry, as well as in animal husbandry through intramural learning. The para-clinical phase, undertaken in years three and four, includes bridging subjects between the pre-clinical and clinical phases, such as pathology, microbiology, parasitology and pharmacology. The clinical phase (surgery, medicine and gynaecology) starts in year four and culminates in the fifth year. At the end of course work (9 semesters), the students undergo a compulsory rotational internship programme of six calendar months on the training in diagnostic laboratories, clinical practice and animal production technology. The programme aims to enrich the knowledge of the students to be professionally competent and face the professional challenges.

The successful completion of B.V.Sc.& A.H. programme entitles the graduates to seek mandatory registration with the Punjab State Veterinary Council / Veterinary Council of India as registered veterinary practitioner.

College of Dairy Science and Technology



COLLEGE OF DAIRY SCIENCE AND TECHNOLOGY

Programmes	Intake Capacity
B. Tech. (Dairy Technology)	25 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	4 - ICAR (based on entrance test conducted by ICAR)
	2 - Kashmiri Migrant (based on CET merit)
	3 - NRI (merit based on qualifying exam)
	2 - Nominees from other states which do not have colleges of Dairy Science and Technology (against additional seats)
M. Tech. (Dairy Technology)	2 (merit based on qualifying exam)
	2 - ICAR (based on entrance test conducted by ICAR)

The College of Dairy Science and Technology was established in the year 2008 with the following mandate:

- To produce quality human resource through its undergraduate/postgraduate degree programmes.
- To develop new technologies in the field of milk processing and dairy product development.
- To conduct training programmes and vocational courses for dairy farmers, entrepreneurs & persons from dairy industry.
- To provide consultancy services to dairy farmers, industry, Govt. & non-Govt. agencies involved in dairy development programme.
- To liaise with various dairy development organization(s).

The college offers the following programmes of study:

- B. Tech (Dairy Technology) – 4 year Programme
- M. Tech (Dairy Technology)

The four year B.Tech. (Dairy Technology) programme is a unique job oriented course for the overall professional development of dairy specialists to meet the requirements of industry, research and development. The programme follows the course curriculum as recommended by the 4th Dean's Committee constituted by the Indian Council of Agricultural Research, New Delhi. The programme has been structured into eight semesters. The first six semesters include the courses (Theory & Practicals) on Dairy Technology, Dairy Engineering, Dairy Chemistry, Dairy Microbiology and Dairy Economics & Business Management. Seventh and eighth semesters include in-plant training practical on different aspects of Dairy Technology. M.Tech. (Dairy Technology) was started in the College of Dairy Science and Technology in the academic year 2012-13 to strengthen the research programmes of the college. Under both undergraduate and postgraduate programmes, the students are exposed to every aspect of equipment designing, technology of product making and quality assurance.

College of Fisheries



COLLEGE OF FISHERIES

Programmes	Intake Capacity
B.F.Sc.	18 - Open seats for domicile of Punjab State and UT of Chandigarh (based on CET merit)
	3 - ICAR (based on entrance test conducted by ICAR)
	2- Kashmiri Migrant (based on CET merit)
M.F.Sc (Aquaculture)	3 (merit based on qualifying exam)
	2 - ICAR (based on entrance test conducted by ICAR)
Ph.D. (Aquaculture)	2 (merit based on qualifying exam)
PG Diploma in Inland Fisheries (PGDIF)	5 (State Government nomination)

College of Fisheries was established in April, 2008 with the following objectives:

- To develop qualified human resource in fisheries.
- To carry out basic, applied and adaptive research for higher fish productivity.
- To disseminate the developed technologies to the farmers and entrepreneurs for commercial adoption.

The college has competent and experienced faculty and is well equipped with both laboratory and farm facilities to carry out teaching, research and extension activities efficiently. The college offers following programmes of study:

- B.F.Sc.
- M.F.Sc. in Aquaculture
- Ph. D. in Aquaculture
- Post-graduate Diploma in Inland Fisheries (PGDIF)

The curriculum of the four year UG degree programme (B.F.Sc.) is based on recommendations of the 4th Dean's Committee of the ICAR and is divided into eight semesters. During the first six semesters, courses (theory and practical) cover taxonomy, anatomy, physiology, biology, biochemistry, culture techniques, nutrition, breeding, disease management for finfish and shell fishes, aquatic ecology, culture and capture fisheries resources and their management, post-harvest technology, marketing and trading, economics and statistical methods and extension education. During the 7th semester the students undergo experiential learning programme (credit Hours- 0+25) at the fish farm, College of Fisheries and take up In-plant training (credit hours- 0+20) in the 8th semester which includes practical training at aqua-farms, hatcheries, feed industry, fish markets and processing/value addition units. The curriculum of M.F.Sc and Ph.D in Aquaculture is also based on ICAR recommendations covering both theory and research in the field of advanced aquaculture technologies. One year PG diploma in Inland Fisheries is offered to the in-service candidates of the State Fisheries Department.

Postgraduate Institute of Veterinary Education and Research

Postgraduate institute of Veterinary Education & Research (PGIVER) has been established in 2007 to give impetus to specialized and need-based research and imparting training to graduates of various disciplines. The basic objectives are to develop and strengthen postgraduate education, research and training programs. The priority areas are molecular biology, biotechnology, diagnostics, bioinformatics, communication technology including computer education and business management. The other objectives of PGIVER include strengthening of embryo transfer technology for better productivity in relation to milk, meat and disease resistance, development of molecular techniques for production of better diagnostics, genetically defined marker vaccines and transgenic organisms for producing animal products of superior quality and identification of physiological, biochemical, molecular and cytogenetic markers for early selection of animals and poultry for increased production and quality products.

School of Animal Biotechnology



SCHOOL OF ANIMAL BIOTECHNOLOGY

Programmes	Intake Capacity
M.V.Sc./M.Sc. (Animal Biotechnology)	4 (merit based on qualifying exam)
	1 - ICAR (based on entrance test conducted by ICAR)
	8 (JET of JNU, Delhi)
Ph.D. (Animal Biotechnology)	4 (merit based on qualifying exam)

The Department of Animal Biotechnology was established in February, 2008 under the aegis of PGIVER. In view of the progress made by the department, and the opportunities available in biotechnology, the university established the School of Animal Biotechnology in September 2010 by upgrading the department with the mandate to integrate and strengthen the research in various facets of molecular biology with the aim of improving livestock productivity and healths, and to produce professionally trained manpower.

The broad mandates of the School of Animal Biotechnology include:

- To generate scientific expertise and human resource in various facets of animal biotechnology
- To develop specialized and state of art facilities for research in cutting edge fields of biotechnology
- To undertake research in different areas of molecular biology and biotechnology for improving animal health and productivity

The thrust areas in Animal Biotechnology are:

- Animal genomics, proteomics vis-a-vis genetic improvement
- Animal disease diagnostics and vaccinology

Presently the School is offering the following programs of study:

- M.V.Sc./ M.Sc. (Animal Biotechnology)
- Ph.D. (Animal Biotechnology)

The M.V.Sc./M.Sc. and Ph.D. programs in Animal Biotechnology follow the course curriculum as recommended by the Indian Council of Agricultural Research for the Animal Biotechnology group. The first batch of the students of M.V.Sc./M.Sc. has completed their program in July/August, 2010. School of Animal Biotechnology has been granted accreditation to confer M.V.Sc./ M.Sc. and Ph.D degrees under the aegis of Ministry of Science and Technology.

Veterinary Polytechnic, Kaljharani, Bathinda



VETERINARY POLYTECHNIC, KALJHARANI

Programmes	Intake Capacity
Diploma in Veterinary Science & Animal Health Technology	60 (merit based on qualifying exam)
	2 (For residents of Kaljharani)

With an aim to produce trained supporting manpower capable of handling livestock health and production, GADVASU has established a Veterinary Polytechnic at Kaljharani, District Bathinda for imparting Diploma in Veterinary Science & Animal Health Technology in 2010. The diploma has been designed for the training of veterinary pharmacist to support and complement veterinary practitioners in a better way, in order to provide better care and guided treatment to domesticated animals within veterinary hospitals, veterinary colleges, research institutes etc.

Regional Research and Training Centre at Kaljharani, Bathinda

Keeping in view the decline in Sahiwal cow population in the State due to extensive crossbreeding, the GADVASU has established a regional research station at village Kaljharani (Bathinda) in 2008 for Conservation and Genetic improvement of Sahiwal cattle. The Centre has been strengthened with establishment of herds of Sahiwal cattle, crossbred cattle, Beetal goats, fish unit, vermi-compost unit and honey bee unit for area specific studies and demonstration purposes.

Regional Livestock and Poultry Research and Training Centre at Bhatoli, Talwara

This centre has been established at Bhatoli (Talwara) in 2008 at Hoshiarpur district for transfer of the technologies developed by the university to the Kandi area of the State. The agricultural farming system of Kandi area is different from the rest of the State because of the rain fed sub-mountainous area, lack of awareness about improved animal production systems and poor financial resources for managing the input systems. The agro-climatic conditions of Kandi area including the type of feed and fodder resources are also different from those prevailing in other parts of the State. This centre is providing extension services to the farmers for improving the livestock enterprises particularly sheep and goat which can be reared effectively in this area. The centre is also providing

a strong supporting hand for the proper implementation of the NAIP sub-project on "Sustainable livestock based farming system for livelihood security in Hoshiarpur district of Punjab".

Regional Research and Training Centre, Booh, Tarn Taran

GADVASU has been established with the aim to spearhead research, teaching and extension of emerging issues related to livestock development in the State of Punjab. Recognizing the conservation and proliferation of Nili Ravi as one of its priority areas for research and development, GADVASU has established one Regional Research and Training Centre for conservation, improvement and proliferation of Nili Ravi buffaloes at Booh, Dist. Tarn Taran which is the natural habitat of Nili Ravi buffaloes.

Counselling and Placement Cell

The university has a placement cell which is manned by experienced members well-versed with job opportunities in Veterinary & Animal Husbandry, Fisheries and Dairy sectors. The placement cell is involved in organizing different activities for the personality development and to provide information and guidance for the better placement of the young graduates of the university. The university has a very impressive track record of placement of its graduates in highly competitive organizations both within and outside the country.



Oath Taking Ceremony of passing out veterinary graduates

Academic programs of the university are of high standard and attract students and fellows both at national and international level for education and research.

Educational Programme(s)

Admissions to the various undergraduate programs of the university, and Diploma for Veterinary Pharmacists were strictly on the basis of entrance examinations conducted by the Controller of Examinations.

Entrance Tests conducted by Controller of Examinations for admission to various programmes

Test	Date of Test	Number of Applications Received	Number of Candidates appeared in the test
Common Entrance Test (CET-2013) for admission to undergraduate programs of the university	26.06.2013	2595	2245

The detail of admissions made in various undergraduate and postgraduate programmes for the academic session 2013-14

Program	General/ Reserve Categories	VCI/ICAR/ JNU/ State Govt. Nominations	NRI Seats/ Foreign Nationals	Total
B.V.Sc. & A.H.	61	06	13	80
B.F.Sc.	20	-	-	20
B. Tech. (Dairy Technology)	27	02	-	29
M.V.Sc./M.Sc. (ABT)/ M.F.Sc. / M. Tech. (Dairy Technology)	52	35	01	88
Ph.D.	23	-	-	23
PGDiploma in Inland Fisheries (PGDIF)	-	5	-	05
Diploma in Veterinary Science Animal Health Technology	62	-	-	62
Grand Total				307

College of Veterinary Science

The total number of students admitted in the College of Veterinary Science for the session 2013-14 was 172 which included 80 in B.V.Sc. and A.H., 74 in M.V.Sc. and 18 in Ph.D program. Among 172 students admitted, 93 were male and 79 were female.

During 2013-14, a total of 123 students' successfully completed their degrees, of which 53, 62 and 8 students completed B.V.Sc. & A.H., M.V.Sc. and Ph. D. programmes in different disciplines, respectively.

Scholarships/Fellowships

The university awards merit scholarships to students for academic excellence. During 2013-14, University Merit Scholarship was given to 40 undergraduate, 28 M.V.Sc. and 16 Ph.D students. Junior Research Fellowship of ICAR was awarded to 11 M.V.Sc. students and Senior Research Fellowship to one Ph.D student.

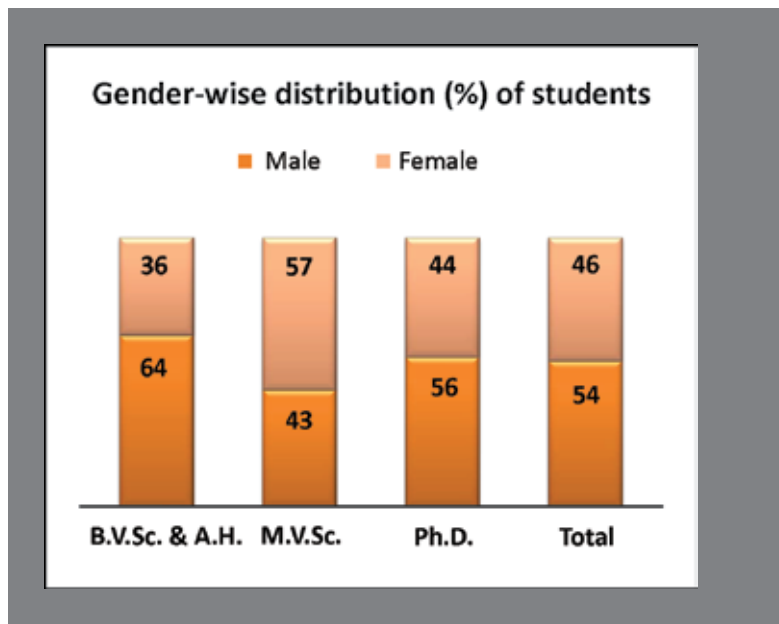
Courses Taught

The undergraduate students of the college were offered courses as per Veterinary Council of India – Minimum Standards of Veterinary Education Degree Course (B.V.Sc & A.H.) Regulations, 2008. The students were offered 36 courses in the Semester I and 32 courses in Semester II according to the new guidelines and 11 courses in Semester I and 11 courses in Semester II as per the old guidelines. Postgraduate students were offered courses in their respective major, minor and supporting field as approved by the Dean, Postgraduate Studies.

Thesis/Dissertations

Master of Veterinary Science

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
1.	Chougule Satish Suresh	June, 2013	VETERINARY MICROBIOLOGY "Studies on biofilm formation by salmonella enteritidis and to evaluate the effect of bacteriophage on it"
2.	Gauri Jairath	July, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Shelf-life extension of goat meat bites using edible coatings and natural antioxidants"
3.	Anuradha Yadav	July, 2013	ANIMAL NUTRITION "Effect of feed acidification on the performance of broilers"
4.	Harveen Kaur Randhawa	July, 2013	VETERINARY PHYSIOLOGY "Effect of amla powder supplementation on physiological and blood biochemical responses in heat stressed goats".
5.	Shikha Sharma	July, 2013	VETERINARY PHYSIOLOGY "Effect of bypass fat supplementation on blood biochemical responses and reproductive performance in heat stressed goats"
6.	Siddharth Gautam	July, 2013	VETERINARY PATHOLOGY "Possible role of pesticide residues in canine mammary tumor with special reference to molecular oncogenesis"
7.	Navdeep Singh	July, 2013	VETERINARY GYNAECOLOGY & OBSTETRICS "Studies on cryocapacitation in buffalo bull sperm and its minimization by supplementing extender with cholesterol loaded cyclodextrin"



Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
8.	Prapat Singh	July, 2013	VETERINARY SURGERY & RADIOLOGY "Surgical management of oral and dental affections in dogs"
9.	Tarun Pal Singh	August, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Development of chitosan based edible antimicrobial films for the extension of shelf life of chicken <i>lollipops</i> "
10.	Subrat Kumar Dash	August, 2013	VETERINARY BIOCHEMISTRY "Biochemical studies on mammary gland tumor in bitches".
11.	Mukesh Mangal	August, 2013	VETERINARY PHARMACOLOGY & TOXICOLOGY "Pharmacokinetic and toxicological studies of cefquinome in buffalo calves"
12.	Shikha Sharma	August, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Development and storage stability of hurdle treated chicken meat croquettes"
13.	Sudhakar Savaram	August, 2013	VETERINARY PHARMACOLOGY & TOXICOLOGY "Disposition of cloxacillin in healthy and fenvalerate exposed buffalo calves"
14.	Kulvinder Singh Sandhu	August, 2013	LIVESTOCK PRODUCTION MANAGEMENT "Studies on management strategies to reduce weaning stress in piglets"
15.	Sreeshitha S.G.	August, 2013	VETERINARY PHARMACOLOGY & TOXICOLOGY "Influence of subchronic oral exposure of quinalphos on the pharmacokinetics of lincomycin in buffalo calves"
16.	Sivaramakrishna Akondi	August, 2013	VETERINARY MICROBIOLOGY Studies on <i>Pasteurella multocida</i> with special reference to detection and virulence typing"
17.	V. D. Sravani Gantasala	August, 2013	VETERINARY MICROBIOLOGY "Molecular characterization of bovine rotavirus in neonatal calves by 'P' and 'G' genotyping"
18.	Vimlesh Gupta	August, 2013	VETERINARY MICROBIOLOGY "Application of bacteriophages in pen side diagnosis of some common infectious diseases of livestock "
19.	Milanjeet	August, 2013	VETERINARY PARASITOLOGY "Prevalence & molecular detection of canine monocytic ehrlichiosis"
20.	Karuna Rai	August, 2013	VETERINARY PUBLIC HEALTH "Studies on molecular differentiation and sexing of bovine meat"
21.	Anil Kumar Sharma	August, 2013	LIVESTOCK PRODUCTION MANAGEMENT "Evaluation of aerobic composting as suitable alternative for poultry farm waste management "
22.	Kanwaldeep Singh Mann	August, 2013	LIVESTOCK PRODUCTION MANAGEMENT "Studies on weaning stress management in beetal kids"
23.	Sarada Prasanna Sahoo	August, 2013	LIVESTOCK PRODUCTION MANAGEMENT "Comparative efficacy of different litter amendments in broiler production"
24.	Soya Rungsung	August, 2013	VETERINARY PHARMACOLOGY & TOXICOLOGY "Ameliorative effect of selenium on enrofloxacin induced testicular toxicity in rats".
25.	Stanzin Zadon	September, 2013	VETERINARY MICROBIOLOGY "Development and application of the novel loop mediated isothermal amplification (LAMP) for rapid detection of Brucella species"
26.	H.Saraniya	September, 2013	VETERINARY MEDICINE "Studies on anaemia of chronic renal failure in dogs and its management with recombinant human erythropoietin"
27.	Kamlesh Kumar Ahirwar	September, 2013	VETERINARY GYNAECOLOGY & OBSTETRICS "Effect of season on oocyte quality and characteristics of ovarian follicular fluid in buffaloes"

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
28.	Dimple Puri	September, 2013	VETERINARY MEDICINE "Studies on categorization of prevalent diseases and clinic biochemical profile of geriatric dogs"
29.	Adarsh Mishra	September, 2013	VETERINARY MICROBIOLOGY "Studies on the respiratory tract infections in poultry in relation to mycotoxins in feed"
30.	Lahari Laddika	September, 2013	VETERINARY MICROBIOLOGY "Evaluation of bacteriophages and microencapsulated bacteriophages against Salmonella under in vivo condition"
31.	Hitesh Jaswal S	September, 2013	VETERINARY PARASITOLOGY "Polymerase chain reaction based assay for diagnosis of <i>Anaplasma marginale</i> infection in tick infested cattle"
32.	Ajaybir Singh Dhaliwal	September, 2013	VETERINARY SURGERY AND RADIOLOGY "Studies on the use of polypropylene mesh for repair of body wall hernias in farm and companion animals"
33.	Nancy Laldinpuii	September, 2013	VETERINARY & ANIMAL HUSBANDRY EXTENSION EDUCATION "Studies on the dairy farming practices followed and training needs of dairy farmers in Punjab"
34.	Amil Challana	September, 2013	VETERINARY ANATOMY "Study on histogenesis and morphogenesis of mammary glands in buffalo (<i>Bubalus bubalis</i>)"
35.	Aejaz Ahmad Wani	September, 2013	VETERINARY GYNAECOLOGY & OBSTETRICS "Effect of antioxidant and ecbolic treatment on uterine health in buffaloes subjected to fetotomy operation"
36.	Rahul Kumar	September, 2013	VETERINARY PATHOLOGY "Clinicopathological studies on vitamin D3 toxicity in broiler chicks"
37.	Supriya Beri	September, 2013	VETERINARY PHARMACOLOGY & TOXICOLOGY "Comparative antibacterial activity of fluoroquinolones and ceftiofur against <i>Escherichia coli</i> in diarrheic buffalo calves"
38.	M. Jagan Mohan Reddy	September, 2013	VETERINARY MICROBIOLOGY "Studies on the efficacy of brucella phage and its endolysin in therapy against brucella abortus"
39.	Shah Riaz Ahmed Chowdhary	September, 2013	VETERINARY PHYSIOLOGY "Effect of summer heat stress on quality of cervico-vaginal mucus in relation to reproductive performance in murrah buffaloes"
40.	Sawant Laximan Navsu	September, 2013	VETERINARY PUBLIC HEALTH "Prevalence and molecular characterization of <i>Listeria</i> species in bovine milk".
41.	Pradeep Chawhan	September, 2013	VETERINARY PUBLIC HEALTH "Prevalence and molecular epidemiology of <i>Taenia solium</i> cysticercosis in pigs in Punjab"
42.	Tawheed Ahmad Shafi	September, 2013	VETERINARY MEDICINE "Evaluation of therapeutic potential of herbal therapy in bovine mastitis"
43.	Parminder Kaur	September, 2013	VETERINARY SURGERY AND RADIOLOGY "Diagnostic approaches to musculoskeletal disorders in large animals with special reference to ultrasonography".
44.	Jatinderveer Kaur Billing	September, 2013	VETERINARY ANATOMY "Histomorphological and histochemical studies on thyroid gland of buffalo during prenatal development".
45.	Shivdeep Singh	September, 2013	VETERINARY MEDICINE "Studies on Efficacy of area specific mineral mixture on general health, production and reproduction in dairy animals of central zone of Punjab".

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
46.	Neysa Grace Diniz	September, 2013	VETERINARY SURGERY & RADIOLOGY "Ultrasonographic studies on the topography of reticulum and omasum in bovine"
47.	Saptak Dey	September, 2013	VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION "Scientific documentation of ethno veterinary practices followed in diary animals in rural Punjab"
48.	Amritpal Singh	September, 2013	VETERINARY PARASITOLOGY "Prevalence & molecular detection of canine babesiosis"
49.	R.D. Srinath	September, 2013	VETERINARY ANATOMY "Study on prenatal development of brain in Indian buffalo (<i>Bubalus bubalis</i>)"
50.	Sahiba Mann	September, 2013	VETERINARY MEDICINE "Management of chronic renal failure in dogs through therapeutic and dietary Intervention"
51.	Ravneet Kaur	October, 2013	LIVESTOCK PRODUCTS TECHNOLOGY "Processing quality and storage stability of functional barbeque chicken prepared from spent hen"
52.	Carvalho Keara Sessa	October, 2013	VETERINARY MEDICINE "Mineral imbalances in dairy animals raised on alkali soils of Punjab and its therapy with area specific mineral mixture"
53.	Jerry Ramnieng Joute	October, 2013	VETERINARY PUBLIC HEALTH "Prevalence and molecular epidemiology of <i>Cryptosporidium parvum</i> in cattle in Punjab and its public health significance"
54.	Pranoti Sharma	October, 2013	VETERINARY PATHOLOGY "Studies on ante-mortem detection of rabies from skin: patho molecular approaches"
55.	Bachint Bir Singh	October, 2013	VETERINARY MEDICINE "Clinical evaluation, diagnosis and medical management of common eye affection in dogs"
56.	Somya Rao	October, 2013	VETERINARY PHYSIOLOGY "Effect of UMMB lick on ruminal profile of buffalo calves exclusively fed wheat straw".
57.	Suiding Hinglak	October, 2013	VETERINARY GYNAECOLOGY & OBSTETRICS "Studies on reducing age at first calving by oral progesterone feeding in pubertal murrah buffalo heifers"
58.	Avtar Singh Gill	November, 2013	VETERINARY SURGERY AND RADIOLOGY "Comparison of ketamine and thiopentone as induction agent for general anaesthesia with butorphanol – midazolam premedication in bovine"
59.	Chandreyee Sen	December, 2013	VETERINARY MEDICINE "Diagnostic and Therapeutic studies on diarrhoea in dogs"
60.	Princejot Singh	December, 2013	VETERINARY AND ANIMAL HUSBANDRY EXTENSION EDUCATION "To study the effect of region and herd size on dairy management parameters in commercial dairy farms of Punjab".
61.	Harneet Kaur	January, 2014	VETERINARY PUBLIC HEALTH "Quality analysis of water for environmental pollutant and microbial contaminants in Punjab"
62.	Anukirat Nanda	February, 2014	VETERINARY MEDICINE "Hemato-biochemical changes and comparative diagnostic efficacy of tuberculin testing and gamma interferon assay in bovine tuberculosis"

Sr. No.	Name	Month & Year of completion	Major Subject and Title of Thesis
63.	Neha Chauhan	March, 2014	VETERINARY MEDICINE "Role of hemostatic studies in the prognosis and treatment of equine colic"
64.	Satinderpal Singh Grewal	March, 2014	VETERINARY PHYSIOLOGY "Studies on the effect of Yea Sacc ¹⁰²⁶ supplementation on rumen profile of buffalo calves exclusively fed wheat straw"

Ph. D. Program

1.	Apminder Pal Singh	April, 2013	VETERINARY PATHOLOGY "Studies on immunopathological and molecular diagnostics of infectious causes of diarrhea in bovine calves"
2.	Bibhuti Ranjan	May, 2013	VETERINARY PHARMACOLOGY AND TOXICOLOGY "Evaluation of ameliorative effect of selenium supplementation on carbendazim-induced endocrine disruption"
3.	Anil Kumar Bishnoi	October, 2013	VETERINARY SURGERY AND RADIOLOGY "Studies on the efficacy of composite bone grafts in comminuted long bone fracture healing stabilized by intramedullary interlocking nailing in canine"
4.	Arun Kumar	December, 2013	VETERINARY SURGERY & RADIOLOGY "Clinical studies on surgical affections of abdomen and perineum in equine"
5.	Puneet Malhotra	January, 2014	ANIMAL GENETICS & BREEDING "Genetic evaluation of murrah buffaloes at organized herds"
6.	Adil Mehraj Khan	February, 2014	VETERINARY PHARMACOLOGY & TOXICOLOGY "Evaluation of retinopathic potential of fluoroquinolones"
7.	Befekadu Urga Wakayo	February, 2014	VETERINARY GYNAECOLOGY & OBSTETRICS "Study on endometrial cytokine expression, uterine health and reproductive performance in postpartum dairy cows and buffalo"
8.	Suhail Ahmad Bhat	February, 2014	VETERINARY PARASITOLOGY "Nucleic acid based studies on prevalence on <i>Babesia bigemina</i> infection in cattle and vector tick, <i>Rhipicephalus microplus</i> "
9.	Kamalpreet Kaur Gill	February, 2014	VETERINARY PHARMACOLOGY & TOXICOLOGY "Toxicological studies on fenvalerate, nitrate and their interaction in buffalo calves"
10.	Abhishek Gaurav	March, 2014	VETERINARY PUBLIC HEALTH "Studies on antibiotic residues in milk in Punjab and its public health significance"



Internship students in Large Animal Clinics

Internship Programme

After completion of course work in nine semesters, 48 B.V.Sc. and A.H. students were registered to the six months compulsory internship programme. The students underwent training programme in Veterinary Medicine, Animal Disease Research Centre, Veterinary Surgery and Radiology, Veterinary Gynaecology and Obstetrics, Livestock Production Management, Veterinary Pathology and Teaching Veterinary Clinical Complex for a total period of 6 months.

