KERALA VETERINARY AND ANIMAL SCIENCES UNIVERSITY

Pookode, Wayanad, Kerala

REPORT ON RESEARCH ACTIVITIES 2017-18

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Lakkidi (P.O), Pookode, Wayanad – 673576, Kerala State

Report on Research Activities 2017-18

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MESSAGE

Prof. (Dr.). M. R. Saseendranath
Vice-Chancellor

The Kerala Veterinary and Animal Sciences University came into existence on 14th June, 2010. During the last seven years the University has carried out pioneering work in the areas of academics, research, entrepreneurship and allied activities. The vision of the university is to impart quality education to students enrolled in various programmes and to conduct research in the areas of Veterinary Sciences, Dairy Technology and other related subjects so as to promote the advancement of these branches of science. The university also remains committed to taking all measures to disseminate these research findings to the farming community so that these advancements in scientific know-how have a direct impact on improving their livelihoods. An environment that facilitates and encourages research and researchers is of paramount importance in a university for maintaining the benefits achieved and for the continued progress of the institution.

I am happy to announce that the university is publishing annual research report of 2017-18, that marks another year of change and challenge for the university. It has been a period of significant growth. The University is leading research in areas of livestock improvement, climate change, disease diagnosis, treatment and public health. Our research programs generate new knowledge, both basic and applied, relating to the health of domestic animals and wildlife, ensuring a safe food supply and finding a cure for infectious diseases, improving the productivity of livestock products and securing their safety by enhancing feed management technology and prevention of zoonosis. The research publications included in this edition provide a snapshot of recent accomplishments and serve as a pivot point for identifying future challenges. The research must strengthen the scientific impact of its core mission in animal health while firmly reinforcing its societal and global relevance. This will help in dissemination of efficient and innovative technologies for socio economic transformation and expansion.

I am grateful to our community here at the college, our alumni and also to our well-wishers who are contributing actively to take the institution into new heights. Through our academic programs, research accomplishments and outreach service, I am confident that our institution will continue to make great headway in creating a healthier world for all. Congratulations and best wishes for the entire team.

Prof. (Dr.). M. R. Saseendranath
Vice-Chancellor

PREFACE

Dr. C. Latha
Director of Academics and Research

It is heartening to know that Kerala Veterinary and Animal Sciences University is publishing the annual research report, which highlights our achievements, challenges and ambitious plans for the future. The year 2017-18 has yet again been vibrant and bustling in terms of academic and other research activities. We pride ourselves with the high quality of our faculty who have built a name for themselves in top quality teaching, high impact outreach activities and extremely relevant research. Our university has been playing a pioneering role in professionalizing veterinary education through its various graduate, post graduate, doctoral programmes, training and research activities. Through these findings, we can educate the public, find better ways to diagnose, treat and prevent diseases. The research conducted in the university emphasizes on research for sustainable development in animal production, thereby assuring food safety and security. It focuses on animal welfare and health, the effects of animal production on the environment and application of new technologies to increase animal production. I look forward enthusiastically in continuing the growth and to diversify our programs of scientific research for serving our public better in the future.

I extend my sincere thanks to the students for their brilliant efforts as well as to the faculty for their academic and research accomplishments. I wish all success to the entire team.

Dr. C. Latha
Director of Academics and Research

About the University

Kerala Veterinary and Animal Sciences University (KVASU) came into existence on 14th June, 2010 as per Ordinance No.44/2010 and later Act 3/2011 of the Government of Kerala. This institution presently undertakes academic, research, extension and entrepreneurship activities in animal production and dairy sector.

The University aims,

- to implement new courses and curricula based on the advances in the field of Veterinary and Animal Sciences
- to advance and disseminate learning and knowledge in Veterinary and Animal Sciences, Dairy Science and allied fields by fostering and promoting Veterinary and Animal Science research
- to undertake extension activities
- to collaborate and co-operate with regional, national and international research institutions and exchange any information that may be advantageous to livestock development in the State
- to act as the primary consulting and advisory body of the state government and various other agencies involved in policy making and implementation in the Veterinary and Dairy sectors

Kerala Veterinary and Animal Sciences University has three faculties, eight constituent colleges, 16 research stations and 12 schools/ centers

Faculties under Kerala Veterinary and Animal Sciences University include

1. Faculty of Veterinary and Animal Sciences
2. Faculty of Dairy Science
3. Faculty of Poultry Science

The eight constituent colleges of the University are:

1. College of Veterinary and Animal Sciences, Mannuthy, Thrissur
2. College of Veterinary and Animal Sciences, Pookode, Wayanad
3. College of Dairy Science and Technology, Mannuthy, Thrissur
4. College of Dairy Science and Technology, Pookode, Wayanad
5. College of Dairy Science and Technology, Chettachal, Thiruvananthapuram
6. College of Dairy Science and Technology, Kolahalamedu, Idukki
7. College of Food Technology, Thumburmuzhy, Chalakudy, Thrissur
8. College of Avian Sciences and Management, Thiruvazhamkunnu, Palakkad

The research stations of the University and the year of establishment are as follows:

1. University Veterinary Hospital, Kokkalai, Thrissur 1904
2. University Livestock Farm and Fodder Research and Development Scheme, Mannuthy, Thrissur -1917
3. Livestock Research Station, Thiruvazhamkunnu, Palakkad-1950
4. University Poultry and Duck Farm, Mannuthy, Thrissur – 1950

5. University Veterinary Hospital, Mannuthy, Thrissur- 1961
6. Centre for Pig Production and Research, Mannuthy, Thrissur-1965
7. University Goat and Sheep Farm, Mannuthy, Thrissur- 1965
8. Cattle Breeding Farm, Thumburmuzhy, Chalakkudy, Thrissur- 1973
9. All India Co-ordinated Research Project on Poultry for Eggs, Mannuthy, Thrissur- 1976
10. University Dairy Plant, Mannuthy, Thrissur- 1985
11. Centre for Advanced Studies in Poultry Science, Mannuthy, Thrissur- 1986
12. Centre for Advanced Studies in Animal Breeding and Genetics, Mannuthy, Thrissur- 1986
13. Meat Technology Unit, Mannuthy, Thrissur- 1992
14. Base Farm, Kolahalamedu, Idukki – 2000
15. Instructional Livestock Farm Complex, Pookode, Wayanad- 2004
16. Avian Research Station (ARS), Thiruvazhamkunnu -2015

Kerala Veterinary and Animal Sciences University has a well fabricated research network operated through the following schools and centres.

1. School of Applied Animal Production and Biotechnology
2. School of Animal Nutrition and Feed technology
3. School of Zoonoses, Public Health and Pathobiology
4. School of Bioenergy and Farm Waste Management
5. School of New media and Research
6. Centre for Advanced Studies in Poultry Science, Mannuthy, Thrissur
7. Centre for Advanced Studies in Animal Breeding and Genetics, Mannuthy, Thrissur
8. Centre for Animal Adaptation and Climate Change Studies, Mannuthy, Thrissur
9. Centre for Ethno Pharmacology, Pookode, Wayanad
10. Centre for Wildlife Studies, Pookode, Wayanad
11. Centre for One Health, Education, Advocacy, Research and Training, Pookode, Wayanad
12. Centre for Livestock Development and Policy Research, Thiruvananthapuram

At present the University has five NABL accredited laboratories that include the following

1. Central Instruments Laboratory, College of Veterinary and Animal Sciences (CVAS), Mannuthy
2. Feed Analysis Laboratory, Dept. of Animal Nutrition, CVAS, Mannuthy
3. Quality Control Laboratory, Dept. of Veterinary Public Health, CVAS, Mannuthy
4. Food Quality Assurance Laboratory, Dept. of Veterinary Public Health, CVAS, Pookode
5. Feed and Fodder Analysis Laboratory, Dept. of Animal Nutrition, CVAS, Pookode

Chancellor's Award for the Best Emerging Young University for the year 2016-17 and 2017-18 were bagged by the University. Kerala Veterinary and Animal Sciences University has received around 10 externally aided projects. The faculty have published 7 books/ book chapters, around 200 articles in peer reviewed journals, 20 popular articles. The faculty members have also received 41 awards during 2017-18.

Research Policy

1.0 PURPOSE

This policy sets the framework to spearhead research at the Kerala Veterinary and Animal Sciences University (KVASU) consistent with its policy on research. The research policy shall help to –

a. Identify core areas of research.
b. Give direction to research activities carried out in different disciplines of basic science, veterinary science, animal science and dairy science.
c. Promote multi-disciplinary research.
d. Instil quality in research through competition among faculty members seeking research funds.
e. Act as the lead guide with a clear-cut policy on research and extension.

2.0 ORGANISATIONAL SCOPE

This is a university-wide policy and exceptions are to be accepted only with due approval by its Research Council.

3.0 VISION

The University aspires to be recognized nationally and internationally as the University of choice, in nurturing meritorious/ renowned Veterinarians, Dairy/ Livestock Products Technologists and professionals in related disciplines by entrenching a strong research culture. The research undertaken shall (a) promote sustainable and profitable animal production systems (b) provide quality care and veterinary services (c)assure food safety and quality and security of the State (d) disseminate modern scientific knowledge and skill (e) foster professionalism in animal welfare and ethics and (f) help the government to modify/ formulate policies based on scientific information and data.

4.0 MISSION

Sustainable animal production and development through –

a. Scientific breeding and production of superior quality stock and germplasm.
b. Model livestock and poultry enterprises and integrated farming systems.
c. Cost-effective interventions in feeds and feeding.
d. State-of-the-art hospitals, accredited laboratories, advanced diagnostics and superior vaccines for better diagnosis, treatment and control of animal diseases, food-borne diseases and management of infertility.

e. Production and evolution of value-added formularies. Internationally competent graduates/ professionals who can foster and promote veterinary, animal science and dairy research.
f. Control and prevention of zoonotic diseases.
g. Effective animal waste management.
h. Conservation and utilization of domestic and wild animal biodiversity.
i. Animal welfare measures in veterinary and animal science education and research.

5.0 CORE AREAS OF RESEARCH

5.1 Animal Production and Management

a. Continued improvement of stock through scientific intervention, and evaluation of various domestic and exotic animal genotypes. Breeding for disease resistance. Evolving new strains of animals and poultry adapted to local conditions.
b. Conservation, characterization, evaluation and improvement of domestic animal and avian biodiversity.
c. Model livestock farms for optimum utilization of genetic potential of animals through micro-environmental interventions in different ecological zones; adoption of scientific management practices, user-friendly and less labour intensive technologies in routine farm operations; integration of bio-fuel technologies and value addition of farm wastes for higher net farm income.
d. Developing of feeds and fodders; cost-effective feeding schedules based on the availability of feed, fodder, other raw materials and unconventional feeds appropriate for small, medium and large livestock/poultry production units to make animal farming sustainable and economically viable.
e. Development of reproductive technologies for augmenting fertility and production in livestock.
f. Impact of climate change in animal production. Mitigation of greenhouse gas emissions and their link to climate change.
g. Application of biotechnological tools for improvement of animal and poultry production.

5.2 Animal Health

a. Development of vaccines, vaccination protocols and diagnostics for control, surveillance of diseases of farm and companion animals and disease forecasting.
b. Better strategies for treatment and control of disease of livestock and poultry, reproductive disorders and zoonotic and food-borne disease, to maintain a high standard of animal health and fertility.
c. Advanced molecular biological techniques for diagnosis of viral, bacterial, rickettsial, fungal, algal, protozoan and metazoan diseases and diseases due to infectious protein particles/ prions.
d. Investigations on disease of livestock and poultry due to deficiency or toxicity.

5.3 Improvement in Veterinary Care/Support Service

a. Research, development and refinement of medical/ surgical treatment and diagnostic strategies to sustain and improve health of farm and companion animals; development and use of biomaterials for veterinary use.
b. Research and development of newer drugs and drug molecules. Ethno veterinary medicine and health care of animals.

5.4 Biotechnology

a. Molecular characterization of domestic animal biodiversity, marker assisted selection
b. Bioinformatics
c. Development of diagnostic kits.
d. Gene expression studies- nutrigenomics
e. Embryo transfer technology, oestrous synchronization.
f. Manipulation of rumen ecosystem for improving productivity.

5.5 Livestock Products and Processing

a. Processing, packaging, preservation and storage, transport and marketing of meat, milk, egg and their products from the farm to the consumer, with quality management.
b. Traceability of food of animal origin and development of healthy low fat functional foods.
c. Value addition of livestock and poultry products
d. Development of production process through modern innovative technologies for traditional, fermented, functional and ethnic foods.

e. Energy conservation measures in dairy and food processing.
f. Low cost farm mechanisation for small scale milk and meat processing.
g. Physicochemical and microbiological characterisation of milk from different species and their value addition-Starter culture technology
h. Adulterants/contaminants in dairy and meat products

5.6 Extension and Economics

a. Technology validation through farmer participatory research/ on-farm research; development of client based knowledge sharing methods in the practice of Veterinary Science.
b. Documentation and evaluation of indigenous technical knowledge.
c. Economic feasibility of different systems of animal production and transfer of technology.
d. Evolving a mechanism to monitor the cost of production, market intelligence and suggesting periodic revision in the pricing of dairy, meat and egg products.
e. Utilisation of Information and Communication Technology (ICT) for linkages with other institutions for tele-imaging and diagnosis.

5.7 Other Core Areas

a. Need-based/ Problem-oriented research and adaptive research.
b. Animal welfare
c. Animal wastes management
d. Rearing of pet animals, birds and fishes as a livelihood.
e. Organic farming systems, nutrient cycling, insect and disease control.
f. Laboratory animal breeding and development of animal models.
g. Wildlife conservation and welfare
h. Veterinary forensics

6.0 OUTCOME

1. Food security and food safety for the state
2. Growth and development of the State of Kerala based on animal production systems.
3. Self-sufficiency in animal germplasm, production inputs and animal products.
4. Healthy and immune animals.
5. Better employment opportunities to economically weaker sections of people.
6. Equitable development and poverty alleviation through animal farming.

7.0 SUMMARY

The Kerala Veterinary and Animal Sciences University research policy is framed with an emphasis on research leading to sustainable development in animal production, thereby assuring food safety and security. It focuses on animal welfare and health, the effects of animal production on the environment, and application of new technologies to increase animal production.

Research Projects

1. Externally Aided Projects

Sl. No	Name of the Project	FundingAgency	Principal Investigator	Department	Total outlay (Lakhs)
1	Establishment of State of the art Large Animal Surgical teaching facility in the Department of Surgery and Radiology, Mannuthy-	RKVY	Dr S Anoop	Department of Veterinary Surgery and Radiology, Mannuthy	50
2	Isolation and genotype characterization of the Infectious bronchitis virus isolates from Kerala, India	DST SERB	Dr. Surya Sankar	Department of Veterinary Microbiology, Mannuthy	30.92
3	Clinical applications of Porcine derived collagen graft in Veterinary Practice	KSCSTE, Thiruvananthapuram	Dr S Anoop	Department of Veterinary Surgery and Radiology, Mannuthy	15.56
4	Investigation of therapeutic and bio-preservative potentials of lactoferrin of Vechur cow milk	Dept of Animal Husbandry	Dr Uma R.	Department of Veterinary Biochemistry, Mannuthy	15.2
5	Early life care of calves and its implication in future milk production. Centre for rehabilitation of stray puppies under end programme	Dept. of Animal Husbandry	Dr. M. K. Narayanan	Department of Veterinary Surgery and Radiology, Mannuthy	13.5

6	Field studies on hoof disorders in goats to develop a protocol for its clinical management	Agricultural Technology Management Agency	Dr Laiju M Philip	Department of Veterinary Surgery and Radiology, Mannuthy	5.8
7	Evaluation and prophylactic management of laminitis for enhancing production in dairy cattle	Dept of Animal Husbandry	Dr Laiju M Philip	Department of Veterinary Surgery and Radiology, Mannuthy	3.64
8	Fermentation for |Value Addition	KSCSTE	Ms. Archana Chandran, Assistant professor	College of Dairy Science and Technology, Pookode	3.2
9	Development of a field based protocol for management of congenital and early musculoskeletal disorders in ruminants	Dept of Animal Husbandry	Dr. Sudhesh S Nair	Department of Veterinary Surgery and Radiology, Mannuthy	2.84
10	Maintenance of healthy hoof in dairy cattle for production benefit and welfare in ruminants	Kerala State Council for Science, Technology and Environment	Dr Laiju M Philip	Department of Veterinary Surgery and Radiology, Mannuthy	2

Isolation and genotype characterization of the Infectious bronchitis virus isolates from Kerala, India

Isolation and genotypic characterisation of infectious bronchitis virus isolates from Kerala, India was carried out and a high prevalence of the virus was detected in the state. in the present study, RT-PCR assays targeting the 5'UTR and partial region of S1 subunit of spike gene was standardised for the direct detection of virus from clinical samples and also, two Taqman probe based real time RT-PCR assays targeting 5'UTR and conserved region of N gene were developed for the rapid detection of the virus from cases of field outbreaks. We have developed RT-PCR assays targeting complete S1 subunit of spike gene, N gene and M gene and the representative amplicons from different zones of Kerala were sequenced and the sequences were compared with that of vaccine strain and other Indian isolates. Nucleotide variations were noted in the isolates belonging to different zones of Kerala and also with reference strain and other sequences from India.

Early life care of calves and its implication in future milk production

The project had the proposed objective of improvement of 50 cross bred calves from age of birth to cows through scientific management model as future dairy herd development for sustainable milk production. Field based intervention on calf rearing by monitoring growth for initial 100 days of early life care in calves resulted in average weight gain of 400 g/ calves and age at fertility by 13- 14 months and age at first calving by 24 months.

Clinical applications of porcine derived collagen graft in veterinary practice

Objectives of the Project was to develop low cost surgical treatment procedures for curing common diseases like corneal damage and cutaneous wounds of pet and farm animal and to develop at least two patentable clinical formulations of xenogeneic grafts for veterinary use.

Important findings of significance are : Porcine cholecyst derived collagen scaffold is found to be very effective in the management of corneal defects in dogs, Porcine small intestinal submucosa (SIS) derived collagen sheet has been used successfully in the treatment of pigmentary keratitis after superficial keratectomy and The project is being undertaken in the Teaching Veterinary Clinical Complex and Department of Veterinary Surgery and Radiology attached to College of Veterinary and Animal Sciences, Mannuthy. The grafting techniques have been very widely used for the treatment of corneal ulcers in dogs and collagen sheet of porcine cholecyst origin has found to be very effective in augmenting healing process. Work has been started to use this materials in the treatment of extensive skin wounds also.

Patent application filed: Title. A method for fabricating corneal grafts using mammalian cholecyst erived extracellular matrix. Indian patent office. Filed through Sree Chithira Thirunal Institute of Medical Science and Technology. Ref. No. 5649/CHE/3013 of 7-12-2013

Establishment of state of the art large animal surgical teaching facility in the Department of Surgery and Radiology, Mannuthy

The project was undertaken with the following objectives viz., to establish a large animal surgical teaching facility for veterinary undergraduate and post graduate students, to impart high quality surgical procedures to the cases referred to the TVCC from different parts of the state and to establish a facility to record and demonstrate surgeries to students using Closed Circuit Television System (CCTV system). Physical achievements are Established a fully equipped State of the art Large Animal Operation theatre, established a CCTV system in the theatre for undergraduate teaching, installed Large Animal Anaesthesia system with Ventilator for the first time in Kerala and conducted a training programme on Large Animal Anaesthesia under the banner if ISVS, Kerala Chapter to the Veterinarians practicing in the field.

Maintenance of healthy hoof in dairy cattle for production benefit and welfare in ruminants

As part of the project a documentary on Hoof Care in Dairy Cattle was produced in the telecastable format by Prasar Bharathi, Doordarshan Kendra, Thiruvananthapuram. The documentary on Hoof care in Dairy Cattle was telecasted through Dooradarshan Malayalam Channel on 21.11.2017 at 5.30 pm, and re telecasted on 22.11.2017 at 7.00 am and 11.30 pm. Booklets and leaflets on the importance of hoof care were distributed to the farmers during seminars, field demonstrations, awareness classes and field visits. Posters were distributed in different milk societies and veterinary institutions for the popularization of hoof care.

Evaluation and prophylactic management of laminitis for enhancing production in dairy cattle

Dairy cows reared under stall fed condition on concrete floor were affected with subclinical laminitis and resultant hoof disorders. Majority of lesions are prevalent in hind feet than fore feet. Lesions of hoof identified were sole ulcers, toe ulcers, white line lesions in adult dairy cattle and tender sole in recently calved primiparous cows. Heel erosions were the predominant lesion of lameness in organised farms followed by sole and white line haemorrhage. Lameness due to digital dermatitis decreased locomotion with negative consequences for lying and feeding behaviour.

Field studies on hoof disorders in goats to develop a protocol for its clinical management

Goats reared under stall fed condition were commonly affected with lameness due to overgrown and misshapen hooves. Prevalence of the overgrown hoof, foot rot and white line lesion were among the observed hoof lesions in goats. Lesions were observed in both forelimbs and hind limbs more prevalence in forelimbs compared to cattle.High incidence of foot rot in rainy seasons can be effectively prevented with use of foot bath with Combination of 5 per cent Zinc Sulphate and 2 per cent Sodium Lauryl Sulphate.

Development of a field based protocol for management of congenital and early musculoskeletal disorders in ruminants

All the findings of the studies were consolidated to formulate a field based protocol for treating congenital and early musculo skeletal disorders in young ruminants. Prepared resource materials in the form of 5 instructional DVD's on the various musculoskeletal disorders and their management by field based protocols. The results of the study disseminated among the field veterinarians in the form of this training in the form of one day training and workshop was conducted to 40 Veterinary Officers of Thrissur district in 10 batches of each from 6-9 Feb 2017 on topic "Management of congenital and early musculoskeletal disorders in ruminants".

Investigation of therapeutic and bio-preservative potentials of lactoferrin of Vechur cow milk

Purified lactoferrin from Malabari and Attappady Black goat colostrum for the first time and found that the lactoferrin from these native goat breeds of Kerala possess better antimicrobial properties than that of crossbred goat lactoferrin. Purified lactoferrin from Kasargod Dwarf colostrum for the first time and found enhanced antioxidant properties than that of commercially available bovine lactoferrin. Metabolic profiling of dairy cows during the transition period has been established. Significant antineoplastic activity was noticed for goat milk lactoferrin against Dalton's Ascites lymphoma in mice

Fermentation for value addition

The project entitled 'Fermentation for value addition' under KSCSTE envisages to transfer the 'science of fermentation' to common man in a simple way to enable them to adopt fermentation as a viable way of value addition of milk. The project aimed at providing rural employment opportunities by transfer of "fermentation technology" for value addition of milk by entrepreneurship training. Beneficiaries (SHGs)selected from different regions of Wayanad district were given two weeks intensive training. During this period they were exposed to all aspects of fermentation technology to achieve value addition of milk. Knowledge transfer in

the areas: fermentation, starter culture technology, preparation of fermented / value added milk products, packaging and marketing aspects, quality assurance and FSSA regulations were given thrust. At the end of training programme the participants were taken to commercial Dairy and Food plants to have an exposure on mechanization and large scale production and processing. The participants were equipped with the technical knowhow of the product preparation. The participants prepared value added products and sold under the supervision of experts from university. After the training programme the participants were given minor equipment/utensils like thermometer, lactometer and incubator as an initiative to support their venture.

2. ICAR network projects

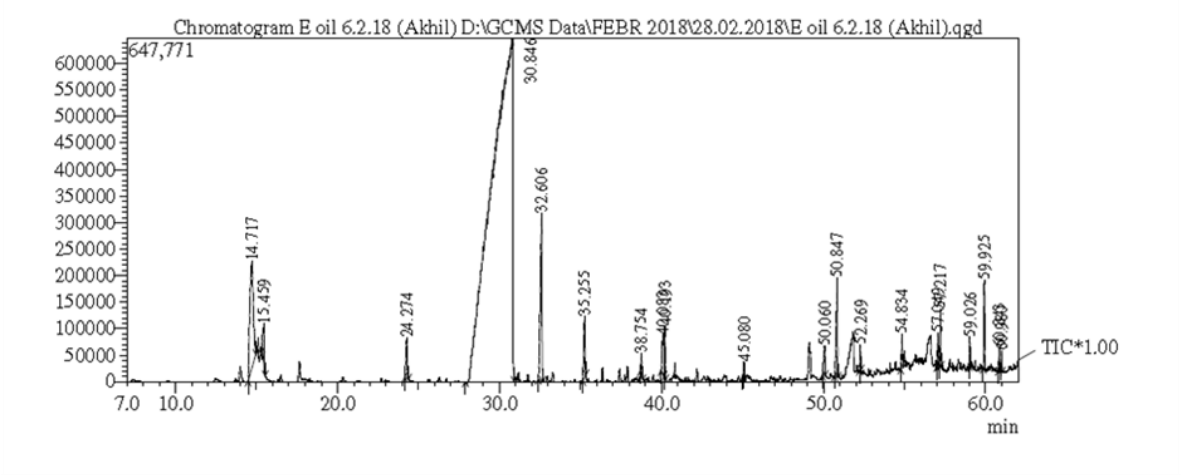
Sl. No	Name of PI	Funding agency	Title of the project	Total outlay in Lakhs
1	Dr. A. P. Usha	ICAR	AICRP on pigs	73.46
2	Dr. A. P. Usha	ICAR	Mega seed project	57.98
3	Dr. Binoj Chacko	ICAR	AICRP on poultry for eggs (75 per cent of total outlay)	50.75
4	Dr. K Anilkumar	ICAR	AICRP- Field Progeny Testing Project	49.96
5	Dr. Thirupathy Venkatachalapathy	ICAR	AICRP on Goat Improvement	29.00
6	Dr. B. Sunil	ICAR	Outreach programme on zoonotic diseases	6.75
7	Dr. Usha Narayana Pillai	ICAR	Outreach programme on ethnoveterinary medicine	5.83
8	Rejeesh R	ICAR - NCVTC, NRCE	Network centre on Dairy Microbes under Network project of ICAR - NCVTC, NRCE, Sirsa, Haryana.	1.84

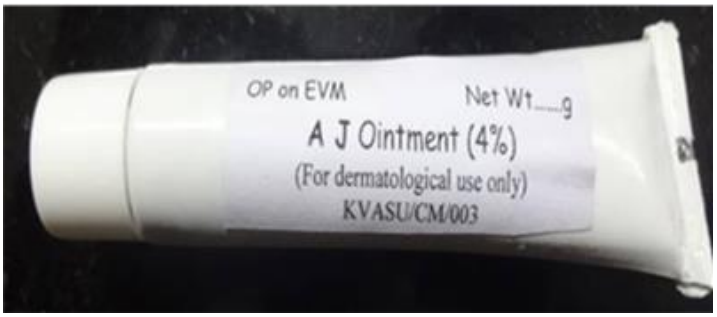
Outreach programme on Ethno Veterinary Medicine

The important findings are acetonic extract of *Artemesia Japonica* leaf possess antifungal activity. Major compounds of AE05, an essential oils were identified by GCMS analysis. Cost effective antifungal ointment for the management of fungal disease in animals. Major compounds of AE05, an essential oils were identified (GCMS analysis)

***Artemesia japonica* leaves**

***Artemisia japonica* oil**





Artemisia japonica ointment

AICRP on poultry for eggs

The KVASU, Mannuthy centre during 2017-18 has evaluated the S-2 generation of native chicken germplasm up to 40 weeks of age. Egg production of native chicken germplasm to 40 weeks of age was 75.96 eggs with average egg weight of 42.47 g. Egg production increased by 3.88 eggs and egg weight increased by 0.7 g in the S-2 generation as compared to the previous generation. Good fertility (90.04per cent) and hatchability (94.27 and 84.89 per cent on FES and TES) was observed in S-3 generation. Age at sexual maturity was 154.2 days in S-3 generation. ASM advanced by 2.55 days in S-3 compared to S-2 generation. Farm and field testing of three way cross (NDR) was carried out. Hen housed egg production upto 40 weeks of age of NDR in farm condition was 80.87 eggs and in field condition it was 49.73 eggs. Besides,the centre evaluated IWN and IWP strains up to 40 weeks of age in S-30 generation along with layer control population. in this generation, egg production up to 40 weeks of age decreased by 2.51 eggs in IWN (120.23) whereas it increased by 3.8 eggs in IWP (124.83) strain on phenotypic scale as compared to the previous generation. Average egg weight at 28 weeks of age was improved by 0.78g (48.11 g) in IWN and 0.23g (48.62 g) in IWP strains respectively.The centre has generated the revenue of Rs. 53.84 lakhs, which was 218.15 per cent of the total expenditure on feed (Rs. 24.68 lakhs). The centre has supplied a total of 216397 number germplasm during the year. There was considerable improvement in revenue generation and germplasm supply of this centre as compared to previous year.

Growth and production performances in S-30 generation of IWN and IWP strains and control layer population.

Traits	**IWN**		**IWP**		**Control**	
	n	**Mean ± SE**	**n**	**Mean ± SE**	**n**	**Mean ± SE**
Body weight (g)						
16 weeks	622	1081.00±2.77	753	1103.16±2.92	147	1023.40±7.18
40 weeks	580	1497.50±5.73	695	1500.28±5.03	139	1511.41±16.76
ASM (days)	619	139.58±0.39	753	135.44±0.46	145	156.23±0.67

Egg weight (g)						
28 weeks	595	48.11±0.13	727	48.62±0.11	140	49.05±0.27
40 weeks	557	52.03±0.16	681	52.11±0.15	131	53.01±0.29
EP to 40 weeks (Nos.)						
Hen housed	622	120.23±0.99	753	124.83±0.88	147	86.99±1.79
Survivors'	580	124.47±0.71	699	129.51±0.60	140	89.54±1.46
Hen day: 17-40 weeks		122.85		127.83		89.04
Hen day: 21-40 weeks		120.76		123.57		89.42

Outreach programme on zoonotic diseases

Campylobacteriosis:

Out of a total of 50 well water samples from Thrissur and Ernakulam districts, 20per cent were found positive for *C. jejuni.* One of the sample was found positive for both *C. jejuni* and *C. coli.* One out of seven rivers of Thrissur District was positive for *C. jejuni.* The chicken meat samples were collected from retail shops during monsoon season from three districts, Ernakulum (60 samples), Palakkad (57 samples) and Thrissur (53 samples) of central Kerala. All the samples collected were subjected to isolation and identification of *Campylobacter* spp. by conventional culture technique. All the isolates were further subjected to molecular characterisation by mPCR. The occurrence of *C. jejuni* from Ernakulam was 28.33per cent and *C. coli* was 3.33per cent; while it was 47.37per cent of C.jejuni and 12.28per cent of *C.coli* from Palakkad. The occurrence of *C.jejuni* from Thrissur was 26.42per cent. Meat samples collected from Palakkad and Ernakulam districts during monsoon season showed higher prevalence rate *Campylobacter* spp (*C. jejuni).* Eggs collected from retail market (Thirty samples each from Ernakulum, Palakkad and Thrissur) showed occurrence of 13.33per cent of *C. jejuni* in Ernakulam, 6.66per cent of *C. jejuni* from Palakkad and Thrissur.

Listeriosis:

The survivability of *L. monocytogenes* in river water collected from Thrissur district of Kerala revealed that the organism survived more in sterile water compared to unsterilized conditions. Lower temperature of 4^0C better supported the growth of *Listeria* than 22^0C in water. The maximum days of survivability of *L. monocytogenes* in sterile river water at 4^0 C and 22^0 C was 120 days and 90 days respectively. The survivability of *L. monocytogenes* in river water was found to be maximum in post monsoon due to changes in the chemical parameters between the two seasons. Seven out of the 50 well water samples analysed were positive for *L. innocua.* Two of seven rivers water samples of Thrissur District was positive for *L. innocua.* One human diarrhoeic stool sample was found positive for *L. monocytogenes.*

Network centre on dairy microbes

51 different samples of household fermented milk products were collected across Kerala. After isolation, 20 isolates were obtained, out of these, 12 were *Lactobacillus* and remaining were of cocci. Conclusions made in the initial year of study were as follows. Almost all samples were contaminated or inhabited with yeasts. Most of the isolates were of *Lactobacillus sp* which was against the myth. All *bacilli* were either thermophilic or mesophilic, and had adapted to grow in the humid and medium temperature conditions (32 to 35° C) of the state. These isolates will be further assessed on techno textural attributes and molecular level characterisation. Proven isolates will be deposited to NCBI and VTCC and will be available for prospective entrepreneurs of the state.

3. State plan projects

Name of Project	Name of the Department	Financial outlay in Lakhs
Proposed International Training centre and renovation of existing residential building at Base Farm, Kolahalamedu	Base Farm, Kolahalamedu	100.00
Enhancement of productivity at Cattle Breeding Farm, Thumburmuzhy	Cattle Breeding Farm, Thumburmuzhy	80.00
Enhancement of productivity at Cattle Breeding Farm, Thumburmuzhy	Cattle Breeding Farm, Thumburmuzhy	80.00
Increasing productivity of cross bred cattle of University Livestock Farm	University Livestock Farm and Fodder Research Development Scheme, Mannuthy	76.13
Strategies for improving the fodder production	University Livestock Farm and Fodder Research Development Scheme, Mannuthy	65.63
Conservation centre for Vechur and Kasargod Cattle (122-49-0013-6100)	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	50.00
Strengthening of Heritage Farm at Base Farm, Kolahalamedu	Base Farm, Kolahalamedu	49.41
Strengthening of Instructional Livestock Complex	Instructional Farm, Pookode, Pookode	43.75
Popularization of integrated small holder rabbit farming	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	30.00
Strategies for improving fodder production and improvement of nutritional base	Cattle Breeding Farm, Thumburmuzhy	30.00
Strategies for improving fodder production and improvement of nutritional base	Cattle Breeding Farm, Thumburmuzhy	30.00
Energy conservation programmes at Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	26.50
School of Animal Nutrition & Feed Technology	School of Animal Nutrition and Feed Technology	26.25

AICRP on poultry for eggs (25per cent)	AICRP on poultry for eggs, Mannuthy	25.00
Assessing the performance of Murrah Buffalo herd for milk and meat production in hot and humid climate of Kerala	University Livestock Farm and Fodder Research Development Scheme, Mannuthy	21.88
Strategies to improve availability of fodder/forages to ILFC (cattle farm) Pookode	Instructional Farm, Pookode	21.88
Preparation of complete feed blocks using locally available unconventional/ayurvedic byproducts for dairy cattle"	Department of Animal Nutrition, Mannuthy	20.00
Improving backyard poultry production by supplying crossbred chicks from improved hens	AICRP on poultry for eggs, Mannuthy	20.00
Ecofarm tourism project at Kerala Veterinary and Animal Sciences University	Cattle Breeding Farm, Thumburmuzhy	20.00
Field Progeny Testing of Crossbred bulls(122-49-0013-6003)	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	18.00
Survey and Estimation of endosulfan in milk collected from prone areas in the state of Kerala	CDST, Mannuthy	17.50
Survey and Estimation of endosulfan in milk collected from prone areas in the state of Kerala RSP/17-18/IX-14	Head, Dairy Chemistry, CDST, Mannuthy	17.50
Strategies for improving fodder production at Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	15.15
Strengthening of Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	15.00
Establishment of canine fertility unit at UVH Mannuthy	University Veterinary Hospital and Teaching Veterinary Clinical Complex, Mannuthy	15.00
Establishing satellite Backyard breeder farms in Wayanad	Instructional Farm, Pookode	14.88

Conservation and popularization of native chicken varieties in Kerala	Centre for Advanced Studies in Poultry Science, Mannuthy	13.13
Improvement of integrated farming of livestock, fodder and fish at Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	12.62
Ensuring breed purity and augmenting marketing facilities for dairy products and byproducts from indigenous dwarf cattle maintained by farmers of Kerala (114-89-0003-6792)	Department of Animal Breeding, Genetics and Biostatistics, Mannuthy	12.00
A study on prevalence and clinico pathological effects of common tick borne haemoparasitic pathogens observed in cattle population of Wayanad district	Department of Clinical Medicine, Ethics and Jurisprudence, Pookode	11.00
Characterization, expression and polymorphism analysis of candidate genes affecting production, reproduction and disease resistance in native cattle and goat breeds of Kerala for sustainable improvement and development of native breeds (114-89-0003-6532)	Department of Animal Breeding, Genetics and Biostatistics, Mannuthy	11.00
AICRP-Malabari Goat Improvement (122-49-0013-6001)	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	11.00
Selective identification of the elite duck farming clusters of Kerala for strengthening of in situ conservation and multiplication of duck varieties in their breeding tract	Department of Animal Breeding, Genetics and Biostatistics, Mannuthy	10.00
Utilisation of inedible dairy by products for preparation of animal feed ingredients	Department of Dairy Science, Mannuthy	10.00
Establishment of Germplasm Repository for domestic animal diversity of Kerala(122-49-0013-6045)	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	10.00
Centre for Advanced Studies in Animal Genetics and Breeding (122-49-0013-6462)	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	10.00

Enhancing milk production potential of genetically superior cows through scientific intervention for production better progenies	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	10.00
Conservation and evaluation of Malabari and Attappady black goats	Goat and Sheep Farm, Mannuthy	10.00
Universal Veterinary Health coverage for optimizing productivity livestock	University Veterinary Hospital and Teaching Veterinary Clinical Complex, Mannuthy	10.00
Establishing calf nursery at CBF, Thumburmuzhy	Cattle Breeding Farm, Thumburmuzhy	10.00
The loresectos copy for the treatment of teat obstruction in dairy cattle	Department of Veterinary Surgery and Radiology, Pookode	9.00
A study on management of surgical disorders in dairy cattle with special emphasis on hoof disorders	Department of Veterinary Surgery and Radiology, Pookode	9.00
Establishment of calf nursery at ULF & FRDS	University Livestock Farm and Fodder Research Development Scheme, Mannuthy	8.75
Hatchery waste disposal and its effective utilization	Centre for Advanced Studies in Poultry Science, Mannuthy	8.75
Advanced mycotoxin testing facility for poultry feed.	Centre for Advanced Studies in Poultry Science, Mannuthy	8.75
Calf Nursery at Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	8.75
Effect of LH, IGF-1 and EGF on in vitro granulosa cell expression and secretion of vascular endothelial growth factor in the ovarian follicle during estrous cycle of Malabari Goats	Department of Veterinary Physiology, Pookode	8.75
Strategies for augmentation of fertility and productivity by mi nimizing empbryonic mortality and abortions in cattle of Wayanad district.	Instructional Farm, Pookode	8.75

Strengthening of School of Applied Animal Production and Biotechnology.	School of Applied Animal Production and Biotechnology, Mannuthy	8.75
Development of adulteration test strips for milk	CDST, Mannuthy	8.75
Development of adulteration test strips for milk RSP/17-18/IX-13	Head,Dairy Chemistry, CDST, Mannuthy	8.75
Establishment of Calf Nursery at ILFC, Pookode	Instructional Farm, Pookode	8.75
Establishment of Calf Nursery at Base Farm, Kolahalamedu	Base Farm, Kolahalamedu	8.73
Antibiotic resistance in veterinary practice-A representative study	Department of Veterinary Microbiology, Mannuthy	8.50
Preventive Healthcare programme for livestock in rural areas of Wayanad district with special emphasis to mastitis and haemoprotozoan diseases	Department of Veterinary Epidemiology and Preventive Medicine, Pookode	8.00
Establishment of ophthalmic surgical facilities to meet the challenges of modern times	Department of Veterinary Surgery and Radiology, Pookode	8.00
Buffalo herd improvement at Livestock Research Station, Thiruvazhamkunnu	Livestock Research Station, Thiruvazhamkunnu	7.50
Production and marketing of enriched chicken eggs	AICRP on poultry for eggs, Mannuthy	7.00
Strengthening of Backyard pullet supply chain management in Wayanad	Instructional Farm, Pookode	7.00
Metabolic profiling of transition dairy cows	Department of Veterinary Biochemistry, Mannuthy	7.00
Enhancing kid production for sustainable livelihood security of farmers in Thrissur District	Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy	7.00
Screening and evaluation of medicinal plants for anticancer activity	Department of veterinary pharmacology and toxicology	5.00
Clinical evaluation of canine amniotic fluid derived mesenchymal stem cells for the treatment of spinal cord injuries in Dogs.	Department of Veterinary Physiology, Mannuthy	5.00

Livestock Advisory based on weather forewarning1. Livestock Advisory based on weather forewarning	Centre for Animal Adaptation to Environment and Climate Change Studies (CAADECCS)	5.00
Process standardization for the preparation of dahi powder	Department of Dairy Microbiology, CDST, Mannuthy	5.00
Identification of critical control points for quality improvement of ice cream processed in KVASU dairy plant	Department of Dairy Microbiology, CDST, Mannuthy	5.00
Study of diseases of street dogs in connection with animal birth control programme	Department of Clinical Medicine, Ethics and Jurisprudence, Mannuthy	4.50
Investigations to control metabolic disorder and infertility in crossbred cattle Augmenting biotechnology and molecular biology research in KVASU	Department of Clinical Medicine, Ethics and Jurisprudence, Mannuthy	4.38
Establishing of an Ostrich Unit at ILFC, Pookode	Instructional Farm, Pookode	4.38
Development of immunochromatographic strip test for the rapid diagnosis of acute leptospirosis in field conditions	School of Applied Animal Production and Biotechnology, Mannuthy	4.38
Ascertaining a reliable method for isolation and purification of mesenchymal stem cells from dogs	School of Applied Animal Production and Biotechnology, Mannuthy	4.38
Scientific validation and evaluation of galactogogue herbal formulations used by local tribes as supplement to increase milk yield	Department of Veterinary Physiology, Pookode	4.37
Field oriented screening of brucellosis and related infertility management in bovine in Thrissur and Wayanad districts	Department of Veterinary Microbiology, Mannuthy	4.00
Studies on bacterial pyoderma in dogs	Department of Veterinary Epidemiology and Preventive Medicine, Pookode	4.00
Process development for the preparation of low fat ice cream from goat milk 2017-18	Department of Dairy Science, Mannuthy	4.00

Structured value chain approach for designing strategies to enhance competitiveness and diversification among buffalo and dairy farmers of Kerala	Department of Veterinary and Animal Husbandry Extension, Mannuthy	4.00
Evaluation of medicinal plants for wound healing properties	Department of veterinary pharmacology and toxicology 5	4.00
Strengthening of small Animal Breeding Station	Small Animal Breeding Station, Mannuthy	4.00
Strengthening of school of zoonoses,public health and pathobiology	School of Zoonoses Public Health and Pathobiology	4.00
A retrospective study on the prevalence and distribution of Metabolic diseases of ruminants in Kerala	Department of Clinical Medicine, Ethics and Jurisprudence, Pookode	3.50
Histological and molecular classification of canine mammary tumours	Department of Veterinary Pathology, Mannuthy	3.00
Augmenting livestock technology delivery through micro level Stakeholder oriented experiential learning programme for the students in the adopted villages for establishing a single window total solution providing system in livestock and allied sectors	Department of Veterinary and Animal Husbandry Extension, Mannuthy	3.00
Establishing a Diagnostic protocol for Disseminated intravascular coagulation in animals Blood transfusion facility in farm animals	Department of Clinical Medicine, Ethics and Jurisprudence, Mannuthy	2.63
Development of base level software of virtual farming and farms to ensure attitudinal change of stakeholders towards livestock farms and farming	Department of Veterinary and Animal Husbandry Extension, Mannuthy	2.50
Complete feeds for dairy cows as a solution for the feed and fodder scarcity of Kerala	Animal Nutrition, Pookode	2.21
Assessment of the status of antibiotic residues in milk samples in and around Thrissur district of Kerala	Department of Veterinary Public health	2.00
Effect of various herbal and chemical sanitizers on quality of drinking water	Department of Veterinary Public Health	2.00

Establishment of training centre for Laparoscopic animal birth control	Department of Veterinary Surgery and Radiology, Pookode	2.00
Development of Micro-encapsulation system for enhancing the viability of probiotic bacteria in functional foods	Department of Dairy Science, Mannuthy	2.00
Anti-neoplastic potentials of goat milk lactoferrin	Department of Veterinary Biochemistry, Mannuthy	2.00
Physiological evaluation of electrolyte supplementation to ameliorate heat stress in cattle.	Department of Veterinary Physiology, Mannuthy	2.00
Maintaining, Strengthening & Refurbishing CAADECCS for climate change preparedness in livestock sector	Centre for Animal Adaptation to Environment and Climate Change Studies (CAADECCS)	2.00
Establishing Speciality Surgical Facilities for excellence in Clinical Teaching and delivery of surgical care	Department of Veterinary Surgery and Radiology, Mannuthy	1.99
Investigations on animal reservoirs of Leishmaniosis in Kerala	Department of Veterinary Parasitology, Mannuthy	1.00
Establishment of Effluent Treatment Plant	Dairy Plant, Mannuthy	0.13

Study of diseases of street dogs in connection with animal birth control programme

Investigated various infectious and Noninfectious disease conditions in street dogs. Establishing a Diagnostic protocol for disseminated intravascular coagulation in animals and strengthened the diagnostic procedures for DIC in animals.

Blood transfusion is being carried out in farm animals

This facility can be utilized as life saving measure for counteracting anemia in farm animals especially with parasitic infestation

Blood transfusion

Field oriented screening of brucellosis and related infertility management in bovine in Thrissur and Wayanad districts

A total of 400 bovine sera were screened for brucellosis using antibody detection lateral flow assay and RBPT. Sensitivity of lateral flow assay was found to be 89.29per cent (out of 400 samples 25 were positive by Lateral flow assay while 27 were positive by RBPT). Specificity was 100per cent • Out of 50 uterine/vaginal discharge/aborted foetal stomach contents tested, four were positive for PCR while three were found positive by Immuno-chromatography. Sensitivity was found to be 75per cent and sensitivity 100per cent

Antibiotic resistance in veterinary practice- A representative study

"Antibiotic resistance in Veterinary practice- a representative study" was conducted during the year 2017-18. Microbiological culture of about 190 clinical samples from different animals (poultry -91, cow-38, dog-46, pig-8, goat-3, rabbit-2, cat-1, elephant-1) have been carried out and on antibiogram of the isolates, an alarming increase in resistance is noticed against the common antibiotics used in field conditions which includes sulpha drugs, penicillin's and their combinations, quinolones, second and third generation cephalosporins. Least resistance was noticed towards aminoglycosides and chloramphenicol.

Standardisation of Copro PCR for detection of *Haemonchus* spp. in cattle

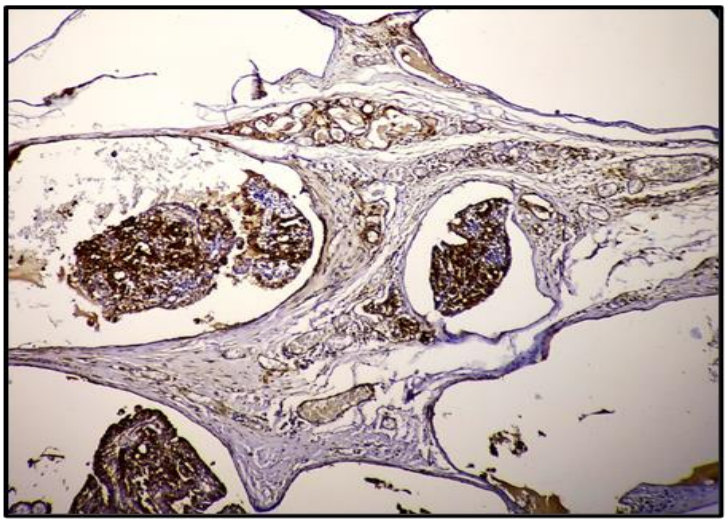
Examination of 320 faecal samples of cattle from different regions of Thrisur revealed an overall occurrence of Strongyle infection as 36.8 per cent. The strongyle spp. identified during coproculture were those of Haemonchus (14.68per cent), Mecistocirrus (8.4per cent), Trichostrongylus (3.4per cent), Bunostomum (3.1per cent and Cooperia (1.25per cent). Haemonchus spp. was one of the predominant strongyle species. Gradient PCR protocols were standardised with primers targeting the ETS region in *H. placei*.. Copro- PCR was standardised using copro DNA as template and adult worm DNA as positive control. A 176 bp product was amplified by PCR. The amplicons obtained consequent to PCR were purified and sequenced. The partial sequence of ETS region revealed 99 percent identity with corresponding published sequence of H. placei. Phylogeny of H.placei revealed that Kerala isolate was closest to the USA isolate. It was sister clade with Ireland and Iran isolates and farthest from the clade containing Uzbekistan isolate.

Investigations on animal reservoirs of leishmaniosis in Kerala

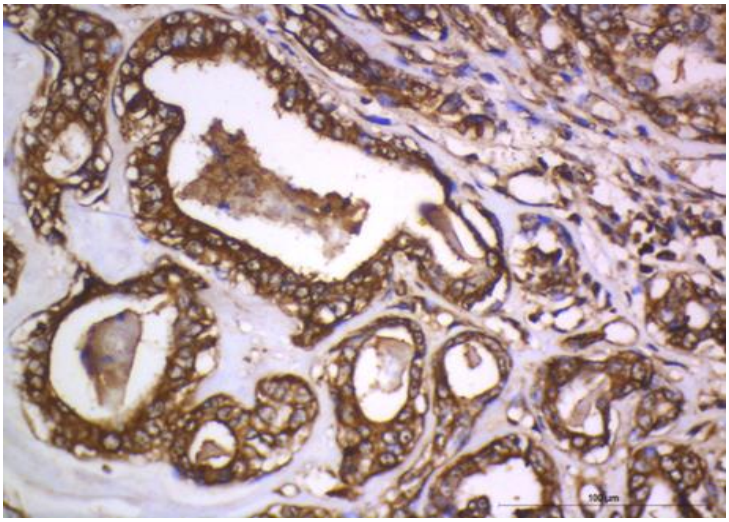
Fifty blood samples of dogs belonging to suspected areas of leishmaniosis outbreak were subjected to ELISA. None of the samples were found positive to the test**.**

Histological and molecular classification of canine mammary tumours

Histological and molecular classification of canine mammary tumours was done based on the expression of hormone receptors, galectin-3 and proteins belonging to m-TOR pathway and the results were compared with the histological type and grade of the tumour. Significant collaboration with the clinical departments handling such cases was done supporting them with the diagnosis and in formulating appropriate treatment strategy.