All India Educational Tour

Sixty two students of B.V.Sc.& A.H. participated in All India Study Tour from January 15-28, 2014. The students visited various Veterinary Colleges, National Institutes, Laboratories and places of academic interest at Mumbai, Goa, Bengaluru, Chennai and Hyderabad.



Students of College of Veterinary Science (2009 batch) at Madras Veterinary College, Chennai

Teaching Veterinary Clinical Complex (TVCC)

The location of different units of Veterinary Clinics and various clinical departments at one place has provided a well integrated and coordinated approach to the diagnosis and treatment of diseases in small and large animals. The department also provides physical facilities for training of undergraduate and postgraduate students; organizes internship programme, provides regular ambulatory service to rural areas; organizes training courses for the field Veterinarians and animal owners; organizes exhibitions at Kisan Melas, Kisan Diwas etc., and provides mass communication through radio, television and printed literature.

In addition to specialized services for disease diagnosis and treatment of animals, TVCC provides 24 hrs emergency services to the farmers and pet owners.

R&V Sqn NCC Unit

R&V Sqn NCC, an integral part of College of Veterinary Sciences, GADVASU, is entrusted with the task of imparting infantry as well as equestrian training to NCC cadets enrolled with this unit. Various NCC Training activities performed by the NCC cadets of 1st Punjab R&V Sqn NCC, GADVASU, Ludhiana during the year 2013-14 are listed below:

- Annual Training Camp was attended by 45 Cadets (SD 25 and SW 20) of this unit from Oct. 21-30, 2013 at NCC Academy, Malout. During the camp lectures were delivered on basic army training and cadets were imparted rigorous training in drill, equestrian and firing etc.

Clinical cases registered in the hospital (Jan 1 to Dec 31, 2013)

	Small animals (dog and cat)	Large animals	Total
Medicine	14089	4127	18216
Surgery	4524	2136	6660
Gyane	727	1059	1786
Total	19340	7322	26662

Total number of lab samples tested (Jan 1 to Dec 31, 2013)

Pathology	6144
Parasitology	3552
Biochemistry	2032
Microbiology	1074
Total	12802



Dr. V.K. Taneja inspecting the 1 Punjab R&V Sqn NCC Cadets during Independence Day Celebrations



A tree plantation drive by the cadets under the theme "ONE CADET ONE TREE"

- NCC week was celebrated from Nov. 11-24, 2013 and cadets of College of Veterinary Science participated in various activities like painting competition, declamation, awareness rallies against social evils and Run for Fun for good health.
- Four students (2 boys and 2 girls) participated in various equestrian activities during Republic Day Camp and Prime Minister Rally which was held from Jan. 1-31, 2014. Cadets Navgeet Singh and Harnoor Kaur were conferred the ranks of Senior Under Officers, while cadets Randhir Singh and Navdeep Khaira were conferred with Under Officers.
- Ten SD cadets of the unit attended Army attachment Camp held at Ferozepur Cantt from Jan. 20, 2014 to Feb. 03, 2014.
- Fifty seven cadets appeared for NCC "C" certificate examination which held at NCC academy, Malout on February 16, 2014.

College of Dairy Science and Technology

During the session 2013-14, the total admissions made in undergraduate programme in B. Tech. (Dairy Technology) were 29. Among these 25 were male students and 4 were female students. Four students were admitted in M.Tech. (Dairy Technology), out of which one student was female.

Scholarships/Fellowships

During 2013-14, university merit scholarship was given to 26 undergraduate and 2 M.Tech. (Dairy Technology) students of College of Dairy Science & Technology. Two students got Post-Metric Scholarship and one student received National Talent Scholarship.

Courses Taught

The undergraduate students were offered courses as per the recommendations of 4th Dean's committee constituted by ICAR, New Delhi. The B. Tech. students were offered 51 courses in 1st and 2nd semester.

All India Study Tour

All India Study Tour of B. Tech (Dairy Technology) students of 4th year (2010 batch) for 7 days was organized from Jan. 6-12, 2014. The route plan of the tour was Ludhiana-Vadodara-Anand-Ahmedabad-Jaipur-New Delhi-Ludhiana, covering the three states viz, Gujarat, Rajasthan and Delhi. The students visited dairy plants at various places and SMC College of Dairy Science and Technology at Anand.



Students of College of Dairy Science & Technology working on Cheese/Paneer Processing Unit

College of Fisheries

Total number of students admitted during 2013-14 in various programs of College of Fisheries were 28, which included 20 in B.F.Sc., five in PGDIF and three in M.F.Sc. Out of these, 15 were male and 12 were female students.

Scholarships/Fellowships

University Merit Scholarship/Fellowship was given to 14 undergraduate, one postgraduate and one doctoral student. ICAR Scholarship (NTS) was given to four undergraduate students.

Courses Taught

The undergraduate students of the college were offered courses as per recommendations of the 4th Dean's Committee of the ICAR. The students were offered 23 courses in the Semester I and 25 courses in Semester II. Postgraduate students were offered courses in their respective major, minor and supporting field as approved by the Dean, Postgraduate Studies.

Thesis/Dissertations

M.F.Sc. in Aquaculture

Sr. No.	Name	Month & Year of completion	Title of Thesis
1.	Brahma Nand Shukla	September, 2013	"Efficacy of duckweed (<i>Spirodela polyrrhiza</i>) in grass carp based poly-culture system"
2.	Archit Shukla	September, 2013	"Effect of supplementary diets on growth and flesh quality of fingerlings of catfish heteropneustes <i>fossilis</i> (Bloch)"

All India Study Tour

All India Educational Tour of 15 days was conducted for five students of PGDIF and 11 students of B.F.Sc. final year from Jan. 16, 2014 to Feb. 01, 2014. The students visited different national institutes like Indian Agricultural Research Institute (IARI), New Delhi, National Agricultural Science Centre (NASC Complex), New Delhi, Agricultural Science Museum, New Delhi, Central Inland Fisheries Research Institute (CIFRI), Barrackpore, Central Institute of Fisheries Education Regional Centre (CIFE RC), Kolkata, Ornamental fish market, Kolkata, Central Institute of Freshwater Aquaculture (CIFA), Kausalyaganga, Bhubaneshwar, Odisha, Central Institute of Fisheries Technology (CIFT), Kochi, Kerala, Central Marine Fisheries Research Institute (CMFRI), Kochi, Kerala, Marine Products Export Development Authority (MPEDA), Kochi, Kerala, National Institute of Oceanography Regional Centre (NIO RC), Kochi, Kerala. The students were made aware of various ongoing teaching, research, extension and developmental activities in these institutes. Students also visited fish landing sites and fishing vessels along with fish museums & aquarium houses.



All India Study Tour by Students of College of Fisheries

School of Animal Biotechnology

Total number of students admitted for the session 2013-14 was 12 which included seven in M.V.Sc./M.Sc and 5 in Ph.D. Out of 12 students, 83.3% (10/12 students) were female and 16.67% (2/12 students) were male.

Courses Taught

A total of 21 courses were offered during the year which included one for UG, 14 for Masters and six for PhD.



Hybridoma Laboratory

Thesis/Dissertations

M.V.Sc./M.Sc. Animal Biotechnology

Sr. No.	Name	Month & Year of completion	Title of Thesis
1.	Kamalpreet Kaur	August, 2013	"Isolation and characterization of lytic bacteriophages against <i>Staphylococcus aureus</i> "
2.	Elza Neelima Mathew	August, 2013	"Cloning, sequencing and expression of the gene encoding heat shock protein-70 (HSP70) from chickens (<i>Gallus gallus</i>)"
3.	Gebremeskel Mamu Werid	August, 2013	"Molecular characterization of mannose binding lectin protein in chickens"
4.	Reddy V.V.S.N. Murthy	August, 2013	"Comparative proteome analysis of <i>Brucella</i> species by two dimensional gel electrophoresis"
5.	Shradha Jamwal	November, 2013	"Cloning, sequencing and expression of genes encoding 86 KDA outer membrane protein (OPR86) from <i>Pseudomonas aeruginosa</i> "
6.	Jasdeep Kaur Dhanoa	November, 2013	"Expression profiling of Leptin and Aromatase – P450 genes in semen of buffalo and crossbred cattle bulls"
7.	Naseer Ahmad Kutchy	November, 2013	"Identification of molecular markers contributing to sperm chromatin integrity in cattle and buffalo bulls"
8.	Navdeep Singh Aujla	December, 2013	"Expression of TLR9 and TNF α in the lungs of mice after single and multiple exposures to poultry barn air"
9.	Mridula	January, 2014	"Molecular characterization of field isolates of Marek's disease virus"

Veterinary Polytechnic, Kaljharani

During the session 2013-14, the total number of students admitted in Diploma in Veterinary Science and Animal Health Technology were 62. All the admitted students were male.

Courses Taught

The diploma students were offered 6 courses in 1st Semester, 6 courses in 2nd semester, 5 courses in 3rd semester and 5 courses in 4th semester.



Elite herd of Murrah

Undertaking need based research on different aspects related to production and health of various livestock species, poultry and fisheries forms an integral part of the mandate of the university. During the year 2013-14, a total of 28 new project proposals were submitted to various funding agencies, viz. University Grants Commission (4), Department of Biotechnology (11), Department of Science and Technology including FIST& SERC (4), Council of Scientific and Industrial Research (2), Indian Council of Medical Research (2), Indian Council of Agricultural Research (2) and others (3).

During the year 2013-14, a total of 215 research schemes were operational in the university as detailed below:

Non Plan Schemes	41
Plan Schemes	22
ICAR Schemes	13
UGC	23
DBT	18
DST	06
ICMR	03
Revolving Fund Schemes	04
Miscellaneous Schemes	16
RKVY Schemes	69
Total	215

Research Highlights

College of Veterinary Science

Animal Genetics and Breeding

Cattle Breeding



Crossbred Cattle

Genetic improvement of crossbred cattle in terms of milk production traits maintained an upward trend at GADVASU dairy farm. Average 305-day milk yield and peak yield were 5,123 kg and 27 kg, respectively with wet average as 13.80 kg. In the elite herd, which is being used for the production of future crossbred bulls, the average 305-day milk yield and complete lactation yield was 6,305 kg and 7,531 kg, respectively with peak yield of 34 kg. In this herd, the maximum 305-day milk yield and peak yield was recorded as 6,447 kg and 37.1 kg, respectively. In crossbred cattle, the average age at first calving was 27.4 months. For the genetic improvement of crossbred cattle in Punjab state, six breeding bulls, 33,156 doses of frozen semen and 2,824 doses of chilled semen were supplied to farmers and other

dairy development agencies.

Buffalo Breeding

Genetic improvement of buffalo is being done through progeny testing of bulls under All India Coordinated Research Project on Buffalo breeding. The best buffalo bulls were selected on the basis of performance of daughters produced at GADVASU, Ludhiana; NDRI, Karnal; CIRB, Hisar; CCSHAU, Hisar and IVRI, Izatnagar and in the villages surrounding Hisar, Ludhiana and Karnal.

Average 305-day milk yield of general buffalo herd was 2,524 kg with 2,961 kg as lactation yield. In elite herd used for production of future young sire, average 305-day milk yield, lactation yield and peak yield was 3,236 kg, 3,658 kg and 16.3 kg, respectively. In the same herd, the maximum 305-day milk yield and peak yield was 3,583 kg and 20 kg, respectively.

Under the Network Project on Buffalo Improvement, in the 14th set, three buffalo bulls were selected. For improvement of buffalo population of the state, 27 buffalo breeding bulls/bull calves, 32,304 doses of frozen semen and 1,362 doses of chilled semen were supplied to the farmers and other dairy development agencies. The semen of test bulls was also supplied to 25 AI centres adopted under Field Progeny Testing Project and daughters were ear tagged for future recording of milk production.

Conservation and improvement of Nili Ravi buffalo

Nili Ravi buffalo is considered as one of the major milch breeds in Asia. Ministry of Animal Husbandry and Dairying, GoI has given responsibility to Punjab state to conserve Nili Ravi breed by procuring from their native breeding



Murrah Buffalo

tracts. Under the project, GADVASU Dairy Research Farm has increased the herd strength of Nili Ravi Buffaloes to 95 with 56 breedable buffaloes. Their average 305-day milk yield and lactation yield was 2,339 kg and 2,644 kg, respectively. In the herd, the peak performer has produced 3,223 kg milk in 305-day lactation and 5,105 kg milk in complete lactation, with the peak yield of 19.5 kg, which is comparable to best of any buffalo breeds. Dissemination of germplasm is a foremost priority and efforts were initiated by supplying three breeding bull/bull calves to progressive dairy farmers.



Nili Ravi Buffalo

Layer Breeding

Rhode Island Red female is a hardy and dual-purpose bird that is well suited to small farmers of the state for improving their economy. Thus, RIR strains have been taken up by GADVASU for their genetic improvement and multiplication. This strain lays 260 eggs / year with an average egg weight as 54 g. The stock is expected to be more popular with small and marginal farmers as brown eggs laid by RIR birds fetch a premium. Since the birds tend to be heavier at the end of lay, the income from the spent-up hens is also higher. These birds perform well on a comparatively lesser management input. Farmers can procure fertile/hatching eggs, day-old chicks and parent stocks from the university.



Rhode Island Red

Broiler Breeding

The commercial broiler (IBL-80) has the potential to attain 1600-1700 g as an average 6-week body weight, with feed efficiency of 1.9 and mortality <5%. Egg weight remained more or less static but egg production to 52 weeks of age has improved significantly. This implied the availability of greater number of chicks/dam. The hatchery operators can procure parent stocks and commercial chicks from GADVASU hatchery.



IBL-80 Broiler

Quail Breeding

Quails are less susceptible to poultry diseases and even do not require majority of the poultry vaccinations. At 5-week age, the commercial cross has average body weight as 240 g. Another strain of quail with white plumage named as 'Punjab White Quail' has average egg weight around 12 g and these eggs are used for pickle preparation. Quail meat is tasty and is thought to be helpful against certain ailments. Quail eggs, day old chicks and 5-week old dressed or live birds can be procured from the university.



Punjab White Quail

Animal Nutrition

Feeding value of maize in dogs

Dry matter and organic matter digestibility of maize in Labrador dogs was 86.3 and 85.8%, respectively. In terms of energy value, the DE and ME data were respectively recorded as 3,304 and 3,239 kcal/kg maize

Impact of garlic and cinnamon supplementation on broiler performance

Supplementation of 1.5% garlic and 0.5% cinnamon improved the growth performance of broilers in terms of the body weight gain and feed conversion efficiency.

Impact of plant's secondary metabolites on nutrient utilization in goat kids

Based on *in vitro* gas production technique, three herbs viz. suva (source of essential oils), kulthi (source of saponin) and babul (source of tannins) were selected for *in vivo* studies. The optimum level selected for these herbs was @ 2% of dry matter intake. Out of these, supplementation of babul increased digestibility of dry matter, organic matter, CP, NDF, ADF, cellulose and hemicelluloses, and improved nitrogen balance/ nitrogen utilization as indicated by lower blood urea. Moreover, babul supplemented diet had best conversion efficiency with respect to microbial nitrogen synthesis/supply.

Nutritional evaluation of Hypsizygus almarius harvested spent wheat-rice straw as livestock feed

Wheat straw (WS), rice straw (RS) and wheat-rice straw (WS₅₀RS₅₀) had low total ash and CP content, and high OM, EE, cell wall constituents and ADL content compared to their spent WS, RS and WS₅₀RS₅₀ counterparts. *In vitro* net gas production (NGP) was lower in the spent straws than the original straws. The NDF digestibility in the spent straws was comparable to their original straws, except that it was depressed in spent RS. The effective degradability of DM in all the spent straws, true OM digestibility in spent RS and spent WS₅₀RS₅₀, and total degradable fractions in spent WS and spent WS₅₀RS₅₀ improved over their original counterparts. It was concluded that spent rice straw could be effectively utilized for livestock feeding.

In vitro gas production and in vivo nutritional evaluation of J1006 and HQPM maize silage

Net gas production, OMD%, NDFD%, microbial biomass production (MBP%) and % efficiency of MBP were similar in both silages. In goats fed HQPM or J10006 silage, silage DM intake (863.25 vs. 775.50 g), cellulose digestibility (73.54 vs. 66.29), TDN intake (553.66 vs. 443.18g) and nitrogen retention (33.21 vs. 20.39) was higher in the former silage.

Nutritional evaluation of pelleted feed containing waste potatoes as replacement of maize grain in cattle feed

Control pelleted feed contained 40% maize and 2% urea, whereas, test pelleted feed contained 30% potato waste, 10% maize and 1% urea besides other ingredients, which were similar. These pelleted feeds and their respective total mixed rations (TMRc and TMRt) with R:C 60:40 were subjected to *in vitro* gas production. A metabolic trail conducted on 12 heifers randomly divided equally and fed pelleted feed along with 5 kg green fodder and wheat straw *ad lib*. Results of *in vitro* gas production indicated almost similar NGP (ml/24 h) in treatment (76.0), control (72.0) and TMRc (69.5) as well as similar OMD% and NDFD%. Thus, waste potatoes can be used as a replacement of maize in cattle feed during potato glut.

Feed analytical services

During the current year, >160 samples of compounded feed, feed ingredients and forage crops were analyzed for various proximate components and farmers were advised based upon the chemical constituents.

Livestock Production Management

Comparative efficacy of different litter amendments in broiler production

Litter amendment influenced litter quality and subsequently growth, carcass characteristics and immune response of broiler chicks. Litter amendments with alum or sodium bisulfate were beneficial to reduce litter pH and overall litter

quality. Sodium bisulfate in litter @ 25 g/feet² effectively controlled pH and microbial load and improved the ambient environment of broiler chicks. Dietary manipulation with yucca supplementation @ 125 mg/kg feed improved desirable traits viz. weight gain, feed efficiency and carcass characteristics by improving the microclimatic condition and immunity.

Aerobic composting as suitable waste management technique for poultry farmers

Treatment of poultry waste containing dead bird carcasses and litter by composting with either paddy straw or sawdust produced a stable compost product that is a valuable source of organic matter, nitrogen, phosphorus and plant nutrients. Locally available indigenous carbonaceous wastes materials can be effectively utilized for making poultry compost. The way of making compost by mixing poultry manure with carbonaceous wastes not only reduces the ammonia loss but also solve the disposal problem of poultry carcasses, litter and agricultural waste products. In addition to the cost and return, other benefits like environmental protection, improved dead bird and waste handling, odor and fly control and reduced storage volume made this method a suitable alternative for poultry farm waste management.

Impact of mineral mixtures containing organic and inorganic zinc and copper on beetal kids

Indigenously prepared zinc and copper lysine chelate containing mineral mixture was at par with the inorganic mineral mixture with zinc sulphate and copper sulphate as mineral source as indicated by their impact on haematological and biochemical profiles in beetal kids.

Impact of feeding crop residue-based feed block in beetal kids under stall-fed conditions

Optimum feed utilization and growth can be obtained in beetal goat kids after feeding the required DCP content in diet. Increasing CP content of diet had no advantage, whereas crop residue based complete feed with adequate DCP is necessary to meet the maintenance and growth requirements. Under different feeding regime, growth rate can be correlated with various haematological, biochemical and hormonal profiles that can help in better understanding of growth physiology.

Impact of bypass fat or amla powder supplementation in heat-stressed goats

Bypass fat supplementation can ameliorate the adverse effect of heat stress on reproductive performance of goats as indicated by increased plasma progesterone and decreased negative energy balance. Moreover, amla powder supplementation, as an antioxidant, can improve reproductive performance of heat stressed goats as suggested by elevated plasma progesterone.

Weaning stress management in beetal goat kids

Supplementing diet with soybean oil for two months and by-pass fat for three months from birth @ 3% of feed is a suitable strategy for improving the body reserve of kids to mitigate weaning stress as well as for getting better performance in terms of body weight, ADG, FCR and economic returns.

Livestock Products Technology

Novel bioactive edible films for extending shelf life of meat based products

Chitosan-based biodegradable edible films can be developed with 2% chitosan and 0.75% glycerol at 40°C drying temperature. The degradability tests of developed films suggested a period of 21-27 days for shrinkage and subsequently complete degradation. Bioactivity of developed films against known food associate organisms was enhanced by the incorporation of nisin and 1.5% lemon grass oil (*Cymbopogon citratus*), 0.5% cinnamaldehyde potassium sorbate and 1.0% v/v eugenol. Starch and Chitosan-based edible films can be developed from the mixture of potato starch and chitosan using starch 4%, glycerol 1.5%, chitosan 1.5% and acetic acid 1%. The development of edible films from whey protein concentrate can be based on the basis of different physic-chemical parameters of film (colour, penetrability, water vapour transmission rate (WVTR), moisture, pH, solubility, transmittance, thickness and density).

The effect of different packaging methods (aerobic, vacuum and MAP) and refrigerated storage (4±1°C) on the quality of developed chicken meat *lollypops* wrapped in developed chitosan based edible antimicrobial films suggested the

Transfer of Technologies

Department of Livestock Products Technology has transferred many technologies on value added products to the entrepreneurs for their commercial exploitation.

Sr. No.	Technology	Name of the party	Remarks
1	Egg Jam	Kansal & Kansal Agro Farms 27, Virat nagar, Model Town, Panipat	Single user
2	Meat cutlets, Meat croquette, Meat samosa	P.P. Chicken Corner Dashmesh Nagar, Moga	Multiple user (Ready-to-eat meat snacks)
3	Emu Meat pickle, burger patties, Emu meat nuggets, Emu meat balls/koftas	Emu farming and Research Private Limited Bibiwala Chowk, Bhatinda	Multiple user (Emu meat products)
4	Emu Meat pickle, Emu meat burger patties, Emu meat nuggets, Emu meat balls/koftas	Punjab Agro Farms Opposite Gurudwara Singh Sabha, Main Road, Majari Tehsil Balachour	Multiple user (Emu meat products)
5	Emu Meat pickle, burger patties, Emu meat nuggets, Emu meat balls/koftas	J.D. Agro Farms, Kartar Colony, Near Military Cantt., Nabha, Disstt. Patiala	Multiple user (Emu meat products) Under process
6	Meat cutlets, Meat croquette, Meat samosa	S. Surinder Singh S/O Dhain Singh, Kangna Chicken Corner, V.P.O. Kangna Bet, Tel Balachur	Multiple user (Ready-to-eat meat snacks)
7	Omega-3 enriched low-fat chicken meat patties, Bioactive compound enriched low-fat chicken meat nuggets	S. Purshotam Singh, President The Banga Co-operative Marketing Society Ltd., Banga, Railway Road, Old Dana Mandi, Banga, Distt. S.B.S. Nagar	Multiple user (Functional/ Health-oriented Meat Products)



Transfer of Technology by Department of Livestock Products Technology, College of Veterinary Science, Guru Angad Dev Veterinary & Animal Sciences University to budding entrepreneurs in the presence of Dr. G. Vajralingam, Financial Commissioner, Animal Husbandry, Fisheries and Dairy Development, Dr Vijay Kumar Taneja, Vice Chancellor and other Officers of the University

successfully storage under modified atmosphere packaging (MAP) conditions at refrigeration temperature ($4\pm 1^\circ\text{C}$) for 35 days without any appreciable effect on sensory quality attributes, oxidative stability and microbial load well below the permissible level.