Galectin-3 in tumour cell emboli and intravascular tumour cells (IHCx100)



Strong expression of DEPTOR in canine ductal carcinoma of the mammary gland (IHCx200)

Establishment of calf nursery at ULF & FRDS, Mannuthy

New Calf shed

Inauguration of *'sathothara rajatha jubilee akhosham of ULF & FRDS'* by Sri.K.Rajan, M.L.A

Fodder maize cultivation in new fodder plots

	
Micro sprinkler irrigation	**Cows at exercise yard/paddock**
	
Hybrid Napier CO3 Plantation	**Farm training for IVth BVSc & AH clinical batch students**
	
Rain gun sprinkler irrigation	**Replanting of fodder plots with Hybrid Napier CO3**

	
Rain water harvesting in hilly area utilising the quarry	**Practical training for Diploma in Dairy Science students**
	
Fodder Sorghum cultivation in hill plots	**FMD vaccination in dairy buffaloes**
	
Construction of a new pond for irrigation purpose Cultivation of Hybrid Napier	**CO3 on roadsides in the campus**

	
Intensive calf management in calf nursery unit transrectal	**Fertility management using ultrasonography in ULF Farm**
	
Early detection of mastitis using electronic mastitis detector	**Educating the farmers on benefits of hoof trimming and hoof care**
	
Environment day -planting of 300 mahagony and anjily saplings	**Planting of 250 coconut seedlings and 100 arecanut seedlings- inauguration by Dean**

Assessment of the status of antibiotic residues in milk samples in and around Thrissur district of Kerala

The survey revealed the extensive use of antibiotics among dairy farmers. The microbial inhibition assay revealed that 1.31 per cent of milk samples collected from government, private and individual farms revealed the presence of antibiotic residues .67 per cent of the samples detected by MIA had residues above the MRL. The quantification of antibiotics in these samples revealed that the Oxytetracycline, enrofloxacin and cloxacillin had mean concentration of 1430, 530 and 118.77 ng/mL which was very high.

Effect of various herbal and chemical sanitizers on quality of drinking water

Bleaching powder with an available chlorine 25-35per cent was found to completely eliminate E coli at the level of 10^6 cfu/mL at a concentration of 2.5g/ 1000L. Caesalpenia Sappan (Padhimukham) used in water was found to considerably reduce E coli organisms in water. Dahashamini used in water did not reveal antibacterial property.

Conservation and popularisation of native chicken varieties in Kerala

Equipments and research materials used for molecular biology works in avian biotechnology laboratory were purchased. PCR and gel electrophoresis was performed for SNP analysis of White leghorn and native chicken. Polymorphism of neuropeptide Y gene in 200 native chicken and 200 IWN strain of White Leghorn was carried out using the technique Single strand conformation polymorphism (SSCP). The PCR products with distinct band pattern were sent for sequencing.

Advanced mycotoxin testing facility for poultry feed

All ingredients purchased for feed production and the compounded feed produced in RFPP under CASPS were screened for aflatoxin level using ELISA reader. in 2017-18, 105 samples were screened for Aflatoxin level.

ELISA READER PCR MACHINE

Hatchery waste disposal and its effective utilization

As per the conditions laid in MoU between KVASU & KAU, standardization procedures for preparation of reagents and conversion of hatchery waste to a fertilizer product by fortification with the reagents prepared by Dept.of Soil Science, College of Agriculture, Vellayani is undergoing. After the completion of the process, the protocol will be adapted using the equipments installed in this project for the proper utilization of hatchery waste in the poultry farms of KVASU.

Establishing speciality surgical facilities for excellence in clinical teaching and delivery of surgical care

Equipped Speciality facilities viz Orthopaedic and Ophthalmology units for Under graduate teaching. Equipped State of the Art Speciality Orthopaedic and Ophthalmology Surgical theatres for advanced treatment of animal patientsvisions of surgery. Imparted clinical training to 132 undergraduate students in speciality divisions of surgery. Conducted research work of Post graduates in speciality areas of surgery such as orthopaedic and dental surgery.

A study on prevalence and clinico pathological effects of common tick borne haemoparasitic pathogens observed in cattle population of Wayanad district

Sub clinical theileriosis was detected in 23per cent of farm cattle in Wayanad. This can lead to sub optimal milk production and clinical illness if there is any stress.

Bacterial Pyoderma in dogs

Staphylococcus spp. was identified as the commonest organism (84.51 per cent). Among the 60 *Staphylococcus* spp., 53.33 per cent (32 isolates) were identified as *S. epidermidis.* On antibiogram 68.75 per cent of isolates were resistant to penicillin group of antibiotics followed by tetracycline (65.63 percent), fluroquinolone (50 per cent) and macrolide (21.88 per cent). Both genotypic and disk diffusion method of resistance patterns were comparable.High occurrence of coagulase- negative staphylococci which are emerging as potential zoonotic pathogens highlights the need for routine monitoring of etiology of canine pyoderma. The present study showed resistance to antibiotics which are most clinically prescribed such as amoxicillin, amoxicillin- clavulanate and enrofloxacin at an alarming rate, which recommends the need for routine screening for antimicrobial resistance prior to therapeutic management of the condition and prudent use of antimicrobials for companion animals.

Preventive healthcare programme for livestock

Identified major hemoprotozoans affecting ruminants and molecular characterisation of causative agents were carried out. Culture and antibiogram studies of about 200 milk samples from animals suspected of mastitis was carried out . characterization of multidrug resistant bacteria causing mastitis has been done. Identified virulence factors causing resistance to antibiotics.

Biopreservation of traditional dairy products using lactic acid bacteria

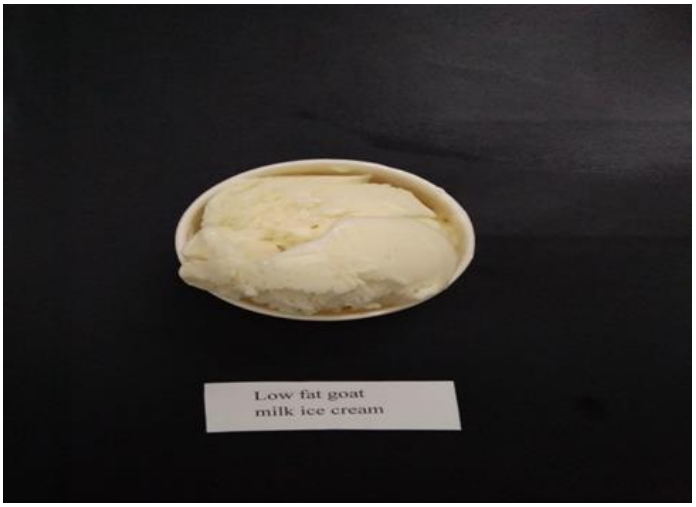
The crude culture extract from *Lactobacillus acidophilus* isolates showed a positive zone of inhibition against Bacillus species.

Development of Micro-encapsulation system for enhancing the viability of probiotic bacteria in functional foods

Objective of the project was to evaluate the material characteristics for encapsulation of probiotics and standardize Microencapsulation process attributes. Chemical and microbiological attributes of functional yoghurt prepared using encapsulated probiotic cultures was also evaluated. Encapsulation of bacteria using calcium alginate as wall material provided good viability of *B.bifidum.* The survivability of non-encapsulated cells in yoghurt was significantly decreased from 0^{th} day to 15^{th} day of storage. for encapsulated *B.bifidum,* Viability is maintained throughout storage. The minimum therapeutic requirement of probiotic was maintained in the microencapsulated yoghurt throughout the storage. On sensory evaluation the overall acceptability of microencapsulated probiotic yoghurt was slightly superior to non-capsulated yoghurt.

Process development for the preparation of low fat ice cream from goat milk

Low fat ice cream was successfully developed from goat skim milk by using whey protein concentrate as a fat replacer. The level of WPC required for optimum sensory quality was standardized. The protein content of low fat ice cream incorporated with WPC was significantly higher than control. The developed product was evaluated based on Physico-chemical, microbiological and sensory qualities and was found to be good.



Utilization of inedible dairy byproducts for preparation of animal feed ingredients

Acid Casein and caseinates (Sodium caseinate, potassium caseinate, ammonium caseinate) were produced from an ayurvedic by product. Proximate analysis of the preparation showed higher fat (12.3per cent) and protein (18.57per cent) levels in these products. They were utilized for preparation of meat products like cutlet and results of sensory analysis were satisfactory

Structured value chain approach for designing strategies to enhance competitiveness and diversification among buffalo and dairy farmers of Kerala

Training Need Analysis and identification of main actors on the milk value chains among dairy and buffalo farmers of selected milk cooperative societies was conducted through participatory discussions and personal interviews on the homestead using a pretested structured interview schedule. The buffalo milk value chain sketch was developed. Marketing and other constraints encountered by dairy and buffalo farmers were identified. Areas for remedial action through capacity building programmes were identified. Farmer training cum participatory discussions for dairy and buffalo farmers were organised at Manamangalam Milk Cooperative Society for 62 farmers on 14.3.2018 and a Farmer seminar and Hands on training programme on value

addition of milk for 24 buffalo farmers of Anthikad Block on 18.05.2018 in association with the Department of Dairy Science, College of Veterinary and Animal Sciences, Mannuthy.

Based on the initial study, adopted two villages viz. Maniyan Kinar Tribal Colony, Pananchery GP and Mannanmangalam of Puthur Grama Panchayath of Thrissur District. Conducted

Experiential learning programmes for the students in the above said areas. Identified gaps and implemented capacity building measures

Anti-neoplastic potentials of goat milk lactoferrin

Lactoferrin from Malabari and Attappady Black goat colostrum was isolated and purified for the first time.The *in vitro* antineoplastic effects of the isolated lactoferrin in DLA cells was found to be significant compared to the known anticancer drug Cisplatin. Defined the limits of a normal profile of various analytes during the transition period of dairy cows. Ascertained the suitability of a few analytes to identify cows at risk.

Screening and evaluation of medicinal plants for anticancer activity

Artocarpus hirsutus and *Basella alba* were screened for anticancer activity against MCF7 and MDA MB 231 cell lines. Both plants were found to exhibit anticancer activity

Evaluation of medicinal plants for wound healing properties

Kaempferia rotunda and *Pergularia daemia* were evaluated for wound healing properties in L929 cell lines and found that both the plants exhibited wound healing activity.

Physiological evaluation of electrolyte supplementation to ameliorate heat stress in cattle

Dietary supplementation resulted in increasing of the serum concentrations of sodium, potassium and chloride. No significant difference was observed on haematological parameters. Plasma cortisol showed significant reduction in the supplemented group compared to control and daily average milk production was more in the supplemented group compared to the control, but the differences were not significant.

L**ivestock advisory based on weather forewarning**

in collaboration with KAU weekly bulletins containing tips on animal husbandry practices being distributed to farmers of Thrissur, Palakkad and Ernakulam districts using messengers, online services like email and Whatsapp. Farmer interfaces have been arranged at different milk societies for discussing the solutions and the precautions to be taken by them to counteract the weather based problems faced by them.

Maintaining, strengthening & refurnishing CAADECCS for climate change preparedness in livestock sector

Survey and Estimation of endosulfan in milk collected from prone areas in the state of Kerala

A Total of 40 raw cow milk samples were collected from individual dairy farmers residing in different areas of Kasargod district and were analysed. We could not detect the presence of Endosulfan in any of the raw milk samples.

Development of adulteration test strips for milk

Two different test strips were developed for the detection of neutralizers and glucose.

Strategies for improving fodder production at cattle breeding farm, Thumburmuzhy

Produced more than 3500 T of fodder for farm use and supplied 30 T of fodder to farmers. Supplied 6,00,000 fodder slips to farmers during 2017-2018. Produced 5 T of straw and 2 T of hay for farm use. Trained 730 farmers on fodder farming techniques and irrigation. Also given training to 280 farmers on composting techniques and waste management. Purchased and planted vegetable seeds, fodder, maize seeds. Planted pepper, arecanut, Fruit trees and coconut trees.

Process standardization for the preparation of dahi powder (continuation project of development of starter culture centre

Standardized the procedure for development of dahi powder and ready to reconstitute probiotics using an indigenous isolate of lactic acid bacteria. Dry blended skim milk powder, ground sugar vanilla powder and freeze dried culture (13:4.5:1:0.01) when mixed with luke warm water in the ratio 1:4 yielded a probiotics drink with an overall acceptability of 8.1 on 9 point headonic scale.for the preparation of dahi powder freeze drying was done at -70^0C at a pressure of 50-100mm torr. The freeze dried powder so obtained when inoculated at the rate of 3per cent in milk, yielded dahi with good textural properties after overnight incubation at 37^0C.

Identification of critical control points for quality improvement of ice cream processed in KVASU dairy plant

Handlers hygiene, air and water quality were found to be highly critical in deciding product quality. Environmental hygiene was improved by giving thrust to cleaning activities by way of demonstration. On implementation of control measures, the product quality was conformed to standards.

Estimation of Antibiotic residues present in individual raw milk samples from Thrissur and Wayanad Districts. A total of 100 individual milk samples were collected from Thrissur and Wayanad and were further analysed for detecting the presence of Antibiotic residues mainly belonging to the class sulphonamides, tetracyclines and β-lactams. Specific detection kits were used to check the presence of the above mentioned antibiotics.

Survey and estimation of endosulfan in milk collected from prone areas in the state of Kerala

A Total of 40 raw cow milk samples were collected from individual dairy farmers residing in different areas of Kasargod district and were analysed. We could not detect the presence of Endosulfan in any of the raw milk samples.

Development of adulteration test strips for milk

Two different test strips were developed for the detection of neutralizers and glucose.

Research on fermented and functional dairy foods process standardization of carrot lassi

A process was standardized to prepare lassi incorporated with carrot juice.

Development of diabetic peda

A technology for the development of Diabetic peda was formulated. The diabetic peda was manufactured from buffalo milk containing 5per cent fat by completely replacing sucrose with low calorie sweetner sucralose.

Development of calcium enriched herbal whey beverage

Herbal whey beverage was prepared by incorporating extracts of Brahmi *(Bacopa monnieri*). Brahmi *(Bacopa monnieri)* is traditionally used as a medicinal herb and alternative medicine in treating numerous kinds of diseases.

Research on fermented and functional dairy foods

Development of ginger peda: An attempt was made to prepare nutritious peda by incorporating ginger (Zingiber officinale roscoe). Peda was prepared from buffalo milk (standardized to 6per cent fat and 9per cent SNF) with the addition of 33per cent sugar on khoa basis.

Economic analysis of industrial production of whey melon

Objective of the study is to analyze the economic feasibility of industrial production of whey melon, a delicious beverage prepared from whey by incorporating watermelon juice.

Interventions to increase vitamin c in milk ice using guava (*Psidium guajava*) pulp

Attempts were made to prepare milk ices by incorporating guava (*Psidium guajava*) pulp which is a good natural source of vitamin C.

Development of low calorie fibre incorporated shrikhand using little millet

The present study "Development of low calorie fibre incorporated shrikhand using little millet (*Panicum sumatrense)*" was carried out with an intension to prepare healthy nutritious shrikhand variety.

Development of Burfi Incorporated with Foxtail Millet (*Setaria italica)*

The present study "Development of burfi incorporated with foxtail millet (*Setaria italica*)" was carried out with an intention to prepare healthy nutritious burfi variety. The product was prepared by incorporating foxtail millet to burfi. Value addition for Skim Milk through product diversification.

Development of iron fortified low fat yoghurt

Yoghurt is excellent sources of vitamins, minerals and protein but like any other dairy product; they contain very little iron (approximately 0.2mg/kg). Therefore, dairy products are logical vehicle for iron fortification and considered as practical and cost effective long-term solution.

Development of low calorie jackfruit (*Artcarpus heterophyllus)* flavoured milk

Low calorie jackfruit flavoured milk is a beverage made from skim milk by replacing cane sugar by low calorie sweetener called sucralose and steamed jackfruit juice as flavouring agent. This project was planned to develop jackfruit flavoured milk incorporating sucralose as low calorie sweetener.

Studies on the development of diabetic flavoured milk

in the current study low calorie flavoured milk incorporating sucralose as low calorie sweetener and maltodextrin was developed.

Studies on the development of diabetic sandesh

A preliminary study was conducted to standardize the concentration of sucralose and maltodextrin to be used in the preparation of diabetic sandesh. 300ppm of sucralose was found to be high in sensory attributes like sweetness, flavour, appearance, colour, body, texture and overall acceptability, which was almost comparable to control and hence was selected for further studies.

Strategies for improving fodder production at cattle breeding farm, Thumburmuzhy

Produced more than 3500 T of fodder for farm use and supplied 30 T of fodder to farmers. Supplied 6 ,00,000 fodder slips to farmers during 2017-2018. Produced 5 T of straw and 2 T of hay for farm use. Trained 730 farmers on fodder farming techniques and irrigation. Also given training to 280 farmers on composting techniques and waste management. Purchased

and planted vegetable seeds, fodder, maize seeds. Planted pepper, arecanut, Fruit trees and coconut trees.

Establishing calf nursery at CBF, Thumburmuzhy

Given special care to calves by providing the calf milk replacer, calf starter, mineral mixture and and medicines. Thereby maximizing growth and productivity. Produced 10 heifers for supplying to Elite farmers. Sold 31 quality bull calves for fattening purpose to farmers. Given training to 110 professional students and 730 farmers.

Strengthening of school of zoonoses, public health and pathobiology-Research: Impact of animal and population dynamics and environment on Leptospira infection in Alappuzha, Kerala

The study on prevalence of leptospirosis was done in cattle and cattle owners in Mannancherry and Mararikulam south panchayats of Alapuzha. in humans, an overall seropositivity of 22.3 per cent was observed. in cattle an overall seropositivity of 40 per cent was observed at a titre between 1:50 and 1:200 where 52.2 per cent were from Mannancherry and 29.5 per cent were from Mararikulam south panchayats respectively It was observed that Grippotyphosa and Autumnalis were the predominant serovars in both cattle and cattle owners which revealed a link between transmission of the organism from cattle to cattle owners. Water samples from these pamhayths from various sources also revealed the presence of the organism by molecular detection technique (PCR). The cattle urine and backwater samples collected from Kainagiri panchayath dis not reveal the presence of pathogenic leptospires.A training programme on Basic techniques in parasitology was conducted for graduate and post graduate (Zoology) students of St. Xavier College , Aluva. Awareness class on zoonoses and Exhibition was organised for school students in Aluva.

4. PhD and PG Projects

Sl. No	Title of the Thesis/Dissertation	Degree conferred	Department
1	Characterization of malabari buck seminal plasma proteins in relation to semen freezability and fertility	Ph.D	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
2	Clinical study of canine cardiomyopathies in association with B-MYH7, MYBPC3 and TCAP gene mutations.	Ph.D	Veterinary Clinical Medicine, Ethics and Jurisprudence, Mannuthy
3	Evaluation of antitumour properties of Simarouba (Lakshmi Taru) and *Thespesia Populnea* (poovarasu) in experimental mammary tumour models in rats	Ph.D	Veterinary Pharmacology & toxicology, Mannuthy
4	Identification, isolation and characterization of potential molecule(s) from plant extract and studies on their mode of action	Ph.D	Veterinary Pharmacology and Toxicology, Mannuthy
5	Mineral profile of livestock farm waste and its bio- accumulation effects in cross bred cattle	Ph.D	Livestock Production Management, Mannuthy
6	Molecular and immunohistochemical studies on tumours of the nasal sinuses in domestic animals	Ph.D	Veterinary Pathology, Mannuthy
7	Acute phase proteins in serum and milk as diagnostic tools in bovine subclinical mastitis	M.V.Sc	Preventive Medicine, Mannuthy
8	Anthelmintic activity of fruit extracts of *Duranta erecta* (Neelakantha) and *Piper longum* (Tippali)	M.V.Sc	Veterinary Pharmacology and Toxicology, Mannuthy
9	Association of polymorphism of prolactin gene with production traits in white leghorn and native chicken	M.V.Sc	Poultry Science, Mannuthy
10	Assessment and alleviation of transition stress from pregnancy to lactation in crossbred dairy cattle	M.V.Sc	Veterinary Physiology, Mannuthy

11	Bone marrow cytology of chicken in experimentally induced *Escherichia coli* and *Eimeria tenella* infection	M.V.Sc	Veterinary Pathology, Mannuthy
12	Canine newborn vitality and viability following caesarean section under two anaesthetic protocols	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
13	Clinico-pathological and therapeutic investigations on Jaundice in dogs	M.V.Sc	Veterinary Clinical Medicine, Ethics and Jurisprudence, Mannuthy
14	Developmental studies and expression profile of alfa-fetoprotein gene on liver of embryonic and day-old Turkey (*Meleagris gallopavo*)	M.V.Sc	Anatomy and Histology, Mannuthy
15	Echocardiographic evaluation of malabari goats with haemoparasitic diseases	M.V.Sc	Veterinary Clinical Medicine, Ethics and Jurisprudence, Mannuthy
16	Effect of different levels of Aflatoxin B1 on production performance of breeder Japanese Quails (*Coturnix coturnix japonica*)	M.V.Sc	Poultry Science, Mannuthy
17	Immunodiagnosis and therapeutic management of canine Brugian filariosis	M.V.Sc	Clinical Medicine, Mannuthy
18	Modulation of post thaw attributes of buck semen using choline chloride as chelating agent	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
19	Molecular characterization and expression profiling sirtuin 3 gene in goats	M.V.Sc	Genetics, Mannuthy
20	Molecular characterization and seromonitoring of canine parvovirus following modified live CPV-2b vaccination in pups	M.V.Sc	Veterinary Preventive Medicine, Mannuthy
21	Molecular detection and pathology of porcine circovirus-2 infection among piglets	M.V.Sc	Veterinary Pathology, Mannuthy
22	Molecular detection and therapeutic management of canine babesiosis	M.V.Sc	Preventive Medicine, Mannuthy
23	Pathology of Salmonella associated porcine gastroenteritis in mouse model	M.V.Sc	Pathology, Mannuthy

24	Ultrasonographic characterization of follicular dynamics in post-partum Attappady black does	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
25	Ultrasonographic studies on periovulatory follicular dynamics and response to GnRH therapy in repeat breeding cattle with prolonged oestrus	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
26	Ultrasonographic studies on uterine and ovarian changes during early pregnancy in bovines	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
27	Yield and quality of transvaginally retrieved oocytes in normal and repeat breeding cattle	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Mannuthy
28	Effect of dietary incorporation of spent cumin (*Cuminum cyminum*) seeds on growth performance of broiler chicken	M.V.Sc	Animal Nutrition, Mannuthy
29	Effect of *Polyalthia longfolia* and piper beetle leaf meal as feed additive broiler chicken	M.V.Sc	Animal Nutrition, Mannuthy
30	Epidemiology of enterohaemorrhagic *Escherichia coli* in raw milk	M.V.Sc	Veterinary Public Health, Mannuthy
31	Occurrence of Campylobacter species in chicken meat and eggs	M.V.Sc	Veterinary Public Health, Mannuthy
32	Occurrence of Toxoplasma gondii in feline, caprine, human and environmental samples	M.V.Sc	Veterinary Public Health, Mannuthy
33	Seasonal occurrence of Leptospira spp. different water sources	M.V.Sc	Veterinary Public Health, Mannuthy
34	Acute and sub-acute oral toxicity studies of aqueous extract of leaves of *Wedelia trilobite* (Manja kanjunni) in rats	M.V.Sc	Veterinary Pharmacology and toxicology, Mannuthy
35	Behavioural physiological and biochemical stress responses of crossbred cows to varying thermal indices in different management systems	M.V.Sc	Livestock Production Management, Mannuthy
36	Bronchoscopic evaluation of respiratory tract disorders in dogs	M.V.Sc	Veterinary surgery and Radiology, Mannuthy

37	Comparative efficacy of isoflurane and sevoflurane anaesthesia following induction with thiopentone sodium in goats	M.V.Sc	Veterinary surgery and Radiology, Mannuthy
38	Comparative evaluation of conventional and real time PCR for detection of haemoparasites in dogs and ixodid ticks	M.V.Sc	Animal Production and Biotechnology, Mannuthy
39	Comparative evaluation of travoprost and trabeculectomy in the management of glaucoma in dogs	M.V.Sc	Veterinary Surgery and Radiology, Mannuthy
40	Comparison of management systems of captive male Asian elephants in South India	M.V.Sc	Livestock Production Management, Mannuthy
41	Detection and molecular characterization of benzimidazole resistance in gastrointestinal nematodes of goats	M.V.Sc	Veterinary Parasitology, Mannuthy
42	Development of recombinant outer membrane protein A based ELISA for the diagnosis of *Riemerella anatipestifer* infection in duck	M.V.Sc	Veterinary Microbiology, Mannuthy
43	Development of spent chicken meat spread incorporating edible poultry offal	M.V.Sc	Livestock Production Management, Mannuthy
44	Effect of feeding system and floor types on growth performance of Malabari kids	M.V.Sc	Livestock Production Management, Mannuthy
45	Effect of incorporation of spent rosemary leaf meal as an ingredient in kid starter	M.V.Sc	Animal Nutrition, Mannuthy
46	Effect of weaning age on performance of large white Yorkshire pigs	M.V.Sc	Livestock Production Management, Mannuthy
47	Efficacy of epidural polyethylene glycol in spinal cord injured dogs treated with intravenous methyl prednisolone sodium succinate	M.V.Sc	Veterinary surgery and Radiology, Mannuthy
48	Enhancing biogas production by co- digestion of livestock manures	M.V.Sc	Livestock Production Management, Mannuthy

49	Evaluation and management of joint disorders in calves	M.V.Sc	Veterinary Surgery and Radiology, Mannuthy
50	Evaluation of E74-like factor 5 (Elf5) gene polymorphism and its association with milk production traits in crossbred and Vechur cattle of Kerala	M.V.Sc	Animal Production and Biotechnology, Mannuthy
51	Expression of vascular endothelial factor (*VEGF*) and its biological receptor, *VEGFR2* in granulosa cells of Malabari goat	M.V.Sc	Veterinary Physiology, Mannuthy
52	Expression profile of insulin like growth factor1 (*IGF1*) gene and its receptor, *IGFR1 in* granulosa cells of goats	M.V.Sc	Veterinary Physiology, Mannuthy
53	Identification and protein profiling of the bacterial isolates from corneal diseases in dogs	M.V.Sc	Livestock Production Management, Mannuthy
54	Isolation and characterization of angiotensin converting enzyme inhibitory peptides from fermented goat milk	M.V.Sc	Dairy Science, Mannuthy
55	Isolation and charecterization of lactoferrin from colostrum of goats	M.V.Sc	Veterinary Biochemistry, Mannuthy
56	Lactation performance and milk composition of Attappady black goat	M.V.Sc	Livestock Production Management, Mannuthy
57	Metabolic profile of crossbred dairy cows during transition period	M.V.Sc	Veterinary Biochemistry, Mannuthy
58	Minimally invasive plate osteosynthesis (MIPO) for the management of long bone fracture in goats	M.V.Sc	Veterinary surgery and Radiology, Mannuthy
59	Molecular characterization and expression profiling of *lactoferrin* gene in goats	M.V.Sc	Veterinary Biochemistry, Mannuthy
60	Molecular detection and occurrence of Ehrlichiosis and Anaplasmosis in dogs	M.V.Sc	Veterinary Pharmacology and Preventive Medicine, Mannuthy