The antimicrobial activity of Coumarin was expressed as MIC (minimum inhibitory concentration) values for *Staphylococcus aureus*, *Bacillus cereus* and *Shigella flexineri* as 500 ug/ml, *Yersinia enterocolitica* 525 ug/ml whereas *Vibrio parahaemolyticus* and *Listeria monocytogenes* 450 ug/ml *Klebsiella pneumonia*, *Escherichia.coli* and *Salmonella typhimurium* as 475 ug/ml. Comparative efficacy of Nisin and Eugenol in Starch-Chitosan films against different food associated microorganisms using antimicrobial assays was assessed.

Development and storage stability of hurdle treated chicken meat croquettes

Combination of 5% texturized soy protein (TSP) plus 0.5% carrageenan reduced water activity (a_w), increased emulsion stability and cooking yield, and improved sensory quality of chicken meat croquettes. The croquettes prepared from emulsion adjusted to pH 5.6 were superior as compared to those prepared from emulsion with pH 6.0 and 5.2 in respect of physico-chemical quality, colour and texture profiles, and sensory attributes. Eugenol 0.05% as a natural preservative was better compared to chitosan 1% for chicken meat croquettes. The shelf life of chicken meat croquettes in MAP ($\text{CO}_2:\text{N}_2$, 50:50) under refrigerated condition was 45 days against 30 days in control aerobic packaged samples. In brief, hurdle treatment along with MAP storage can improve quality and extend shelf life of chicken meat croquettes.

Shelf-life extension of goat meat bites using edible coatings and natural antioxidants

Three edible coating/enrobing material viz, 0.4% chitosan, 25% Liquid egg white (LEW) and 0.75% carboxymethylcellulose were compared for the development of enrobed goat meat bites (EGMB). On account of higher cooking yield, better pickup and overall acceptability, 25% LEW was selected. The antioxidant potential of aloe vera gel (AVG) was higher than apple peel extract (APE), thus, EGMB incorporated with 3% AVG exhibited higher oxidative stability, colour and textural stability and sensory attributes than EGMB incorporated with APE during refrigerated aerobic storage of 30 days. The effect of packaging conditions (aerobic and MAP; 50% CO_2 and 50% N_2) and refrigerated storage suggested that developed EGMB with 3% AVG can be successfully stored under aerobic packaging conditions for 35 days and 45 days under MAP conditions at $4\pm 1^\circ\text{C}$ temperature with an acceptable sensory, oxidative and microbial quality attributes. The developed EGMB has almost 15% lower calories content and 16.20% lower cost of production. Hence, the developed goat meat bites has commercial significance as low-calorie product at lower cost for better marketability.

Veterinary Anatomy

Prenatal development of buffalo ovary

At 10.0 cm CVRL, differentiation of ovarian cortex and medulla starts. At 37 cm CVRL, the cortex was demarcated into zone-I containing ovigerous cords and zone-II containing newly formed follicles. At 15 cm CVRL, interstitial cells within the medullary tissue-penetrating cortex were first differentiated that were maximum at 20 cm CVRL. At same stage, the ovigerous cords were also visible. With an advancement of fetal age, area occupied by ovarian cortex increased as the ovigerous cords become more extensive, convoluted and elongated. These cords contained germ cells (spherical in shape and appeared towards the ovarian periphery) and pregranulosa cells (in the central part). EM studies showed abundance of lipid droplets and smooth endoplasmic reticulum. At later stages of development, there was regression of ovigerous cords and interstitial cells, which results in the formation of primordial follicles which migrated centrifugally from the inner region of cortex toward the outer.

Microscopic studies on buffalo oocytes

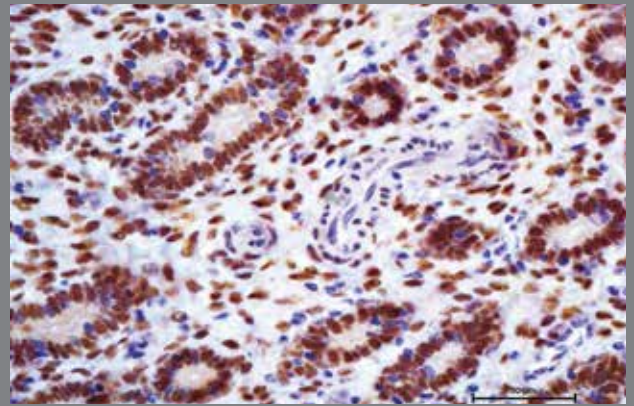
Differential interference contrast and phase contrast microscope studies detailed the 2D images where grade A (oocytes completely surrounded by cumulus cells) and grade B (oocytes partially surrounded by cumulus cells) oocytes were surrounded by cumulus cells. The confocal microscopy revealed 3D views of oocyte. Minimum of 3-4 layers of cumulus cells were observed in all the direction of oocyte of grade A.

Immunolocalization of progesterone receptor in buffalo oviduct

Progesterone receptors were expressed in nuclei of epithelial, stromal and muscular cells in infundibulum, ampulla, isthmus and uterotubal junction. Maximum localization was in lamina epithelialis, where both ciliated and secretory cells were positive. The lining epithelium of oviductal glands was also intensely positive.

Immunolocalization of estrogen receptor alpha (ER α) in buffalo uterus

Estrogen receptor- α , in the nucleus of cells, was localized >50% cells in luminal epithelium, glandular epithelium, stromal cells, myometrium and few cells in perimetrium. In lamina epithelialis, immunoreactivity was higher in follicular phase compared to luteal phase of estrous cycle.



Immunohistochemical localization of ER α in buffalo uterus

Veterinary Gynaecology and Obstetrics

Melatonin: A potential candidate for alleviating seasonal suppression of fertility in buffalo

Melatonin treatment induced ovarian cyclicity (overt or covert estrus) in 44.2% buffalo (vs. 10% controls) around 18.8 ± 2.2 days subsequent to implant insertion. Conception rate, following AI at overt estrus or following fixed-time AI, was high in melatonin-implanted buffalo (62.8% vs. 35%). Melatonin decreased lipid peroxidation and selectively upregulated anti-oxidant enzymes.

Development of an economical and efficient fixed-time AI protocol for buffalo reared in tropical areas

The presence of functional corpus luteum at the start of synchronization protocol or the size of largest follicle at the start of fixed-time AI protocol or at the time of AI had no influence on pregnancy outcome in buffaloes.

Understanding physiological and genomic regulation of summer infertility in buffaloes and its alleviation through genetic selection and endocrine interventions

Melatonin implants treatment was able to improve the success rate of fixed-time AI protocol in summer anestrous buffalo. Studies are undergoing for assessing the polymorphism of melatonin receptor MT1 gene in buffalo that can be associated with the reproductive pattern of buffalo throughout the year.

Impact of cholesterol loaded cyclodextrin on cryocapacitation of buffalo semen

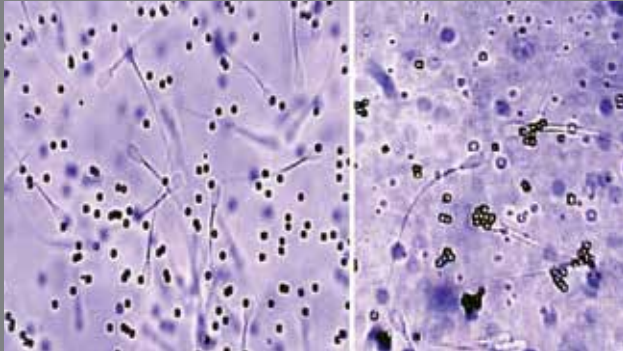
Cholesterol loaded cyclodextrin (CLC) supplementation in the semen extender improved sperm motility and viability at pre-freeze and post-thaw stage. Electrophoresis and western blotting of sperm extract with CLC supplementation showed that freezing increased the intensity of phosphotyrosin protein that was minimized following the supplementation of CLC in extender, thus, indicating minimization of capacitation like changes. In brief, CLC supplementation improved, motility, viability and minimizes the cryocapacitation during cryopreservation.

Uterine immunomodulation: A swap of antibiotherapy in endometritic cattle

Standardization of cytobrush technique to collect uterine samples for cytological examination and bacterial isolation as well as fabrication of instrument required for collecting samples. Cytobrush is an efficient and reliable method for the diagnosis of clinical and subclinical endometritis in repeat breeding dairy cows on the basis of presence of $\geq 5\%$ polymorphonuclear cells (PMN) in the uterine swab. About 180 repeat breeding cows were examined and 40 were confirmed with endometritis based upon uterine cytobrush cytology and microbial assay, thus recording 22.2% incidence of endometritis in dairy cows.

Anti-sperm antibodies in cattle

Blood and cervical mucus of inseminated or non-inseminated heifers/cows indicated the presence of anti-sperm antibodies (ASA) using immunological tests such as immunoperoxidase assay (IPA), Sperm mart test, ELISA, immunofluorescence and immunoblotting. A positive correlation was observed between ASA in blood serum and cervical mucus and number of estrus and AI. About 22.2% of tested cows were common with $\geq 40\%$ IgG particle reacted spermatozoa in the presence of serum and cervical mucus. Sub fertility/infertility in 22.2% of the tested animals was due to the presence



Sperm mart test: Adherence of latex particles to different compartments of spermatozoa (Right Panel) in the presence of blood serum and cervical mucus (Left is control)

of ASA against sperm specific proteins in serum and cervical mucus. The detection of ASA in blood serum of non-inseminated heifers also indicated inheritance.

Progesterone measurements for the evaluation of reproductive status of dairy animals

Progesterone radioimmunoassay using indigenously raised polyclonal progesterone antiserum is being employed for the reproductive status evaluation of dairy cattle and buffalo of Punjab State management of dairy animals. Analysis of 1,458 plasma samples was carried out during 2013-14 that has led to savings of about Rs 3.42 lakh. Veterinary institutes located at Srinagar, Jammu, Hisar are also utilizing the services of RIA lab at GADVASU.

Veterinary Medicine

Culture sensitivity pattern of clinical mastitis

Out of 2005-quarter foremilk samples from 665 dairy animals, 750-quarter milk samples were positive for one or the other bacterium. Isolated organisms from the affected quarters were coagulase-negative staphylococci (65.86%), *Staphylococcus aureus* (20.26%), *Pseudomonas* and Gram-negative spp. (6.00%), *Streptococcus* spp. (4.40%), *Corynebacteria* spp. (1.73%) and others (1.75%). Drug sensitivity revealed ceftriaxone-tazobactam as the most effective drug (81.01%) followed by gentamicin (80.74%) and ceftriaxone-salbactam (69.86%). The least effective drugs were amoxicillin (17.99%), penicillin (19.51%) and ampicillin (22.94%).

Evaluation of therapeutic measures in bovine mastitis

Lactating mastitic cows (n=24) receiving antibiotic treatment, as per the sensitivity pattern, or antibiotic treatment along with herbal and non-proprietary preparations (Mastilep gel for udder massage and Masticare powder p.o.) exhibited average days under treatment as 11.71 ± 4.42 days and 9.18 ± 2.28 days, respectively.

Therapeutic potential of herbs was tested in lactating cows (n=30) with at least one specific subclinical mastitic quarter and were given *O. sanctum* leaf powder, *W. somnifera* root powder or placebo treatment. This eliminated intramammary infections respectively in 69.23%, 64.28% and 26.67% cases at d 14 post-treatment. *O. sanctum* treatment led to decline in CMT score on day 14 (0.80 ± 0.28) and day 28 (0.40 ± 0.23) post-treatment in comparison to CMT score on day 0. Moreover, the SCC of milk in this group showed decline on day 28 ($394.30 \pm 83.91 \times 10^3$ cells/ml) post-treatment in comparison to SCC on day 0 ($762.60 \pm 89.28 \times 10^3$ cells/ml).

Treatment of galactorrhoea (blood in milk) in cows

The treatment of lactating cows (n=10), with galactorrhoea and infected with coagulase negative staphylococci, with Ipecac (a homeopathic medicine @ 1 ml sc daily x 3 days followed by 10 drops twice daily p.o.), as well as rationale antibiotics cured with average days under treatment as 5 ± 2 days.

Fluorosis as a cause of health problems in dairy animals

Low productivity in adult buffalo and cattle in semi-arid Mansa and Ferozepur districts of Punjab was due to poor genetic makeup, inadequate supply of green fodder, concentrates, minerals as well as high fluoride and arsenic content and high pH of drinking water. In these areas, >92% dairy animal population was affected by subclinical fluorosis, which warrants defluoridation of drinking water. Most commonly reported health problems were anestrus, repeat breeding, weakness and low milk yield. Considerable population was suffering from mastitis, lameness, leucoderma, malformation of bones and bony exostosis.

Impact of area specific mineral supplementation in dairy animals of central zone of Punjab

In central zone of Punjab (Ludhiana, Nawanshahr and Fatehgarh Sahib), the overall prevalence of Ca, P, Mg, Cu, Zn and Mn deficiency was respectively recorded as 22.89, 27.12, 14.40, 37.29, 20.34 and 7.63% in cattle and 20.49, 27.04, 14.75, 34.43, 18.03 and 2.46% in buffaloes. The soil and fodder was deficient in Ca, P, Cu and Zn. Various clinical signs such as lameness, low body score condition, low feed intake, low milk yield, dermatological and reproductive problems were observed in deficient animals. Area specific mineral mixture supplementation for 6 months improved milk yield as well as plasma Ca, Cu, Mn, Hb and PCV in buffaloes and Ca and P in cattle. Improvement in body condition score, clinical signs and blood parameters was also observed.

Blood biochemical and mineral status of cows around parturition

Non-lactating multiparous crossbred cows in the last trimester of pregnancy (n=96) being reared in Amritsar and Bathinda district exhibited an increase in plasma BHBA and NEFA with approaching parturition, which peaked in first month post-partum. On the contrary, plasma glucose decreased with approaching parturition, which decreased further in first month post-partum, more specifically in Amritsar district. Variable results in plasma Ca, Mg and Cu levels around peri-parturient period in cows of these districts, especially a decrease after parturition was observed.

Strengthening of diagnostic and critical care facilities for domestic animals

Blood pressure monitoring is done in critically ill patients. Cases with cardiac affections were subjected to electrocardiographic studies. Endoscope is used for diagnosis and subsequent treatment of various gastrointestinal affections. Affections of upper respiratory tract were addressed in pediatric large animals. Eye ailments were diagnosed and successfully treated.

Diagnosis and therapeutic management of important diseases of equines

Equine referral cases (n=102) were diagnosed and treated for impaction, verminous, caecal dilation, volvulus, fecoliths, ant enteritis, peritonitis, diarrhoea, phrangitis, hemoprotozoan, respiratory and urinary tract infections. In colic management, heart rate, CRT and blood lactate was adjudged as the important diagnostic and prognostic indicators. For diagnosing pleuritis, thoracocentesis was used as an efficient diagnostic and therapeutic technique.

Clinical and therapeutic studies on foot lameness in dairy cattle

Feeding of high grain diet was associated with increase in severity of lameness lesions such as heel erosions, white line hemorrhages, white line fissures and overgrown soles in dairy cattle. In animals on high grain diet, supplementation of zinc sulphate along with sodium bicarbonate and magnesium oxide buffer helps in controlling these lesions. Sole ulcers in dairy cattle can be effectively managed by topical dressing of copper sulphate and zinc sulphate in 1:1 ratio every 5th day.

Veterinary Microbiology

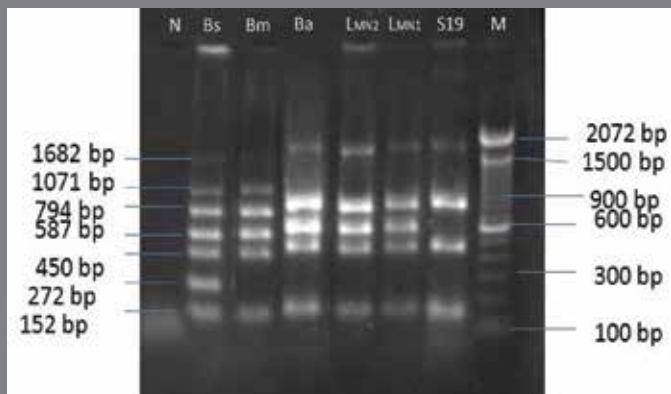
Brucellosis screening

Sera samples collected from cattle (480), buffaloes (234), buffalo bull (7), dogs (33), equine (1) and human (5) were subjected to Rose Bengal plate test and 269 samples (~35%) were found positive (111 buffaloes, 136 cows, 14 dogs, 4 Buffalo bulls, 1 equine, 3 human).

Isolation, isolate characterization and genome sequencing of *Brucella* sp.

Foetal stomach content, placenta and vaginal mucous samples collected from cattle (25), buffaloes (10), pig (6), dog (6) and sheep (1) and blood sample from human (4) were processed for *Brucella* isolation. Only 2 samples of foetal

stomach content (a Buffalo and a pig, having a history of abortion) were positive. On *Brucella* selective agar media small convex, smooth translucent colonies showing gram negative coccobacilli were further identified by biochemical tests like catalase, oxidase, urease and nitrate reduction test. Both isolates were positive for agglutination reaction with *Brucella* positive serum. Isolates were further subjected to PCR using B4/B5 primers and confirmed as *Brucella* spp. The isolates were designated as LMN1 and LMN2, grown in *Brucella* selective broth and preserved at -80°C. The standard cultures were procured and Bruce ladder primers were standardized for these standard cultures. Both the isolates were subjected to Bruce ladder PCR and were confirmed as *Brucella abortus*. DNA having a concentration of 102.8 ng/μl (purity 1.89 for LMN1) and 99.8 ng/μl (purity 1.98 LMN2)



Differentiation of *Brucella* species by Bruce-ladder PCR (N: Negative control, Bs: *Brucellaisuis*, Bm: *B melitensis*, Ba: *B abortus*, LMN1/LMN2: *B abortus* isolates, S19: Vaccine strain, M: Marker)

were submitted for genome sequencing. Real time PCR (Hinc) using Taqman Probe chemistry is under standardization for detection of *Brucellasp.*

Molecular heterogeneity/typing of *Brucella*

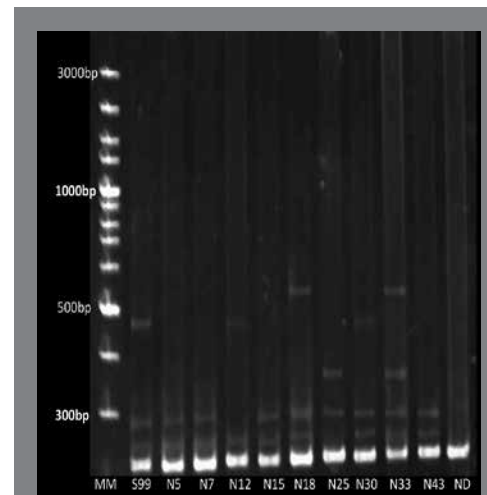
RAPD Analysis with OPG-10 or OPG-13 grouped 18 isolates including S99, 16M, *B. suis*-1330 into 7 profiles and has respective D-value of 0.82 and 0.74. ERIC and REP analysis grouped isolates into 6 and 9 profiles respectively with the respective D-value as 0.72 and 0.80. In the former, the number of bands from isolates ranged from 4-9, while in the later, bands ranged from 4-24. SSCP analysis exhibited a D-value of 0.83, thus, SSCP revealed highest discriminatory ability among all typing techniques. This analysis grouped isolates into 10 profiles.

Development of a superagglutination test for Brucellosis

False negative and false positive results are commonly encountered in the conventional agglutination based tests like RBPT for Brucellosis. A novel Superagglutination test was developed and was found more sensitive than current agglutination tests and agglutination based diagnostic kits. Superagglutination test reduced false results, had higher sensitivity (95.88%) and negative predictive value (95.83%) than Rose Bengal Plate Test (RBPT), Standard Tube Agglutination Test (STAT), ELISA, and Complement Fixation Test and specificity (89.32%) and positive predictive value (89.42%) higher than RBPT and STAT. The economic losses caused by spread of infectious diseases like brucellosis due to false negative diagnosis and culling/slaughtering of productive animals due to false positive diagnosis can be avoided by employing the new test.

Development of cost effective bacteriophage therapy for brucellosis

The advantages of phages and endolysin as antibacterial agents over antibiotics are their specificity for pathogen without disturbing normal flora, low chance of bacterial resistance and their ability to kill colonizing pathogens in various tissues. A bacteriophage against *B abortus* S19 was isolated from the sewage samples (n=15), which was



PCR-SSCP analysis: Polyacrylamide gel image showing different patterns formed by single strand DNA conformers (MM: Molecular weight marker, ND: Non-denatured control, S99: *B abortus* reference strain)

lytic against *B abortus* S19, *B abortus* field isolates (n=9) and *B melitensis*, but was non-lytic for any heterologous species tested. Therapeutic efficacy of brucellaphage, phage adsorbed *B. abortus* S19, phage associated lysin (PAL) extracted from brucellaphage and PAL lysed *B. abortus* were tested *in vivo* using mice model. Maximum reduction in bacterial load was observed in *Brucella* infected mice that were treated with PAL lysed *B. abortus* followed by phage adsorbed *B. abortus*.

Therapeutic potential of bacteriophage therapy for Salmonella infection

Out of 50 poultry sewage samples processed a total of 10 phages against *S Enteritidis* were isolated. *In vivo* therapeutic efficacy of phages was evaluated in 7-day old broiler chicks and 30-day old broiler birds by administering $8.84 \log_{10}$ CFU of *S Enteritidis* orally and $9.54 \log_{10}$ PFU phages and $9.47 \log_{10}$ PFU microencapsulated phages via oral and intramuscular routes. Following sacrifice of 7-day old broiler chicks at about 48 h post-infection, bacteriological enumeration showed that intramuscular delivery of bacteriophages reduced *S Enteritidis* to $2.7 \log_{10}$ CFU/g (control - $5.34 \log_{10}$ CFU/g). In broiler birds, intramuscular route was also most effective compared oral route as exhibited by reduction in bacteria count to $>1 \log_{10}$ CFU/g of *Salmonella* on 15th day post-infection from 5th day post-infection. Thus, phage administration via intramuscular route may be effective for treating *Salmonella* infection.

Multiplex agglutination based test for FMD

This kit can differentiate serum antibodies against different serotypes of FMD virus by employing latex beads/microspheres of different colors. The kit was used for detection of antibodies in sera from 142 cattle and buffaloes. Antibodies could be detected against all 3 serotypes in sera of 93.66% animals. Antiglobulin enhanced the sensitivity of kit through cross-linking of smaller clumps. Thus, antiglobulin aided multiplex agglutination may be more sensitive by minimizing false negative results.

Pasteurella multocida: pathogenicity and detection

Eight isolates of *P multocida* were obtained from 424 samples comprising of nasal swabs, peripheral blood from live animals and tissues (heart blood, tracheal swabs, lung, liver and spleen) from dead animals. All isolates were sensitive to chloramphenicol, enrofloxacin, tetracycline and spectinomycin. Using real time PCR, relative expression of virulence genes (*plpE*, *hgbA*, *fhaB1/2*, *ptfA*, *tbpA*) of *P multocida* grown under iron limiting condition at different time periods indicated significant up-regulation of *tbpA*, *plpE*, *hgbA*, *fhaB1* genes and down-regulation of *ptfA*. This emphasised the significance of increased pathogenicity of *P multocida* when growing in host under natural state of iron starvation stress. A novel loop mediated isothermal amplification (LAMP) based on *Kmt1* for the detection of *P multocida* was developed which had sensitivity 10^4 fold higher than PCR and was easy, rapid, accurate and sensitive for the detection of *P multocida*.

Mycotoxins in animal and poultry feed

Feed samples tested (n=115) for aflatoxins included green fodder (3), cattle feed (30), concentrates (2), deoiled rice bran (1), deoiled sarson cake (1), rice bran (1), wheat straw or *turi* (4), pig feed (1), chokar (1), wheat (1), maize (13), wheat bran (1), *bhusa* (1), emu feed (1), poultry feed (45), milk samples (2) and silage (1). Out of these, 59.13% samples were positive for aflatoxins ranging from 50 ± 25 to 600 ± 25 ppb. Aflatoxin B2 was most prevalent (88%) followed by other mycotoxins including B1 (84%), Ochratoxin (74%) and Citrinin (10%). All the milk samples were negative for aflatoxins.

Isolation of bacteria in chicken with respiratory tract infections

Fifty-two isolates of bacteria associated with various respiratory tract infections in chicken (including chronic respiratory disease or CRD cases) were isolated. These comprised of *Staphylococcus aureus* (24), *E. coli* (15), *Proteus* sp. (5), *Klebsiella pneumoniae* (3), *Streptococcus equi* subsp. *zooepidemicus* (2), *Pseudomonas aeruginosa* (2) and *Citrobacter koseri* (1). The molecular detection by PCR of *Avibacterium paragallinarum* (1.29%) was done although the organism

INTERNATIONAL PATENT ON INNOVATION IN DIAGNOSIS OF INFECTIOUS DISEASES

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana has been granted a South African patent on an innovation in diagnosis of infectious diseases. The new diagnostic test called Superagglutination test provides an ingenious solution to the problem of false positive and false negative results common with the available diagnostic tests and kits employed for diagnosis of a large number of infectious diseases of animals and humans, including important zoonotic diseases like Brucellosis (the Rose Bengal Plate Test) and Salmonellosis, transmissible from animals to humans. The idea behind the breakthrough is the brainchild of Dr. Hari Mohan Saxena, Professor of Immunology.

The new method of diagnosis was recently selected among the "Top 100 innovations" in the India Innovation Growth Program 2013 jointly organized by the Department of Science and Technology of the Ministry of S&T, Government of India, Martin Lockheed Inc., Federation of Indian Chambers of Commerce and Industry, Indo-US Science & Technology Forum, Stanford Graduate School of Business and IC2 Institute of Texas University, USA, respectively.



Dr. Hari Mohan Saxena

could not be isolated. Occurrence of *Mycoplasma gallisepticum* was 59.15% while that of *Mycoplasma synoviae* was 33.8%.

Molecular detection of *Mycobacterium avium* subsp. *paratuberculosis* (MAP) (Johne's disease)

Out of 100 faecal samples from cattle and buffaloes (with a history of chronic intermittent diarrhoea and emaciation, suspected for Johne's disease) were collected from gaushalas and dairy farms, about 72 samples revealed the presence of acid-fast bacilli. Faecal samples (n=46) detected positive by ZN staining exhibited 56.25% specificity and 60% specificity was exhibited by faecal culture and faecal PCR. MAP cultures were isolated from 4 faecal samples showing 8.7% prevalence and faecal IS900 PCR exhibited 21.74% prevalence. Milk PCR detected 8% animals as JD positive, which were also positive in faecal PCR and ZN staining. The faecal PCR was more sensitive than culturing.

Comparative intradermal test (CITT) and Gamma interferon assay (IFN- γ) were assessed in detecting tuberculosis (TB) in dairy cows and buffaloes. Both these tests complement each other for TB diagnosis. Amplification of IS900 gene sequence specific for MAP revealed 229bp band in DNA extracted from the fecal samples suggestive of TB. The prevalence of Johne's disease was similar in TB positive (10.8%) and TB negative (10.9%) animals, irrespective of tests used for assessing cell mediated immune (CMI) response.

Canine Parvovirus

The rectal swabs from dogs showing signs of gastroenteritis were processed for DNA extraction and isolation in MDCK cell line. The extracted DNA was subjected to PCR and Nested-PCR. Out of 85 rectal swabs, 8.23% were positive by PCR and 45.88% were positive by nested-PCR. The PCR and nested-PCR yielded a product size of 1198bp and 548bp, respectively. When virus inoculum was subjected to isolation in MDCK cell line, the observed cytopathic effects were rounding of cells within 24 h, clumping of cells within 48 h and final detachment of cells within 72 h.

Veterinary Parasitology

Seroprevalence of bovine trypanosomiasis

To assess immune contact of *T evansi* with dairy animals, 732 sera (282 cattle adult, 130 cattle calves, 212 buffalo, 108 buffalo calves) samples collected from different agro-climatic zones of Punjab were subjected to card agglutination test for *T evansi* (CATT/*T evansi*). Overall seroprevalence was higher (39.34%) than parasitological prevalence by Giemsa stained based thin blood smears (2.18%). Highest seroprevalence was observed in Jalandhar (58.41%), while



Agarose gel electrophoresis (1.5%) revealing 1572bp product for *T evansi* targeting *RoTat 1.2* gene. (Lane M: DNA ladder, Lane P and N: Positive and Negative control, Lane 1-4: tested samples)

lowest seroprevalence was in Pathankot (16.67%). The seroprevalence was higher in buffalo adults (50.47%) compared to their calves (33.33%) or cattle adults (36.88%). Thus, CATT/*T evansi* is a pen-site test and has higher field applicability for assessment of serology based diagnosis. The risk factors were predominately associated with location of farms inside Sutlej basin.

Molecular and Serological detection of latent trypanosomosis in equines

Card agglutination test for detecting *T evansi* in comparison to PCR targeting repetitive nucleotide sequences was applied on 169 blood samples from horses (65) and mares (104) of Punjab State. By PCR, 1.92% and 1.51% samples were positive from Central Plain Zone and Western Zone, respectively. CATT/*T evansi* performed by targeting *RoTat 1.2* gene of *T evansi* revealed 6.8% positive samples from Central Plain Zone and 13.63% from Western Zone, respectively. Comparison between sexes revealed higher percent positivity in mares. With respect to PCR assay, CATT/*T evansi* showed 100% sensitivity and 92.1% specificity.

Molecular detection of persistent anaplasmosis in tick infested cattle

Thin blood smear of samples from tick-infested cattle (n=120) revealed 15.83% positive for *A marginale*. *Rhiphicephalus (Boophilus) microplus* infection was highest (89.16%), followed by *Hyalomma anatolicum anatolicum* (7.50%) and mixed infestation (3.33%). Amplification of *msp1β* gene of *A marginale* detected DNA in 39.16% cattle blood (adult cattle, 42.30%; calves, 18.75%) and in 26.67% tick samples. The semi-nested PCR specific for *Anaplasma* genus revealed amplicon of 577 bp in 40.83% samples. Further restriction digestion of 577bp semi-nested PCR products by Bst 1107I at *A marginale* specific GTATAC site confirmed 42 out of 49 specific for *A marginale*, while remaining 7 undigested products indicated other species of *Anaplasma*.

Molecular characterization of *A marginale* based on *msp1β* and 16S rRNA gene revealed that 16S rRNA gene possesses conserved primer binding site and thus shows more sensitivity for the diagnosis of *A marginale*, where as *msp1β* was less sensitive owing to its polymorphic nature.

Comparative evaluation of PCR and indirect ELISA for detection of acute anaplasmosis

From submountain zone and undulating zone of Punjab, out of 184 samples collected from animals infested with ticks, and having fever, jaundice or anaemia, 13.58% were positive by blood smear examination and 25.54% by indirect ELISA. With respect to PCR, blood smear showed 24% sensitivity and 95% specificity. Out of samples positive by blood smear, 20% were detected negative by PCR assay targeting *msp1β* gene specific for *A marginale*, while sample were positive when amplified for *Anaplasma* spp. targeting 16S rRNA gene, indicating the possible prevalence of other *Anaplasma* sp. The serological test based on indirect ELISA showed 30.8% sensitivity and 78% specificity in concordance with PCR assay. Of 82 samples positive by PCR, 57 were negative by ELISA which indicated inefficacy of ELISA to detect infectivity in acute phase of infection. Thus, blood smear examination may be erroneous and ELISA had low sensitivity to detect infection in acute phase.

Real time PCR for detection of Theileria annulata

Real time PCR for *T annulata* was standardized and applied on 65 samples of naturally infected bovines. The quantitative findings revealed by Real time PCR were also corroborated with nested PCR for *T annulata* targeting *Tams1* gene. There was close concordance between two tests. However Real time PCR could present a quantitative status, while nested PCR could reveal only qualitative status of infection.

Diagnosis of canine ehrlichiosis

Of total samples (n=214) subjected to *E canis* specific PCR assay, an amplicon of desired size (389bp) was produced in 4.21% samples, while the routinely used blood smear revealed morulae only in 2.34% samples. *Ehrlichia* genus specific PCR revealed 6.54% samples positive, whereas nested PCR assay revealed positivity in 41.59% samples, thus, indicating that nested PCR in conjugation with primary PCR increases sensitivity in detection of *E canis* infection.

Diagnosis of canine babesiosis

Examination of peripheral thin blood smears (n=214) revealed 7.47% positivity for canine babesiosis. Out of these, 0.93% positive for piroplasms of *B canis* and 6.54% for *B gibsoni*. The PCR assays detected 13.55% samples positive for *B canis*, and 15.42% positive for *B gibsoni*.

Seroprevalence of Babesia bigemina

Seroprevalence of *B bigemina* was assessed in 360 dairy animals from low lying areas of Punjab using indirect ELISA based on 200kD merozoite antigen. Overall seroprevalence was 30%, with highest seroprevalence in undulating plain zone (39.6%) and lowest in western zone (10.5%), and district-wise highest was in Ropar (48.4%) and lowest in Fazalika (5.8%). The seroprevalence was highest in adult cattle and lowest in buffalo calve. Between species, seroprevalence was higher in cattle (54.14%) compared to buffalo (11.33%).

In another study, examination of blood smears of apparently healthy cattle (n=482) revealed 2.07% animals positive for the piroplasms, whereas 5.81% and 22.2% animals were positive in PCR and nPCR, respectively. Based on nPCR product, the highest infection was in central plain zone (30.39%) followed by western zone (21.60%), western plain zone (16.98%), sub-mountain undulating zone (10.20%) and undulating zone (7.84%). Among the simultaneously collected blood and tick samples from same animals (n=135), only 1.6% cattle were found positive for piroplasms in blood smear examination while 5.6% and 16% were positive in PCR and nPCR, respectively.

Amitraz resistance in Rhipicephalus (Boophilus) microplus

The resistance status of *R (B) microplus* was evaluated against amitraz. The regression graph of probit mortality of ticks plotted against log values of progressively increasing concentrations of amitraz revealed the slope of mortality (95% CI) as 2.36 ± 0.61 (0.38 to 4.33). The LC_{50} (95% CI) and LC_{95} (95% CI) were recorded as 332.52 (305.06-362.44) and 1646.93 (1383.97-1959.84) ppm, respectively and the resistance factor was 13.17, which indicated level-II resistance status.

Acaricide multi-resistance in Rhipicephalus (Boophilus) microplus

A level-II resistance status was recorded against amitraz and deltamethrin; level-I against fenvalerate and malathion whereas, the ticks were susceptible for cypermethrin. The current study for the first time reports a multi-drug *R (B) microplus* population from Punjab state, India with different levels of resistance to various classes of acaricides.

Cypermethrin resistance in Rhipicephalus (Boophilus) microplus and Hyalomma anatolicum

Resistance to cypermethrin was categorized as level-II and -I in *R (B) microplus* collected from Muktsar and Mansa districts, respectively whereas, *H anatolicum* from both locations showed susceptible status. The RF value of Muktsar and Mansa isolates of *R (B) microplus* (5.48 and 2.18, respectively) was much higher as compared to that of *H anatolicum* (1.12 and 0.82, respectively), thus indicating a lower level and slower rate of development of cypermethrin resistance in multi-host tick.

Treatment of synthetic pyrethroid resistant Rhipicephalus (Boophilus) microplus with plant extracts

Rhipicephalus (Boophilus) microplus showed resistance of level-I and -III against cypermethrin (RF=4.67) and deltamethrin (RF=34.2), respectively. Acaricidal activity of aqueous and ethanolic extracts of leaves of *Cymbopogon winterianus*, *Vitex negundo* and *Withania somnifera* along with roots of *V negundo* was assessed against synthetic pyrethroid (SP) resistant engorged females of *R microplus*. The highest acaricidal property activity was found with ethanolic extract

of leaves of *C winterianus* with LC₅₀ (95% CL) values as 0.46% (0.35-0.59%), followed by *W somnifera* as 5.21% (4.45-6.09%) and *V negundo* as 7.02% (4.58-10.74%). The live ticks treated with extracts had reduced egg mass weight, reproductive index and oviposition. The complete inhibition of hatching was recorded in eggs laid by ticks treated with ethanolic extracts of leaves of *V negundo* and aqueous extracts of leaves of *W somnifera*.

Treatment of synthetic pyrethroid resistant *Hyalomma anatolicum* with plant extracts

The presence of level-I resistance was observed against deltamethrin (RF=2.81), whereas, the tick isolate was susceptible to cypermethrin (RF=0.2). Acaricidal activity of aqueous and ethanolic extracts of leaves of *Cymbopogon winterianus*, *Vitex negundo* and *Withania somnifera* along with roots of *V negundo* was assessed against larvae of deltamethrin resistant *H anatolicum*. The highest mortality (93.68±0.66%) was observed at 5.0% ethanolic extract of leaves of *C winterianus* and the lowest LC₅₀ value (0.011%) was recorded for ethanolic extracts of leaves of *V negundo*.

Veterinary Pathology

Role of pesticide residues in causing malignant canine mammary neoplasia

Malignant canine mammary tumor (CMT) in female dogs (n=36) were classified as carcinoma (19), carcinosarcoma (14), sarcoma (1) and TVT (2) and were placed in grade I and III and stage 4 and 5 mainly. A significant difference in serum estradiol was recorded in CMT cases as compared to tumor free dogs. Analysis of serum, mammary fat and mammary tissue elucidated the pesticide presence in variable concentrations. Varying expression of ER α , aromatase, HER2, pan-RAS, p53 and Rb, was detected in CMT cases. A significant correlation between ER α and aromatase was detected. It was inferred that some insecticides viz. dieldrin, heptachlor and γ -HCH may be associated with oncogenesis in CMT, possibly by activating conversion of androgens into estrogens.

Poultry diseases

Studies on various poultry diseases, revealed prevalence of diseases like oophoritis and egg peritonitis in adult, omphalitis in young chicks, airsacculitis, coccidiosis, *E. coli* infections, chronic respiratory disease, viral disease like Marek's disease, Newcastle disease, Infectious bursal disease, pigeon pox. Besides this, cancer, metabolic disease like rickets/soft bones, visceral gout and congenital defect like kidney aplasia were also observed.

Disease diagnosis

Immunohistochemistry can be used as diagnostic tool for IBD, MD, NCD and CRD and also using fluorescent-tagged secondary antibody for diagnosing IBD. ELISA technique was developed for detection of Marek's disease viral antigen in tissue homogenates.

Veterinary Pharmacology and Toxicology

Lemon grass - a plant with potential therapeutic efficacy

Quinalphos (2 mg/kg) following oral subacute exposure for 30 days induced oxidative stress and altered biochemical parameters in rats. Lemon grass essential oil treatment @ 35 mg/kg (1/100 th of LD₅₀) in rats for 45 days showed protective effects on quinalphos-induced oxidative damage and biochemical alterations in rats.

Nitrate toxicity in buffalo calves

Oral subacute exposure of buffalo calves to sodium nitrate (20 mg/kg/day; 21 days) lead to major alterations in haematological and biochemical parameters. The plasma nitrate increased from 7.59±0.27 ppm on day 0 to 23.9±0.93 ppm on day 10 with maximum elevation on day 14 with the levels rising to 13.9±0.42% from pre exposure levels of 0.69±0.11%.

Impacts of subacute pesticide and insecticide toxicity

Cypermethrin, a type II pyrethroid, was orally administered to buffalo calves at a dose of 0.5 mg/kg/day for 14 consecutive weeks. It was observed that oxidative stress is one of the important mechanisms involved in cypermethrin-induced toxicosis. Fenvalerate, a pyrethroid, was used to induce subacute toxicity in buffalo calves by daily oral

administration (1.0 mg/kg/day for 21 consecutive days), which lead to marked changes in their antioxidant profile, and biochemical homeostasis without any major toxic signs except for ocular discharge.

Oral subacute exposure of carbendazim for 28 days produced mild toxicity viz, decline in body weight, weakness in hindlimbs, nasal discharge and emaciation in rats. Oxidative stress was one of the mechanisms involved in carbendazim-induced toxicity, as there was an increase in the extent of lipid peroxidation and superoxide dismutase and catalase activity which was substantiated by decrease in blood glutathione levels with decrease in the activity of glutathione peroxidase.

Subchronic fipronil toxicity in buffalo calves increased plasma levels of TSH, LDH, GGTP, ALT, ACP, total proteins, blood glucose, BUN, phosphorus, and lipid peroxidation with decrease in plasma T_4 and cholesterol.

Oral subchronic quinalphos exposure (1.0 mg/kg/day for 90 days) produced mild clinical toxicity in buffalo calves along with a significant increase in extent of lipid peroxidation and in activity of blood glutathione and catalase and reduction in glutathione peroxide and superoxide dismutase.

Influence of exposure of insecticides on the disposition of antimicrobial agents

Pharmacokinetics of lincomycin varied significantly in quinalphos-administered buffalo calves. The peak plasma level of lincomycin was $121 \pm 7.73 \mu\text{g/ml}$ at one minute. The values of Vd_{area} (0.84 ± 0.13) and Vd_{ss} (0.62 ± 0.08) were shorter in quinalphos-exposed animals when compared to healthy, whereas $t_{1/2\alpha}$ (0.08 ± 0.01) and K_{12}/K_{21} (5.25 ± 0.48) increased. Thus, oral subchronic exposure to quinalphos can alter pharmacokinetic properties of lincomycin without any change in dosage regimen.

Veterinary Physiology and Biochemistry

Amla powder or bypass fat supplementation can effectively enhance the reproductive performance of goats by improving their antioxidant status. UMMB supplementation can increase the population of ruminal microflora and rumen metabolites which in turn can improve nutrient utilization. Thus, during the lean period, UMMB should be supplemented with wheat straw in order to maintain optimum microbial fermentation in the rumen. Various characteristics of cervico-vaginal mucus are altered in buffaloes during summer season. Oxidative stress arising due to generation of Reactive Oxygen Species (ROS) may enhance lipid peroxidation in animal body.

Veterinary Surgery and Radiology

Equine colic surgery

Horses with heart rate <80 bpm, TLC $>8600/\mu\text{L}$, PCV 30-35% and blood lactate below 2.8 were suitable candidates for surgery. Ventral midline celiotomy provided proper visualization of intestinal lesion and in removal/drainage of

obstruction. Foleys catheter as an indwelling peritoneal drain, lateral to incision line had a potential in draining and collection of peritoneal fluid for analysis. Postoperative sonography was reliable in assessment of intestinal peristalsis and volume of peritoneal fluid. Lignocaine as a prokinetic drug was helpful in preventing postoperative paralytic ileus.

Equine perineal surgery

Perineal surgery under epidural anesthesia in standing mares provided good visualization and convenient approach for repair of perineal laceration. Inside out continuous suture pattern to repair third degree perineal laceration was effective and quick method of suturing. Poly-p-dioxanone monofilament absorbable suture material had good results in perineal repair.



Colic surgery in horses

Specialized facilities provided by Department of Veterinary Surgery and Radiology



Large and small animal surgery



Anaesthesia unit



C-Arm for orthopaedic surgery



Operating microscope for cataract surgery and intra-ocular lens implantation



Small animal ultrasound



Laproscopic surgery in small animals

Ultrasonographic topography of reticulum and omasum

In apparently healthy non/early pregnant cattle, reticulum was seen at 5th ICS from right (83.3%) and left (75%) sides, whereas in non/early pregnant buffaloes, it was seen upto 6th ICS only. In late pregnant cattle and buffaloes, reticular wall was seen at 5th ICS from both sides. Omasum was visualized at 8-9th ICS in all animals irrespective of pregnancy. In reticular diaphragmatic hernia, motile reticulum was visualized closer to thoracic wall at right 4th ICS (93.3%) as compared to left (33.3%). In diaphragmatic hernia cases, omasum was small (upto 4th ICS) and showed more prominent contractions. In omasal impaction cases, scanning of omasum at 12th ICS and having a size of more than 6 ICS was suggestive of omasal impaction.



Ultrasonographic topography of the reticulum and omasum

Canine oral surgery

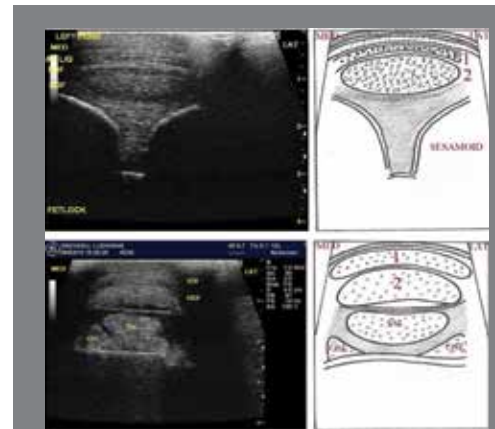
Malignant oral swellings, osteosarcoma being most common, were resected surgically which helped in alleviating clinical signs and prolonging the animal life. Dental scaling with ultrasonic and manual scaling was helpful in removal of dental tartar. Mandible and maxillary fractures were immobilized and repaired by orthopedic wiring and bone plating.

Repair of body wall hernias

Conventional herniorrhaphy using absorbable suture or non-absorbable suture materials was suitable in smaller defects and with less tension on surgical site, while polypropylene mesh hernioplasty was procedure of choice for valuable animals with large hernial defects and with suspected suture line tension. Nylon mesh was successfully used in cases of prepubic tendon rupture.

Ultrasonography of tendons and ligaments

A 7-12 MHz ultrasound transducer was suitable for the evaluation of tendons, ligaments and joints in bovines and equines. Ultrasonography can be used for reliable diagnosis of complete and partial tendon rupture and in various tendon and tendon sheath affections, hematoma and abscess in joints. Ultrasonography was useful in diagnosis of pelvic fractures and other subtle bone lesions which otherwise are difficult to diagnose. Ultrasonography of tendons and ligaments should be an integral part for the diagnosis of lameness in large animals.

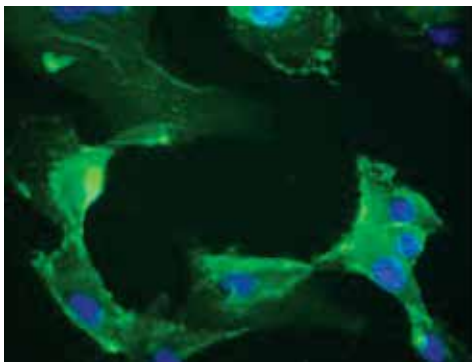


Ultrasonography of the tendons and ligaments

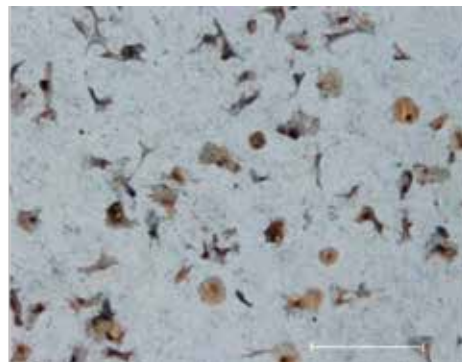
School of Animal Biotechnology

Application of adult mesenchymal stem cells (MSCs) for bone and tissue regeneration

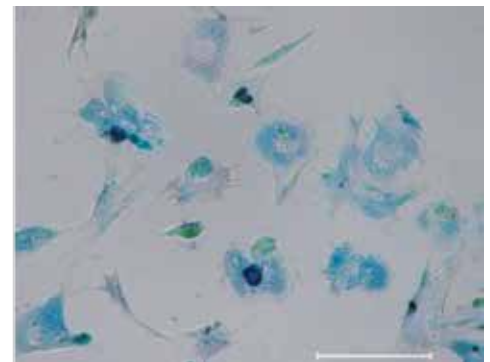
Mesenchymal stem cells are multipotent stem cells capable of differentiating into osteocytes, chondrocytes, adipocytes, myocytes, and tenocytes. Bone marrow aspirates were collected from the wing of ilium (iliac crest) in fracture cases of



Flourescence signal for stem cell marker CD44+



Osteogenic differentiation of cMSCs



Chondrogenic differentiation of cMSCs

dogs. Following culture, MSCs at 3rd to 5th passage were examined for their stemness properties by immunostaining. The positive expression of surface markers CD44⁺, CD105⁺ and Stro-1, and negative expression of hematopoietic markers CD34⁺ and CD45⁺ revealed intact stemness properties. Thereafter, canine MSCs were subjected to growth in osteogenic, chondrogenic and adipogenic differentiation media followed by characterization of differentiated cells in RT-PCR and immuno-cytochemistry. In brief, isolated cells showed osteogenic, chondrogenic and adipogenic differentiation potential.

Sero-prevalence of viruses associated with porcine reproductive problems

Epidemiological data of Punjab state revealed that reproductive diseases associated with sows, in decreasing order, were abortion, repeat breeding, anestrus and retention of placenta. Diseases associated with piglets, in decreasing order, were death in the young ages, stillbirth, weak litter and mummified fetuses. The sero-prevalence of CSF in the non-vaccinated animals was 34.62%, whereas in vaccinated pigs only 35.21% exhibited CSF antibodies. For the first time in Punjab state, sero-prevalence data was recorded for porcine parvovirus, circovirus and pseudorabies virus that was respectively as 36.82%, 25.94% and 6.69%. No incidence of PRRS was found.

Development of molecular diagnostic assays for infectious causes of abortions

PCR and Multiplex PCR assays were developed, standardized and evaluated for individual as well as simultaneous detection of bovine herpesvirus 1 (BHV-1), *Brucella* spp. and *Leptospira* spp.

Development of diagnostic test against *Leptospira*

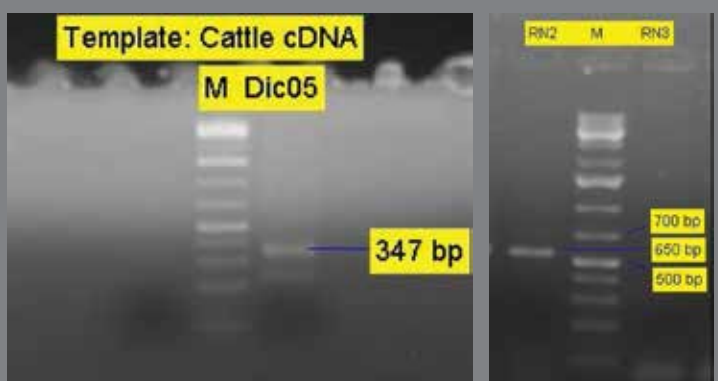
PCR amplification and cloning of genes LipL21, LipL41 and Loa22 of *Leptospira* sp. These genes were expressed in prokaryotic expression system. The recombinant proteins were purified and confirmed by western blotting. Hyperimmune antisera were raised against these recombinant proteins in mice.

Expression profiling of various genes in canine mammary tumor

From mammary tumors and healthy mammary tissue, RNA was isolated and cDNA was synthesized. Expression profiling of mammaglobin, HSP90 and ErbB genes was done by qRT PCR. Expression of ErbB and Hsp 90 was five folds higher, while that of MamB was six fold higher in mammary tumor. Mammaglobin, HSP90 and ErbB genes were cloned in TA cloning vectors.