61	Molecular detection of theileriosis and anaplasmosis in goats	M.V.Sc	Veterinary Parasitology, Mannuthy
62	Myostatin and insulin like growth factor-1 gene expression in broiler chicken exposed to monochromatic light	M.V.Sc	Veterinary Physiology, Mannuthy
63	Nutritional management of early weaned large white Yorkshire piglets by functional amino acid supplementation	M.V.Sc	Animal Nutrition, Mannuthy
64	Occurrence and clinico –therapeutic studies of feline infectious anemia	M.V.Sc	Veterinary Preventive Medicine, Mannuthy
65	Pathology of *Salmonella choleraesuis* infection and antibacterial effect of aqueous garlic extract in mice model	M.V.Sc	Veterinary Preventive Medicine, Mannuthy
66	Quality characteristics of restructured chicken cubes incorporating spent chicken meat	M.V.Sc	Livestock Products Technology, Pookode
67	Quality evaluation of ultra- high temperature milk from Thrissur district	M.V.Sc	Dairy Science, Mannuthy
68	Standardization and species identification of pressure cooked meat by polymerase chain reaction	M.V.Sc	Livestock Products Technology, Mannuthy
69	Utilization of whey based media for maintenance of lactic cultures	M.V.Sc	Diary Science, Mannuthy
70	Evaluation and comparison of four different types of bio-gas plants utilizing livestock waste	M.V.Sc	Livestock Production and Management, Pookode
71	Evaluation of anti-stress supplements on growth performance of early weaned piglets	M.V.Sc	Livestock Production and Management, Pookode
72	Molecular detection and characterization of common enteric bacterial pathogens of public health significance	M.V.Sc	Veterinary Public Health, Pookode
73	Effect of feeding complete ration with tween 80 on growth performance of post ruminant dairy calves	M.V.Sc	Animal Nutrition, Pookode
74	Effect of dietary incorporation of cashew apple waste on growth and nutrient utilization in kids	M.V.Sc	Animal Nutrition, Pookode

75	Ultrasonographic studies on post-partum uterine involution and ovarian cyclicity in malabari goats	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Pookode
76	Evaluation of post-partum uterine involution and resumption of ovarian cyclicity in Vechur cows	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Pookode
77	Ultrasonographic assessment of embryonic and foetal development in malabari goats	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Pookode
78	Effect of gelatin binding proteins (Gbp) and non gelatin binding proteins (Ngbp) of seminal plasma on freezability of vechur bull semen	M.V.Sc	Animal Reproduction, Gynaecology and Obstetrics, Pookode
79	Empowerment and employment generation among livestock based women self help groups (Kudumbashree) in Wayanad district	M.V.Sc	Veterinary and Animal Husbandry Extension, Pookode
80	Molecular characterization of bovine *Babesia bigemina* Isolates from Kerala	M.V.Sc	Veterinary Parasitology, Pookode
81	Molecular detection of haemoprotozoans in ticks infesting cattle and dogs of Kerala	M.V.Sc	Veterinary Parasitology, Pookode
82	Biomechanical and histopathological assessment of in vivo remodelling response of decellularised bovine pericardium	M.V.Sc	Veterinary Pathology, Pookode
83	Tissue response of decellularized bovine omental implants in rat model	M.V.Sc	Veterinary Pathology, Pookode
84	Acute and sub-acute oral toxicity studies of ethanol extract of aerial parts of *Blumea laevis* in rats	M.V.Sc	Veterinary Pathology, Pookode
85	Clinical evaluation of dexmedetomidine midazolam-ketamine with atracurium for isoflurane anesthesia in dogs	M.V.Sc	Veterinary Surgery and Radiology, Pookode
86	Radiography, ultrasonography and laparoscopy for the diagnosis of intra-abdominal disorders in dogs	M.V.Sc	Veterinary Surgery and Radiology, Pookode
87	Evaluation of chlordiazepoxide or haloperidol as pre-medicants for midazolam ketamine anesthesia for vasectomy in bonnet macaques (*Macaca radiata*)	M.V.Sc	Veterinary Surgery and Radiology, Pookode

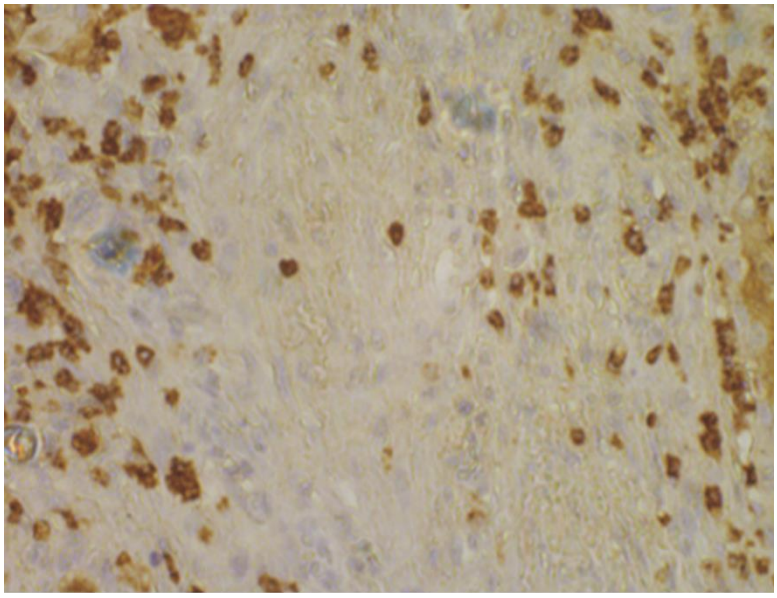
88	Evaluation of production performance of gramasree hens by feeding black soldier fly (*hermetia illucens)* larvae as a protein replacer	M.V.Sc	Poultry Science, Mannuthy
89	Characterisation of bovine integrin beta 6 gene and analysis of its expression with reference to foot and mouth disease	M.V.Sc	Animal Genetics and Breeding, Mannuthy
90	Hepatoprotective effect of *Eclipta prostrata* (L) L. leaves on experimentally induced aflatoxicosis in broiler chicken	M.V.Sc	Veterinary Pharmacology and Toxicology, Mannuthy
91	Isolation and Charecterization of Lactoferrin from Colostrum of Goats	M.V.Sc	Veterinary Biochemistry, Mannuthy
92	Optimisation of whey based media for maintenance and preservation of starter cultures	M.V.Sc	Dairy Science, Mannuthy
93	Bacteria associated with periodontal ailments in dogs	MSc.	Veterinary Microbiology, Mannuthy
94	Detection of biofilm forming ability of *Riemerella anatipestifer* isolates of Kerala	MSc.	Veterinary Microbiology, Mannuthy
95	Diagnosis of infectious laryngotracheitis in chicken using enzyme linked immunosorbent assay and polymerase chain reaction	MSc.	Veterinary Microbiology, Mannuthy
96	Dynamics of cytokine expression in dairy cattle during transition period	MSc.	Veterinary Biochemistry, Mannuthy
97	Effect of slurry irrigation from cattle and pig farm on hybrid napier fodder yield and its mineral analysis	MSc.	Livestock Production Management, Mannuthy
98	Isolation and characterization of lactoferrin from milk of Kasargode dwarf cattle	MSc.	Veterinary Biochemistry, Mannuthy
99	Modelling of microbial growth in broiler chicken meat during storage in a domestic refrigerator at 4+-10C	MSc.	Veterinary Microbiology, Mannuthy

100	Molecular characterization of B-casein among various livestock breeds of Kerala	MSc.	Veterinary Biochemistry, Mannuthy
101	Molecular characterization of Potassium inwardly rectifying channel, subfamily J, member 11(Kcnj11) gene in dogs	MSc.	Veterinary Biochemistry, Mannuthy
102	Oxytetracycline residue analysis in poultry meat by ultra-high performance liquid chromatography	MSc.	Veterinary Biochemistry, Mannuthy
103	Phenotypic and genotypic characterization of mecA and blaZ gene mediated antibiotic resistance in *Staphylococcus aureus* and other coagulase negative Staphylococci associated with mastitis in bovines	MSc.	Veterinary microbiology, Mannuthy
104	Polymorphism study on candidate genes affecting height in Vechur and crossbred cattle of Kerala	MSc.	Animal Production and Biotechnology, Mannuthy
105	Protective effect of *Tribulus terrestris* (NJERINJIL) in Cyclophosphamide Toxicity on Reproductive system of Male Rats	M.Sc	Veterinary Pharmacology and Toxicology, Mannuthy

Effect of incorporation of spent rosemary leaf meal as an ingredient in kid starter

An experiment was conducted for a period of 42 days in the Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy to study the effect of dietary incorporation of spent cumin on growth performance, nutrient utilization, gut microbial load and carcass characteristics in broiler chicken. One hundred and fifty, vaccinated day-old straight run commercial broiler chicks (Ven Cobb - 400) formed the experimental birds. All the chicks were wing banded and weighed individually before housing. The chicks were randomly allotted to three treatment groups (T1, T2 and T3) with five replications per treatment and ten chicks per replicate in a completely randomized design. The three dietary treatments consists of T1 (standard broiler ration without spent cumin seed as per BIS, 2007), T2 (standard broiler ration containing 5 per cent spent cumin) and T3 (broiler standard ration containing 10 per cent spent cumin). Data on body weight, daily feed intake, feed conversion ratio, digestibility of nutrients, blood parameters (total protein, albumin, serum total cholesterol, HDL cholesterol, triglycerides, calcium, inorganic phosphorus, SGOT, SGPT and glucose) and carcass characteristics (live weight, carcass weight, Carcass yield without giblet, Carcass yield with giblet, cut up parts, yield of Shank, giblet, blood, meat, bone, abdominal fat and meat : bone ratio), sensory evaluation of meat (appearance, odour, texture, colour, flavour, juiciness, odour, overall acceptability and overall tenderness) and faecal microbial count (total viable count and coliform count) were the parameters used for the evaluation of work. The cost of production per kg body weight gain was also calculated.

The results obtained in the present study showed no significant difference among the three treatments regarding the final body weight, cumulative body weight gain, average daily gain, feed intake and feed conversion ratio. Dietary incorporation of spent cumin seeds at 5 and 10 per cent had no influence on the digestibility of dry matter, crude protein, ether extract, crude fibre, nitrogen free extract and organic matter. The result revealed better per cent availability of phosphorus



Porcine undifferentiated carcinoma.
Heavy infiltration of TAMs in to the tumour (IHCx200)

in control ration. However, the retention (g per day) was similar in all the dietary treatments and all the birds showed positive balance for phosphorus. It indicates that phosphorus in the three dietary treatments were well utilized by the experimental birds. There was no significant difference in availability of calcium among three dietary treatments. There was no significant difference among the three treatment groups in serum Phosphorus, total cholesterol, triglyceride, LDL cholesterol, SGPT, SOPT, glucose concentration and carcass characteristics. Serum HDL cholesterol and calcium were higher ($P<0.05$) for T3 and T2 compared to T1. All the serum biochemical values were within the normal range indicating the good nutritional status of all the experimental birds. Faecal total viable count was reduced in group fed with 10 per cent cumin seed diet (T3) and there was no reduction in coliform count ($p>0.05$) between treatment groups. Sensory evaluation of meat showed no significant difference in appearance, odour, texture of raw meat and colour, flavour, overall tenderness, overall acceptability of cooked meat but, juiciness of cooked meat had improved ($p<0.05$) in birds fed with T2 and T3 compared to T1. Protein efficiency ratio, production efficiency factor and energy efficiency ratio were similar ($p>0.05$) among treatment groups. The total cost of production per bird for group T3 was ($p<0.05$) lowest compared to other treatment groups. Hence, it can be concluded that dietary incorporation of spent cumin seeds up to 10 per cent can be recommended in broiler chicken.

Development of recombinant outer membrane protein A based ELISA for the diagnosis of *Riemerella anatipestifer* infection in duck

Crude Omp was extracted from *R.anatipestifer* (RA1), amplified using in-house designed primers, inserted in pET32a vector and was used for transforming *E.coli* BL21 (DE3) for expression of r*omp* A for its use in ELISA. The recombinant outer membrane protein A was purified using nickel affinity chromatography and used for standardisation of ELISA. An ELISA was developed using the Recombinant outer membrane A (r *omp A*) as an antigen and its efficacy was compared with crude outer membrane protein based ELISA for serodiagnosis of *R. anatipestifer.*

Detection and molecular characterization of benzimidazole resistance in gastrointestinal nematodes of goats

The study was conducted with the objectives of assessing the status of benzimidazole resistance in gastrointestinal (GI) nematodes of goats in Kerala, detection of single nucleotide polymorphisms (SNPs) associated with benzimidazole resistance in the β-tubulin gene of predominant GI nematode species and to evaluate the efficacy of the egg hatch assay, larval

development assay and PCR-RFLP in detection of benzimidazole resistance. Microscopical examination of 520 faecal samples collected from goats from 10 organized farms and 16 small holder farmers' flocks in eight agro-ecological zones of Kerala revealed an overall prevalence of 81.5 $\pm$ 5.54 per cent strongyles in goats. The prevalent genera of strongyles identified on coproculture were *Haemonchus* spp., *Trichostrongylus* spp. and *Oesophagostomum* spp. Screening for benzimidazole resistance status in 10 organized goat farms and 16 small holder farmers' flocks in Kerala by Faecal egg count reduction test (FECRT) revealed benzimidazole resistance in all the organized farms and 43.75 per cent of small holder farmers' flocks. There was significant association between the resistance status and farm type. Resistance status was found to be significantly correlated with the frequency of deworming in flocks. *Haemonchus* spp. was found to be the major species responsible for benzimidazole resistance. Molecular genotyping by PCR-RFLP revealed E198A polymorphism in isotype 1 β-tubulin gene in *Haemonchus* spp. with an overall frequency of 0.516 for the resistant allele (r). No polymorphism was identified at codons 167 and 200 in *Haemonchus* spp. in *Trichostrongylus* spp., F200Y polymorphism was identified in isotype 1 β-tubulin gene with an overall gene frequency of 0.337 while susceptible genotype was identified at codons 167 and 198. All the *Oesophagostomum* spp. larvae genotyped were found to be of the susceptible genotype at codons 198 and 200. There was significant correlation ($p < 0.05$) between the results of FECRT, egg hatch assay, larval development assay and PCR-RFLP in detection of benzimidazole resistance.

Molecular detection of Theileriosis and Anaplasmosis in goats

An overall prevalence of 59.44 per cent and 37.69 per cent was observed for *Theileria* spp. and *Anaplasma* spp., respectively in goats selected from organised farms and small holder farms in different districts *viz.*, Thrissur, Palakkad, Ernakulam and Wayanad using PCR. The PCR-RFLP with restriction enzymes using *Hind II* digestion differentiated *Theileria*/*Babesia* spp. and *Vsp I* differentiated *T. ovis* from *T. lestoquardi*.None of the goats harboured *Babesia* spp. The presence of *T.ovis*, *T.lestoquardi* and *T. luwenshuni* were detected in 67, 2 and 22 goats, respectively with mixed species infections in 14 animals. The study places on record the identification of a novel *Theileria* spp *viz.*, *T.luwenshuni* in goats for the first time in India. The prevalence of infection was significantly higher in males and in older animals aged 1-3 years. The incidence of theileriosis was more in Thrissur, while majority of the study population in Palakkad harboured *Anaplasma* spp.The present work provided molecular evidence of the most prevalent haemoparasite in tick vectors for the first time in Kerala. The ticks belonging to

Haemaphysalis spp. and *Rhipicephalus sanguineus* were tested positive for *T. ovis*, while, one tick pool of *Haemaphysalis spp* was positive for *T. luwenshuni* by PCR. Out of the 100 ticks analysed as 20 tick pools, 35 per cent were found to harbour *Theileria* spp. The PCR-RFLP protocol could detect *Theileria* spp. and *Anaplasma* spp. in 49 and 32 apparently healthy animals respectively, signalling the carrier status or subclinical infection.

Molecular and immunohistochemical studies on tumours of the nasal sinuses in domestic animals

This study was undertaken to evaluate the expression pattern of certain specific markers (proteins, cytokines and enzymes) and the role of tumour associated macrophages (TAMs) in sinus tumours of domestic animals through immunohistochemical techniques.

From the study, it can be concluded that the detection of specific proteins, enzymes and cytokines can be used as an early diagnostic measure of these neoplastic conditions.

Quality characteristics of restructured chicken cubes incorporating spent chicken meat

Novel chicken sausage with incorporation of paneer and oats which increased the sensory appeal and dietary fibre level was developed. Chitosan addition (1.5per cent level) and vacuum packaging were employed to increase the shelf life of the developed sausage under chiller shelf life. It was observed that chitosan and vacuum packaging could enhance the shelf life of the sausages by 5 days.

Restructured chicken cubes to be used in different meat preparations with 25, 50 and 75 per cent replacement of broiler chicken meat with spent hen meat were developed and their physico-chemical, microbiological and sensory attributes were studied under freezer conditions for 60 days. Fifty percent replacement was found to be economical with good sensory attributes.

Expression of vascular endothelial factor (*VEGF*) and its biological receptor, *VEGFR2* in granulosa cells of Malabari goat.

The follicular fluid Progesterone (P_4) and Estradiol-17β (E_2) concentration was significantly ($p \leq 0.05$) higher in large (>5mm) follicles when compared to the P_4 and E_2 concentration in medium sized (3–5 mm) follicles. The granulosa cell (GC) *VEGF* do not play a significant role in transition of medium to large follicle in caprines. Increase in concentration of E_2 with increase in follicle size might be due to increase in number of GCs with increase in the size of follicle because GCs are the principal site of aromatization activity which enhanced the production of E_2. Similarly, increase in P_4 concentration in large follicles might be due to the production of P_4 in the synthetic pathway of follicular production of E_2.

Expression profile of insulin like growth factor1 (*IGF1*) gene and its receptor, *IGFR1 in* granulosa cells of goats

The expression of *IGF1* and *IGFR1* mRNA in granulosa cells of caprine follicles indicated that it plays a role in granulosa cell proliferation and steroidogenic activity of granulosa cells during transition from medium to large follicles. However for the conclusive assessment of the role of IGF1 in follicular development the level of IGF1 protein should be correlated with the mRNA expression of *IGF1*. The dimensions of ovary like breadth, weight and thickness of right and left ovaries of Malabari breed of goats were not significantly different while the length of right ovary was significantly more than that of the left. There was no significant difference in the number of medium sized follicles (3-5 mm) and large follicles (>5 mm) between left and right ovaries. There was no difference in the mean micrometric values of medium follicles (3-5mm) and large follicles (>5mm) follicles studied.

Myostatin and insulin like growth factor-1 gene expression in broiler chicken exposed to monochromatic light

The study was conducted to evaluate the effect of different LED monochromatic light (green, λ= 560 nm; blue, λ= 480 nm; red, λ= 660 nm) on growth of broiler chicken in comparison with white LED light and incandescent bulb light. Relative expression of *IGF-1* and *MSTN* gene in breast muscle, muscle fibre diameter of breast and thigh muscle of 17, 24 and 31 day old broiler chicks as well as weekly body weight and body weight gain was used to assess the growth. The study showed that on day 17 the birds under green light had more *IGF-1* and *MSTN* expression, followed by those under blue light. A better breast and thigh muscle fibre diameter was also observed in birds under green and blue light. On day 24 and 31 birds reared under blue light showed a better breast and thigh muscle fibre diameter, *IGF-1* and *MSTN* gene expression than others. However, on day 31, they had *MSTN* expression similar to other birds except the birds under red light. Though changes in *IGF-1* expression were noticed at different ages in birds reared under blue, green, red, white LED and incandescent light; there were corresponding changes in *MSTN* expression which followed the same pattern. Light colour affected the growth and expression of *MSTN* and *IGF-1* genes, breast and thigh muscle fibre diameter, body weight and body weight gain. in the early period up to day 17, green light was most stimulatory to growth, breast and thigh muscle fibre diameter and the expression of *MSTN* and *IGF-1* genes under study. After day 17 up to day 31, blue light resulted in maximum expression of *MSTN* and *IGF-1* genes, breast and thigh muscle fibre diameter and growth. The study revealed that blue and green monochromatic LED light is better for growth of broiler chicken than other lights used.

Evaluation of antitumour properties of *simarouba glauca* ('Lakshmi taru') and *Thespesia populnea* ('Poovarasu') in experimental mammary tumour models in rats

The present study was undertaken to evaluate the antitumour properties of *Simarouba glauca* ('Lakshmi taru') and *Thespesia populnea* (*Poovarasu) in in vitro cancer cell line and in DMBA (7, 12 dimethyl benz[a]anthracene) induced mammary tumours in rats. The crude alcoholic extracts and different fractions of *S. glanca* leaves and *T. populnea* bark were screened for their cytotoxic property in MCF-7 human breast carcinoma cell line. Based on the IC50 value, chloroform soluble fractions (CSF) of both *S. glauca* and *I. populnea* were found to be superior in cytotoxic action than crude extracts and other fractions, and hence CSF's of both the plants were selected for further in vitro and in vivo studies. Thus in the present study,CSF of ethanolic extract of *S. glauca* leaf and CSF of methanolic extract of *I. populnea* bark exhibited a dose dependent cytotoxic and antitumour activity both in vitro and in vivo. The plant fractions were effective in inducing apoptotic cell death and may be considered as potent sources for isolating therapeutic molecules for cancer treatment.

Hepatoprotective effect of *Eclipta prostrata* (l.) Leaves on experimentally induced aflatoxicosis in broiler chicken

The study was aimed to investigate the hepatoprotective effect of *E.prostrata* (Kayyonni) leaf powder on experimentally induced aflatoxicosis in broiler chicken. Aflatoxin was produced in maize using the culture *Aspergillus flavus* NRRL 6513. The maize culture powder yielded 143.48 ppm of aflatoxin. This mouldy maize was incorporated in experimental feed to arrive 500 ppb of aflatoxin Sixty Cobb400 day old broiler chicks weighing 50+5g were randomly divided into six groups comprising 10 birds in each group. The birds were maintained under deep litter system and provided with ad libitum water and feed throughout the experimental period. All the birds were vaccinated as per the standard schedule. Aflatoxicosis was experimentally induced in all groups except T, and Tz by giving 500 ppb of aflatoxin B1 (AFB) from eighth day of age onwards.

The group T, was kept as normal control and T2 as toxic control. Tz was fed with *E. prostata* leaf powder at 0.2 per cent level. The leaf powder of *E.prostrata* was given to T4, Ts and To at dose rates of 0.05, 0.1 and 0.2 per cent respectively. Serum was used for the estimation of biochemical parameters such as aspartate transaminase (AST), creatine kinase (CK), cholesterol and total proteins. On the day 42, all the birds were sacrificed, detailed post-mortem examination was conducted. Liver samples were taken to estimate antioxidant parameters such as lipid peroxidation (LPO) and reduced glutathione (GSH). Representative

liver samples were also taken and preserved with 10 per cent neutral buffered formalin for histopathological examination.

Treatment with *E. prostrata* leaves powder revealed hepatoprotection in dose dependent manner which is indicated by significant ($P<0.05$) reduction in the level of serum AST and increase in the level of cholesterol and total protein.Thus, it could be concluded that *E.prostrata* leaf powder had marked antioxidant and hepatoprotective effect on experimentally induced aflatoxicosis in broiler chicken.

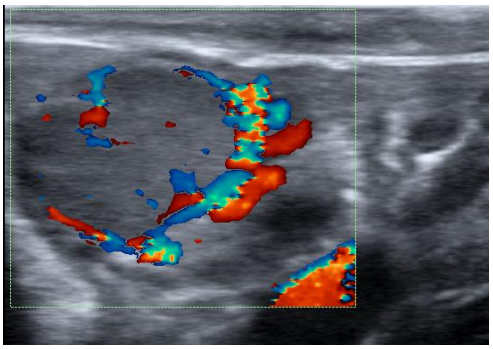
Protective effect of *Tribulus terrestris* (Njerinjil) in cyclophosphamide toxicity on reproductive system of male rats

A study was conducted to identify the effect of *Tribulus terrestris* (Njerinjil) on reproductive system of male rats in cyclophosphamide toxicity. Ethanolic extract was prepared from fruits of *T.terrestris* by soxhlet extraction and its phytochemical analysis revealed the presence of active principles like steroids, alkaloids, glycosides, tannins, phenolic compounds, flavonoids, terpenes and saponins. Forty adult male Wistar rats were divided into five groups-I, II, III, IV, V. Group I was set as control whereas II, III, IV, V were administered with cyclophosphamide orally at the rate of 15mg/kg twice in a week for 30days. Ethanolic extract was given to groups III, IV and V daily at the dose rate of 100, 250 and 500 mg/kg orally for 30 days with cyclophosphamide. On day 30, all the rats were sacrificed. After assessing weight, left testis and epididymis were taken from each animal for the estimation of semen parameters and for histopathological samples, while the other testis and epididymis were immediately cooled for evaluation of antioxidant assays.

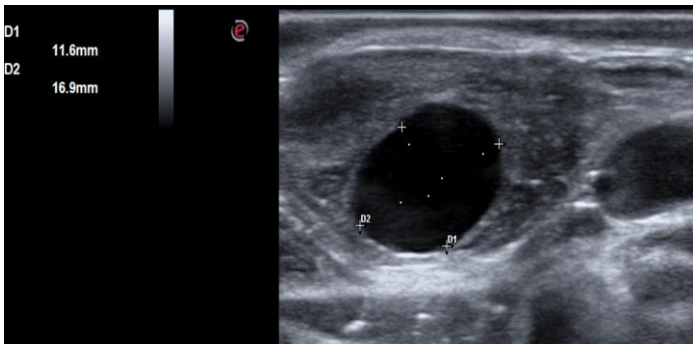
Groups treated with ethanolic extract of *T.terrestris* have significant dose –dependent increase in body weight, relative testis weight, size , mass activity ,sperm progressive motility, sperm count, acrosome integrity, superoxide dismutase (SOD), glutathione (GSH),acid phosphatase (ACP), alkaline phosphatase (ALP) and decrease in percent of abnormal sperms, lactate dehydrogenase (LDH), lipid peroxidation (LPO) and sorbitol dehydrogenase (SDH) with a protective effect at 500mg/kg. Histopathological examination of treatment groups showed a dose dependent restoration of seminiferous tubular epithelium and reversion of renal and hepatic architecture to normal. Hence, it was found that ethanolic extract of fruits of *T.terrestris* have a significant protective effect in male rats with cyclophosphamide toxicity.

Ultrasonographic studies on periovulatory pollicular dynamics and response to GnRH therapy in repeat breeding cattle with prolonged oestrus

Ultrasonographic (US) assessment of follicular dynamics, progesterone concentration and the efficacy of GnRH administration on ovulation and fertility in repeat breeding (RB) cows with prolonged oestrus was studied. in RB animals, three waves were predominant followed by two waves and one wave. Duration of persistence of ovulatory follicle was found to be longer in RB animals (>24 hrs in 70per cent animals) whereas it was less than 24 hrs in all normally cycling animals in the control group. The mean serum progesterone value on day 5 & 10 in RB animals were lower when compared to animals with normal oestrus.



Developed CL on day 10 of oestrous cycle



Graafian follicle

Modulation of post thaw attributes of buck semen using choline chloride as chelating agent

A study to characterize Fn2 type proteins in buck seminal plasma and to assess the effect of choline chloride as a chelating agent (of Fn2 type proteins) on freezability of buck semen with good and poor semen freezability was carried out. The mean total protein content of whole seminal plasma and gelatin binding protein fractions, did not differ significantly between good and poor semen freezability bucks. Analysis of Gelatin binding fraction (the Fn2 type proteins of goat seminal plasma, termed as GSP) revealed four protein bands of apparent molecular weight 14 kDa, 15 kDa, 20 kDa and 22 kDa. Cryopreservation studies recorded that incorporation of choline chloride as a chelating agent for GSP improved cryopreservability of Malabari bucks semen with good semen freezability, while such an effect was not noticed for semen of bucks with low semen freezability.

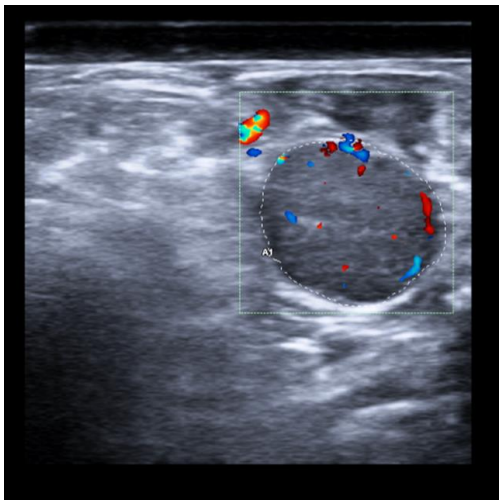
Characterization of Malabari buck seminal plasma proteins in relation to semen freezability and fertility

The study was undertaken to characterize the protein profile of Malabari buck seminal plasma for identifying protein markers of freezability and fertility and to compare the in vivo fertility of Malabari buck semen with low and high semen freezability. Proteins of apparent molecular weight. 24 kDa, 79 kDa, 84 kDa and 134 kDa were found significantly higher in seminal plasma of bucks with high semen freezability whereas 15 kDa, 19.9 kDa, 21.5 kDa, 70 kDa and 89 kDa were found significantly higher in seminal plasma of bucks with low semen freezability. 2D analysis of seminal plasma proteins did not record any significant difference between seminal plasma of good or poor semen freezability. On western blot analysis, osteopontin, a protein fertility marker, was found to be present in seminal plasma of all the bucks studied. The conception rate with cryopreserved semen was significantly higher in bucks with high semen freezability than bucks with low semen freezability. But when chilled semen was used, the conception rate and number of kids per AI were significantly higher for the semen of bucks with low semen freezability than the semen of bucks with high semen freezability.

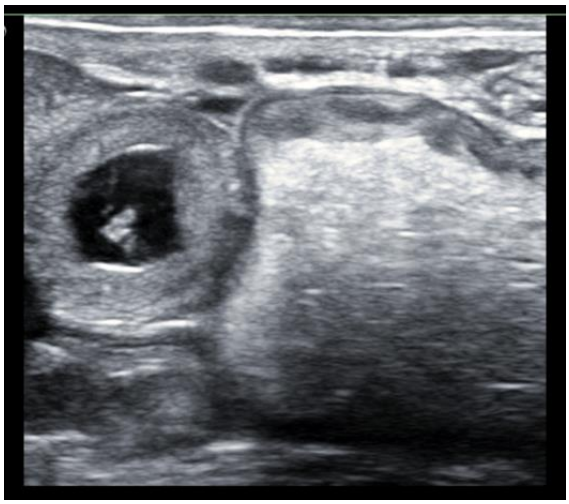
Ultrasonographic studies on uterine and ovarian changes during early pregnancy in bovines

Early detection of pregnancy by ultrasonography and progesterone assay for comparing the sensitivity and specificity of the two methods in the development of bovine embryo during early pregnancy was studied. Corpus luteum size did not show any significant difference between pregnant and non-pregnant animals till day 16 thereafter significant reduction in size was observed in non-pregnant animals. Corpus luteum cavity was seen in both pregnant and non pregnant animal where mean day of disappearance was 16.55 and 15.5 in pregnant and non pregnant animals respectively. Corpus luteum blood flow till day 15 the blood flow was the same in pregnant and non-pregnant animals but on day 16 blood flow was increased in non-pregnant animals than pregnant animals thereafter it was reduced in non-pregnant animals, whereas, in pregnant animals it was maintained at same level. Earliest day on which foetal /extrafoetal structures were visualised was- anechoic area (16 th day), amniotic vesicle (22 nd day), embryo (22 nd day), heart (24 th day), placentome (26 th day), vertebral column (35 th day) limb buds (40 th day), liver (45 th day), spleen (45 th day) and tail bud (45 th day), cloven feet (50 th day), orbit (50 th day) and brain ventricles (50 th day), Bladder (55 th day), Falx cerebri (55 th day) and each vertebrae and ribs were easily distinguishable by day 60. When

Colour Doppler ultrasonography was combined with B-Mode ultrasonography to evaluate the blood flow to the CL, pregnancy can be diagnosed as early as day 18.



Corpus luteum of pregnant cow with more perfusion Day 18



First detection of embryo on day 22

Ultrasonographic characterization of follicular dynamics in post-partum Attappady black does

The mean number of days required for uterine involution in Attappady black does after kidding was 27 days post- partum and mean day of first post- partum ovulation was on Day 45.15 ± 2.66. Percentage of animals with short oestrous cycles was 38.46 and mean cycle length was 8.4 days. Post -partum cycles were characterised by three and four wave pattern cycles predominantly. The follicles of first and last waves attained maximum diameters in both wave patterns. The mean preovulatory follicle size in three and four wave cycles were 7.62±0.08 and 7.50±0.20 mm, respectively. The mean day of ovulation was 21.33±0.33 and 21.50±0.28 in three and four wave cycles, respectively and mean duration of oestrus was 29.76±1.44 h in post-partum Attappady does.

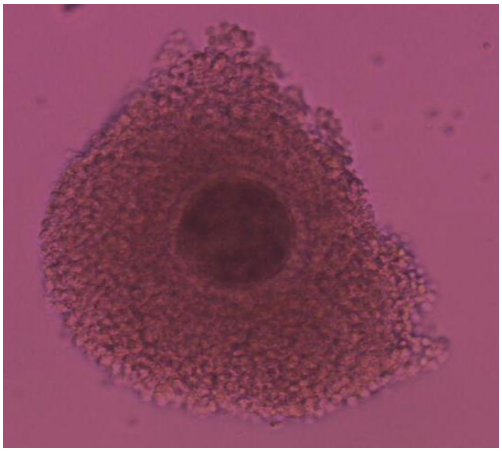
Canine newborn vitality and viability following caesarean section under two anaesthetic protocols

The viability and vitality of canine newborn and efficacy and safety on health of dam subjected to Caesarean section under two anaesthetic protocols viz. total intravenous propofol anaesthesia and propofol- isoflurane anaesthesia was studied. Both the groups induction of anaesthesia with propofol (5mg/Kg Bwt, IV) and maintenance of anaesthesia in group 1 was done with total intravenous administration of propofol (0.4 mg/Kg Bwt) as continuous rate infusion, while Group II animals were subjected to inhalant anaesthesia using isoflurane. There was no variation in Apgar Score and neonatal reflexes at birth, 30 min and 60 min of birth in

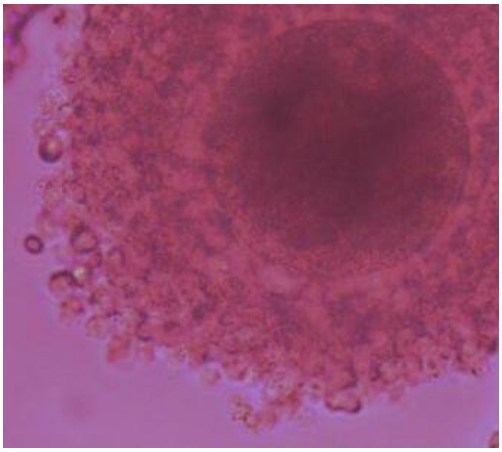
neonates between two groups. The lactate level was significantly higher in intra venous treated group than group . Blood gas parameters of neonates revealed primary metabolic acidosis in both the groups. There was no significant difference in neonatal mortality and survivability between the two protocols. The study revealed safe and effective use of total intravenous anaesthesia using propofol in canine neonatal vitality and viability as well as health of dam and can be applied in field anaesthetic protocols of canine C- section where inhalant anaesthesia is not available.

Yield and quality of transvaginally retrieved oocytes in normal and repeat breeding cattle

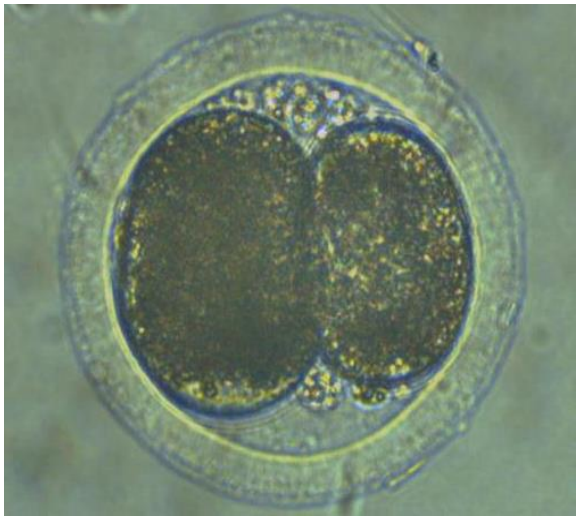
The efficacy of transvaginal oocyte recovery (TVOR) and the quality of oocytes recovered from 12 normal and 12 repeat breeder crossbred cows was assessed. Frequency of TVOR or reproductive status of animal was not found to influence ovarian biometry. Number of small (< 5 mm) and medium (5-9 mm) follicles were significantly higher and large (> 9 mm) follicles were significantly lower in normal and repeat breeder cows subjected to twice weekly TVOR. The number of follicles aspirated, number of oocytes retrieved, culture grade oocytes, matured oocytes, fertilized oocytes, cleaved oocytes per session and oocyte recovery rate were significantly higher in normal animals and those animals subjected to twice weekly TVOR. However, the maturation rate, fertilization rate and cleavage rates between normal and repeat breeder animals and animals subjected to once and twice weekly TVOR didn't vary. Evaluation of oocyte maturation rate using Hoechst 33342 and FDA also revealed that maturation rate was higher in normal breeders. The follicular fluid progesterone concentration was higher in normal animals when compared to repeat breeders. The present study revealed that oocyte quality in repeat breeders was significantly lower than normal breeders, and TVOR at twice weekly interval was found to be an effective tool for harvesting maximum number of oocytes from crossbred cows.



GRADE A OOCYTE



GRADE B OOCYTE



IVF and Embryo development

Association of polymorphism of prolactin gene with production traits in white leghorn and native chicken

Marker Assisted Selection (MAS) is the most efficient and advanced method in poultry breeding programme. This can be done by using different types of molecular markers namely RFLPs, RAPDs, AFLPs, microsatellites and SNPs (Single Nucleotide Polymorphisms). The main aim of the present study was identification of polymorphism of prolactin gene and its association with production traits in White Leghorn and Native Chicken were randomly selected from AICRP on Poultry Improvement, Mannuthy. Blood samples were collected from the randomly selected birds and isolation of genomic DNA was done by using DNA isolation kit. PCR and PCR- RFLP analysis was carried out to find a 24-bp insertion-deletion at the site of -358 of promoter 1 and two SNPs (C-2402T and C-2161G) in promoter 2, respectively of prolactin gene. The genotypes are designated as II,ID and DD for promoter 1 and CC, CT and TT and also CC, CG and GG for C-2402T and C-2161G sites respectively for promoter 2.

These results suggest that the SNP C-2402T in promoter 2 of prolactin can be used as a molecular marker in selection and breeding programme.

Comparison of management systems of captive male Asian elephants in south India

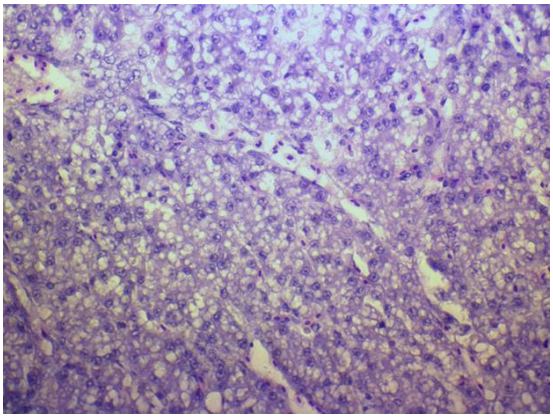
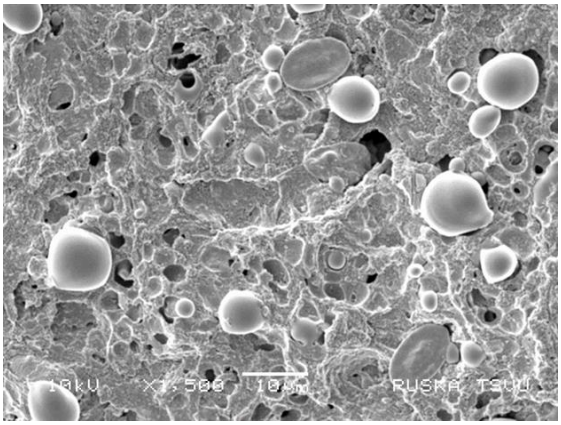
The study was conducted to identify and compare the existing management systems of captive male elephants in the southern states of Kerala, Tamil Nadu and Karnataka. The study covered different male elephant holding facilities in the above three states and various aspects of general management and musth management were studied. Behaviour studies were also taken up including duration and frequency of stereotypic behaviour. Data was collected from sources like keepers, veterinarians, owners and forest officials through a detailed questionnaire and by

direct observation of the practices. Records also formed a source of data. Body condition score of each animal was assessed. Guidelines prescribed by the Ministry of Environment and Forests for management of Captive elephants and ICAR feeding standards were taken. From the study it was found that the management systems varied between the three states. Three different systems were identified in Kerala viz., forest camps, private and temples, while in Karnataka, forest camps and zoo possessed bulls. in Tamil Nadu male elephants were found only in the forest camps. Utilities of the animals also varied largely with the management system. Facilities in Kerala maintained animals in an intensive system, while, animals in facilities of Tamil Nadu and Karnataka were maintained extensively. Although feeding and housing of animals in all the systems followed the prescribed guidelines, availability of water was a major drawback in the intensive systems. Average duration of musth varied between systems and maximum duration was observed in private facilities (4.21 0.26 months) while minimum duration was in the forest camps of Tamil Nadu (1.92 0.20 months). Presence of stereotypic behaviours was also highest in temples (85per cent) and private facilities (71per cent). Obesity was a major problem for the animals in captivity. The body condition score (BCS) of animals in the different systems revealed that most of the animals maintained intensively suffered from obesity. Most of the mahouts in the intensive systems complained of poor welfare.

Developmental studies and expression profile of alpha-fetoprotein gene on liver of embryonic and day-old turkey *(Meleagris gallopavo)*

Current research was aimed to comprehend the hepatogenesis in Beltsville Small White turkey embryos during different pre-hatch periods and in day-old poult, using various morphological, histological and histochemical techniques along with temporal analysis of Alpha-feto protein expression in liver. Six embryos each on 3 rd, 6th, 9th, 12th, 15th, 18th, 21st, 24th and 27th day of incubation and six day-old poults collected from the University Poultry and Duck Farm, Mannuthy were utilized for morphological, histological and histochemical studies. for expression studies six embryos each on 9th and 15th day of incubation and six day-old poults were used. Liver was noticed grossly on ninth day of pre-hatch period but primordium could be appreciated histologically by day third of pre-hatch life. Lobation of liver could be observed from ninth day with two distinct lobes. Adult topography and lobation of liver was attained by 18th day of pre-hatch period. During pre-hatch development, colour of liver varied from ginger colour to red but it became yellowish by the day of hatch. On sixth day of incubation liver parenchyma showed a few branching hepatic cords and several acini with wide sinusoidal spaces in between. Central vein, portal vein and portal triad were first recognized on 9th, 12th

and 18th day of pre-hatch period, respectively. By 12th day of development, a thin layer of Glisson's capsule appeared and by 15th day it became thicker. From 21st day onwards most of the hepatocytes were arranged as cords of two cells thickness. As age advanced, number of hepatic cords increased and was arranged compactly with narrow sinusoidal spaces separating them. Histochemical studies showed the presence of glycogen granules in hepatocytes during pre-hatch and post-hatch periods whereas phosphatases could be observed only in day-old poult. Liver parenchyma showed initiation of haemopoiesis by sixth day, reached peak by 15th day and got reduced by the day of hatch. Present study revealed that liver of turkey attained histological characteristics similar to that of adult birds by 21st day of pre-hatch development. Analysis of temporal expression of AFP transcript revealed a decreasing trend towards the end of the incubation period suggesting that the biological role of AFP was most during pre-hatch period for hepatogenesis.

	
Liver of poult on the day of hatch – cross section - H&E X 400	***Liver of poult on the day of hatch. SEM x1500***

Molecular characterization and expression profiling sirtuin 3 gene in goats

Sirtuin3 (SIRT3), a member of the NAD^+ dependent deacetylase, is a mitochondrial fidelity protein, which prevents the activation of reactive oxygen species. The present study was a novel attempt in Malabari and Attappady Black goats, to identify potential polymorphisms in caprine SIRT3 and assess its association on production traits, to study its tissue expression profile and to characterise the complete coding sequence of SIRT3.

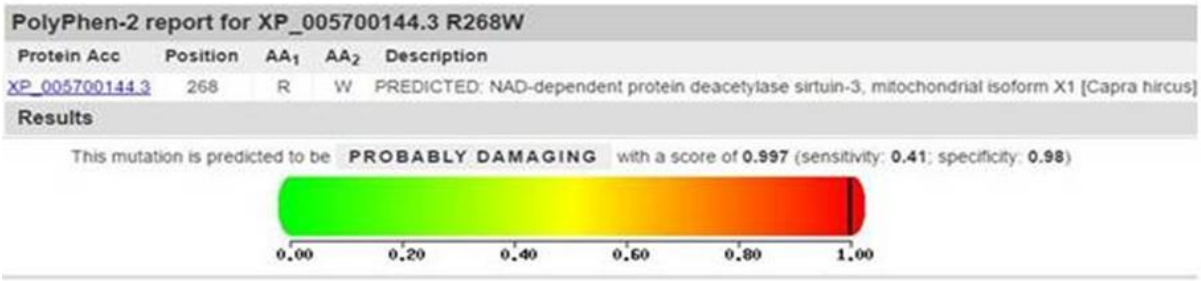
PCR-SSCP analysis of six fragments, covering all the seven exons of SIRT3 revealed six novel SNPs, c.384C>T and c.450T>G of 576 bp fragment in exon 3, c.691C>T of 213 bp exon 5 fragment, c.802C>T and c.835G>A of 250 bp exon 6 fragment and g.154C>T of 500 bp exon 7 fragment

Significant (p≤0.05) associations were observed between the genotypes of 213 bp fragment and 500 bp fragment with litter size. The genotypes of 213 bp fragment and 250 bp fragment had significant (p≤0.01) influence on body weight.

Out of the six novel SNPs, three were non-synonymous mutation and out of which two were predicted (Polyphen-2) to be having damaging effect on protein. Our study revealed that the animals with these SNPs have lower values for litter size and body weight in goats.

Relative expression of SIRT3 was significantly (p≤0.05) higher in muscle tissue, followed by uterus, liver and ovary on between breed comparison, a significantly (p≤0.05) higher expression was noticed in liver and ovary of Malabari goats when compared to Attappady Black goats.

A 1070 bp mRNA sequence of SIRT3 with an ORF of 1002 bp was obtained from caprine cDNA encoding 333 amino acids, having 96 per cent identity with bovine SIRT3.



Results of the PolyPhen-2 analysis for single variant query p. Arg268Trp. The large "heatmap" with the black indicator mark dominates the display, illustrating the strength of the putative effect for the variants (Probably damaging)

Evaluation of E74-Like Factor 5 (ELf5) gene polymorphism and its association with milk production traits in crossbred and Vechur cattle of Kerala

Milk production traits are typically quantitative characteristics controlled by a number of genes. Mutation in them may alter (increase or decrease) performance of these traits. in the present study, the association of polymorphisms of Elf5 gene with milk production traits were evaluated in crossbred and Vechur cattle of Kerala.

DNA was isolated from blood samples of 81 crossbred and 52 Vechur cattle of Kerala using the phenol chloroform extraction procedure. All DNA samples obtained were suitable for downstream analysis. PCR reactions were conducted under standard conditions with custom designed primers to amplify the intron1 of 420 bp length and partial intron 3 and exon 4 of 362 bp length of Elf5 gene.

Pooled amplicons from each genetic group were sequenced by Sanger's dideoxy chain termination method. Three novel SNPs at 27221 position A to C, 26960 position T to C and 27106 position A to G in the intron1 of Elf5 gene were detected. The 362bp amplicon of partial 3 and exon 4 of Elf5 gene was monomorphic in the test population and had 100 per cent sequence homology with the reference sequence.

RFLP analysis was designed to identify SNPs at 180 th position T to C and 326 th position A to G in intron 1 region of Elf5 gene. Restriction enzyme digestion with Mva1291 identified TT and TC genotype at 180 th position. The 420 bp amplicons which carried Thymine base at 180 bp position were digested to produce two fragments of 183bp and 237bp size while those amplicons with Cytosine base at this site remained uncut. Restriction enzyme Fnu4H1 cleaved the 420 bp amplicons containing Guanine at 326 th position to give two fragments of 324bp and 96bp length while those amplicons with Adenine base at this site remained uncut. All three genotypes (AA, AG and GG) were present in the tested population. Univariate analysis of variance (ANOVA) was used to study the association of Elf5 polymorphisms with milk production traits of 15 th and 180 th day of lactation. The diplotypes of Elf5 gene showed significant association with milk fat and protein at 15 th day of lactation. The AA diplotype showed significantly higher fat per cent at 15 th day of lactation while BB and BD diplotypes showed significantly lower fat per cent than other groups. Above observation indicated that animals with AA genotype at 326 th position of intron 1 of Elf5 gene had better milk fat per cent at 15 th day of lactation. Similarly, in case of milk protein per cent at cent at 15 th day of lactation animals with AC diplotype were significantly better than BB, BD and AB diplotypes. The mean values for AD and AA diplotypes though lower were comparable with AC diplotype. These results again point out that animals with AA genotype at 326 th position of intron 1 of Elf5 gene had better milk protein per cent at 15 th day of lactation than those with GG genotype.

Selection of animals with A allele at 326bp position of Elf5 gene may produce animals with better milk fat per cent and protein per cent at 15 th day of lactation. Only results from larger population could confirm the influence of Elf5 polymorphisms on milk composition in crossbred and Vechur cattle.

Immunodiagnosis and therapeutic management of canine brugian filariosis

To develop an indirect plate ELISA and DotELISA for the diagnosis of canine brugian analysis and to assess the microfilariciadal action of ivermectin, diethyl carbamazine in repeat doses, individually and in combination in dogs with brugian filariosis. The indirect plate ELISA

developed with the excretory secretory protein from brugian filaria had a sensitivity and specificity of 84 and 100 per cent respectively when compared with blood smear examination. The DOTELISA developed could not distinguish between positive and negative cases. The pretreatment groups didnot show any statistical difference. all the three groups were effective prestatistically reducing the microfilarial loads in the weekly assessment. The third group was considered superior because of shorter treatment duration.