Proteome analysis of *Brucella* spp by 2D electrophoresis

For *B abortus*, *B melitensis* and *B suis* spp, a total of 380, 392 and 365 protein spots were detected. In response to heat stress, few new proteins ranging from 30-70 kDa MW were synthesized. A total of 380 spots were detected under normal growth conditions, while 356 and 368 spots were detected in bacteria supplemented with 100 and 200 μ m of 2,2'-Bipyridyl containing media, respectively. Iron chelator inhibited synthesis of few proteins in the bacteria.



A ~347 bp region of *Dicer I* cds was amplified and custom sequenced

A ~650 bp region was amplified with primers designed for *dicer* sequence

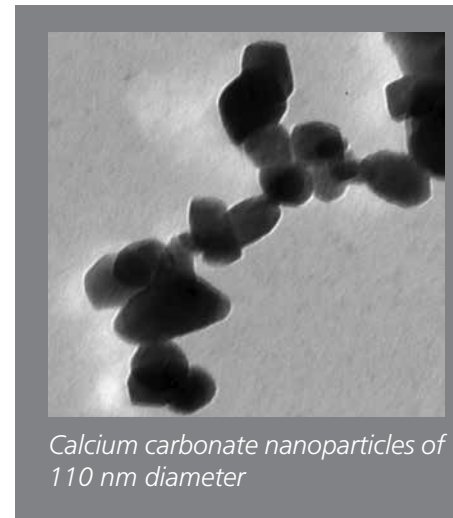
Cloning and Sequence Analysis of *Dicer I* (Ribonuclease III) cDNA in Indian Buffalo

Primers were designed from whole sequence of *Dicer* from *Bos tarus*. Some partial coding sequence (cds) of *Dicer* of buffalo were amplified by using designed primers. The PCR products were custom sequenced in order to confirm results and were submitted to NCBI site for publication. Cloning of amplified products that were confirmed by custom sequencing in a TA cloning based vector- pGEMTeasy has been started using standard protocol.

Nanotechnology

Synthesis of calcium carbonate nanoparticles for possible use as oral calcium supplement for animals

Calcium deficiency disorders are common in livestock and pet animals. A variety of calcium supplements are available in the market, but following oral administration, most of them are poorly absorbed (~40%) in animals probably due to large particle size (11,000 nm) of calcium compounds present in these supplements. Calcium carbonate nanoparticles of about 110 nm diameter were synthesized by low cost technique, and were characterized by X-ray diffraction analysis, particle size analysis, measurement of zeta potential and scanning electron microscopy. The safety and toxicity profile of synthesized nanoparticles will be tested by *in vitro* and *in vivo* studies before use as oral calcium supplement.



School of Public Health and Zoonoses

Collaborative Research and Training Experience (CREATE)

'Integrated training program in infectious disease, food safety and public policy' is a collaborative project with University of Saskatchewan and Free University, Berlin with funding by Natural Sciences and Engineering Research Council of Canada (NSERC). Two students from GADVASU are enrolled for online class and PBL course 'Inter-Disciplinary Approach to Mitigating Disease'. Summer school on 'Pathogen-Host Interplay' was held in Berlin, June 10-15, 2013 in which Anita Tiwari, a PhD student, School of Public Health and Zoonoses participated. Each student has to do at least one-externship of at least 2 months in this program.

Prevalence of major zoonotic disease and foodborne pathogens in Punjab

Seropositivity of brucellosis by IgG ELISA kit was detected in 20% population of dairy farmers, veterinary officers, veterinary students, veterinary inspectors, pharmacists, dairywomen, animal attendants and general population. Cattle and buffalo revealed 33.5% seropositivity of brucellosis by ELISA. The sensitivity of PCR was 100% using STAT as gold standard. The detection limits of PCR were found to be 696 cfu/ml by using B4/B5 primer pair and 696x10² using JPR/JPF primer pair.

Seroprevalence of *Taenia canis*, *T spiralis* and *T solium* was 22.13%, 5.73% and 11.47%, respectively. In farmers, the relative risk of being infected for *T canis*, *T spiralis* and *T solium* was respectively recorded as 1.91 (95% CI 0.786-4.669), 2.61 (95% CI 0.3258 to 20.94) and 1.596 (95% CI 0.427 to 5.3893) times higher as compared to veterinary practitioners.

In Punjab, prevalence of *T solium* cysticercosis in pigs was 4.23%. Phylogenetic analysis of cytochrome oxidase I gene amplified products revealed the presence of Asian genotype of *T solium* and absence of *T solium* (African/Latin American genotype) as well as *T asiatica* in Punjab.

The prevalence of *E granulosus* sheep strain (G1) using PCR was 0.84% in naturally infected dogs. Economic losses due to cystic echinococcosis in India was estimated to be a total annual median loss of Rs. 11.47 billion (US \$ 212.35 million). Cattle and buffalo industry accounted for 93.05% of the animal and 88.88% of total losses. Human hydatidosis related losses were Rs. 472.72 million (US \$ 8.75 million).

The prevalence of 1.14% pathogenic, multi-drug resistant *L monocytogenes* serotype 4b was recorded with significant sero-convergent status among bovines in Punjab.

Environmental pollutants and production of safe and residue free animal food

Enrofloxacin and Oxytetracycline residues in individual animal milk varied from 39.6-247.7 ppb, and 76.3-196.3 ppb, respectively, whereas, in pooled milk samples, enrofloxacin and oxytetracycline levels were 2.4-21.8 ppb and 19.2-71.3 ppb, respectively. Thus, pooling of milk samples decreased the residue level significantly and the level was below MRL values recommended for antibiotics.

Pesticide residues in meat revealed 5% chicken samples exceeded MRLs established by Codex Alimentarius (CAC 1993) and Commission Regulation (EU) No 600/2010 for endosulphan sulphate, cypermethrin and malathion. Chlorpyrifos was the most frequent contaminant in both chicken and chevon. Presence of cypermethrin, malathion and chlorpyrifos residues indicated a shift in consumption pattern of pesticides from organochlorine to synthetic pyretheroids and organophosphates. Application of cooking methods reduced pesticide levels by 22-60.9% in chicken and 23-60.1% in chevon.

About 25% human milk samples were positive for pesticide residues with cyfluthrin as leading pesticide. Other pesticide residues were β -HCH, γ -HCH, p,p' DDE, p,p' DDT, cypermethrin, fenvalerate, chlorpyrifos, phosalone, profenphos and monocrotophos. As compared to previous study from Punjab, HCH and DDT levels were reduced by 15 and 12 times, respectively.

Between the sprayers and non-sprayers, no difference was observed in urinary pesticide residues (Dialkyl phosphates) and in blood levels of various organophosphate and organochlorine pesticide residues. Endosulfan and Endosulfan sulphate was detected in blood samples, which indicates past exposure to these pesticides.

Gas chromatographic analysis of vegetables, soil, feed and water collected from 5 villages revealed the presence of ethion (0.03 ppm), chlorpyrifos (0.014-0.062 ppm), endosulfan sulphate (0.02 ppm) and parathion residues (0.03 ppm).

Animal Disease Research Centre

During the current period, 27 outbreaks of different bacterial (Hemorrhagic septicemia, 4), viral (Classical swine fever, 4; Pestes Des Petitis Ruminant, 1; Rabies, 1; Bovine Herpes Virus, 1) and parasitic (Anaplasma, 2; Coccidiosis, 1) diseases and toxicities (Nitrate, 11; Oxalate, 2) were attended and successfully controlled.

For brucellosis, 596 bovines (cattle and buffaloes) were tested and 7.88% were found positive by Rose Bengal Plate Test (RBPT) and Competitive ELISA. In addition, 6.51% small ruminants (sheep and goats) were positive for brucellosis out of 215 tested by RBPT.

For tuberculosis, 470 bovine and 154 small ruminants were tested by comparative intradermal test and Gamma Interferon assay. Of these 15.95% bovine and 0.64% small ruminants were found positive.

Agronomical factors play important role in accumulation of nitrate and oxalate in fodder crops. Nitrate toxicity outbreaks are common in hot and humid weather. Higher nitrate in fodder was found in Ludhiana, Moga, Bathinda, Ropar and Jalandhar districts. About 25-30% fodder samples had nitrate levels >2000 ppm. The blood of healthy bovines and goats respectively had 9-44 and 7.5-18 ppm nitrate. Napier Bajra was associated with oxalate toxicity. Nitrate levels were >1200 ppm in all samples having oxalate levels >2%.

Centre for Wild Life Studies and Research

India is among the twelve mega biodiversity countries of the world having rich heritage of exclusive, fascinating and diverse ecosystem. The concept of zoo was to support conservation of endangered and rare species but captive animal healthcare is one of the crucial components of modern zoo management to attain the larger goal of successful conservation breeding. Keeping above facts in view, Centre for Wildlife Studies and Research (CWSR) was established in Jan, 2013, at college of Veterinary Science, GADVASU, Ludhiana. This centre is providing a regular consultancy in disease diagnosis and treatment of the captive animals. Various samples like blood, urine, fecal samples are submitted for pathological, parasitological and biochemical evaluation. Animals are also brought for X-ray, ultrasound and ECG. At present work is going to Standardization of non-invasive techniques for disease diagnosis of captive and free ranging animals. Besides this evaluation of health and welfare indicators of Felids in Chhatbir Zoo is also being undertaken.



Examination of tiger at university hospital

College of Dairy Science and Technology

Development of Phytosterol enriched fermented dairy products

Technology for manufacturing Mozzarella Cheese after enrichment with phytosterol has been standardized and its consumer survey has been completed.

Existing status of food safety measures at dairy farms of Punjab

The study was conducted in three districts, covering a sample of 240 households of various size categories. From initial investigations, it was observed that compliance with requirements of food safety measures involves cost. The major cost component was additional labour.

Functional Dhoda

Functional Dhoda burfi is a milk cereal based sweetmeat made from germinated wheat, sugar and milk. The product is further enriched with fiber, calcium and phytosterol. The product prevents gut disorders and helps in cholesterol reduction and has improved digestibility. The product is also a rich source of protein and fiber. The product can be kept for 10-12 days at ambient temperature. Further research on shelf life extension is going on.

Economics of milk production and its regular monitoring in Punjab

During 2010-12, the input cost has increased the cost of milk production by 30% in buffaloes and by 24% in cows. In the current scenario of higher input cost, to make dairy farming sustainable, efforts should be done in feed & fodder development, reduce losses due to animal health, emphasis on dairy processing, genetic improvement to reduce cost per litre and to encourage more & more farmers to join organized marketing set up.

College of Fisheries

Aquaculture in inland salt affected/waterlogged wastelands

Fresh water carp poly-culture trials in different species combination viz; 5 (catla, rohu, mrigal, common carp and grass carp), 4 (catla, rohu, common carp and grass carp) and 3 (catla, rohu and common carp) were conducted in salt affected waterlogged area in district Fazilka. Maximum fish biomass (2.38/ha) was harvested from 3 species culture system followed by 4 species (2.18t/ha) and 5 species (2.07t/ha) culture system after 6 months of culture period. For the first time in the State, a preliminary culture trial of brackish water shrimp 'Vannamei' - *Litipenaeus vannamei* (a prized commodity of immense export potential), was conducted in inland saline water ponds (salinity range 3-8 ppt) in village Shajrana, District Fazilka. In 90 days culture period, 18-22g vannamei was harvested, with 88% survival. The results revealed ample scope of taking up Vannamei culture in zero earning salt affected waterlogged wastelands for developing high scale 'Aqua Industry'. *Channa punctatus* (daula), reared in inland saline water (salinity up to 10 ppt) successfully, with an average productivity of 1.93 t/ha/yr at stocking density of 12000 fingerlings/ha and supplementary feeding with formulated diets and trash fish. As compared to fresh water carp poly-culture (5 species combination), about 40% higher net profit recorded in integrated fish cum duck farming (5 species carp poly-culture with Khaki Campbell variety of ducks) in inland saline water ponds (salinity 4-8 ppt). About 50 acres of salt affected waterlogged waste land was converted into fish ponds in village Shajrana, District Fazilka, after witnessing the successful aquaculture research trials conducted by GADVASU.



Mozzarella Cheese

Doda Burfi



Brackish water shrimp 'Vannamei' (*Litipenaeus vannamei*) harvested from inland saline water pond in Fazilka

Culture and breeding of Singhi

Induced breeding trials of catfish *Heteropneustes fossilis* (Singhi) were conducted in indoor catfish hatchery, with an average fecundity of 153 eggs/g fish body weight, 70.33% fertilization and 84.33% hatching success. However, only 2.6% of hatchlings could survive during indoor rearing of 1 week. Indoor reared hatchlings were further reared



Singhi brooders raised at COF



Indoor breeding facilities for catfish



1 month old fry



Fingerlings reared under outdoor conditions in flow through FRP troughs



in outdoor flow through FRP troughs for 3 months. About 66% survival was recorded from hatchling to fry (Av. length - 5.6 cm; Av. wt. 1.2 g) and 92% from fry to early fingerling stage (Av. length - 9.4 cm & Av. wt. 5.9 g). Three-month-old fingerlings were stocked in two earthen ponds for further rearing (over wintering). From the pond where the stock was not disturbed during the overwintering period, after 3 months, advanced fingerlings were harvested with about 99% survival and with an average body wt 34 g.

Culture and breeding of Saul

For the first time a trial was conducted to assess the scope of breeding and seed production of a priced murrel species, *Channa striatus* (Saul) under captive conditions. Yearlings and brood stock of Saul were collected from the natural water resources, fish markets and farms of some farmers and reared successfully under simulated natural habitat conditions in an earthen pond. Surface floating and submerged aquatic plants (*Eichhornia*, *Echinodorous*, *Nymphaea*, *Hydrilla*) were provided in the pond to simulate a near natural habitat to the fish. Fish was intensively fed on forage fish and slaughterhouse waste @ 10-15% of fish BW daily. Natural breeding of fish occurred during June, 2013. Due to parental care behavior of fish, the young ones were allowed to stay with the mother (for about 3 weeks) and 20-day old fry were then collected from brood stock pond and reared in outdoor flow through FRP pools for 30 days. The fry showed preference for live food (carp spawn/insect larvae) than animal waste. After 30 days, the advanced fry (av. wt. 23 g) were shifted to cemented ponds (20 m²) with soil layering for further rearing up to fingerlings stage.



Mature female of Saul



Saul Fry produced through natural breeding under pond conditions & reared in flow through FRP troughs



Pond cage aquaculture technology

About 13.93% higher biomass of carps was harvested from ponds integrated with murrel culture (*Channa punctatus*) in cages and 32.12% more net income recorded as compared to ponds without cages. Similarly, 57% higher biomass

of high value catfish- *Pangasius pangasius* (Pangas) harvested from cages at stocking density of 25 fish/m³ as compared to stocking density of 15 fish/m³. Different models of low cost cages were designed and fabricated using locally available materials with cost reduction by 75-94.60%.

Duckweed culture technology

Culture technology for two duckweed species viz, *Lemna minor* and *Lemna gibba* was standardized during one year culture period under local climatic conditions using combinations of organic manures/inorganic fertilizers. Highest duckweed biomass production was achieved with organic fertilizers viz, poultry droppings (PD) and combination of cow dung (CD) and poultry droppings (1:1). Poultry droppings supported maximum duckweed biomass production @ 600 kg/ha/week for *L. minor* (155 t/ha/yr) and @ 500 kg/ha/week for *L. gibba* (81 t/ha/yr) followed by combination of CD+PD (138 and 76 t/ha/yr, respectively). Higher biomass production, in terms of number of harvestings was recorded during March, May, July, August and September for *L. minor* and during February, March and July for *L. gibba*. The stock of *L. minor* survived during winter, but stock of *L. gibba* vanished completely during the same season.

Efficacy of Azolla compost in aquaculture

Comparative efficacy of *Azolla* compost (AC) and traditionally used cow dung (CD) revealed 54.69% higher nitrogen, 109.94% higher potassium and 43.52% less phosphorus content in AC as compared to CD.



Azolla culture unit

with or without CD was used to work out the optimum dose with respect to water quality, plankton production and fish growth in a semi-intensive common carp (*Cyprinus carpio*) monoculture trial of 150 days. All the AC treatments had better water quality, in terms of dissolved oxygen, total alkalinity and total hardness, and higher plankton population along with higher fish growth.

Heavy metal toxicity in catfish

Bioassay studies conducted for 96 h to assess toxicity of mercuric chloride (HgCl₂) revealed that the 50% lethal concentration (LC₅₀-96h) for HgCl₂ was 0.695 ppm, with upper and lower confidences limit of 0.625 and 0.773 ppm, respectively. The behavioural changes observed by catfish were respiratory distress, loss of balance and rolling movement.

Probiotic diets for carps

Three bacterial strains *Bacillus coagulans*, *B. licheniformes* and *Penibacillus polymyxa* were fed for 80 days as potential probiotic to *Catla catla* and *Cyprinus carpio*. The growth, digestive enzyme activities and non-specific immune response of probiotics groups were much better. Among tested probiotics, *P. polymyxa* can be used as growth promoter for better feed utilization through digestive enzyme activity improvement and enhancement of non-specific immune response.



Pond cage culture technology with carps in the open water and murrel (C. punctatus) in cages



High value murrel fish (C. punctatus) harvested from cages



Pangas culture in cages



Pangasius pangasius

Integrated fish cum duck farming

Fish productivity from fish cum duck farming unit enhanced from 3.87 to 6.05 t/ha/yr by increasing water depth, enhancing fish-duck stocking densities and additional feeding of fish @ 0.5% of body weight daily.

Periphyton based aquaculture system

As compared to non-periphyton based aquaculture system, 31% higher growth and 5% higher survival was recorded in rohu (*Labeo rohita*) reared in tanks provided with bamboo poles as periphytic substrate.

Ornamental fish culture

Value added gold fish (*C. auratus* var. *comet*) with enhanced colour pattern was developed with beat root incorporated @ 3% in farm made feeds. Preliminary breeding trials of two varieties of gold fish (*Carassius auratus* var. Black moor and Red head) were carried out successfully for the first time.

Freshwater pearl culture

Designer and round nucleuses were prepared from dead mussel shells for implantation inside freshwater mussels (*Lamillidens marginalis*) for pearl production. Successful rearing of implanted mussels in net bags, suspended from bamboo frame in a earthen production pond is being carried out.



Designer and round nucleus

Surgical procedure for implantation of nucleus in mussel

Livestock waste water recycling through duckweed based bioremediation technology

Carp poly-culture productivity in fishpond of bioremediation unit enhanced from 2.5 to 3.8 t/ha/yr with technological interventions like stocking density enhancement, additional supplementary feeding and water quality management. In semi-intensive carp poly-culture, about 98% higher net profit in terms of 68% feed cost reduction and 45% fish growth enhancement was seen in duckweed (*Spirodela polyrrhiza* L. Schleiden)

fed system as compared to non-duckweed fed system.

Post-harvest processing and value addition

Gelatin was prepared from skin and scales of carp fish (Rohu, *Labeo rohita*) with an average gelatin recovery of 21.14% and 15.86% and crude protein content of 75.26% and 52.50%, respectively. Crunchy and fried brackish water shrimps (Vannamei, *Litopenaeus vannamei*) were prepared and nutritional value of both raw and prepared product estimated. Fish meat analogue products in combination with paneer, soya bean and chana dal were prepared and their nutritional value was estimated along with sensory acceptability. Recipe for fish pickle was also developed.

Survey of fish market of Punjab

The survey of various fish markets revealed that number of fish species from culture and capture fishery within the state was 10 and 24 respectively, shellfish available were 2, fish species from other states were 4, quantity wise highest demanding fish species was *Labeo rohita* (rohu), the highest priced fish and shellfish from capture fishery in Punjab was respectively *Channa striatus* (saul) and *Macrobrachium rosenbergii* (Scampi), and the highest priced fish species exported from outside state was *Pampus argenteus* (Guj, Maharashtra).



Fish Gelatin prepared from fish skin Crunchy shrimp (cooked)



Pashu Palan Mela

The Directorate of Extension Education geared up extension activities through its wings like Farm Advisory Service, Training and Visit to villages. In order to transfer the new technologies evolved by the university, training courses were organized for the farmers, field veterinarians and scientists from other universities. Faculty published about 138 extension articles in various magazines, journals, news papers etc. in order to disseminate information important to farmers. The faculty members also delivered 43 TV and 45 radio talks on the topics assigned by the Directorate of Extension Education.

Training programmes organized for farmers

Name of the training programme	Duration (days)	No. of trainings held	No. of Beneficiaries
Specialized dairy farming training course	10 days	3	126
Specialized pig farming training course	5 days	2	116
Specialized poultry farming training course	10 days	2	66
Specialized training course on goat farming for farmers of Punjab	5 days	1	60
Training on balanced and quality feed manufacturing	3 days	1	37
Training on progressive dairy farming	3 days	1	18
Knowledge up gradation programmes for farmers	5 days	2	50
Specialized training on dairy	5 days	1	18
Specialized training course on goat farming for farmers of Jammu and Kashmir	3 days	1	6
Enterpreneurs Training Programme on "Hands-on product development and Technical know-how, of various value added products"	3-5 days	06	2-3 in each training

Training programmes organized for Veterinary Officers of Animal Husbandry Department, Punjab

The University has liaison with Animal Husbandry Department, Govt. of Punjab. University provides latest technical know-how to Veterinarians of the State to refresh their knowledge and enhance professional skill. The trainings organized for the officers of state department during 2013-14 are given below:

Name of the training programme	Duration (days)	No. of trainings held	No. of Beneficiaries	Collaborative Department
Hands on training on Radiology for surgical specialists for Animal Husbandry Department of Punjab	5 days	2	29	Veterinary Surgery and Radiology
Refresher course to update the knowledge of Veterinary Officers of Animal Husbandry Department of Punjab	5 day	3	29	-
Training on Management and disease problem of commercial dairy farming for Veterinary Officers of Animal Husbandry Department of Punjab	5 day	2	16	Veterinary Medicine
Training on Canine diseases: Diagnosis, prevention and treatment for Veterinary Officers of Animal Husbandry Department of Punjab	5 day	3	45	Veterinary Medicine
Training on diagnosis of animal diseases for Veterinary Officers of Animal Husbandry Department of Punjab	5 days	1	13	Veterinary Medicine
Training on management of infertility in bovines for Veterinary Officers of Animal Husbandry Department of Punjab	5 days	2	22	Veterinary Gynaecology
Hands on training on ultrasonography for surgery specialist and gynaecologists	3 days	1	8	Veterinary Gynaecology
Hands on training on latest microbiological techniques for Veterinary Officers of Animal Husbandry Department of Punjab	5 days	1	11	Veterinary Microbiology
Training on Equine diseases management, diagnosis and treatment for Veterinary Officers of Animal Husbandry Department of Punjab	5 days	1	9	Veterinary Surgery and Radiology

Other trainings

Goat Farming Training Programme of five days duration at RRTC, Kaljharani, Bathinda on May 28-June 3, 2014 and Nov. 24-29, 2014.

Animal Welfare Camps

The Directorate of Extension Education organized 8 animal welfare camps in the rural areas of Punjab for the treatment of sick animals. In these camps, the farmers and the field functionaries were advised/made aware of the recommended animal health practices. The technical support in the form of animal welfare camps and Pashu Palan Melas has been regularly provided to Regional Research and Training Centres i.e. Booh (Tarnwaran), Kaljharani (Bathinda) and Talwara (Hoshiarpur). University Faculty also participated in NAIP Mela-cum-Animal welfare camp organized at RRTC, Bhatoli (Talwara), Hoshiarpur on Oct. 01, 2013 and Women-in-Agriculture Day cum Animal Welfare Camp held at Ramgarh Sikri (Talwara), Hoshiarpur on Dec. 04, 2013 and put up their demonstrations like testing of feed/milk/faecal samples.



Specialized training course on dairy farming for the farmers of Punjab and neighbouring states



Knowledge upgradation training programme for the dairy farmers



Specialized training course on dairy farming for the farmers of Jammu & Kashmir



Specialized training course on dairy farming for the farmers of Madhya Pradesh



Specialized training programmes on dairy farming in collaboration with National Bank for Agriculture and Rural Development (NABARD)



Training programmes for in-service Veterinary Professionals



Pig farming training for the farmers of Punjab and neighboring states



Training Programme on "Scientific Pig Management"

Pashu Palan Melas

The faculty actively participated in organizing the Pashu Palan Melas of the Guru Angad Dev Veterinary & Animal Sciences University held in the months of March and September every year. In these melas, the departments of various constituent colleges of the University arranged exhibition stalls to demonstrate the new technologies/innovations developed for the farmers. On this occasion, other government and private agencies involved in animal welfare work also displayed exhibits important to the farmer community. A large number of farmers visited the melas and discussed their problems with the experts of the university. On this occasion, pamphlets highlighting the services and facilities available at university and other informational materials were distributed to the farmers. The university also participated as knowledge partner in the Kisan Melas at Balowal Saunkhadi, Gurdaspur, Bathinda, Rauni, Tarntarn/Amritsar, Faridkot Regional Research Stations/KVKs of PAU for the benefit of the Livestock farmers. University also provided technical support in the form of Animal Judging at Animal Fairs organized by Department of Animal Husbandry, Punjab at Mandi Kutbi Nangal (Gurdaspur), Hoshiarpur and Kank Mandi Bhoa, (Pathankot) on 18-19th November, 25-26th November and 2-3rd December, 2013, respectively.