Clinico-pathological and therapeutic investigations on Jaundice in dogs

Selected animals were subjected to clinicopathologic evaluation including haematology, serum biochemistry, urinalysis, blood smear examination, radiographic and ultrasonographic scanning. Based on the study conclusions drawn were leptospirosis were the most important cause of jaundice in dogs. Therapy against jaundice should be directed at the causative aetiology and requires an aggressive management strategy. Higher survival rate is noted only when the treatment is initiated at an early stage of icterus. The occurrence of leptospirosis in vaccinated dogs should be a cause of alarm because of the public health importance of the disease.

Assessment and alleviation of transition stress from pregnancy to lactation in crossbred dairy cattle

The study was conducted to assess and compare the changes in oxidative stress parameters during transition period in dairy cows, supplemented with/without antioxidants; vitamin E and/or selenium. Twenty four healthy pregnant dairy cows belonging to 2 nd /3 rd parity at 220 th day of pregnancy were selected and divided randomly into four groups of six animals each, G 0 (control), G 1 (selenium @ 0.3 ppm/kg DM/day), G 2 (vitamin E @ 1000 IU/day)and G 3 (selenium @ 0.3 ppm/kg DM + vitamin E @ 1000 IU per day). Oxidative stress parameters (blood Glutathione peroxidase and Superoxide dismutase; serum catalase and malonaldehyde) haematological parameters (volume of packed red cells-VPRC, total erythrocyte count-TEC, haemoglobin concentration-Hb and total leucocyte count-TLC and serum biochemical parameters (total protein, albumin, globulin and albumin:globulin ratio) were estimated. Observed oxidative stress in G 0 and better antioxidant status in the supplemented groups on the day of calving and 30 th day post-partum. The improvement in health status of supplemented group animals was evident from better oxidant-antioxidant and hemato-biochemical profile.

Pathology of *Salmonella choleraesuis* infection and antibacterial effect of aqueous garlic extract in mice model

Extra- intestinal salmonellosis caused by the host restricted *Salmonella choleraesuis* was confirmed by PCR and respiratory tract was identified as the most common extra intestinal site for the organism. The salmonella isolate was subjected to biochemical and molecular detection tests which confirmed extraintestinal salmonella infection in piglets. The gross and histologic alterations associated with Salmonellosis in the respiratory tract of piglets were studied. The infection was induced in mice to study the lesions and also the antibacterial effect of garlic treatment. The intensity of lesions were less in the garlic and antibiotic treatment group, compared to the salmonella control group.

The study concluded that lesions produced by salmonella infection can be reduced upon treatment with garlic. Garlic produced an effect almost similar to that in group treated with antibiotics.

Acute phase proteins in serum and milk as diagnostic tools in bovine subclinical mastitis

Rise in levels of haptoglobin (Hp) and acid glycoprotein (AGP) in milk correlated with the rise in California mastitis test and somatic cell count scores of milk samples. There was a strong positive correlation between haptoglobin in serum and cow serum amyloid A (SAA) in serum at 0.01 levels. Hp and AGP in milk and SAA in serum are potential biomarkers for diagnosis of subclinical mastitis (SCM) and assessment of progression of inflammatory changes. The diagnostic value of Lf (lactoferrin) is an effective marker for SCM.

Molecular detection and therapeutic management of *canine babesiosis*

PCR assay was carried out for detection of 18SrRNA gene fragment of Babesia organism from blood of dogs. Highest percentage of *Babesia gibsoni* positive dogs were Labrador retrievers while *Babesia canis* was detected more in Rottweilers. Higher percentage *B. canis* positive dogs of age group between 6 months to 1 year of age and higher percentage of *B.gibsoni* among dogs between 1 to 5 years of age. Females were affected more compared to male in both *B.canis* and *B.gibsoni* infection Good survival rate was noted in cases with an early intervention.

Isolation and characterization of angiotensin converting enzyme inhibitory peptides from fermented goat milk

A study was conducted to isolate and characterize the angiotensin converting enzyme (ACE) inhibitory peptides from fermented goat milk. Goat milk was fermented by using 14 different lactic acid bacterial cultures at three and four per cent inoculum levels. Fermented goat milk

samples were analysed for pH, titratable acidity, lactic acid bacterial count, proteolytic activity and ACE inhibitory activity. The results showed that pH, titratable acidity, lactic acid bacterial count, proteolytic activity and ACE inhibitory activity varied significantly ($p \leq 0.01$) among milk samples fermented with different lactic acid bacterial cultures. The highest ACE inhibitory activity was observed in milk fermented with L. plantarum 379 (97.558 ± 0.965)at four per cent inoculum level. The lowest ACE inhibitory activity was observed in milk fermented with L. helveticus288(65.121± 0.963) at three per cent inoculum level. The corresponding IC50 values were 0.018 and 0.082 mg/ml. A positive correlation between proteolytic activity and ACE inhibitory activity was observed in milk samples fermented with L. helveticus 192, L. bulgaricus 009, L. plantarum 379 and L. casei 017. There was also a positive correlation between inoculum level and ACE inhibitory activity in milk samples fermented with L. helveticus 192, L. rhamnosus 024 and L.acidophilus (015 & 298). Isolation of ACE inhibitory peptide was done by reverse phase high performance liquid chromatography. Characterization of ACE inhibitory peptide was done by Tris-tricine SDS PAGE which showed that the molecular weight of the identified peptide was 1.4 kDa.

Optimisation of whey based media for maintenance and preservation of starter cultures

A study was conducted to develop an alternative cheap medium for maintenance and preservation of lactic acid bacterial (LAB) cultures. Among seven types of whey based media analysed, whey incorporated with one per cent yeast extract (1 WYE) was found to be the optimized whey medium, based on the growth rate of starter cultures. All the six lactic acid bacterial (LAB) cultures studied maintained the required level of activity in optimized whey medium. It was also observed that whey grown cultures can be stored effectively in freeze dried form and can be utilized for preparation of yoghurt either in liquid form or in freeze dried form without any noticeable variations in chemical, microbiological and sensory quality.

Molecular characterization and expression profiling of *lactoferrin* gene in goats

The study reveals that the *lactoferrin* of indigenous goat breeds of Kerala possesses changes in their aminoacid sequences compared to the goat *lactoferrin* sequence retrieved from the database that could be functionally related. It also proves that the inflammation of the mammary gland induces more expression of *lactoferrin* in the epithelial cells and that its expression is much higher in acute infections than in subclinical cases.

Metabolic profile of crossbred dairy cows during transition period

There was increase in the levels of serum non esterified fatty acids, ß hydroxy butyrate, haptoglobulin, malondialdehyde as well as in the number of neutrophils and monocytes during

transition period in crossbred dairy cows. No change could be detected in the levels of ceruloplasmin and total antioxidant status. The levels of serum glucose, cholesterol and number of lymphocytes were found to be decreased in the animals in transition.

Isolation and characterization of lactoferrin from colostrum of goats

The indigenous as well as crossbred goat lactoferrin isolated by cation exchange chromatography from colostrum exhibited the same intensity of antibacterial activity against Gram-positive bacteria. Against Gram-negative organism, lactoferrin of indigenous goats were found to be more potent when compared to the crossbred goat lactoferrin.

Molecular detection and occurrence of Ehrlichiosis and anaplasmosis in dogs

Conventional PCR is compared with noval nested PCR for the detection of Ehrlichia and found nested PCR is more sensitive than conventional PCR targeting 16S rRNA. Fifty five samples out of hundred were found to be positive for Ehrlichia geus by nested PCR, whereas only four samples were positive by conventional PCR.

Out of which twenty samples tested positive for E canis and four samples tested positive for E ewingi uning species specific primers.

Labrador Retrievers were the breeds found to be affected with erlichiosis and anaplasmosis followed by Rottwellers and German Shephens.

Ehrlichiosis was more in male dogs and granulocytic anaplasmosis in females. Higher prevalence of ehrlichiosis was observed in age group more than five years and five E canis, dogs belonging to age group two to three years. Occurrence of anaplasmosis was more in dogs of age group two to three years.

Serum biochemical profile of dogs with ehrlichiosis revealed increase in total protein with considerable elevation of globulin level. Albumin level was relatively reduced but statistically higher than that of control group. for dogs tested positive for E. canis no statistical difference was evident in any of the biochemical parameters compared to control group. Dogs having granulocytic anaplasmosis, there was considerable elevation in the serum alkaline phosphatase and creatinine levels.

Epidemiology of enterohaemorrhagic *Escherichia coli* in raw milk

The study was undertaken to study the epidemiology of Enterohaemorrhagic *E. coli* (EHEC)in raw milk. A total of 72 pooled raw milk samples from different milk cooperative societies were screened for the presence of the organism.

One milk cooperative society from which pooled raw milk samples were contaminated with EHEC was selected and 125 individual raw milk samples belonging to that society were screened for EHEC.

To trace back the possible source of contamination to raw milk, a total of 486 samples comprising of dung, hair coat of cow, udder swab, milking utensil wash, milkers hand wash, water, soil and feed samples were collected from dairy cattle rearing environment of positive individual households.

The occurrence of EHEC in pooled and individual raw milk samples were 11.11 and 8.8 per cent respectively. The highest occurrence of EHEC was seen in dung samples collected from dry cows (45.83 per cent) than milking cows (23.33 per cent)

The EHEC was detected from 11.11 per cent of water samples used for cleaning and animal husbandry purpose. Among the 36 soil samples collected from in and around the dairy cattle rearing environment, 8.33 per cent of the samples tested positive for EHEC.

Occurrence of Campylobacter species in chicken meat and eggs

The occurrence of Campylobacter species in chicken meat and eggs in three districts of central Kerala viz. Ernakulam, Palakkad and Thrissur was studied. A total of 521 samples comprising of 341 chicken and 180 chicken eggs were collected between june 2016 and may 2017. The occurrence of Campylobacter spp. was significantly higher in monsoon season (42.94 per cent) than post monsoon season (12.28 per cent) from chicken samples collected. However there was no significant difference in the occurrence of Campylobacter from egg samples of the 94 positive samples from chicken meat, 18.77 per cent were positive for *C. jejuni*, 7.04 per cent for *C.coli* and 1.76 per cent showed presence of of both *C. jejuni* and *C. coli*. All the 6.67 per cent culture positive egg samples were identified as *C. jejuni.*

Occurrence of *Toxoplasma gondii* in feline, caprine, human and environmental samples

The study was undertaken to determine the occurrence of *T. gondi* in felines, caprines, human and environmental samples in and around Thrissur. A total of 704 samples comprising of feline faeces, caprine serum, caprine milk, human serum, soil and water were collected during june 2016 and may 2017. The overall occurrence of *T. gondi* in feline faecal sample was 4.47 per cent. Caprines revealed an overall seroprevalence of 41.30 per cent. There was no relation between the occurrence of the parasite and the occurrence of ophthalmic disease condition. There was a higher occurrence of *T. gondi* in individuals following non vegetarian diet as compared to vegetarians. A high occurrence of the parasite in the animals, human and environment is a clear indication of the wide pread presence of the parasite in the area.

Seasonal occurrence of *Leptospira spp.* in different water sources

Study investigated the seasonal occurrence of *Leptospira spp.* in different water sources and soil in Thrissur district of Kerala. Samples were collected during monsoon and summer. Three hundred and thirty water samples were collected from ponds (80), rivers (80), canal (85) and paddy fields (85) and 65 soil samples were collected from the vicinity of rodent inhabitation near the water source. The occurrence of Leptospira in paddy field, pond, canal and river water was found to be 26.66, 57.50, 32.50, and 40 per cent in monsoon and 12.5, 72.5, 46.66 and 45 per cent in summer. None of the soil samples revealed the presence of leptospira by direct PCR. However, one of the soil samples revealed the presence of Leptospira when cultured in EMJH media.

Bronchoscopic evaluation of respiratory tract disorders in dogs

Bronchoscopic examination of respiratory tract could provide accurate visual information of the tract in disease condition. Standard operating procedure for bronchoscopy could be developed. Appropriate medical management and modification of treatment were possible after performing bronchocopy

Comparative evaluation of travoprost and trabeculectomy in the management of glaucoma in dogs

Medical management with travoprost 0.004 per cent eye drops efficient in reducing the IOP with mean per cent reduction of 55.5per cent during the observation period. Trabeculectomy was found to be efficient in reducing the IOP with a mean percent reduction of 75.97per cent but the postoperative complications are limiting factors affecting the success of the technique. Trabeculectomy was effective in reducing the IOP than travoprost 0.004 per cent in dogs with glaucoma.

Efficacy of epidural polyethylene glycol in spinal cord injured dogs treated with intravenous methyl prednisolone sodium succinate

Single intravenous dose of methyl prednisolone sodium succinate(30mg/kg) was found to be effective in early treatment of spinal cord injuries in dogs. Single epidural administration of 10 per cent polyethylene glycol(0.2ml/kg) along with single intravenous dose of methyl prednisolone sodium succinate(30mg/kg) was effective in treating spinal cord injuries without any side effects and the treatment could regain early return of spinal reflexes and ambulation in dogs.

Minimally invasive plate Osteosynthesis (MIPO) for the management of long bone fracture in goats

MIPO was easy to perform, less traumatic, less painful and less time consuming for reduction and immobilization of fracture fragments. The technique didn't elicit physiological, haematological and biochemical alterations in goats.

Comparative efficacy of isoflurane and sevoflurane anaesthesia following induction with thiopentone sodium in goats

The anaesthetic protocol using xylazine as preanaesthetic and thiopentone sodium for induction with sevoflurane or isoflurane for maintenance was effective and satisfactory for routine clinical cases in goats.

Evaluation and management of joint disorders in calves

Congenital affections of joint were the more commonly encountered condition in distal joints of forelimb of calves. Complication of joint affections are more due to delayed presentation of animals for the treatment. Lavage of wounds at the joint, maintenance of proper nutritional status and supplemental therapy are needed for satisfactory outcome from the joint affections

Characterisation of bovine *integrin beta 6* gene and analysis of its expression with reference to foot and mouth disease

The study was carried out to identify single nucleotide variations in *Integrin beta 6* (ITGβ6) gene, to evaluate its association with Foot and mouth disease infection and to compare the expression profile in the infected and non-infected cattle. The exons 1, 2 and 14 of ITGβ6 were analysed for polymorphism detection. Similar banding patterns (AA with two bands) were observed for exon 1 in all the animals studied. The PCR-SSCP analysis of exon 2 revealed two genotypes BB (two bands) and BC (three bands) and on further sequencing one synonymous SNP, c.29G>A was revealed. The genotype BC was significantly (pδ0.01) higher in non-infected cattle. Three banding patterns (two, three and four bands) were observed for exon 14 and further sequencing revealed a synonymous SNP, c.133C>T and a non-synonymous SNP, c.135G>A. The diplotypes II (CC, GG) and HI (CT, GG) were identified in crossbred cattle while an additional diplotype IJ (CC, GA) was observed in Vechur cattle. The diplotype HI was significantly (pδ0.01) higher in non-infected cattle. The relative expression of ITGβ6 was downregulated by 0.49 fold in the infected group than the non-infected group.

Effect of different levels of aflatoxin b1 on production performance of breeder Japanese quails (*Coturnix corturnix japonica*)

An experiment was conducted in Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy to evaluate the effect of different levels of aflatoxin B1 on production performance of breeder Japanese quails (*Coturnix coturni japonica*). One hundred and sixty Japanese quail birds at six week age are distributed in a completely randomized experimental design with five treatments each having four replicates of eight birds each (3:1 female to male ratio). The five different dietary levels of AFB1 studied in the experiment were<5(control-T1), 20(T2), 40(T3), 60(T4) and 80 ppb(T5). The birds were given the experiment diets from 7 to 26 weeks of age.

The egg production in Japanese quail birds was affected significantly (P<0.05) on exposure to AFB1 levels 20 ppb and above. Aflatoxin B1 level at 20, 40, 60 and 80 ppb in diet significantly (P < 0.05) reduced feed intake. The fertility percent significantly (P<0.05) reduced in birds given diet containing 60 and 80 ppb AFB1 compared to birds on control diet whereas hatchability was negatively (P<0.05) affected in birds given AFB1 at 40,60 and 80 ppb levels. All levels of AFB1 studied significantly (P<0.05) increased embryonic mortality per cent during 0 to 5 and 6 to 10 days of incubation. The dietary level of AFB1 at 60 ppb and above significantly (P<0.05) reduced livability in birds.

Return over feed cost per bird was highest in birds fed on control diet than AFB1 fed groups. The study conducted that aflatoxin B1 level at 20 ppb and above adversely affected production performance, emphasizing the importance of controlling aflatoxin contamination in diet of breeder Japanese quail birds.

Clinical study of canine cardiomyopathies in association with *B-MYH7, MYBPC3* and *TCAP* gene mutations.

ECG was an important tool used to detect arrhythmias in DCM cases rather than finding chamber enlargement patterns. Thoracic radiography was useful in differentiating the origin of cough in dogs and vertebral heart score was found to be a reliable tool in the diagnosis of DCM. Tissue Doppler Imaging was an effective method in the diagnosis of diastolic failure in both occult and overt stage of DCM. Dogs with DCM showed significantly reduced regional and global myocardial velocities. Pulsed wave Tissue Doppler Imaging is an ideal method for the real time assessment of peak systolic and diastolic velocities in dogs. Combination of Pimobendan, Enalapril and Lasilactonewas found to be effective in the management of DCM in the absence of cardiac arrhythmias. Exon 12 of β-MYH7 gene (303 bp), exon 15 and 16 of

MYBPC3 gene (438bp) and exon 2 of TCAP gene (508bp) did not show any mutations in twenty six animals with cardiomyopathies. Sequencing of 508bp fragment of TCAP gene revealed a novel SNP at position 36 (A>G transition) (intron one) of this amplicon.

Echocardiographic evaluation of Malabari goats with haemoparasitic diseases

in the current study, standard echocardiographic values and indices were established for adult Malabari female goats. These indices were compared with cardiac dimesnsion in goats affected with haemoparasitic diseases. Significant difference was observed in the left atrium to aorta ratio in B and M mode in affected goats when compared with healthy goats. Haematological parameters were significantly lower in healthy animals. serum creatinine kinase- MB values were significantly elevated in affected animals. This study established the normal echocardiographic parameters in female adult Malabari goats. variations in left atrium and aorta ratio and serum creatinine kinase-MB values in affected animals suggested cardiac involvement in haemoparasitic diseases.

Pathology of Salmonella associated porcine gastroenteritis in mouse model

The gross and histopathological lesions observed in salmonellosis affecting the gastrointestinal tract in piglets were studied. The species of salmonella affecting gastrointestinal tract of piglets was confirmed as *Salmonella choleraesuis*. Infective dose of Salmonella was injected in mice to study the gross and histopathologic lesions. The study revealed that porcine salmonella infection in mice was comparable with that of natural salmonellosis in pigs and hence mice could be a good model for studies regarding Salmonella infection in pigs.

Molecular detection and pathology of porcine circovirus-2 infection among piglets

Among samples from fifty two pig carcasses, eight samples were found to be positive for PCV-2 and localisation of viral antigen was done in lymphnodes and spleen by immunohistochemistry. The gross examination revealed weak, poor body condition with visible bony prominences, prominent rib cage, decreased back fat thickness, rough, long hair coat and sunken eyes. Lungs were heavy, severely congested or hemorrhagic. Lymphnodes were swollen, congested and edematous. Histopathological examination of lymphoid tissues revealed moderate to severe lymphoid depletion, absence of demarcation between follicular and parafollicular areas and congestion mainly in the bronchial, mesenteric, inguinal lymphnodes and spleen. Non lymphoid tissues revealed severe congestion, interstitial pneumonia, peribronchial lymphoid accumulation, lympho-histiocytic infiltration and granulomatous inflammation. Thus, the present study confirms the presence of PCV-2 associated systemic disease

Bone marrow cytology of chicken in experimentally induced *Escherichia coli* and *Elmeria tenella* infection

E.coli infection and caecal coccidiosis were induced in chicks to study their effect on cellularity of bone marrow. The bone marrow revealed significant increase in number of blast cells and number of cells in storage pool and caused a significant reduction in intermediate stages of cell population in erythroid and myeloid series in both the treatment groups compared to that of control group. The morphology and population of bone marrow cells in poultry in E.coli infection and caecal coccidiosis could be ascertained in detail. The morphology of cells were unaffected in both the cases.

Anthelmintic activity of fruit extracts of *Duranta erecta* (Neelakantha) and *Piper longum* (Tippali)

The present study was conducted with the view of evaluating in vitro ovicidal, larvicidal and adulticidal activity of methanolic extract and its n-hexane, chloroform, n-butanol and aqueous fractions from fruits of *Duranta erecta* (Neelakantha) and *Piper longum* (Tippali) against strongyle ova, larvae and adult amphistomes.

The fruits of both plants were identified and accession numbers 005 (D. erecta) and 006 (P. longum) were obtained. The phytochemical analysis revealed the presence of flavonoids in all the extracts and fractions while tannins, glycosides and diterpenes were absent in hexane fraction of D. erecta. Saponins were absent in methanolic extract and fractions of P. longum. The extracts and fractions were diluted serially in distilled water/tween 80 to obtain concentrations of 500, 250, 125, 62.5, 31.25, 15.63, 7.81, 3.91 and 1.95 mg/mL. Ivermectin and thiabendazole at 10 µg/mL acted as positive control and the solvents as negative control.

The methanolic extract of P. longum was effective in inhibiting hatching of ova with IC50 of 0.026 mg/mL. The n-butanol fraction of D. erecta fruit extract was potent in inducing larval mortality with IC50 0.04 mg/mL while chloroform fraction of methanolic fruit extract of P. longum inhibited larval migration with IC50 of 1.796 mg/mL. Amphistomes were highly sensitive to chloroform fraction of D. erecta which possessed IC50 of 1.354 mg/mL and histopathology of extract treated amphistomes revealed morphological changes in tegument, syncytium and parenchyma. The n-butanol fraction of D. erecta and methanolic extract of P. longum fruits were found to be most potent based on IC50 values for the potent extract/fraction while chloroform fraction of P. longum was consistently effective on all stages of helminth development with low IC50 values.

GCMS and FTIR analysis revealed the presence of phenolics, short chain carboxylic acids, benzofuran, monolinoleoylglycerol trimethylsilyl ether and octadecatrienoic acid in the n-butanol fraction of D. erecta. Piperidinone, hydrocinnamic acid, ethylhexahydro azepine, methyleugenol, hexadecanoic acid and caryophyllene oxide were identified in the methanolic extract of P. longum while octadecatrienoic acid, caryophyllene, caryophyllene oxide and hydrocinnamic acid were present in the chloroform fraction of P. longum. The acute oral toxicity study revealed mild vascular changes in liver. The methanolic extract of P. longum, n-butanol fraction of D. erecta and chloroform fraction of P. longum possessed potent anthelmintic activity. The chloroform fraction of P. longum possessed potent broad spectrum anthelmintic activity.

Behavioural physiological and biochemical stress responses of crossbred cows to varying thermal indices in different management systems

The study was conducted to analyse the behavioural, physiological and biochemical responses of crossbred lactating cows to varying levels of thermal stress. Based on the stress responses, different thermal stress ameliorative measures were evaluated. The work was conducted at Cattle Breeding Farm, Thumburmuzhy, Thrissur, Kerala from October 2015 to May 2016. Study period was classified as low, medium and high THI seasons. Three stress alleviating measures (T2-automated wetting and forced ventilation, T3-Feeding concentrate during early morning and late evening. T4-Vitamin E supplementation) were tested with a control (T1) where no intervention was used. The immediate physiological responses were favourable for animals subjected to wetting and forced ventilation (T2). Thermal hysteresis of 4-7h was observed among different treatments. Haematological parameters showed no significant difference among treatments. Significantly different Cortisol, T-3, T-4, IGF-1 and BUN concentrations in T2 group compared to other treatments showed the effect of wetting and forced ventilation. Behavioural pattern of animals in T2 was suggestive of relatively reduced thermal stress.. Although significantly not different, animals in treatment T2 performed better in milk characteristics. Early morning and late evening feeding and vitamin E supplementation yielded no significant difference in alleviating thermal stress. Among the different stress alleviating measures, wetting and forced ventilation was found economically viable. It was observed that among different bioclimatic indices, BGHI recorded maximum correlation with stress responses followed by LPHSI and HLI. The observations are indicating the necessity for direct and immediate stress alleviating interventions in crossbred dairy cows for sustaining

production. Dynamic nature of climatological factors and physiological parameters should be investigated further to design comfortable housing systems.

Effect of feeding system and floor types on growth performance of Malabari kids

The research work was conducted to study the efficacy of probiotic (*Lactobacillus casei*) and ascorbic acid in alleviating summer stress in growing broiler rabbits. The study was done in the summer season from March to May. The growth performance of rabbits in summer, their physiological response to stress and the cost effectiveness of supplementing probiotic, *Lactobacillus casei* and ascorbic acid were studied.

Twenty four weaned New Zealand White rabbits were randomly selected from Rabbit unit at Krishi Vigyan Kendra, Kerala Agricultural University, Vellanikkara were utilised for the study. They were divided into four groups of six animals each. The treatments were as follows: Treatment I (TI) - Ascorbic acid (Merck) at the rate of 200 mg per kg feed was given along with the basal diet, Treatment - 2 (T2) - Probiotic, *Lactobacillus casei* (Unique Biotech) containing 10^6 colony forming units per gram of feed was given along with the basal diet, Treatment -3(T3) - Probiotic ad Ascorbic acid at the same rate as in T2 and T3 were given along with the basal diet and Treatment - 4 (T4) - Rabbits fed with basal diet alone.

The various climatic parameters studied were maximum and minimum temperature and relative humidity (morning and afternoon) in macro climate and maximum and minimum temperature, dry bulb temperature (morning and afternoon) and humidity (morning and afternoon) in micro climate. The production parameters recoiled was weekly body weight, daily feed intake, average daily weight gain and feed efficiency. The physiological parameters studied were weekly respiration rate, weekly rectal temperature and monthly cortisol (faecal and serum) values (twice a month for three months). Disease incidence and mortality during the period was recorded. Cost effectiveness of supplementing probiotic and ascorbic acid was determined. The mean monthly temperature humidity index values suggested that animals were under moderate heat stress in the first (28.4510.16) and the second month (28.50 0.22), while no stress prevailed in the third month (26.83-0.21). By one way Analysis of variance it was found that supplementation of probiotic, *Lactobacillus casei* and ascorbic acid has significant effect in alleviating summer stress in rabbits. The animals in the T1 group showed significantly (P 0.05) higher overall mean daily body weight gain, over mean feed efficiency and significantly ($P<0.05$) lower overall mean respiration rate and faecal cortisol level compared to T4 animals. The rabbits in T2 treatment showed significantly higher ($P<0.05$) final body weight, overall mean daily body weight gain, overall mean feed efficiency and significantly

(P<0.05) lower overall mean respiration rate compared to T4. The rabbits in the T3 group showed significantly higher (P<0.05) final body weight, overall mean daily body weight gain, of all mean feed efficiency and significantly (P<0.05) lower overall mean faecal cortisol level compared to T4. There was no significant difference (P>0.05) between the treatments in mean feed intake, rectal temperature and serum cortisol No disease incidence or mortality was observed during the experimental period supplementation of probiotic and ascorbic acid was found to be efficient in reducing the production economics. Hence it was concluded that supplementation of probiotic, *Lactobacillus casei* at the rate of 10 cfu per g of feed and ascorbic acid the rate of 200 mg per kg feed in combination was found to be most effective and economic in alleviating summer stress in growing broiler rabbits.

Effect of weaning age on performance of large white Yorkshire pigs

An experiment was carried out at Centre for Pig Production and Research, Mannuthy, Kerala for a period of three months. Weaning of piglets in three treatments T1, T2 and T3 were done at 42, 35 and 21 days respectively. Piglets in T1 were fed with 20 per cent crude protein and 0 per cent lactose, T2 fed with 20 per cent crude protein and 10 per cent lactose and T3 with 22 per cent crude protein and 15 per cent lactose. There was a significant difference in average weaning weight of piglets between the groups (T1-57.90 ± 5.49a**,** T - 50.47 ± 2.49a and T3 - 32.45 ± 2.49b**).** There was significant difference in average feed intake between the treatments at seven week of age (T1-15.47 ± 0.99b**,** T2-18.17 ± 0.81b and T3-22.32 ± 1.00a). Feeding of lactose at 0, 10 and 15 per cent to piglets have no significant difference on the average feed intake and growth performance of the piglets at the end of the experiment. The outcome of this study demonstrated that weaning of piglets at 35 days and 21 days of age can be done and suggested a higher inclusion level of lactose to the diet of early weaned piglets. Sows were shifted to loose housing system after weaning and were mated (natural mating) in first post weaning heat. Weaning to service interval was noted and pregnancy diagnosis was done 7-8 weeks after mating using pregnancy detector. Farrowing interval and subsequent litter size was noted. Weaning to service interval was similar irrespective of lactation length. The outcome of natural mating have 100 per cent conception rate. Shorter the lactation length shorter is the farrowing interval. Subsequent litter size was higher in sows with longer lactation length. However reducing the lactation length leads to more farrowing per sows during its reproductive life.

Enhancing biogas production by co- digestion of livestock manures

The study was conducted to estimate the biogas production by anaerobic co digestion of different livestock manures and the effect of season on biogas yield. The experiment was conducted in two seasons viz, summer and monsoon for 60 days in each season with biogas plants of 0.5 m capacity. Four treatments were considered for the study namely, T1 (Two kg of fresh cattle dung), T2 (One kg each of fresh cattle and goat manure). T3 (One kg each of fresh cattle and poultry manure) and T4 (One kg each of cattle and pig manure). Substrates were diluted with water in 1:1 ratio on whole weight basis and the biogas production was recorded every day. Composition of biogas was determined using gas analyser at weekly interval. Physico-chemical analysis of substrate and slurry were carried out at weekly intervals.

Average daily biogas yield (L) was highest in T4 (16.41 ± 0.10 in S-1 and 14.24 0.10 in S-II) followed by 12 (15.39 ± 0.86 in S-1 and 13.32 0.86 in S-II). T3 (13.73+0.64 in S-1 and 11.53 +0.64 in S-II) and T1 (10.24±0.11 in S-1 and 9.29 10.11 in S-II). There was a significant difference between the treatments ($P<0.05$) in both the seasons and the gas yield was highest in summer. Cumulative yield (L) obtained throughout the experiment in S-I was highest in T4 with a total yield of 667.78 followed by T2 (650.57), T3 (567.65) and T1 (485.22) in S-L. While, in S-II it was 418.50 in T1, 545.08 in T2, 467.56 in T3 and 571.08 in T4. A significant positive correlation of ambient temperature and THI on biogas yield was noticed. Average methane yield also differed significantly ($P <0.05$) ranging from 52-62 per cent with highest yield from T4 (62.42 ± 0.26 in S-1 and 60.30+ 0.26 in S-II). The biogas slurry was observed to have good nutritive value and CO, equivalent (kg) mitigated in the experiment by T1, T2, T3 and T4 was 3.93, 5.24, 4.31 and 5.39 respectively. The cost of production per liter of biogas was least in T4 (0.08 INR) followed by T3 (0.10 INR), T1 (0.11 INR) and T2 (0.34 INR).

Lactation performance and milk composition of Attappady black goat

An experiment was conducted to assess the Lactation performance and milk composition of Attappady Black and Malabari goats. Thirty Attappady Black and ten Malabari goats were selected for this study. Meteorological data, Proximate composition of feed and fodder, Body weight, BCS, blood composition, milk yield, lactation length, milk composition, mineral composition and SCC were the parameters employed for the evaluation of the work. The meteorological data of air temperature was not significantly ($P>0.05$) differed between the location but relative humidity was significantly ($p<0.01$) higher in Mannuthy than the Palakkad region. The body Weight and BCS was recorded on experimental period and result showed that the body weight ($P<0.05$) and BCS ($p<0.01$) was differed significantly between the breeds.

Body weight and BCS were higher in Malabari than Attappady Black goats. Blood samples were collected per animal on experimental period and analyzed for serum protein, cholesterol and triglycerides. Results showed that serum protein and triglycerides content were not influenced (P>0.05) by breeds. However, cholesterol content differed significantly (P<0.01) between the breeds. Serum protein and triglyceride content were higher in Malabari than Attappady Black goats but Attappady Black had relatively higher cholesterol content than Malabari goats. The does were hand milked daily at 8 am prior to feeding and yield determined for each animal at weekly interval. The milk samples were collected per animal on experimental period and analyzed for total solids, fat, crude protein, Lactose, ash and fat globule size. Results showed that fat, total solids, lactose, ash and fat globule size were not influenced (P>0.01) by breeds. However, protein (p<0.05), milk yield and lactation length (P<0.01) differed significantly between the small ruminant breeds. Total solids, fat, protein and lactose concentrations were higher in milk of Attappady Black than Malabari goats. But Malabari goat had relatively higher fat globule size, milk yield and lactation length than Attappady Black goats. The milk samples also used to analyses the minerals viz., calcium, phosphorus, sodium and potassium content of milk. On that, calcium (p<0.01) and sodium (p<0.05) content was differed significantly between the breeds but phosphorus and potassium content of milk was not significantly (p>0.05) differed between the breeds. Calcium and sodium concentrations in milk were significantly higher (P<0.05) for Malabari goats than Attappady Black goats. However, phosphorus and potassium levels in milk were higher in Attappady Black than Malabari goats. The SCC of milk were analysed per animal on experimental period and results showed that SCC were not influenced (P>0.05) by breeds. SCC content was higher in Malabari than Attappady Black goats. The overall correlation matrix of Attappady Black and Malabari goats indicated significant positive and negative (p<0.05-0.01) correlations between the experimental parameters.

Mineral profile of livestock farm waste and its bio- accumulation effects in cross bred cattle

The present study was conducted for a period of one year and divided to summer, monsoon and post monsoon seasons. The objective of the research was to estimate the minerals in soil, slurry, feed, fodder, dung and vermicompost and also assessment of bioaccumulation of minerals in crossbred cattle. The fodder plots were selected and placed under three treatments. The first treatment plots irrigated by pig slurry, second by cattle slurry and third by irrigation water alone. The soil, slurry and irrigation water were collected at the three different seasons

for mineral estimation. The fodder yield from plots was measured. Three treatment groups of six male calves each were randomly selected and maintained under similar management and concentrate feeding for one year. The treatment groups s of calves received fodder from corresponding fodder plots. The feed, fodder, blood, dung were collected for mineral estimation. Vermicompost produced from dung and fodder waste from the experimental animals was collected. The carcass traits were studied during their slaughter at Meat Technology Unit, Mannuthy and meat, liver, kidney, skin and bone samples were collected for mineral estimation. All the samples were processed and digested by microwave digestion for mineral analysis. Nitrogen element was estimated by Macro Kjeldhal method. The minerals P, K, Na, Ca, Mg, Mn, Fe, Cu, Zn, Cd, Cr and Pb were estimated using Inductively Coupled Plasma Optical Emission Spectrometer. The concentration of N and Mg was highest for first treatment in soil, slurry, fodder, dung, blood, liver, kidney and bone. The concentration of P, K, Ca, Cu was highest for second treatment group in soil, slurry, fodder, dung, bone samples. The concentration of Mn and Zn was highest for third treatment group in fodder, dung, vermicompost, meat, kidney and bone samples. Weight gain was highest for T3 animals. The total fodder yield was highest for plots The final body weight of experimental animals was highest for TI and daily with pig slurry. The bio-accumulation of heavy metals could not be detected in any animal tissue under the present study. Further studies may be required in crossbred cattle with more years of feeding trials to find out bio-accumulation of heavy metals.

Evaluation of production performance of Gramasree hens by feeding black soldier fly (*Hermetia illucens)* larvae as a protein replacer

An experiment was conducted in the Department of Poultry Science, College of Veterinary and Animal Sciences, Mannuthy to evaluate the production performance of gramasree hens by feeding black soldier fly (*Hermetia illucens)* larvae as a protein replacer. A total of 80 numbers of 40 weeks old gramasree pullets were distributed in to 5 treatments each with 4 replicates in completely randomized design and experiment was carried for 8 weeks from 41 to 48 weeks of age with standard management practises. The control group (T1) was fed with 100per cent standard layer diet as per BIS 2007 and other treatments groups were fed with fresh BSFL at 25 (T2), 50 (T3), 75 (T4) and 100 (T5) percent levels on dry matter basis as soya bean meal replacer after analysing chemical composition of BSFL. The remaining feed was provided separately as balancer diet. During experimental periods, daily egg production, fortnightly feed consumption, fortnightly feed conversion ratio, egg weight, egg quality traits at 28 and 56

weeks of age, initial and pre slaughter body weight, body weight gain, carcass characteristics, serum biochemical parameters, digestibility parameters and techno economics were studied.

Based on the overall performance, it is concluded that the gramasree hens can be fed with BSFL up to 100 percent replacement to soya bean meal without effecting egg production and also with reduction in feed consumption and better FCR. Feeding BSFL reduces the feed cost and increases the net profit per bird. So, BSFL is the best alternative source of protein for backyard poultry rearing.

Evaluation and comparison of four different types of bio-gas plants utilising livestock waste

Among the four substrates compared, the bio-gas production potential was highest for pig excreta (0.092 m3) followed by goat (0.088 m3, poultry (0.082 m3) and cattle (0.077 m3). The biogas digesters always followed the same trend of horizontal flow type > floating drum > fixed dome > vertical flow for gas production.The HRT was lowest for fixed dome type (25 days) followed by floating drum type (28) days followed by horizontal flow type (30 days) and highest in vertical flow type (48 days). There was significant difference in the composition of biogas produced from different substrates. Goat and poultry excreta had similar methane content of 43.7 per cent, followed by pig excreta (42.50 per cent and cattle dung had the lowest methane content of 43.47 per cent 41.40 per cent. The biogas production in summer season was significantly higher compared to monsoon and winter season. The methane concentration was higher and carbon dioxide concentration was lower in summer compared to monsoon and winter. in high altitude area, where the mean ambient temperature varied between 20-24 degree centigrade thermal insulation of all types of digesters would be essential for optimum bio-gas production and higher methane content.

Evaluation of anti-stress suppliments on growth performance of early weaned piglets

Effect of supplementing of Vitamin E, Vitamin C and bamboo leaves extract on the growth performance was studied on early weaned piglets. 32 piglets of 21 days of age were randomly allotted to four groups of eight each. The first group was considered control (T1). The second group was offered 40 IU vitamin E in addition to the normal diet. The third group of piglets received 500mg of vitamin C. The fourth group of piglets received bamboo leaf extract 0.5 per cent of the basal diet. The feeding of the experimental ration resulted in the body weight gain of 2.85, 2.90, 2.95 and 3.27 kg respectively in T1, T2, T3 and T4. The mean temperature and THI were positively correlated with body weight under the micro climatic condition. Most of the hemato-biochemical profiles studied (Hb, PCV, glucose, total protein, creatinine and BUN)

were significantly higher in adults as compared to the young ones. The average cost of feeding piglets, per kg body gain with the diet of T1, T2, T3 and T4 worked to be Rs. 71.64, 74.46, 72.25 and 62.33 respectively. From this result it can be concluded that supplementation of bamboo leaves extract @ 0.5 per cent, significantly improved the growth rate by 14 percent and performance indices with economic profitability in the weaned piglets.

Molecular detection and characterization of common enteric bacterial pathogens of public health significance

The infectious diarrhoea due to enteric bacterial pathogen leads to high mortality and morbidity among infants and young animals. Scarcity of data on the magnitude and aetiology of this infectious diarrhoea is a major setback to design an effective control strategies. Hence, the present study was carried out to detect and characterize the enteric bacterial pathogens of public health significances from diarrhoeal stools of infants and faecal samples of young animals, foods (milk and meat) and environmental (soil and water from residential areas) samples from three taluks of Wayanad district. A total of 465 samples were analysed for detection of enteric bacterial pathogens by using standard microbial culture methods and 16S rRNA PCR followed RE digestion. The positive isolates were further characterized for virulence by singleplex PCR and ruled out for co-infection by using multiplex PCR. The occurrence of enteric bacterial pathogens (and their corresponding virulent genes characterized) in different samples were 0.65 per cent of enterohaemorrhagic *E.coli* (EHEC- eaeA and stx1), 1.72 per cent of S. Typhimurium (invA and stm), 2.36 per cent of Shigella (ipaH), 0.86 per cent of Y. enterocolitica (yst), 1.5 per cent of V. cholerae (ctxAB and tcp), 3.23 per cent of L. monocytogenes (hly, prf and plc) and 1.5 per cent of MRSA (mecA). EHEC was detected only in milk and meat. Highest occurrence of S. Typhimurium was observed in meat (3.33 percent) and that of MRSA was in milk (8.33 per cent). Highest occurrence of the pathogens were observed from Mananthavady Taluk. On antibiogram analysis of the isolates majority showed multidrug resistance. Cross sectional survey from school children of Wayanad revealed that majority (87.2 per cent) of the respondents had positive attitude towards food safety and food habits. The presence of Vibrio cholerae (4.4 per cent in infant stools) along with other pathogens imposes the need for regular surveillance of enteric bacterial pathogens coupled with their antibiogram studies for designing prompt control strategies to prevent further outbreak. Cross sectional survey to assess knowledge and disease awareness programs are also needed for disseminating research findings and for inculcating better practice of food safety and personal hygiene.

Publications

Books/ Book Chapters Published

1. Lucy, K. M., Indu, V. R., Patki, H. S., Leena, C., Surjith, K. P., Fathima, R. and Ashok, N. 2017. Comparative anatomy of Wild mammal.1st Ed. Jaya Pub., New Delhi. ISBN: 9789386110626.
2. Biju Chacko - book Chapter entitled, 'Nutrition and Animal Health'. Chapter in the Training Manual of Livestock Inspector trainees published by the Directorate of Entrepreneurship, KVASU and Animal Husbandry Dept., Govt. of Kerala, organized as part of ASCAD in March 2018.
3. Biju Chacko - book Chapter titled, "Animal Nutrition", in "The Companion Professional Manual" brought out by KVASU Union 2016-17 in February 2018.
4. Nayar, R. Prasad, K., Pavan, M. and Irshad, A. 2017. Biosensors: As an emerging tool for food safety. in: Sunil, B., Irshad, A., Vasudevan, V.N. and Sathu, T. (eds.) Climate change and sustainable food production. Excel India Publishers, New Delhi.pp.336-344.
5. Nayar, R. and Vasudevan, V.N. 2017. Opportunities and entrepreneurship developments in meat processing. in: Sudheer, K.P. and Indira, V. (eds.) Entrepreneurship development. in food processing. New India Publishing Agency, N. Delhi.
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7. Pictorial guide for Poultry Science.2017 Muttakozhikalude paripalanam (leaflet)

Peer Reviewed Journal Publications

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7. Biju Chacko, K. M. Syam Mohan, K. Ally, K. Shyama, K.S. Anil and C.T. Sathian. 2017. Performance Enhancement of Lactating Dairy Cows by Dietary Inclusion of Neutral Detergent Fibres. 2017. *Indian Vet. J*., **94** (12): 45 – 48
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57. Sudheesh S Nair, Soumya Ramankutty, Anoop S, Narayanan M K, C B Devanand and Syam K V. Surgical Oncology of Canine Cutaneous Neoplasms – A Review of 28 Cases; 41st annual congress of indian society for veterinary surgery and national symposium on "new horizons in cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th december 2017 at Sri Venkateswara Veterinary University, Tirupati.
58. Sudheesh S, Aswathy P, Athira V P, Thajunnisa A S, Jayakrishnan A, Soumya R Anoop S and C B Devanand Surgical and Therapeutic Management of Urolithiasis in Male Dogs – Review of 6 Cases; 41st annual congress of indian society for veterinary surgery and national symposium on " new horizons in cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th December 2017 at Sri Venkateswara Veterinary University, Tirupati.
59. Sudheesh S Nair, Soumya Ramankutty, Anoop S, Narayanan M. K, Anvitha H and C B Devanand Symphyseal and Transverse Fracture of Mandible in An Indian Grey Mongoose (*Herpestes Edwardsi*) and Its Surgical Management; 41st annual congress of indian society for veterinary surgery and national symposium on "new horizons in

cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th December 2017 at Sri Venkateswara Veterinary University, Tirupati.

60. Anoop S, Aswathy P, Athira V P, Sudheesh S, Soumya R, Narayanan M K, Jayakrishnan A, Devanand C B Chemotherapy of genital and extragenital transmissible venereal tumor in a doberman dog; Poster 41st annual congress of indian society for veterinary surgery and national symposium on "new horizons in cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th December 2017 at Sri Venkateswara Veterinary University, Tirupati.
61. Laiju M P, Athira V P, Aswathy P, Vaisakh V, Dileepkumar K M, Syam K V, Devanand C B. Farnesol mixture caliculi in a labrador dog – a case report; Poster 41st annual congress of indian society for veterinary surgery and national symposium on "new horizons in cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th december 2017 at Sri Venkateswara Veterinary University, Tirupati.
62. Ashok R U, Devanand C B, John Martin K D, Anoop S, Krithiga K. Minimally invasive plate osteosynthesis (MIPO) procedure for the management of tibial fracture in goats; Poster 41st annual congress of indian society for veterinary surgery and national symposium on "new horizons in cancer research pertaining to effect on health, production and reproduction in animals" from 14th to 16th december 2017 at Sri Venkateswara Veterinary University, Tirupati
63. Devanand, C. B. Sudheesh S. Nair, Soumya Ramankutty and S. Anoop. Critical size deep lacerated wound in an Indian rock python (Python molurus) and its surgical management42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018
64. Sudheesh S. Nair, M. K. Narayanan, S. Anoop, Soumya Ramankutty, K. V. Syam and C. B. Devanand. Thoracic radiographic imaging for evaluating pulmonary metastatic pattern in malignant skin and mammary neoplasms in dogs: A review of 24 cases 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018
65. Sudheesh S. Nair, S. Anoop, Soumya Ramankutty, M. K. Narayanan, K. V. Syam and C. B. Devanand. Surgical management of ventral hernia in pouter pigeons: two case

reports. 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018

66. Laiju M Philip, Prabhukumar M. D., Jhn Martin KD, Sudheesh S Nair, Dileep Kumar K. M. Syam K Venugopal, Thajunnissa, AS., Adarsh, S.L., Anvitha Hansoge and Devanand C.B Surgical management of inguinal hernia in dogs: A report of 8 case reports. 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018
67. Laiju M Philip, Thajunnissa, A. S., Sudheesh S Nair, Anoop. Devanand C. B., S, Adarsh, S. L., Prabhukumar. Surgical management and Fourrier transform infrared spectroscopic study of Obstructive urolithiasis in dogs. A report of 9 cases. 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 201
68. Anoop S., Laiju M., Devanand C. B.,Anoop , S, Sudheesh S Nair, Soumya Ramankutty Anvitha H Thajunnissa A.S., Jayakrishnan A., Pravbhukumar M. D., Karthikaa T and Adarsh SL Bone affections other than fractures in dogs an Incidence Study. 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018
69. Soumya Ramankutty, Sudheesh S. Nair., Anoop, S., Devanand C. B. Thoraco centesis in cats a review of six cases10th Kerala Veterinary Science Congress 42nd Annual Congress of Indian Society for Veterinary Surgery and National Symposium held at College of Veterinary Science and Animal Husbandry, Navsari Agricultural University, Navsari (Gujarat) from November 22-24, 2018
70. Khanapur, C.S., Nayar, R., Divakar, N. Rajagopal, K., Sunanda, C., Thomas, M. and Paulose, C. 2017. Physicochemical and microbiological characteristics of restructured chicken cubes incorporating spent chicken meat. in: Proceedings of National Seminar on food adequacy and climate change-strategies for sustainable food production. AMST National Conference. November 3-4. Hotel Dream City, Pattikkad.
71. Khanapur, C.S., Nayar, R., Divakar, N. Rajagopal, K., Sunanda, C., Thomas, M. and James, L. 2017. Sensory characteristics of restructured chicken cubes incorporating spent chicken meat. in: Proceedings of National Seminar on food adequacy and climate

change-strategies for sustainable food production. AMST National Conference. November 3-4. Hotel Dream City, Pattikkad. BEST POSTER AWARD

72. Pavan, M., Nayar, R, Kurian, Y., Sathu, T., Rajagopal, K. and Sunanda, C. 2017. Evaluation of antioxidant activity of finger millet and arrow root in chicken nuggets stored under frozen conditions. in: Proceedings of Ninth Kerala Veterinary Science Congress. 346-349.
73. Khanapur, C.S., Nayar, R., Divakar, N., Rajagopal, K., Eassow, S. 2017. Study on carcass traits of cross bred pigs slaughtered in a commercial slaughter house. in: Proceedings of Ninth Kerala Veterinary Science Congress. pp. 310-311.
74. Naicy Thomas, Muhasin Asaf, Eizabeth Kurian. 2018. Tissue mRNA distribution and expression levels of RBP4 gene in prolific Malabari and low prolific Attappady Black goats. Annual conference on propelling transition towards sustainable food production through rekindling physilogic strategies for addressing contemporary challenges. Proceedings of first meeting of Animal Physiologist's Association. IVRI, UP, December 22-23.
75. Silpa M. V., Naicy T., Radhika G., Aravindakshan T. V., Thirupathy, V. 2018. Molecular characterization and detection of two novel SNPs of caprine Sirtuin3 (SIRT3) gene in Malabari and Attappady Black goats. Asian Regional Conference on Goats (ARCG-2018), Amity University, Jaipur, Rajasthan, October 22-26.
76. Silpa, M. V T. Naicy, G. Radhika, T. V. Aravindakshan, M. Mini. 2018. Ovarian expression, polymorphism identification and association of SIRT3gene with production traits in goats. Proceedings of the 30th Kerala Science Congress, Thalassery, Kerala, January 28- 30.
77. Silpa M. V., Naicy T., Radhika G., Aravindakshan T. V., Mini, M. Anu B. 2017. Tissue expression profile and detection of novel SNPs of caprine Sirtuin3 (SIRT3) gene in Malabari and Attappady Black goats. Proceedings of the 9th Kerala Veterinary Science Congress, Ernakulam, Kerala, November 11- November 12.
78. Naicy Thomas, R. Thirupathy Venkatachalapathy, T. V. Aravindakshan and Elizabeth Kurian. 2017. Tissue mRNA distribution and expression levels of genes relating to reproduction in prolific Malabari and low-prolific Attappady Black goats. National Symposium: Bio Dynamic Animal Farming for The Management of Livestock DiversityUnder Changing Global Scenario and XIV annual convention of Society for

Conservation of Domestic Animal Biodiversity. CVAS, Mannuthy. February 8-February 10.