Glimpses of Pashu Palan Melas

Expert Lectures/Technical guidance

The faculty members delivered extension lectures to the farmers in collaboration with the other animal welfare agencies of the state like Dairy Development Department, Deptt. of Animal Husbandry, Punjab, Nestle, SmithKline Beecham, Punjab & Sind Bank and in the trainings organized by the Krishi Vigyan Kendras and Department of Extension Education, PAU, Ludhiana. On these occasions, demonstrations regarding the collection, dispatch and transport of clinical material like blood, mucous discharge and faeces from the animals, correct method of milking, teat dip, computation of ration, silage making, acaricide drug application and heat detection were carried out in the field for livestock farmers. Faculty also delivered lectures to students of Veterinary Pharmacists course at Veterinary Polytechnic Kaljharani, (Bathinda).

Farmers Associations

Various farmers associations are working under the aegis of Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana. The Directorate of Extension Education is involved in regulating the activities of different livestock farmer associations. The regular monthly meetings/seminars of members of these associations are being held at GADVASU, Ludhiana. Besides giving lectures on technical information, the queries/problems of farmers are solved by university experts. These meetings provide a common platform for both scientists and farmers to solve problems at field level expressed by the farmers.

Farmers Advisory Helpline

The telephonic helpline in the Department of Veterinary and Animal Husbandry Extension Education attends to the queries of livestock owners regarding the animal health and management problems. Telephone helpline was started with the motto "You ask, we reply". The University has also been receiving calls from distant areas like Haryana, U.P, Bihar, Rajasthan, H.P and M.P. for on the spot solution. In addition the queries were also answered through postal letters as well.

Farmers Information Centre

The Farmers Information Centre run by the university acts as a single window system to cater to the needs of farmers at one place. The farmers have been given technical advice during their visits to the University. The various university publications/extension literatures are available in the farmer information centre for the use and purchase by the farmers. The faculty of the department attends to the farmer queries on various subject matters in this centre.

Linkage with other departments

The University has liaison with various Departments of Punjab State viz; Animal Husbandry, Dairy Development and Fisheries for undertaking animal welfare activities. The University participates as knowledge partner in various livestock promoting activities viz. Zonal Livestock Shows, North Zone Livestock Championship, Dairy Training Programmes, Animal Welfare Camps/Field Days etc. organized by the State Departments every year and the exhibitions were arranged at various places of events.

Guided Visits/ Farmers Exposure Visits

To provide the latest technical know-how existing at farms of progressive farmers, the trainees of different associations like ATMA, Punjab Dairy Development Board are taken to these model farms to get exposure about the practices being followed so that they can practically judge the pros and cons of the practices for adoption at their farms. Clinical orientation of final year students of Diploma in Veterinary Science and Animal health Technology from Veterinary polytechnic, Kaljarani, (Bathinda) was also organized.

Utility services: For up gradation of knowledge of the farmers, extension functionaries, scientists and subject matter specialist, the Directorate of Extension Education is providing following utility services at a very nominal rates.

I. Information Services:

a. Publications

- A book on Package of Practices for Livestock Health Management
- Progressive Livestock Farming and Vigyanak Pashu Palan (Monthly Punjabi Magazine)
- Hand book on Infectious Animal Diseases
- Veterinary Punjabi Shabad Kosh
- Dairy Farming
- Goat Farming in Punjab (English & Punjabi)
- Pashuan da parjanan parbandh
- Santulit Ate Miyari Pashu Khurak
- GADVASU hand-book
- Poultry Farming
- Indigenous practices of farmers
- Vet Alumnus
- Vigyanik soor palan
- Paltuu Kitia de samb sambhal
- GADVASU News letter

b. T V/ Radio talk

c. Telephone helpline: 0161-2414005, 2414026

II. Technical services :

- a. O.P.D. /Indoor services for sick animals.
- b. Surgical treatment of animals
- c. Blood/faeces/urine/mucous/milk testing
- d. Feed and fodder evaluation
- e. Testing of water sample of farmer’s ponds

III. Input services:

- a. Mineral mixture.
- b. Uromin lick
- c. Semen

- d. Breeding bulls/calves
- e. Mastitis kit
- f. Disease outbreaks
- g. Sale of carp fish seed and ornamental fish seed/ table size fish and ducklings
- h. Sale of fish, parwn and duck eggs
- i. Maintenance of aquaria
- j. Free of cost Azolla and Duckweed inoculum for livestock and fish farmers

IV. Chartered services:

- a. Animal Welfare Camps/days
- b. Expert lectures (on campus/field)
- c. Training programmes for farmers, field functionaries (on campus/field)
- d. Tailor made courses (on campus/field)



NATIONAL AGRICULTURAL INNOVATION PROJECT

Sustainable Livestock Based Farming System for Livelihood security in Hoshiarpur district of Punjab

Interventions:

- Regular feeding of mineral mixture, uromin licks, fodder blocks and increased availability of green fodder along with deworming of 908 buffaloes and 457 cows of 1284 families led to an increase in milk yield from 2.128 litre per animal per day to 2.736 litre per animal per day. Each family earned an extra income of Rs 45/- (average) from increased milk yield when it was calculated to be sold @ Rs 36/- per litre.
- Two young innovative farmers of village Koi (Block Bhunga, District Hoshiarpur) started piggery after obtaining requisite know-how from University Experts. They made sty for the pigs with locally available material (Bamboo, Sarkanda etc).
- The pigs (n=16; Female-12 and male-4) reared under the guidance of GADVASU experts gained an average weight of 64.26 kg at 7 month of age. All these pigs were kept on swill (Kitchen waste). The local pigs gained about 50 kg of weight during the same period under report when kept on swill feeding.
- Fourteen proven Beetal bucks of high genetic merit from University's stock were provided to 14 beneficiary goat farmers. Breeding of local goats with these bucks led to an increase of 16-18 % higher birth weight than the birth weight of local stock. The growth rate in kids sired by University's bucks was significantly higher than those kids sired by local bucks.
- Supply of seeds of improved varieties of fodder crops like Bajra (PCB 164) and fodder maize to 234 and 139 families, respectively, led to an increase in fodder availability from 11 kg per household per day to 24 kg per household per day in summer and rainy seasons. If sold in the market, this increased green fodder would have fetched Rs 5,45,000/- (aggregate for 373 families).
- Specially designed poultry cages were fabricated by utilizing locally available raw material like bamboo. Each cage measures 9.0'x5.0'x4.5' and can house 35-40 adult layer birds. Each cage costs around Rs 2,500-5,000 when fabricated in the operational area. These cages can be installed anywhere in the vicinity of the farmhouse, even at the rooftop and there is no need of constructing any other infrastructure.
- Four demonstration units of backyard poultry in the above said bamboo made cages was initiated with birds of RIR breed. Each unit has at least 50 birds. These birds started laying eggs at 19-20 weeks of age. Due to the coloured shell, each egg fetches Rs 10 to the farmers. Each farmer on an average earns Rs 250 per day.
- Seeds of improved varieties of Maize (JH3459), Mash (114), Moong (PAU-911), Til (RT 346) led to an improvement in yield by 1.23, 0.94, 0.63 and 0.32 quintals per acre for 360, 318, 86 and 31 households, respectively. The improved yield has fetched Rs 1,09,669, Rs 1,42,787, Rs 40,622 and Rs 22,304 for the respective crops for aggregate families in each category.
- Eleven farm women were given training in bee-keeping and they started this activity with bee-boxes given to them out of NAIP funds. During last academic year, honey worth Rs 17,000/- have been sold by these women.



Sty for pigs made from bamboo and sarkanda



Bamboo made poultry cage

After seeing the success of these women, others demanded training. So, another group of 10 farm women were given training on Sept 23-27, 2013 at KVK, Bahawal (District Hoshiarpur).

- Two groups of 10 and 5 farm women were given training in 'Natural Vinegar Preparation' and 'Alcohol Free Self Carbonated Beverage Preparation' at Fatehpur Kullian and Talwara. Vinegar preparation by the group is under progress.
- A women's SHG (10 members) based at village Koi (Block Bhunga, District Hoshiarpur) is earning on an average Rs 3,500-4,000 per month through stitching and embroidery. Similarly, another SHG (20 members) based at village Asifpur (Block Hajipur) is earning Rs 4,000 per month through same activities. Both these groups are also engaged in extending their skills to other village teens. Other 83 farm women of different villages acquired training in stitching and embroidery for their domestic needs. These women have saved substantial amount of money that had to be paid to commercial stitching houses.
- Seventeen, ten and five farm women were trained in fruit and vegetable preservation, vermicelli making and knitting, respectively. The skills acquired in these trainings were used for domestic needs and needs of the village only.
- Maize shelling by specially designed hand operated maize sheller has reduced the activity time by 60-70%.
- A total of 226 beneficiary farmers were trained for taking care of agro-forestry and medicinal plants.
- One of the Consortium Partners, Unati Cooperative Processing-cum-Marketing Society Ltd, Talwara and a women-SHG (SadaShiv Modern SHG) based at village Ramgarh Sikri got State Awards presented by Honourable Chief Minister S. Prakash Singh Badal on Independence Day (August 15, 2013).

Mechanization and value addition:

- The State Govt. provided a grant of Rs 235 lakhs to a women-SHG (SadaShiv Modern SHG) created under NAIP four years ago at village Ramgarh Sikri (Block Talwara) for the establishment of a processing Unit. The civil work of the Unit got completed. The necessary machinery is being installed now and the processing will start in near future. The SHG will procure the produce from the beneficiary as well as non-beneficiary farmers directly. After processing, the products will be sold by the SHG in the local market. Some of the products will also be exported.

Extension activities:

- Animal Welfare Camps: One Animal Welfare Camp was organized at Shekha Matta in Hajipur Block on 23.08.2013.



Beneficiaries farm women stitching clothes



Consortium Partners, Unati Cooperative Processing-cum-Marketing Society Ltd, Talwara and a women-SHG (SadaShiv Modern SHG) based at village RamgarhSikri receiving State Award

- Pashu Palan Melas: The third Pashu Palan and Kheti Mela was organized at RRTC, Bhatoli (Talwara) in collaboration with NAIP on Oct 01, 2013. The chief guest, Dr V K Taneja, Vice-Chancellor, GADVASU, Ludhiana released two NAIP Bulletins on the occasion.
- Women-in-Agriculture Day: It was celebrated at village Ramgarh Sikri (Talwara) on Dec 04, 2013. Dr V K Taneja, worthy Vice-Chancellor, GADVASU, Ludhiana was the chief guest of the occasion.

Krishi Vigyan Kendra, Booh, Taran Taran

As per the survey conducted on 125 families in five villages selected at random around the KVK Booh, Tarn Taran, revealed the following main features;

- Five villages including Booh, Kirtowal Kalan, Kirtowal Khurd, Booh Havelian and Booh Hathar were surveyed and the average family size was 6.5.
- Number of farmers based on agricultural land holding for large (20-40 acres of land), medium (10-20 acres of land), marginal (5-10 acres of land) and landless was 12 (9.60%), 19 (15.20%), 78 (62.40%) and 16 (12.80%), respectively.
- Land subjected to fodder production was 1 acre per family irrespective of number of livestock heads available.
- Education wise, percentage of graduates for twelfth pass, tenth pass, eighth pass, fifth pass and illiterate was 1.6, 12, 44, 12, 8.8 and 21.6, respectively.
- The livestock status of these families observed in a population of 1066 animals was 330 cattle and 736 buffaloes. There were 9 bulls (2 cattle, 7 buffalo), 185 calves (< 2 years, 74 cattle, 131 buffalo), 107 heifers (30 cattle, 77 buffalo), 216 dry cows (43 cattle, 173 buffalo) and 529 cows in milk (181 cattle, 348 buffalo).
- Feeding management involved feeding of green fodder @ 30-35 kg/animal/day (seasonal), wheat straw throughout the year and only 1-2 % self made concentrates. The rest of the population used commercially available concentrates fed according to self perception of feeding and milk yield.
- Housing system adopted for the livestock was intensive type, stall fed with open yard manual dung removal. Labour used in the animal management was self and family members.
- Total milk production of the cattle was 1264 kg (from 181 cattle in milk) and that for buffaloes was 1636 kg (for 348 buffaloes in milk) with an average milk production of 6.98 and 4.70 kg respectively. The peak yield milk production for cattle was 11.28 kg from 75 observations and for buffalo 9.21 kg from 116 observations. Milk consumption was through household use or middle man marketing.
- Animal health practices adopted included vaccination and deworming, ancillary and breeding facilities from Animal Husbandry Department, Punjab Government.
- Reproductive management of the livestock revealed 80% farmers followed natural service for their animals, whereas, only 20% followed artificial insemination.



Dr V K Taneja, Vice-Chancellor, GADVASU Ludhiana along with other officials releasing two NAIP Bulletins on the occasion of Pashu Palan and Kheti Mela



University contingent that participated in All India Inter-agri Youth Festival held at University of Agricultural Sciences, Bangalore and won Overall Trophy of Theatre and several other prizes/positions

Activities undertaken and progress made

S. No.	Activity initiated	Progress made
1.	Animal welfare and treatment camps	12 camps organized 1580 cases handled in these camps
2.	Specialized training programmes	Seven training programmes conducted in Dairy Farming (2, 43 beneficiaries), Goat Farming (1, 33 beneficiaries), Pig Farming (2, 86 beneficiaries), Poultry Farming (1, 28 beneficiaries)
3.	Farmer support material	Mineral mixture (18 quintals) Uromin blocks (400 number) Medicines through animal welfare and treatment camps (1580 beneficiaries) Vigyanic Pashu Palan Magazine (150 farmers) Literature in the form of animal husbandry packages sold to farmers
4.	Handling of outbreaks	Attended endemic outbreaks of Brucellosis, nitrate toxicity and others.
5.	KVK awareness programme	Field meetings with local educational institutes. Visit to three blocks – Patti, Valtoha and Bikhiwind, in the district for gathering information about the blocks. Five progressive farmers around the KVK involved for adoption under the KVK programmes. Discussed about KVK in the monthly meetings of planning at DC office Tarn Taran.
6.	Health management of livestock	Consultation and treatment cover provided to around 200 farmers around the KVK centre through phone calls, personal contact and visits to the farmers place.
7.	Breeding management of livestock through scientific interventions	OFT in estrous synchronization at two farms (5 animals per farm) has been initiated and results are awaited. OFT in parasitic control and impact on production has been initiated at four farmer's places (5 animals per farmer) results will be taken shortly as per action plan.
8.	Front line demonstration	An effort to carry on the FLD in Maize as fodder crop (J1006) was initiated and the seed was purchased and distributed to the 20 farmers around KVK @ 15 Kg per farmer per half acre plots. Leaf Colour Charts were procured and distributed to 40 farmers free of cost for the proper/judicious use of Nitrogen Fertilizer in Rice, Wheat and Maize crops.
9.	SMS portal for farmers	Around 263 farmers have been enrolled on FarmFlux through ZPD for SMS portal. 529 farmers list has been provided to the ZPD for information who have enrolled/visited the KVK for farmers consultation/trainings/advise etc.

Krishi Vigyan Kendra, Barnala

A. Demonstrations

S.No.	Name of demonstration	Area(Acre)	No. of beneficiaries
A Kharif 2013			
1	Use of leaf colour chart	-	40
2	Maize fodder variety J 1006	10	20
B Rabi 2014-15			
1	Gram , variety GPF-2	15	30
2	Mustard, variety GSC-5	20	20

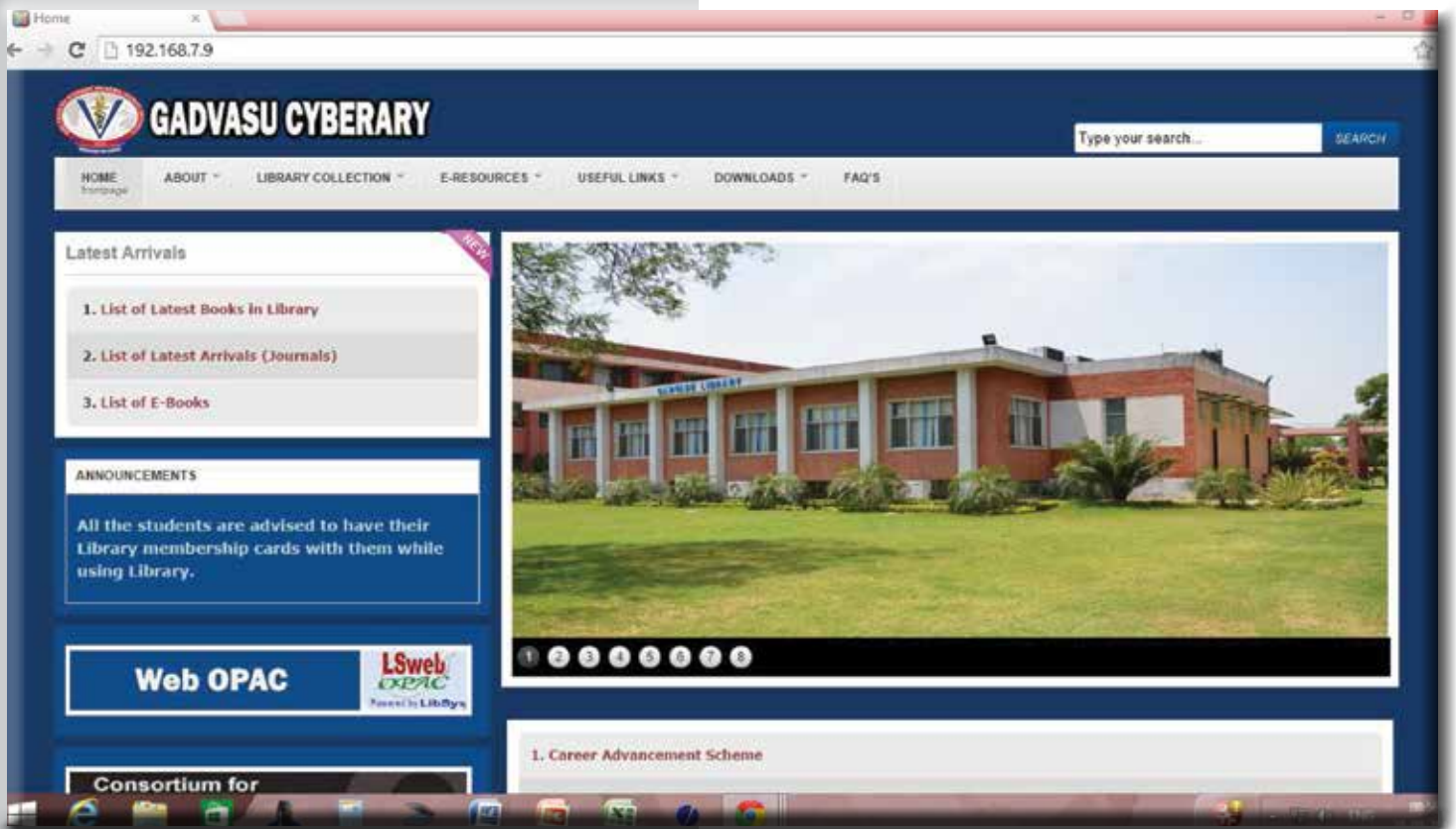
B. Training programme

S. No.	No. of training programme	No. of beneficiaries
1.	5 (short duration)	180
2.	1 (long duration)	48

C. Veterinary camp organized

S. No.	No. of camps	No. of farmers participated	No. of beneficiaries
1.	1	65	117 animals

LIBRARY AND NETWORKING



Cyberary

The GADVASU has state-of-the-art infrastructure and ultra-modern facilities to support the academic and research goals of the University. The Library is fully automated in its operations using LSEase (Libsys) Library Management Software and provides a comfortable reading environment to the students, faculty and staff.

University Library provides a single platform to access various e-resources through its website i.e. Cyberary (<http://www.gadvasu.in/>). The library provides access to about 3400 journals in the broad spectrum of Agricultural Sciences including Veterinary Sciences, Animal Husbandry, Livestock Management & Poultry Sciences, Fisheries and Aquaculture, Dairy Technology, Biotechnology, Animal Nutrition and allied subjects through the Consortium for electronic Resources in Agriculture (CeRA). Access has been provided to KrishiPrabha, a database of doctoral dissertations and theses submitted to Agricultural Universities in India. In addition links have been given to various open access electronic information resources. The Library provides the facility of Online Public Access Catalogue (OPAC) not only inside the library but throughout the campus wide intranet.



Reading hall of the Library



Book exhibition

Library has procured 20 e-books for the academic community of GADVASU. The university library has also subscribed to 11 foreign journals, 7 Indian journals and two databases (Veterinary Science Database and Indiatat.com) during the year 2013-14.

The university library successfully organized a book exhibition on February 5-6, 2014 wherein 31 book publishers and book sellers from different parts of the region had participated and 700 books worth Rs. 29,18,408/- were purchased for the library.

A two day workshop on personality development for UG and PG students of GADVASU was organized by the library on February 21-22, 2014 in association with National Skills Foundation of India, Gurgaon. About 89 students participated in the said workshop and expressed their satisfaction about the proceedings and desired it to be made a regular activity in the institution.

The library had received a grant under 'Centre Sponsored Post-Matric Scholarship to Schedule Caste students' for establishing Book Bank at GADVASU. Under this scheme 329 books worth Rs. 5,84,617/- have been purchased for the benefit of the SC UG/PG students of GADVASU.

Networking

Library has procured latest SPSS Statistical 22.0 software package on network based version for 20 users for statistical analysis. More than 100 new network access nodes were provided in various departments of the University to extend the intranet and internet services. Materials like UTP CAT 6, Fiber Patch Cords etc. were procured for future expansion.

Two Digital Signage/Large Format Displays for providing the information regarding Library Services, Library Rules, Latest Arrival of journals and books, for videos etc. in digital form and for monitoring of various Campus Wide Area Network Services like UTM status, Cisco Network Assistant, Connectivity of Network Switches etc. were purchased. VGA Trans-Receiver equipments was purchased for twin installation to be used during counsellings for admissions to different UG programmes of GADVASU. The same will be installed for benefit of the students and their parents.

The Computer Centre being used by students and staff of GADVASU has been upgraded and new furniture procured. To setup the Video Conferencing facilities in the computer centre for students under CREATE Programme and other important activities at International/National level, two licenses were procured and the new facility established.

Another facility for Video Conferencing will be set up in administrative block for ease of the University administration to interact at different administrative levels and other activities involving signing of MOUs etc.

In order to ensure smooth functioning of the Intranet and Internet facility throughout the GADVASU campus, Support Pack for the Networking Equipments was purchased. UPS for different library facilities were upgraded.

EPABX System was installed in the Library for faster communication within the offices leading to time saving and optimal utilization of the work force.



March Past by Athletes

Sports Wing

During the period under report, university has created enough facilities to promote the sports activities among the students. Large number of students (both boys and girls) from constituent colleges have shown keen interest in sports activities. 8th Annual Athletic meet of the university is organized on Feb. 24-25, 2014. A Sports Contingent also participated in the 15th All India Inter Agricultural Universities Sports & Games Meet held at Assam Agricultural University, Jorhat from March 24-28, 2014. During the year under report, our students participated in various North Zone Inter-varsity Tournaments as given below:

1. Cricket (M) team participated in North Zone Inter Varsity Cricket (M) Tournament held at MDU, Rohtak (Haryana) from Oct. 5-21, 2013.
2. Football (M) team participated in North Zone Inter Varsity Football (M) Tournament held at MDU, Rohtak (Haryana) from Oct. 10-17, 2013.
3. Table Tennis (M) team participated in North Zone Inter Varsity Table Tennis (M) Tournament held at MJP, Rohilkhand University, Bareilly from Oct. 19-23, 2013.
4. Basketball (W) team participated in North Zone Inter Varsity Basketball (W) tournament held at LPU, Phagwara from Oct. 20-23, 2013.
5. Handball (M&W) team participated in North Zone Inter Varsity Handball (M&W) Tournament held at Maharshi Dayanad University Sports Council, Rohtak (Haryana) from Nov. 14-19, 2013.

Glimpses of 8th Annual Athletic Meet



Participants of All India Inter-Agri Youth Festival held at University of Agricultural Sciences, Bangalore



Teej Festival

Cultural Activities Wing

The Cultural Activities Wing of the Directorate has been entrusted with the responsibility of promoting the cultural and co-curricular activities among the students, sharpening of their skills and to provide them a platform to articulate their creativity. To achieve this objective, the Wing organizes regular camps, seminars, meetings and interaction with eminent artists/personalities from the field of art and culture and facilitates the participation of the students in cultural programmes in and out of the University. During the period under report, GADVASU 4th Inter College Youth Festival – 2013 was successfully conducted from Oct. 05-10, 2013. University cultural contingent also participated in 29th North Zone Inter Varsity Youth Festival held at BBAU, Lucknow from Nov. 15-19, 2013.

The Cultural Activities Wing of the University also organized functions to celebrate Independence Day (15 Aug., 2013), Republic Day (26 Jan., 2014) and Parkash Utsav of Shri Guru Angad Dev Ji on April 23-25, 2014.

Glimpses of 4th Inter-College Youth Festival



Independence Day & Republic Day Celebrations



NSS Unit

During the period under report, the NSS Unit conducted the following important activities:

- Organized a seven days NSS Special Summer Camp on the theme “My Plant, My River, My Animal, My City” w.e.f. July 12-18, 2013. The camp was attended by 135 NSS volunteers/students from GADVASU, Ludhiana and Khalsa College of Veterinary and Animal Sciences, Amritsar.
- Organized a seminar on the topic “Disaster management during flood and drought”. NSS volunteers of College of Fisheries and College of Dairy Science and Technology participated in the seminar.
- Organized plantation drive in collaboration with NGO Society for Conservation of Flora and Fauna. About 30,000 saplings were planted in college/university campuses, Govt./private Sr. Sec. Schools, road side and adopted villages in Ludhiana under Environment Awareness Campaign programme during this season. In another plantation drive in collaboration with this society, more than 25000 saplings were planted in and around Ludhiana during June to November, 2013.
- Planted more than 85 herbal/medicinal saplings covering twenty two varieties of plant species in the herbal garden of Kundan Vidya Mandir, Civil lines, Ludhiana on Oct.1, 2013.
- Organized Blood Donation Camps in collaboration with an NGO namely Mahant Ganga Puri Sarva Hitkari Seva Mandal, Ludhiana and Dayanand Medical College and Hospital, Ludhiana on 27/04/2013 to commemorate Prakash Gurburab Utsav of Shri Guru Angad Devji Sahib, World Health Day, Jallianwallah Bagh Massacre Day, B. R. Ambedkar Remembrance Day, and World Earth Day at Langar Bhawan, Gurudwara Gobindnagar on April 27, 2013. A total of 80 units of blood were donated to DMC&H, Ludhiana.
- Twelve NSS volunteers/students were selected for participation in 4th Indian Student Parliament during January 10-12, 2014 at Pune.



Blood donation camp organized by NSS unit



Tree plantation drive on World Environment Day

NSS volunteers also took part in environment awareness rallies, road safety rally, sanitation, health & hygiene awareness and supported the Jamia University Cycle Rally-2013 on the theme “Building India Safe for Women”

During the period under report, the NSS volunteers also observed various important days such as Swami Vivekanand birth anniversary, Independence Day & Republic Day, National Youth Day, Wetland Day, World Health Day, Anti-Terrorism Day, World No Tobacco Day, Food Festival, World Red Cross Day, World Environment Day, World Population Day, Sadbhawana Divas, Teachers Day, International Literacy Day, International Peace Day, NSS Day, Social Justice Day, National Blood Donation Day, Communal Harmony Day, National Integration Day, World AIDS Day, World Human Rights Day, Road Safety Week, National Youth Week, Van Mahotsav Week, International Literacy Week, Parthenium Awareness Week and Qaumi Ekta Week. The volunteers also provided their services in creating awareness on various social issues in rural areas as well as in urban slum areas.



Newly constructed Scientist Home

During the period under report, the Estate Unit continued to look after its lands, buildings and maintenance services. Physical exchange of the lands and buildings as mutually agreed upon by PAU and GADVASU was completed. With the efforts of the Unit, the Hot line power supply in GADVASU has commenced w.e.f. Dec.31, 2013.

The Civil Wing continued its efforts for the construction of new buildings and renovation of existing ones. On the completion of construction work of the buildings of Scientist Home and Kisan Hostel, the inauguration of these buildings was done by S. Parkash Singh Badal, Hon'ble Chief Minister, Punjab on Feb. 01, 2014. The construction work of V.C.'s residence is underway and near completion. The construction work for the buildings of College of Dairy Science & Technology, Girls Hostel and Modern Dairy Sheds has been started. Modernization of livestock farms is in progress with the grant received from the ICAR.

On the front of Students' Welfare activities, efforts have been made to provide maximum facilities and amenities in the hostels so that the students could feel at home. Efforts have also been made to provide security, good landscaping, proper cleanliness and good atmosphere in the campus.




Landscape Section

During the period under report, the Landscape Section of this directorate continued its efforts to aesthetically beautify the campus by plantation of seasonal flowers and ornamental plants of various varieties. Lawns of various buildings of the university are regularly maintained.



Newly constructed breeding and seed production unit for high value species in College of Fisheries

Conferences and Trainings Organized

S. No.	Name
1	World Veterinary Day, Teaching Veterinary Clinical Complex, April 28, 2013  <p><i>World Veterinary day - free vaccination and deworming camp for pet animals</i></p>
2	Trainings on "Diagnosis of Animal Diseases" for Veterinary Officers of Punjab State, Dept of Veterinary Medicine, April 22-26, 2013, May 6-10, 2013, May 27-31, 2013, June 10-14, 2013, Jan 27-31, 2014
3	Technical Seminar on Pig Farming, Department of Veterinary & Animal Husbandry Extension Education, May 9, 2013 
4	Practical Training Course in 'Techniques in Veterinary Microbiology and Molecular Biology' for B.Sc./B.Tech. and M.Sc. Biotechnology/ Microbiology students, Dept. of Vety. Microbiology, June 3–July 2, 2013
5	Advisory Committee Meeting of HRD Project, School of Animal Biotechnology, July 3, 2013. 

S. No.	Name
6	Animal Husbandry Officers' workshop, Department of Veterinary & Animal Husbandry Extension Education, July 29, 2013 
7	Dairy and Fisheries' Officers' workshop, Veterinary and Animal Husbandry Extension Education and College of Fisheries, GADVASU, Aug 12, 2013 
8	26 th Advanced Training Course on "Cutting edge technologies in diagnostics and surgical procedures for veterinary patients" under CAFT, Dept. of Veterinary Surgery and Radiology, Sept 5-25, 2013 
9	21-day Training Course: Updates on male infertility, semen technology and quality oocyte production, Dept of Vety Gyane & Obst., Sept 16 – Oct 7, 2013. 

S. No.	Name
10	ICAR summer school on "Advances in diagnosis, therapy and prevention of Emerging and re-emerging diseases of livestock", Dept of Veterinary Medicine, Oct 8 -28, 2013 
11	First Annual Review Meet of DBT Network Project on Brucellosis, School of Public Health and Zoonoses, Oct 29-30, 2013 

S. No.	Name
12	Training programme "Management and disease problems of commercial dairy farming", Dept of Veterinary Medicine, Nov 25-29, 2013 Dec 9-12, 2013
13	Training programme "Canine Diseases: diagnosis, prevention and treatment", Dept of Veterinary Medicine, Nov 11-15, 2013 Jan 20-24, 2014
14	Silver Jubilee Alumni Meet of College of Veterinary Science, Nov 29, 2013 
15	Training on "Radiographic Interpretation in Small Animals" by Dr. Angela Hartman, Ex. Professor, Massey University, New Zealand, Dept. of Veterinary Surgery and Radiology, Jan 6-8, 2014

Distinguished Visitors

S. No.	Name and other details about the visitor	Date (s) of the visit
1.	Dr. S.D. Singh, ADG (Fisheries), ICAR	June 17, 2013
2.	S. Gulzar Singh Ranike, Cabinet Minister for Animal Husbandry, Fisheries and Dairy Development, Punjab Sh. G. Vajralingam, IAS, Financial Commissioner, Animal Husbandry, Fisheries and Dairy Development, Govt. of Punjab	July 29, 2013
3.	Sh. Des Raj Dhugga, Chief Parliamentary Secretary Animal Husbandry, Fisheries and Dairy Development	Aug. 12, 2013
4.	Dr. Kusmakar Sharma, ADG (Education), ICAR	October 8, 2013
5.	Dr. N.K. Ganguly, Ex Director ICMR Dr. S.R. Rao, Advisor DBT, Govt. of India	Oct. 30, 2013
6.	Dr. Khub Singh, Chairman, Janhit Rural Research and Development Foundation, Noida, UP	Oct. 3, 2013
7.	Shri Janesh Garg, Secretary of ISF and Faculty of Indo Soviet Friendship College of Pharmacy, Moga	Dec. 5, 2013
8.	Dr. G.S. Kalkat, Chairman, Punjab State Framers Commission & Dr. B. S. Sidhu Agricultural Commissioner, Govt. of Punjab	Jan.1, 2014.
9.	Dr. R. S. Sangwan, CEO, Bioprocessing Unit, (DBT), Mohali	Jan. 6, 2014
10.	Dr. Tej Pratap, Vice Chancellor, SKUSAT, J&K Dr. W.S. Lakra, Director-cum-Vice Chancellor CIFE, Mumbai	Jan. 27, 2014
11.	S. Parkash Singh Badal, Hon'ble Chief Minister of Punjab at Farmers-Scientists Interaction held at Guru Angad Dev Veterinary & Animal Sciences University (GADVASU), Ludhiana	Feb. 1, 2014
12.	Sh. Anil Sharma, Minister of Ruler Development, Panchyat and Animal Husbandary, HP	Feb. 10, 2014
13.	Dr. G.S. Khush, Renowned Agronomist and Geneticist, Davis, California	Feb. 26, 2014

Awards and Honours

Name of the Faculty/ Student	Award/Honour
COLLEGE OF VETERINARY SCIENCE	
Animal Genetics and Breeding	
P P Dubey	Genomic selection in Livestock and Poultry, National Conference on EPRAAS: Basic to molecular approaches, Feb 8-9, 2014, at CCS Uni. Meerut, . (Best Poster awarded)
Balwinder Kumar S.T. Singh	Young scientist award by society for scientific development in Agriculture and Technology, CCS Uni. Meerut
Balwinder Kumar	Best Poster Presentation National Conference on EPRAAS: Basic to molecular approaches, Feb 8-9, 2014, at CCS Uni. Meerut, . (Best Poster awarded)
Simarjeet Kaur	Executive Member of Society of Conservation of Domestic Animal Biodiversity (SOCDAB)
Livestock Production Management	
A.L. Saini	Co-Chairman of session on "Climate change and its effect on livestock productivity" XXI Annual Convention of Indian society of Animal Production and Management, held at Anand Agricultural University, Anand (Gujarat) from 28-30 January, 2014.
Chandrasah	Appreciation Certificate for providing excellent services to the farming community by Vets Club, Ludhiana, Punjab Best oral presentation award in Supplementation of prepared organic copper and zinc on performance of Beetal does and kids" authored by Chandrasah, S. Saijpal and A. L. Saini Rapporteur, Progressive Punjab Agriculture Summit-2014, Mohali
Sandeep Kaswan	Awarded Professor Tielen Fund Foundation (PTF) Fellowship for participation in XVIth International Congress on Animal Hygiene, held on May 5-9, 2013 at Nanjing, China. Best Ph.D. (Silver) student of I.V.R.I. of the year 2012-13 conferred at eight convocation of the institute held on Nov. 11, 2013. Smt. Kadambani Jana Award in Research work on "Relative economics of pig rearing with different floor space allowances" and "Behaviour and welfare assessment of pigs reared with reduced floor space allowances"
Priyanka Rana	Best Poster presentation award in "Effect of different immunoglobulin sources on haematology of Beetal kids under stall-fed conditions"
Aleesha Luthra	Best Poster presentation award in "Analysis of age and growth pattern by teeth and body biometry in Beetal goats"
Anil Kumar Sharma	Best oral presentation award in "Aerobic composting as suitable waste management technique for poultry farmers"
Sarada Prasanna Sahoo	Second award in oral presentation award in "Effect of litter acidification on broiler production"
Livestock Products Technology	
Manish Kumar Chatli	Distinguished Veterinarian Award from Alumni Association, GADVASU, Ludhiana.
Veterinary Medicine	
B.K. Bansal	Fellowship of Indian Society of Veterinary Medicine
S. K. Uppal	Best oral presentation awards at ISVM conference, SKAUST, Jammu
Ashwini Kumar	Best oral presentation awards at ISVM conference, SKAUST, Jammu
D. K. Gupta	Best oral and poster presentation awards at ISVM conference, SKAUST, Jammu
Sujata Turkar	Best Poster Presentation Awards at ISVM conference, SKAUST, Jammu

Name of the Faculty/ Student	Award/Honour
Veterinary Anatomy	
Devendra Pathak, Neelam Bansal, Kuldip Gupta and SPS Ghuman	Dr K L Suri Award and Medal for Best Poster presentation for "Immunolocalization of progesterone receptor in oviduct of buffalo". " at XXVIIIth Annual Convention of Indian Association of Veterinary Anatomists and National Symposium at Department of Veterinary Anatomy, Rajasthan University of Veterinary And Animal Sciences, Bikaner during 8-10, January, 2014.
Devendra Pathak, Neelam Bansal and Kuldip	Dr K S Roy Award for Best paper in Histoenzymology and Immunohistochemistry for "Immunolocalization of estrogen receptor alpha in uterus of buffalo" at XXVIIIth Annual Convention of Indian Association of Veterinary Anatomists and National Symposium at Department of Veterinary Anatomy, Rajasthan University of Veterinary And Animal Sciences, Bikaner during 8-10, January, 2014.
Amit Challana, Anuradha Gupta, Neelam Bansal and Varinder Uppal	Dr. C. Vijayragavan Memorial Medal for Developmental Anatomy in XXVIII Annual Convention of Indian Association of Veterinary Anatomists and National Symposium at Department of Veterinary Anatomy and Histology, held at Bikaner from Jan. 8-10, 2014.
Veterinary Physiology and Biochemistry	
Digvijay Singh	Dr. D.N. Mullick Memorial Award 2012
Veterinary Microbiology	
Hari Mohan Saxena	Lifetime Educational Excellence Award & Medal of the Business Development Association of India Awarded a South African Patent on innovation in diagnostics Innovation selected among the Top 100 Innovations of 2013 in the India Innovation Growth Program sponsored jointly by FICCI, Lockheed Martin Inc., Indo-US Science & Technology Forum, Stanford Graduate School of Business, DST of Ministry of S&T of India and IC2 Institute, Texas University.
Deepti	ISVIB Scientist Award
Veterinary Gynaecology & Obstetrics	
Ajeet Kumar	Best paper presentation Award (Oral), for paper "Identification of Heat Shock Protein 70 (HSP70) in fresh and cryopreserved beef bull semen" during 29th Annual Convention of ISSAR and National Symposium held at Nagpur from January 8-10, 2014
Khusdeep Singh	Young Scientist Award (Oral), for paper "Breeding Soundness Evaluation of High and Low Libido Breeding Buffalo Bulls" during 29th Annual Convention of ISSAR and National Symposium held at Nagpur from January 8-10, 2014.
Veterinary Pathology	
NK Sood, K Gupta K and A Singh	Drs. Nemi Chand Jain and Jawahar Lal Vegad Award for Outstanding Research in Veterinary Pathology
K Gupta, NK Sood and Singh A	Savithree Jibachch Sinha Best Poster Presentation Award-2013
A P S Brar, N K Sood, K Gupta and B S Sandhu	Organizing Secretary Award-2013 for the Second Best Poster Presentation
B S Sandhu, NK Sood, K Gupta K and A Singh	Gang-Mana Sharma Award for the best article about the pack animals entitled "Honey bee (Apis mellifera) envenomation induced death in a mare," published in the Indian Journal of Veterinary Pathology, 2011 (35) :77-79.
Veterinary Surgery & Radiology	
P. Kaur, J. Mohindroo, SS Singh, S.K. Mahajan, N. Bansal	Gold Medal for Best Research Paper in the Diagnostic Imaging at the 37th Annual Congress of ISVS held at Thrissur, Kerala (6th to 8th November 2013)

Name of the Faculty/ Student	Award/Honour
Teaching Veterinary Clinical Complex	
Rakesh Ranjan	NAAS Associate
N.K.Sood	Best Oral Presentation Award in the XXXI Annual Convention of Indian Society for Veterinary Medicine (ISVM), Organized by Department of Veterinary Medicine, COVS & AH, Mahu, NDVSU, Jabalpur, M P w. e. f January 9-11, 2013.
Veterinary Parasitology	
L.D. Singla	Selected Editor of Indian Journal of Animal Research Selected Editorial Board Member of Sky Journal of Microbiology Research Selected Editorial Advisory Board member of Applied Biological Research Dr. D. P. Banerjee Memorial Oration Award-2013 by Indian Association for Advancement of Veterinary Parasitology in recognition of valuable contribution/achievements in the field of Veterinary Protozoology
Parul Sharma, P.D. Juyal, L.D. Singla, Deepti Chachra and H. Pawar	ISVIB Scientist award 2013 by Indian Society for Veterinary Immunology and Biotechnology for paper published in journal of highest impact factor
SCHOOL OF ANIMAL BIOTECHNOLOGY	
Niraj K Singh	Young Scientist Award (2013), ISVIB for oral presentation on topic "Effect of small interfering RNA-mediated knockdown of rabies virus polymerase (L) gene transcripts on rabies virus multiplication
R S Sethi	International Travel support fund from Department of Science and Technology, New Delhi
SCHOOL OF PUBLIC HEALTH & ZONOOSES	
J P S Gill	Appointed Adjunct Professor At Western College of Veterinary Medicine, university of Saskatchewan, Canada Nominated Member of Scientific Panel of Food Safety and Standards Authority of India for Contaminants in the Food Chain, Govt. of India Expert in Inter-sectoral Coordination Committee on Antimicrobial Resistance proposed by Task force to discuss the proposed recommendation on antimicrobial resistance to Govt. at CSRI New Delhi Expert in ICAR-NAVS-Expert Consultation on Brucellosis
B. B. Singh	World Association for Advancement of Veterinary Parasitology Scholarship funding (2013)
Simranpreet Kaur	ICP 2013 Travel Scholarship Award" amounting to AUD \$2000 awarded by the "Victorian State Government (Australia) and the Melbourne Convention and Visitors Bureau" to attend and present research paper at the 27th Congress of the International Pediatrics Association being held at Melbourne in August, 2013.
Jasbir Singh Bedi	Award of Honour at World Veterinary Day on 28th April 2013 by Vets Club, Ludhiana
COLLEGE OF FISHERIES	
Vaneet Inder Kaur	Selected to attend 3 month International training at University of Ghent, Belgium in the field of 'Neutraceuticals' under ICAR's National Agricultural Innovative Project
Ajeet Singh, V.K. Reddy Ravneet Singh Asha Dhawan	Best Poster Award for the poster entitled "Nutritional significance of gelatin prepared from rohu (L. rohita) waste" presented at "National Conference on Bioactive Compounds and Functional Foods in Health and Disease Management" at NIFTEM, Sonapat from Nov 15-16, 2013
Deepjot Singh	Got admission in Texas A&M University-Corpus Christi (USA) for MS in Fisheries and Mari culture Program and has also appointed as a Teaching Assistant with an out-of-state tuition fee waiver.
Balwinder Singh	Selected for participation in Republic Day Parade at New Delhi as NSS cadet from GADVASU

Participation of Faculty in Conferences/ Symposia/ Workshop/ Trainings

International

S. No	Name of the Conference/ Symposia/ Workshop/ Training
1	XIX Annual Convention of India Society for Veterinary Immunology & Biotechnology (ISVIB) and National Symposium on Emerging Trends In Biotechnology Research For Sustainable Animal Health And Productivity, IVRI, Bareilly, April 8-10, 2013
2	Experimental Biology Meet, Boston, USA, American Association of Anatomists, April 20-24, 2013
3	XVIth International Congress on Animal Hygiene, Nanjing, China, May 5-9, 2013
4	Continuing Medical Education on Molecular Imaging, WCVI, University of Saskatchewan at University of Saskatchewan, May 15, 2013
5	Workshop on Frontiers of Hybrid Medical Imaging Technology, WCVI, University of Saskatchewan at University of Saskatchewan, May 16, 2013
6	Two Month Training on Diagnostic Imaging and colic surgery, WCVI, University of Saskatchewan from University of Saskatchewan, May 13-July 12, 2013
7	Summer school entitled as "Complexity of Pathogen-Host Interplay", Berlin, Germany, June 1-15, 2013
8	15th International Conference on Production Diseases in farm animals (ICPD 2013), Swedish University of Agricultural Sciences, Uppsala, Sweden, June 24-28, 2013
9	1st International conference of Fish and Shellfish Immunology, Vigo, Spain, June 25-28, 2013
10	First International and Third National Conference on Biotechnology, Bioinformatics and Bioengineering, Society for Applied Biotechnology, Tirupathy, Andhra Pradesh, June 28-29, 2013
11	Advanced Dairy Training, Ministry of Agriculture, Israel, July 7-19, 2013
12	To improve conception rate following application of fixed-time AI (FTAI) protocols in buffaloes under hot-humidity conditions', Department of Animal Reproduction, University of São Paulo, São Paulo – SP, Brazil, July 29-Oct 26, 2013
13	Six Month UGC sponsored Raman Post Doctorate Fellowship for Indian scholars, Purdue University, USA, July 1, 2013 to Jan 2, 2014
14	International Plant Nutrition Colloquium, Istanbul, Turkey, Aug 19-22, 2013
15	International Congress of Pediatrics 2013, International Pediatric Association, Melbourne, Australia, Aug 24-29, 2013
16	24th International Conference of the World association for Advancement of Veterinary Parasitology (WAAVP), Australian Society for Parasitology, being held at Perth, Australia, August 25-29, 2013
17	Animal Nutrition Conference, SKUAST, Jammu, Sept 19-21, 2013
18	International Symposium on Problems on Listeriosis (ISOPOL XVIII), ICAR Research complex, Goa, Sept 19-22, 2013
19	Reproductive Health: Issues and strategies under changing climate scenario organized by Indian Society for the Study of Reproduction and Fertility (ISSRF), IVRI, Bareilly, Sept 26, 2013
20	International Conference on Challenges of Electronic Environment in Academic Libraries, A.C.Joshi Library Panjab University, Chandigarh, Oct 29-30, 2013
21	"International workshop on water for health", Baba Farid University of Health Sciences, Faridkot, Nov 7-8, 2013.
22	Exhibition and conference on agriculture machinery and agro processing Industries, IARI, Pusa, New Delhi, Dec 5-7, 2013
23	Extension Educational Strategies for Sustainable Agricultural Development – A Global Perspective, University of Agricultural Sciences, Bangalore, Dec 5-8, 2013
24	Annual Brucellosis Research Conference, International Brucellosis Research Association, 2013 at Chicago, Illinois, USA, Dec 6-7, 2013
25	Indo-UK Workshop on use of molecular epidemiology and functional genomics to combat S. aureus mastitis, NIVEDI, Bangalore and Univ. of Cambridge, UK, Feb 1-3, 2014
26	International Conference on Reproductive Health: Issues and Strategies under Changing Climate Scenario and 24th Annual Meeting of Indian Society for the Study of Reproduction & Fertility, Indian Veterinary Research Institute, Bareilly, Feb 6-8, 2014
27	32nd Annual Convention and International Symposium of ISVM, Division of Vet. Medicine, SKUAST, Jammu, Feb 14-16, 2014

National

S. No.	Name of the Conference/ Symposia/ Workshop/ Training
1	Workshop on Eye Surgery, Madras Veterinary College, Chennai, April 9-10, 2013
2	Challenges in Feed Milling, Kemin, India, April 12, 2013
3	Workshop on "Advancement in semen – Analysis and Production", IMV India Pvt Ltd at New Delhi, April 16, 2013
4	SAARC Agriculture Centre (SAC) sponsored training on "Molecular technique in diagnosis of diseases of farm animals and poultry, High Security Animal Disease Laboratory (HSADL), IVRI, Bhopal, MP, 22 April 22-May 1, 2013
5	World Veterinary Day, ROVA, Punjab, May 1, 2013
6	Meeting of Nodal Officers, RDDDL Jalandhar, May 10, 2013
7	Scientist Meet and Annual Review of the Research Project under ICAR Niche Area of Excellence: Animal Disease Registry and Tissue Bank held at New Delhi, ICAR, May 24, 2013
8	Research Methodology in science, Deptt. of Biotechnology, PU Chandigarh, May 25-June 14, 2013
9	National symposium on Child Nutrition security in India: Way Forward with Milk to Commemorate World Milk Day, National Academy of Dairy Science, NDRI Karnal, June 1, 2013
10	DBT Network Program on Brucellosis' held at PD ADMAS, Bangalore, DBT, New Delhi, June 1, 2013
11	Workshop on "Willed – Body program and other humane Alternatives in veterinary teaching", Bombay Veterinary College, Goregaon Campus, Mumbai, June 6, 2013
12	All India Conference on livestock and dairy development, JK Group, Gandhi Nagar, June 11-12, 2013
13	National training program on "Advances in Statistical Genetics", CAFT at Indian Agricultural Statistics Research Institute, PUSA, New Delhi, July 2-22, 2013
14	Stakeholders workshop on "Capacity building in national planning for food security", Organized by Department of Economics and Sociology, PAU, Ludhiana at Farmer's Service centre of PAU, Ludhiana, July 4, 2013
15	Workshop on 'Brucella Genomics' at School of Biological Sciences, Madurai Kamaraj University, Madurai, DBT, July 8-12, 2013
16	Recent advances in Proteomics for Biomarker discovery, NDRI, Karnal, July 8-Aug 17, 2013
17	Training on "Capacity Building Programme for University Teachers on Essential Teaching Skills", G. B. Pant University of Agriculture & Technology Pantnagar, Uttarakhand, India, July 15-21, 2013
18	Participated in Training course on "Sustainable Utilization of Indigenous Animal Genetic Resources of India", National Bureau of Animal Genetic Resources (NBAGR), (ICAR), Karnal; NBAGR, KARNAL, HARYANA, July 17-26, 2013
19	National Training on "Innovative Approaches in Processing & Packaging of Milk & Milk Products", NDRI, Karnal, July 19-Aug 8, 2013
20	Animal Husbandry Officer's workshop, Organised by GADVASU, Ludhiana, July 29, 2013
21	Stakeholders workshop on "Capacity building in national planning for food security", Organized by Department of Economics and Sociology, PAU, Ludhiana, July 30, 2013
22	General Orientation Course-92, GNDU, Ludhiana, Aug 1-28, 2013
23	Summer School on, "Decision support system in agriculture using quantitative techniques", NCAP, New Delhi, Aug 2-22, 2013
24	Dairy Husbandry Officers workshop, GADVASU Ludhiana, Aug 12, 2013
25	Workshop on 'e-resources from the researcher and end user Perspective & its benefits', Springer, Sept 4, 2013

S. No.	Name of the Conference/ Symposia/ Workshop/ Training
26	26th Advanced Training Course on Cutting edge technologies in diagnostics and surgical procedures for veterinary patients, Deptt. of Veterinary Surgery and Radiology, GADVASU, Ludhiana, Sept 5-25, 2013
27	Workshop on "Building awareness on need for basic/strategic research in agriculture and veterinary sciences", NDRI, Karnal, Sept 6-7, 2013
28	Participated in Training course on "Updates on male infertility, semen technology and quality oocyte production, ICAR Centre of Advanced faculty training in Veterinary Gynaecology and Reproduction, Sept 16- Oct 7, 2013
29	2nd Natl. Conf. Indian Academy Vet. Nutr. & Anim. Welfare, SKUAST Jammu, Sept 19-21, 2013
30	Induction Training for Fishery Officers, Punjab Agricultural Management & Extension Training Institute (PAMETI), PAU, Ludhiana, Sept 23-Oct 4, 2013
31	National Symposium on Facilitating Growth of Animal Husbandry Sector, CLFMA, India, Sept 26-27, 2013
32	Meeting of Nodal Officers, RDDDL Jalandhar, Sept 25, 2013
33	Training on "Advances in Statistical Methods for Animal Experiments", Indian Agricultural Statistics Research Institute, ICAR, New Delhi, Oct 1-21, 2013
34	ICAR sponsored summer school on Advances in diagnosis, therapy and prevention of emerging and re-emerging diseases of livestock, Dept of Vety Med. COVS, GADVASU, Ludhiana, Oct 8-28, 2013
35	Training Programme on "RNA Interference: Concepts, Hands-on-Training and its Applications in Animal Biotechnology", Animal Biotechnology Centre, Nanaji Deshmukh Veterinary Science University, JNKVV Campus, Adhartal, Jabalpur, Madhya Pradesh, India, Oct 17-30, 2013
36	33rd Annual Conference of Society of Toxicology of India, Dept. of Pharmacology and Toxicology, DUVASU, Mathura, Oct 23-25, 2013
37	Climate change and Abiotic stress management in livestock; Basic concepts and amelioration measures, NIANP Bangalore, Nov 5-25, 2013
38	37th Annual Congress of ISVS & National Symposium on Need for Specialization and Super specialization in Veterinary Surgery and Imaging Techniques for Professional Efficiency Development, Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Sciences University, Mannuthy, Thrissur, Kerala, Nov 6-8, 2013
39	ICAR sponsored winter school on "Expression of immunogenic genes in heterologous systems and its usage in animal disease diagnosis and vaccines, ICAR, Division of Veterinary Biotechnology, IVRI, Izatnagar, Nov 7-27, 2013
40	CAC and CIC meeting of NAI project Rumen microbial diversity in domesticated and wild ruminants and impact of additives on methanogenesis and utilization of poor quality fibrous feeds, IVRI, Izatnagar, Nov 8, 2013
41	"Application of Molecular and Serological Tools in Fish Disease Diagnosis", Central Institute of Freshwater Aquaculture (CIFA) (ICAR), Bhubaneshwar, Odisha, Nov 9-29, 2013
42	ISVIB conference & National Symposium, Indian Society for Veterinary Immunology and Biotechnology, Nov 10-13, 2013
43	XX Annual Convention of Indian Society for Veterinary Immunology and National Symposium on emerging challenges and opportunities in veterinary immunology and biotechnology for improved animal health and productivity, Indian Society of Veterinary Immunology and Biotechnology and Deptt of Microbiology, CSKHPKV, Palampur, Nov 11-13, 2013
44	'National Conference on Bioactive Compounds and Functional Foods in Health and Disease Management', 'National Institute of Food Technology Entrepreneurship & Management (NIFTEM)' Sonipat (Haryana), Nov 15-16, 2013
45	XXII Annual Conference of SAPI and National Symposium on Cardiovascular and hemodynamic changes in endotoxemia and physiological interventions for animal welfare, SAPI, Nov 19-21, 2013

S. No.	Name of the Conference/ Symposia/ Workshop/ Training
46	XIII Annual conference of Indian Society of Veterinary Pharmacology and Toxicology and National Symposia on Biopharmaceuticals and Nanotechnology in Therapeutics & Development of Anti Cancer Drugs from Botanicals, Division of Pharmacology and Toxicology, SKUAST-J, R.S. Pura, Jammu, Nov 20-22, 2013
47	30th Annual Conference of IAVP and 4th Annual meeting of ICVP National Symposium and CL Davis Satellite Seminar, Department of Veterinary Pathology, College of Veterinary Science and Animal Husbandry, Bhubaneswar, Odhisa, Nov 21- 23,2013
48	XXX Indian Poultry Science Association Conference (IPSACON 2013) and National Symposium on "Poultry Production: Feed, Food and Environmental safety", Indian Poultry Science Association at Central Avian Research Institute (CARI), Izatnagar, Bareilly (UP), Nov 22- 23,2013
49	21 Days ICAR sponsored Winter School, Division of Parasitology, IVRI, Izatnagar, Dec 2-22, 2013
50	XXVII Annual Convention of IAVA and National Symposium, Bikaner, Rajasthan, Department of Anatomy, RAJUVAS, Bikaner, Jan 8-10, 2014.
51	29th Annual Convention of ISSAR and National Symposium on "Frontier reproductive biotechnologies for enhancing animal fertility and fecundity", Department of Animal Reproduction, Gynaecology and Obstetrics, Nagpur Veterinary College, Nagpur, Jan 8-10, 2014
52	Participated in Brainstorming workshop on "Strategy related to conservation and Productivity Enhancement of Farm Animal Genetic Resources", ICAR, NAAS complex, New Delhi, Jan,10, 2014
53	Workshop on Mapping Aflatoxin Contaminated Maize Food and feeds Chain-Developing a Roadmap for Safe Food and Feed for improved Health & Nutrition, NASC Complex PUSA, New Delhi, Jan 16, 2014
54	National Conference on Consumer Packaging: Challenges & opportunities, Indian Institute of Packaging, Hotel Shangri-La's, New Delhi, Jan 17-18, 2014
55	"Biotechnology in medicine and herbal drug development", Baba Farid University of Health Sciences, Faridkot, Jan 23-24, 2014
56	Hindi National Conference "Samaarika" Rashtriya Sangosthi on "Khaddyo Prasanskanon abon prabandhan- Udyamiyan ke liye swarajgar ki Sambhabanaye", CIPHET – Ludhiana, Jan 28-29, 2014
57	Farmers-Scientists Interaction meet, GADVASU, LDH, Feb 1, 2014
58	24th National Conference of IAAVP-2014, Thrisur, Kerala, Feb 5-7, 2014
59	National Symposium on "Harmonizing Phenomics and Genomics for sustainable management of livestock for upliftment of Rural Masses", Society of conservation of Domestic Animal Biodiversity (SOCDAB)& National Bureau of Animal Genetic Resources (NBAGR), NBAGR, Karnal (Haryana), Feb 6-7, 2014
60	Emerging Problems and Recent advances in applied sciences, CCSU, Meerut, Feb 8-9, 2014
61	Progressive Agri Summit 2014, Chapparchiri, Mohali, Feb 16-19, 2014
62	Punjab Agri Summit "Commercial Dairy Farming", Chappar Chirri, Mohali, Feb 18, 2014
63	"Accelerating Agricultural growth: Role of Policy and Technology" delivered by Dr Ashok Gulati, Chairman, CACP, Organized by Dr Gurdev Singh Khush Foundation for the advancement of Agricultural Sciences at PAU, Ludhiana, Feb 26, 2014
64	National seminar on "Role of Punjab Mandi Board in Rural Development", Organized by Society of Economics and Development at Department of Economics and Sociology, PAU, Ludhiana, March 3, 2014

List of Research Schemes Operational during 2013-14

Non Plan Schemes	
1	Director of Research
2	Research Facilities for Dairy Cattle and Buffalo Breeding
3	Genetic Improvement of Egg-type Stock
4	Recovery, Cryopreservation and Embryo Transfer in Buffaloes and Crossbred Cattle
5	Germplasm Multiplication of Egg-type Poultry Stocks
6	Physical Facilities of Breed Quails for Meat and Egg
7	Additional Facilities for Modernization of Dairy Operations
8	Advanced Research Centre for Buffalo Reproduction
9	Rearing of Buffalo Male Calves for Meat
10	Introduction and Breeding of Naked Neck/Rhode Island Red and Other Miscellaneous Stocks of Poultry
11	Molecular and Cytogenetic Studies on Animals for Faster Genetical Gains
12	Intensification of Research in Animal Nutrition
13	Improvement of Buffalo and Crossbred Cattle through Nutrition Effect of Plans of Nutrition on their Growth Rate Age at Puberty, Pregnancy and Lactation
14	Seed Production in Forage Crops
15	Establishment of Research Laboratory for Feed Evaluation and Processing
16	Improvement of Forages and Establishment of Forage Unit
17	Establishment of Research-cum-Quality Control Laboratories for Feed for Livestock/Poultry Farmer and Feed Manufacturers
18	Establishment of Small Animal Colony
19	Creation of Facilities for Rearing of Meat Animals i.e. Goat, Pig and Rabbit
20	Studies on Utilization and Popularization of Processed Meat Products Prepared from Buffaloes and Other Species
21	Anatomical, Histological, Histo-Chemical, Electron-Microscopic Studies as Related to Hormonal and Biochemical Profile in Female Reproductive Organs in Buffalo
22	Internal Diseases of Dairy Animal their Clinico Pathological Diagnostic and Therapeutic Aspect
23	Nutritional Deficiency Diseases of Dairy Animal and their Clinico Pathological Diagnostic and Therapeutic Aspect
24	Animal Disease Research Centre and Strengthening of Diagnostic Facilities & Experimentation
25	Reproductive Biology, Ecology, and Management of Birds and Mammals
26	Reproductive Disorders in Dairy Animals
27	Studies on Viral Bacterial and Mycotic Infection of Cattle and Buffaloes with a View to Develop Diagnostic Test and Suitable Vaccines
28	Research on Poultry Diseases
29	Establishment of Research-cum-Diagnostic Laboratory for Rabies
30	Immunological Studies on the Helminthic Diseases of Livestock
31	Immunological Control of Cattle Tick (<i>Boophilus microplus</i>)
32	Toxicity Studies of Insecticide in Livestock
33	Research on Diagnostic Aids & Surgical Treatment of Muscule Skeletal and Abdominal Disorders in Large Animals
34	Strengthening of Fisheries Research in GADVASU
35	Fisheries Research Scheme
36	Establishment of Fisheries Unit
37	Sustainable Aquaculture Technology for Salt-Affected/Water-Logged Areas of Punjab
38	Regional Livestock Research Centre at Bathinda
39	Regional Livestock Research Centre at Kapurthala
40	i. State Share in Aicrp & Other Schemes on Sharing Basis, ii. State Share on Account of Personal promotion in ICAR & Other Agency Shcemes, iii. State Share for Works/ROC Financed by ICAR & Other Agencies iv. Arears of Employees and Provision for Vacant Posts
41	Control of Mastitis in the Punjab State - A Pilot Project

Plan Schemes	
1	Establishment of Research Centre and Referral Hospital for Equines.
2	Studies on Goats for Meat and Milk Production under Staff-Fed Conditions in Punjab
3	Strengthening of Veterinary Laboratory for Advanced Diagnostic Facilities
4	Establishment of Critical Care Unit for Small and Large Animals
5	Establishment of an Immunopathology Research-cum-Disease Diagnostic Centre in the Department
6	Pesticide-Induced Adverse Effects Implication on Livestock Production
7	Development of Strategies for Production of Safe and Residue Free Animal Food
8	Integrated Management and Control of Parasitic Diseases in Domestic Animals for Enhancing Livestock Productivity in Different Agro-Climatic Zones of Punjab State
9	Diagnosis and Control of Brucellosis-A-Dreadful Zoonotic Disease in Domestic Livestock for Enhancing Productivity in Punjab State
10	Strengthening of Postgraduate Institute of Veterinary Education & Research (PGIVER)
11	Studies on Metabolic Profiling, Risk Factors and Treatment of Production Diseases in Dairy Animals in Punjab
12	Epidemiology, Diagnosis and Management of Gastrointestinal Disorders in Dairy Animals in Punjab
13	Strengthening of Livestock Farm for Teaching Students
14	Strengthening of School of Animal Biotechnology
15	Strengthening of Directorate of Research
16	Augmenting Fertility in Dairy Animals through Assisted Reproductive Technologies
17	Studies on Detection & Prevention of Haemorrhagic Septicaemia in Bovines in Punjab
18	Development of Molecular and Rapid Serological Tests for Diagnosis of Paratuberculosis in Cattle and Buffaloes
19	Development of a Molecular Test to Detect Etiological Agents Involved in Neonatal Calf Diarrhea with a View to Quicken its Diagnosis
20	Production of Safe & Wholesome Food Through Food Safety & Quality Control Measure in Punjab
21	Status on Nutritional Profiles & Food Safety Aspects of Meat & Poultry Products Available In Punjab and Improvement in their Quality
22	Development & Standardization of Molecular & Sero Diagnostic Tests against Bacterial and Viral Diseases of Farm Animals Prevalent in Punjab State
ICAR	
1	Network Project on Buffalo Improvement (Field Unit)
2	Network Project on Buffalo Improvement (Main Unit)
3	All India Network Programme on HS
4	Project Directorate on Cattle Field Progeny Testing (FPT)
5	Project Directorate on Animal Disease Monitoring & Surveillance (PD_ADMAS)
6	AICRP on Poultry Improvement
7	AICRP on Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production
8	AICRP on Cattle-Sahiwal (Data Recording Unit)
9	Network Programme on Estimation of Methane Emission under Different Feeding Systems and Development of Mitigation Strategies
10	Niche Area Excellence Project: Inland Aquaculture in Punjab
11	Animal Disease Registry and Tissue Bank - Niche Area Excellence Project
12	Rumen Microbial Diversity in Domesticated and Wild Ruminants and Impact of Additives on Methanogenesis and Utilization of Poor Quality Fibrous Feeds. (NAIP)
13	Development of Sustainable Livestock Farming System for Livelihood Security in Hoshiarpur District of Punjab (NAIP)

UGC

1	Polymorphism Screening and Association Studies of CXCR Genes with Udder Health and Milk Production in Buffalo Breeds of Northern India
2	Studies on Cloning and Expression of Heat Shock Proteins (HSPs) of <i>Brucella</i> spp. and their Immunological Characterization in Experimental Animals
3	Development of User-Friendly and Diagnostic Kit for Marek's Disease
4	Ameliorative Measures for Enrofloxacin Induced Testicular Toxicity in Rats
5	Colour Doppler Studies on Major Blood Vessels in Dairy Animals
6	Development of Biochemical Assay, Diagnostic Tool for Synthetic Pyrethroid Resistance in Cattle Tick <i>Hyalomma anatolicum anatolicum</i>
7	Development of Control Strategies Based on Molecular Epidemiology and Drug Efficacy for Equine Piroplasmiasis in Punjab
8	Persistent Organic Pollutants in Fish, Fish Pond Sediments and Water: Health Risk Assessment through Dietary Exposure
9	Heavy Metal Exposure vis-a-vis Reproductive Performance in Buffaloes
10	Molecular Epidemiology & Diagnostics of Pig Transmitted (Zoonoses) Human Parasitic Diseases
11	Molecular Epidemiological Characterization and Diagnostics of Human Brucellosis, A Major Zoonotic Disease
12	Epidemiology, Diagnostic, Therapeutic and Prophylactic Studies on Goat Mastitis in North-Western States of India
13	Role of Antisperm Antibodies in Infertility /Repeat Breeding of Cattle
14	Studies on Intra-Vitam Diagnostic Approaches of Rabies in Animals
15	Studies on Lymphangiogenesis in Canine Model of Human Breast Cancer
16	Comparison of Canine Parvovirus Vaccine Strain with Field Isolates by Gene Sequencing
17	Development of a DIVA Assay for Differentiation of Haemorrhagic Septicaemia Infected from Vaccinated Cattle and Buffaloes
18	Toxicokinetics of Pyrethroids
19	Uterine Immunomodulation: A Swap of Antibiotherapy in Endometritic Cattle
20	Immuno-Histochemical Localization of Estrogen and Progesterone Receptors in Female Genitalia of Buffalo
21	Standardization of Culture Technology of Duckweed (<i>Lemna</i> sp.) and its Utilization as Feed in Carp Polyculture System
22	Studies on the Fresh Water Pearl Mussel Culture under Agro-Climatic Conditions of Punjab
23	Screening and Evaluating Impacts of Potential Beneficial Micro-Organisms as Probiotics for Fish and Shellfish

DBT

1	Network Project on Brucellosis for Molecular Epidemiology and Characterization of Species and Biotypes for Sustainable Management of Brucellosis - School of Vety. Public Health & Zoonoses
2	Network Project on Brucellosis for Molecular Epidemiology and Characterization of Species and Biotypes for Sustainable Management of Brucellosis - Deptt. of Veterinary Microbiology
3	Development of Virus-Like-Particle (VLP) of Japanese Encephalitis Virus as A Potential Vaccine Candidate
4	Development of Sub-Viral Particle of Infectious Bursal Disease Virus as A Potential Vaccine and Diagnostic Candidate
5	Aetio-Pathology of Molecular Epidemiology of Bacterial or Viral Diseases Associated with the Respiratory Problems of Yak in the North-Eastern Region of India
6	Improvement in Fertilizability of Cryopreserved Buffalo Bull Semen by Minimizing Cryocapacitation and Apoptosis Like Changes
7	Melatonin: A Potential Candidate for Alleviating Seasonal Suppression of Fertility in Buffaloes
8	HRD Program for MVSc/MSc Courses in Animal Biotechnology
9	Development of A Novel Marker Vaccine for Bovine Herpesvirus-1 (BHV-1) and A Companion Diagnostic Test
10	Molecular Characterization of Cytolethal Distending Toxin (CDT) of Genus Salmonella and Exploring its Applicability as Novel Delivery Vehicle and Potential Anti-Tumor Agent
11	A Study on Sero-Prevalence of Viruses Associated with Porcine Reproductive Problems
12	Development of Bacteriophage Therapy as an Alternate Strategy for Treatment of Multiple Drug Resistant Bacteria Causing Pyogenic/Suppurative Infections
13	Characterization and Ultra-Structural Details of Endotoxin Induced Laminitis in Buffalo Calf Model
14	Studies on the Evaluation of Outer Membrane Protein (OMP) Genes of <i>Leptospira interrogans</i> for Development of PCR Based Diagnostics as well as Production of Recombinant OMPs and their Immunological Characterization

15	Studies on the Development and Standardization of Molecular Diagnostic Assays for Infectious Causes of Abortions
16	Development and Evaluation of Sero-Diagnostic Assay for Timely Diagnosis and Prognosis of Mammary Tumors
17	TLR-Ligands: To Design Novel Vaccines Adjuvants in Chicken and Japanese Quail
DST	
1	FIST - School of Animal Biotechnology
2	FIST - Department of Veterinary Gynaecology
3	FIST - Department of Veterinary Microbiology
4	FIST - Department of Veterinary Medicine
5	Construction of Mirna Library Associated with Disease Resistance in Buffalo
6	Biochemical and Molecular Detection of Malathion Resistance in Cattle Tick <i>Rhipicephalus microplus</i>
ICMR	
1	Effect of Single and Multiple Exposures to Poultry Farm Air on Pulmonary Defense of Poultry Workers
2	Production and Evaluation of Hyper Immune Sera and Monoclonal Antibodies against Immuno-Dominant Antigens of Opportunistic Gram-Ve Pathogen <i>Pseudomonas aeruginosa</i>
3	Reducing Pesticide Toxicity in The Exposed Population of Punjab by Targetting the NRF2 Pathway
Others	
1	Development of Subviral Particle of Japanese Encephalitis Virus (JEV) as A Candidate Vaccine Against JEV (BRNS)
2	Evaluation of Free Salt and Mineral Lacking in Ruminants (Akzonobal Company, Netherlands)
3	Development of Prototype for Mechanized Manufacture of Composite Dairy Product – Pinni (SERB, New Delhi)
4	Aflatoxin Contaminated Maize Value Chain and Implication on Poultry Sector in Punjab (Int. Food Policy Research Inst.)
5	Assessment of Recombinant Bovine Somatotrophin Supplementation on Productive and Reproductive Efficiency of Dairy Animals (<i>Bos</i> sp. and <i>Bubalus</i> sp.) (ELANCO)
6	Collaborative Research and Training Experience Program (CREATE) on Integrated Training Program in Infectious Disease, Food Safety and Public Policy in Collaboration with University of Saskatchewan and Free University Berlin (NSERC)
7	Antibiotic Use and Residues in Chicken Meat and Milk Samples from Karnataka and Punjab, India (PHFI)
8	To Evaluate the In-Vitro and In-Vivo Therapeutic Potential of Bacteriophages (RGYI)
9	Novel Bioactive Edible Films for Extended Self Life of Meat Based Products (MFPI)
10	Evaluation of Retinopathic Potential of Fluoroquinolones
11	Influence of Exposure to New Generation Insecticides on the Disposition of Antimicrobial Agents
12	Pharmacokinetics-Pharmaco-Dynamics Integration and Toxicological Studies of Fluoroquinolones and Cephalosporins in Buffalo Species (CSIR)
13	Improvement of Dairy Animals through Embryo Transfer Technology at the Institutional Farm and Field Conditions (PLDB)
14	Open Nucleus Breeding System to Improve Sahiwal Cattle and Nili Ravi Buffalo in The State of Punjab (PLDB-CSS)
15	Economics of Milk Production & its Regular Monitoring in Punjab (PDDB)
16	Improvement of Udder Health and Milk Quality Through Application of Mastitis Control Programme Under Field Conditions (PSFC)
Rashtriya Krishi Vikas Yojna (RKVY)	
1	Environment Pollutants and Zoonotic Pathogens in Punjab: Their Impact on Animal and Human Health under International Partnership Fund Programme (RKVY- University of Saskatchewan, Canada, Collaborative Project)
2	Development & Dissemination of Need-Based Cost Effective Technologies to Promote Livestock & Fish Production in Punjab (Component A: 01, Component B: 02, Component C: 01)
3	Enhancing Livestock Production in Punjab through Need-Based Research and Development Activities. (Component A: 08, Component B: 01 & 02 (I)-(II)-(III), Component C: 04, Component D: 01)
4	Enhancing Production, Reproduction, Health of Livestock in Punjab Through Research Activities. (Component A: 05, Component B: 05, Component C: 08)
5	Strengthening of Veterinary Care Services by Providing High Tech Mobile Van
6	Strengthening of Research in Veterinary, Animal Husbandry, Dairy Technology and Fisheries Sciences for Sustainable Development of Livestock and Aquaculture in Punjab (Component A: 06, Component B: 02, Component C: 05, Component D: 03)
7	Intensifying Research in Livestock, Dairy and Fishery Sector on Production, Disease Diagnosis, Health Care, Food Safety and Value Addition for Improving Rural Economy and Inclusive Growth (Component A: 05, Component B: 02, Component C: 03, Component D: 02)

Research Publications

1. Agrawal, R K, Pawar H N, Kaur D, Dhakal J, Saini N, Mothwal U, Minhas P, Mahajan K, Deka D and Ramneek. 2013. Molecular cloning and expression of cytolethal distending toxin B (CdtB) from *Salmonella typhi*. *The Indian Veterinary Journal*. 90 (9): 73-76.
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National and International Linkages

- Research links with University of Saskatchewan, Canada on Health Effects of Environmental Pollutants.
- Central Institute of Post-Harvest Engineering and Technology (CIPHET) for “Refinement and Evaluation of Fish De-scaling Machine and Entrepreneurship Development”.
- Centre of Advanced Faculty Training for imparting trainings to faculty from SAUs/ICAR institutes in the field of Veterinary Gynaecology and Obstetrics and Veterinary Surgery.
- All India Network Programme on Haemorrhagic Septicaemia
- National Institute of Veterinary Epidemiology and Disease Informatics (Formerly Project Directorate on Animal Disease Monitoring & Surveillance)
- AICRP-Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production
- Network Programme on Brucellosis
- Project Directorate on Cattle, Meerut
- National Dairy Research Institute, Karnal in areas of collaborative research, sharing of faculty for teaching, exchange of academic information, curriculum development and training of students
- Rumen microbial diversity in domesticated and wild ruminants and impact of additives on methanogenesis and utilization of poor quality fibrous feeds - NAIP
- Outreach programme on “Estimation of methane emission under different feeding systems and development of mitigation strategies – ICAR
- Developing international linkages with School of Life Science, University of Sussex, UK and , Department of Basic Sciences, School of Medicine, Loma Linda University, Loma Linda, California 92350, USA by submitting a joint research proposal to the British Council, UK.
- Indo Soviet Friendship (ISF) College of Pharmacy, Moga



Guru Angad Dev Veterinary and Animal Sciences University has signed a Memorandum of Understanding (MoU) with Indo Soviet Friendship (ISF) College of Pharmacy, Moga. Through the MoU both the institutes have agreed to develop novel herbal drug formulations with commercial viability. This collaboration will tap the potential of plant products with potential medicinal value in Punjab.

Farmer-Scientist Interaction

Honourable S. Parkash Singh Badal, Chief Minister Punjab visited Farmers-Scientists Interaction held at Guru Angad Dev Veterinary & Animal Sciences University, Ludhiana on Feb. 1, 2014. S. Badal also inaugurated newly constructed Scientist Home and Kisan Hostel of the university.





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