79. Anu Bosewell, Naicy Thomas, T. V. Aravindakshan and Elizabeth Kurian. 2017. *in silicoanalysis of a novel SNP (c.C880T) in*caprine *SLC11A1*gene. National Symposium: Bio Dynamic Animal Farming for The Management of Livestock Diversity Under Changing Global Scenario and XIV annual convention of Society for Conservation of Domestic Animal Biodiversity. CVAS, Mannuthy. February 8-February 10.
80. Silpa, M. V., Naicy Thomas, G. Radhika, T.V. Aravindakshan, AnuBosewell and Charlotte Coretta Rodricks. 2017. Molecular characterization and detection of two novel SNPs of *SIRTUIN3* (*SIRT3*) gene in Malabari and Attappady Black goats. National Symposium: Bio Dynamic Animal Farming for The Management of Livestock Diversity Under Changing Global Scenario and XIV annual convention of Society for Conservation of Domestic Animal Biodiversity. CVAS, Mannuthy. February 8-February 10.
81. Elizabeth Kurian, Naicy Thomasand T. V. Aravindakshan 2017. Ovarian expression levels of GDF9 and RBP4 genes in Soviet Chinchilla and Grey Giant rabbits. National Symposium: Bio Dynamic Animal Farming for The Management of Livestock Diversity Under Changing Global Scenario and XIV annual convention of Society for Conservation of Domestic Animal Biodiversity. CVAS, Mannuthy. February 8-February 10.
82. Naicy Thomas, R. Thirupathy Venkatachalapathy and T.V. Aravindakshan. 2017. Comparison and differential expression of NGF and FSHR genes and their interactions in reproductive tissues of prolific and low prolific goats of Kerala. Proceedings of 29th Kerala Science Congress. Marthoma College,Thiruvalla, Kerala, January 28-January 30.
83. Anu Bosewell, Naicy Thomas, T. V. Aravindakshan. 2017. Evaluation of mRNA expression and characterisation of SLC11A1 gene in Malabari and Attappady Black goat. Proceedings of 28th Kerala Science Congress. Malappuram, Kerala, January 28-January 30.
84. Radha, K. Jeethusree, V.A. and C. T. Sathian 2017 Bronopol as a milk sample preservative –Effect on composition National seminar on Food adequacy and climate change Strategies for sustainable food production seminar proceedings 293-295

85. Radha K. and Geethu, T.H. Chakka based Dairy spread 2017–A novel low fat spread National seminar on Food adequacy and climate change Strategies for sustainable food production seminar proceedings 265-268
86. Harikrishnan S., and Irshad, A. 2017. "Avian Psittacosis: problems and solutions". Proceedings of National seminar on "Surveillance and control of rabies and other zoonotic diseases" 28th September at Thrissur. 61-63p.
87. Arun T, S., Irshad, A. and Harikrishnan S. 2017. "Avian Influenza Virus: Poultry pathogen having zoonotic and pandemic threats." Proceedings of National seminar on "Surveillance and control of rabies and other zoonotic diseases" 28th September at Thrissur.78-85p.
88. Harikrishnan S., Harsha Y S, and Arsha V S. 2017. "Recent trends in hatchery waste Management." Proceedings of National seminar on "Food adequacy and climate change: strategies for sustainable food production", 3rd and 4th November. 534-35p.
89. Arsha V S, Binoj Chacko, Harikrishnan S and Harsha Y S. 2017. "Designer eggs: A way to improve human health." Proceedings of National seminar on "Food adequacy and climate change: strategies for sustainable food production", 3rd and 4th November. 299-300p.
90. Harsha Y S, Harikrishnan S. and Arsha V S. 2017. "Poultry By-products utilization and waste management." Proceedings of National seminar on "Food adequacy and climate change: strategies for sustainable food production", 3rd and 4th November. 527-28p.
91. . Lakshmi, K. K. Jayavardhanan and J. Thanislass. 2017 Comparison of innate immunity related genes expression in sub-clinical and clinical cases of bovine mastitis. *Second Annual Convention of Society of Veterinary Biochemists and Biotechnologists of India-2017 and National Symposium* held at Veterinary College, Bangalore, Pp. 75-76.
92. Aswathy A., Uma R., Linu Eldho and Jayavardhanan K. K. 2017. Isolation and purification of lactoferrin from colostrum of Kasargod Dwarf cattle. Poster presented at *27th Swadeshi Science Congress*, held at Amrita Viswa Vidyapeetham, Amrita University, Kollam, Pp. 112.
93. Adarsh R., Uma R., Sathu T. and Linu Eldho. 2017. Applications of microbial protease in treatment of crushed bones for gelatin production. Poster presented at *27th Swadeshi Science Congress*, held at Amrita Viswa Vidyapeetham, Amrita University, Kollam, Pp. 182-183.

94. Chinnu, M. V. and Manu, G. C., 2017. Oxytetracyclin residue analysis in poultry serum by ultra-high performance liquid chromatography. *Second Annual Convention of Society of Veterinary Biochemists and Biotechnologists of India-2017 and National Symposium* held at Veterinary College, Bangalore, Pp. 76.

95. Anilkumar K 2018. Risk status and conservation of cattle genetic resources in South India Proceedings of National symposium on Sustainable Management of Livestock and Poultry Diversity for enhancing the farmers income. College of Veterinary and Animal Sciences, Bikaner Rajasthan on February 8-10th, 2018 pp 7-18

96. Archana Chandran, Remya, R., Arun Kumar A., Suresh, G., Smitha J Lukose and Beena A. K 2017. Dietary Fibre Enrichment of Milk Peda Using Rice Bran. Compendium of National Seminar on food advocacy and climate change: strategies for sustainable food production, Mannuthy, Thrissur

97. Neethu C, Archana C, Beena A.K,Anupa A ,& Vinod V. 2018. Isolation, characterization and identification of lactic acid bacteria from Gandhakasala rice of Wayanad origin and its applications Proceedings of the 30th Kerala Science Congress held at Thalassery from 28th -30th January, 2018

98. Beena A. K., Aparna S. V., James L. 2017.Evaluation of probiotic potential of a *Lactobacillus* isolated from ice cream. Proceedings of the extended abstracts .29th Kerala Science Congress from 28th to 30th January, 2017 at Mar Thoma College, Thiruvalla, Pathanamthitta. pp: 41-46.

99. James L, Praseeda K S, Beena A.K, Aparna S.V, Shyama M .2017. Antibiogram of thermal resistant *staphylococcus aureus* isolated from milk. Proceedings of the extended abstracts .29th Kerala Science Congress from 28th to 30th January, 2017 at Mar Thoma College, Thiruvalla, Pathanamthitta. p:23.

100. Beena A.K., Pallavi, S., Ligimol J. Archana, C. 2017. Impact of freeze drying on the probiotic properties of *Lactobacillus* isolated from idly batter. Proceedings of 3rd Convention of association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change. Strategies for sustainable food production" organized by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.pp.115-116.

101. Archana C., Remya, R., Arun Kumar, A., Suresh, G., Smitha, J. L. Beena A.K.2017. Dietary Fibre enrichment of milk peda using rice bran. Proceedings of 3rd Convention of association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change'-: Strategies for sustainable food production" organized

by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.pp.236-237.

102. Aparna S. V, Beena A. K, Jaiby K., Ligimol J. Smitha, J. L., Aswathi S. R., Anagha P.G., Sreepranav, K. Archana, S. and Beena A.K.2017.Formulation of whey based nutritional fruit herbal beverage. Proceedings of 3rd Convention of Association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change'- : Strategies for sustainable food production"organized by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.p.500-501.

103. James, L., Beena A.K, Aparna S.V, Praseeda , K.S.2017. Antibiotic Response Pattern of Heat Resistant *Staphylococcus aureus* Isolates Obtained from Milk Proceedings of 3rd Convention of Association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change'- : Strategies for sustainable food production"organized by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.pp.392-393.

104..Shafna Z., Ligimol J., Beena A. K, Aparna S.V.2017.Utilization of Paneer Whey as an Effective Growth Medium for the Production of Antimicrobial Agents by a *Lactobacillus acidophilus* isolate. Proceedings of 3rd Convention of association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change': Strategies for sustainable food production" organized by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.pp.513-515.

105. Reshma A., Aparna S. V, Beena A. K and Ligimol J.2017.Antibiotic Resistance Pattern of *Escherichia coli* isolated from different food sources. Proceedings of 3rd Convention of association of Meat Scientists and Technologists. National seminar on 'Food adequacy and climate change': Strategies for sustainable food production" organized by Association of Meat Scientists and Technologists during 3-4 November 2017, at Hotel Dream City, Pattikkad.pp.362-36

106. Gheevarghese P. I. and Divya K. B. Functional, Novel and Ethnic foods.2017. National seminar on: Food Adequacy and Climate change: Strategies for sustainable food Production: 2017

107. Dinker Singh and Avinash Singh. Effect of herbs on sensory/Organoleptic Attributes probiotic Frozen Yoghurt.2017. National seminar on Food adequacy and climate chnage strategies for sustainable Food Production

108. Anusha V, Divya, K. B, S. N. Rajakumar S. and Sajitha Jose K.2018. Development of Low calorie Jackfruit (Artcarpusheterophyllus) flavoured milk.46 th Dairy Industry Conference, Kerala

109. Joe Joseph, Divya K B and Rinu THomas. 2018. Development of Low calorie Shrikhand using Pearl Millet (Pennisetummglaucum). 46 th Dairy Industry Conference, Kerala

110. Divya K B, Joe Joseph and Anusha V. 2018. Incorporation of Foxtail Millet (setariaaitalica) for the development of functional Burfi. 46 th Dairy Industry Conference

111. Beena, R L K.N.S. Sai,J. Joe and K.B. Divya. 2018.Development of diabetic Sandesh.46 th Dairy Industry Conference

112. Rajakumar, SN Anusha V, Divya KB and Sajitha Jose K. 2018. Development of Ginger peda.46 th Dairy Industry Conference, Kerala

113. Ajith K.S., Madhura, Y., Arpitha, R., Chandrapal Singh, K., Krishnamoorthy, U., Prabhu, T.M., Narasimhamurthy, H.N. and Gloridoss, R.G. 2018. Nutritional evaluation of spineless cactus (*OpuntiaficusIndica*) in growing lambs Proceedings of XVII biennial conference of Animal Nutrition Society of India Feb 1-3

114. Jasmin Rani, K., Sachin Tripura and Sajith Purushothaman 2017. Effect of supplementation of Moringa oleifera leaves on growth, carcass characteristics and gut health of Japanese quails. Proceedings of the National seminar on climate change: strategie for sstainable food production Nov. 3-4 2017.

115. Syamala, K. and Devad, K. 2018. Distribution of faecal egg count in goats of Kerala and its impact on parasite control. 10th Kerala Veterinary Science Congress2018 November 10th and 11th Kannur

116. Sabin, G., Saseendran, P.C., Anil, K.S., and Gleeja, V. L. 2017. Identification of dairy farming systems in Kerala, proceedings of Kerala Veterinary Science Congress,2017

117. Shynu M. 2017. “The Transition Dairy Cow” in the Compendium of lectures, Training programme for Assistant Directors of Animal Husbandry Department held from 3rd July to 3rd October 2017.

118. Sajith Purshothaman, Vijaya raghavendran, S., Jasmin Rani, K. 2017. Effect of feeding betel leaves (Piper betel) on feed intake, gut healthnand carcass characteristics in

Japanese quail (*Cortnix cortunix japonica*). Association of Meat Scientists and Technologists Conference organized by Department of Meat Science and Technology held at Pattikad, Thrissur, Kerala, India between 3-4th November,

Popular Articles

1. Justin Davis, Prasad A and Arokia Robert M., "Gravity based sand filter for improving water quality., Indian Farmer 4 (Issue 8): 587-489; August-2017
2. Biju Chacko. P.Sathya, , C. Srinivasan, Lejaniya, A.S., K.Radha and S.N. Archana "Krishi cheyyam pashuvinayi", in Karshakan July 2017.
3. 2018 Health benefits of Ghee. Kerala Karshakan Feb 36-39
4. Harikrishnan S. on "Kaadakal ennum priyankaram" Karshakan, June 2017
5. Harikrishnan S. on "Kadaknath enna karimkozhi" Kerala karshakan July 2017
6. Harikrishnan S. "Thaaravu valarthal aanandathinum aadayathinum", Karshakan, July 2017
7. Harikrishnan S. on "Valarthu pakshimekhalayile velluvilikal, sameepanangal", Karshakan, July 2017
8. Harikrishnan S. on "Irachikkozhi vilayum G.S.T yumayi bandhamilla" Karshakan, August, 2017
9. Harikrishnan S. on "Keralathil saadyathakal kandethunna karimkozhi valarthal" *Mannira.in.* September 25, 2017
10. Harikrishnan S. on "Kozhikale rakshikkam vasanthayil ninnu" Karshakan, January, 2018
11. Harikrishnan S. on "Kozhivalarthal mekhalayile saadyathakal;Keralathil" Karshakan, January, 2018
12. Prakash G. and Anilkumar K (2017 A1 and A2 milk a review *J. Indian Vet. Assoc.* 15(2 5-15
13. Anilkumar K 2018 Non verbal communication for teaching, Compendium , 3rd Orientation programme on "Innovative pedagogical strategies" Academic staff college, KVASU, January 3rd to 30th 2018 pp41-52.
14. Justin Davis, Prasad A and Arokia Robert M. Gravity based sand filter for improving water quality. Indian Farmer. August, 2017
15. P.Sathya, Archana, S.N., Seena, T.X. and Justin Davis. Health Benefits of Goat Milk. Kerala Karshakan-Vol.5 Issue-9. March- 2018

16. Seena, T.X., P. Sathya, Archana, S. N. and Justin Davis. Summer management in Dairy farm. Kerala Karshakan-Vol.5 Issue-9. March- 2018
17. B Bindu Lakshmanan. 2018. Theileriosisis in goats. Keralakarshakan June.68
18. Lucy. K.M. 2017. "Effective technical writing-characteristics and skills" Compendium of Refresher programme on reshaping scientific communication in building entrepreneurship. Pp- 75-79. July 11th to 31st, 2017
19. Harikrishnan S and Sunilkumar. N S 2017. "Kozhivalarthal meghalayile sadhyadhakal-Keralathil", Karshakan December 2017 Issue PP- 52-54
20. Devi, S. S. 2017. Drought Management in livestock farming. *Kerala Karshakan ejournal* 48-50

Awards and honours received by faculty and students

1. Rajani C V, Helna M W, Surjith K P, Patki H S, Ajith J G and Ashok N. 2017. Late Shri. L.O. Dhande Memorial Award for Forensic Anatomy including Archeological study for the paper entitled Morphology of skin of leopard (*Panther apardusfusca*) and cheetah (*Axis axis*) as a tool in forensic anatomy. 32nd Annual Convention of Indian Association of IAVA in collaboration with OUAT National Symposium on Advances and Applications of Veterinary Anatomy in Livestock, Pet, Poultry, Lab and Wildlife-Health and Production 21-23rd December, 2017. Bhubaneswar
2. Dr. Ajith K. S. secured second prize in Poster presentation at XVII biennial conference of Animal Nutrition Society of India held during February 1-2 at College of Veterinary Science and Animal husbandry, Junagadh Agricultural University
3. Dr. Dildeep V. received certificate of appreciation from PTA, Pookode for getting Gold medal in Animal Nutrition during, Ph.D at IVRI, Bareilly.
4. Best lady Veterinarian award, IVA, Kerala 2017- Dr. M. Mini
5. Dr. Priya P.M.- First prize for best poster in XXXIV Annual conference & National symposium of Indian Poultry Science Association (IPSACON 2017)
6. Dr. Surya Sankar- Best poster award, 9th Kerala Veterinary Science Congress, held at Hotel Flora, Nedumbassery, Cochin, from 11-12 November 2017.
7. Dr. Ambily R. -Best poster presentation award – 9th Kerala Veterinary Science Congress- held at Hotel Flora, Nedumbassery, Cochin, from 11-12 November 2017.
8. Dr. Ambily R. - Best poster presentation award – World rabies Day National seminar-2017
9. Dr. Indu V Raj – Dr. C. Vijayaragavan memorial silver jubilee medal and award for the best paper in Developmental Anatomy for the research paper entitled “Histogenesis of lymphoid tissue in large intestine of goat foetus’’ authored by Indu V. R., Lucy K. M., Ashok N., Maya S. and Chungath J. J.
10. Dr Indu V Raj- First prize for oral Presentation in the 9th Kerala Veterinary Science Congress for the presentation Indu V. R., Lucy K. M., Ashok N., Maya S. and Chungath J.J. 2017. Electron microscopy and histochemistry of gut- associated lymphoid tissue (GALT) in large intestine of goats. Proceedings of the 9th Kerala Veterinary Science Congress held at Hotel Flora, Nedumbassery, Cochin, from 11-12 November 2017.
11. Dr. Sumena K.B. - Best paper award in the IAVA conference held at Bhuvaneswar, Orissa during December 21 to 23, 2017

12. Dr. Naicy Thomas - Dr. G. Nirmalan Trust Award for Best Research Paper 2017
13. Dr Bindya Liz Abraham - Prof. P. K. Pani Research Award- 2017 for the best research article on Poultry Breeding by Indian Poultry Science Association
14. Dr. K. Radha- Best poster award in National seminar on "Food adequacy climate change: Strategies for sustainable food production"-2017 for the paper entitled "Bronopol as a milk sample preservative- Effect on composition"
15. Dr. Varuna P. Panicker - Early Career Research Award from Science and Engineering Research Board
16. Dr Sudheesh S Nair, Dr M.K.Narayanan , Dr Soumya Ramankutty, Dr S Anoop and Dr C.B.Devanand. SVS Gold medal and Best paper presentation Award -Wild Animal Surgery Session 2017
17. Dr C.B.Devanand , Dr Sudheesh S Nair, Dr Soumya Ramankutty, Dr S Anoop. ISVS Gold Medal for Best Paper in Wild and Zoo Animal Surgery Session- 2018
18. Dr Sudheesh S Nair, Dr M.K.Narayanan , Dr Soumya Ramankutty, Dr S Anoop and Dr C.B.Devanand. Gold Medal for Best Paper in Radiology and Imaging Session – 2018 of Annual Congress of Indian Society for Veterinary Surgery,2018
19. Dr Sudheesh S Nair, Dr M.K.Narayanan , Dr Soumya Ramankutty, Dr S Anoop and Dr C.B.Devanand. ISVS Appreciation award for Best Paper in Avian Surgery Session-2018
20. Dr S Anoop, Dr Sudheesh S Nair and Dr Laiju M Philip. KVASU Faculty achievement award 2017 and 2018
21. Dr. Archana Chandran- Best Teacher Award 2017-18
22. Dr K. Syamala - First prize for oral presentation in Asia regional conference on goats,2018 at Amity University, Rajasthan
23. Dr. Aparna Sudhakaran V- Second prize in Oral presentation- National Seminar on'Food adequacy and climate change: Strategies for sustainable food production" organized by Association of Meat Scientists and held at Hotel Dream City, Pattikkad
24. Dr. Ligimol James Assistant Professor, Department of Dairy Microbiology- First in both Oral and Poster presentation- National Seminar on 'Food adequacy and climate change- Strategies for sustainable food production' organized by Association of Meat Scientists and Technologists held at Hotel Dream City, Pattikkad
25. Ms. Indu B, Assistant Professor, Department of Dairy Chemistry - First in Poster presentation- National Seminar on 'Food adequacy and climate change- Strategies for

sustainable food production' organized by Association of Meat Scientists and Technologists held at Hotel Dream City, Pattikkad

26. Dr. Roshin M. Reji - 2nd place in best oral presentation in Kerala Veterinary Science Congress, held at Hotel Flora, Nedumbassery, Cochin, from 11-12 November 2017.
27. Dr. Chetan S Khanapur (MVSc. Student), Best poster award. in: National Seminar on food adequacy and climate change-strategies for sustainable food production. AMST National Conference. November 3-4,2017
28. Dr. Parvathy.G.Nair - Recipient of NSERC/CREATE, ItraP- IDEP scholarship 2017, Canada
29. Dr. M.V.Silpa, M.V.Sc. Student- 2nd prize in oral presentation -9th Kerala Veterinary Science Congress
30. Dr. M.V.Silpa, M.V.Sc. Student - Best Paper Award -30th Kerala Science Congress
31. Dr.P. Sathya - Best paper award under oral presentation categoryNational Seminar food explore 17- bridging Agriculture with Industry for the paper "Fermented goat milk- A potential source of Antihypertensive peptides"
32. Dr. P. Sathya - Best paper award under oral presentation category in National conference on Scientific perspectives in Home science-2017- for the paper "Angiotensin converting enzyme inhibitory activity in fermented goat milk"
33. Dr. P. Sathya - Second best poster award in Kerala Veterinary Science congress KVSC2017- "Potential of lactic acid bacteria to release Angiotensin converting enzyme inhibitory peptides"
34. Dr. P. Sathya - Best paper award under oral presentation category, National seminar on "Food adequacy & Climate change: Strategies for sustainable food production"- for the paper entitled "Angiotensin converting enzyme inhibitory activity of fermented goat milk prepared with different lactic acid bacteria"
35. Dr. M.V.Silpa- 2nd prize in oral presentation -Asian Regional Conference on Goats (ARCG- 2018)
36. Mr. Mathews Jolly and Mr. Arun Dev C 2015 Batch- Won best start-up award in National Start Up Summit held at Haryana Agricultural University, Haryana- 2018
37. Dr. Murali Krishna- Best poster presentation in the National seminar on 'Food adequacy & Climate Change, Strategies for Sustainable Food Production' 2017 organised by AMST at Thrissur on 3 & 4th November, 2017.
38. Shivaprasad and Adheena (2013 batch BVSc&AH). Got first prize in National level

quiz competition in World Veterinary Day celebration organized by IVA, CVAS, Mannuthy (April 28)

39. Dr. Aswathy, MVSc scholar (Clinical Medicine). Got first prize in poster presentation in World Veterinary Day celebration organized by IVA, CVAS, Mannuthy (April 28)
40. Dr. Rani Maria Thomas, MVSc scholar (Preventive Medicine). Got appreciation award in poster presentation in World Veterinary Day celebration organized by IVA, CVAS, Mannuthy (April 28)
41. Resmi K.M., 2015 batch. All India National level essay competition organized by Natural Remedies – second prize

Schools and Centres

1. School of Applied Animal Nutrition and Feed Technology, Mannuthy

About the centre

The School of Animal Nutrition and Feed Technology is established with objectives to undertake research projects in the field of Animal nutrition and also to impart training to various stake holders in dairy sector. A diploma course in feed technology is being offered to enhance man power in feed mill operations.

Research Activities

i. KVASU Research projects.

- Establishment of pet food manufacturing unit under, KVASU, Plan Project-10 Lakh
  PI: Dr Ally K

Major activities/Achievements

- Inauguration of 2 T /hr automatic feed mill on 6/7/17 by Hon. Minister Adv. V S Sunil Kumar
- Production of 1900T of feed and mineral mixture for various classes of livestock and analysis of feed and fodder generating a revenue of Rs. 4,86,93,600.00
- Conduct of farmers seminar on 6/7/17 with a participation of 120 farmers and officials

Publications

- Banakar, P., Ally, K., Lokesh, E., Saseendran, A., Dominic, G., & Jaafar, J. 2017. in Vitro Assessment of Nutritive Value of Unconventional Feed Resource as Livestock Feed. *Int. J. Livestock Res.* **7**(6), 159-169.
- Biju Chacko, K. M. Syam Mohan, K. Ally, K. Shyama, K. S. Anil and C. T. Sathian. 2017. Effect of paddy straw based complete rations with different levels of neutral detergent fibre on microbial protein synthesis in dairy cows during early and mid lactation. *Indian J Anim. Sci* .87(8): 1000-1004.

2. School of Applied Animal Production and Biotechnology, Mannuthy

About the centre

Modern Biotechnology has tremendous potential to improve animal productivity and health. School of Animal Production and Biotechnology (SAAPBT) has been established in KVASU for conducting research, education and training programmes in identified and frontier areas of Biotechnology such as genetic engineering, hybridoma technology, Molecular Diagnostics, Animal forensics, Reproductive Biotechnology and Animal Genomics. The school was undertaking two new post graduate programmes in the Academic year 2014-15 M.V.Sc. Animal Biotechnology, and M .Sc. Animal Biotechnology. These course were designed to build up technically trained manpower resource base, empowering them with all skills necessary to use biotechnology as a tool for improvement of human and animal health and livestock production including molecular diagnostics, improved vaccines, wild life conservation and forensics and epidemiological and climate change studies. State-of-the-art laboratory facilities for research in various areas of biotechnology are available in SAAPBT.

Trainings conducted.

- Training on Basic Molecular Biology Techniques and Introduction to Bioinformatics Tools" from 17th August to 26th August 2017.
- Training on Molecular Biology and Bioinformatics tools for Advanced Life Science Research from 19th October to 1st November 2017.

Research Activities

i. KVASU Research projects.

- State Plan Project 2017-2018- Strengthening of School of Applied Animal Production and Biotechnology- P.I. Dr.T.V.Aravindakshan- 5lakhs
- State Plan Project 2017-2018- Development of Immunochromatographic strip test for the rapid diagnosis of acute leptospirosis in field conditions-P.I. Dr. Ambily R-2lakhs
- State Plan Project 2017-2018- Ascertaining a reliable method for isolation and purification of mesenchymal stem cells from dogs – P.I. Dr. Bindhu Lakshmanan-2lakhs

ii. Masters /Doctoral Research projects

- Polymorphism Study on Candidate Genes Affecting Height in Vechur and Crossbred Cattle of Kerala- Leo Maria Roy-(15-MSVM-19)

- Comparative Evaluation of Conventional and Real Time PCR for Detection of Haemoparasites in Dogs and Ixodid Ticks- Lavinia Wahlang-(15-MSVM-20)
- Evaluation of E74-Like Factor 5 (E1f5) Gene Polymorphism and its Association with Milk Production Traits in Crossbred and Vechur Cattle of Kerala- Menda Rajendar-(15-MSVM-21)

Major activities/Achievements

- Gold Medal for first rank in MSc (2016)- Anu Boswell (14-MSVM-17) by Kerala Veterinary and Animal Sciences University, Kerala
- Three students successfully completed MSc. Animal Biotechnology Programme in the year 2017-18.
- Conducted two hands on trainings on Molecular Biology and Bioinformatics for research scholars, students and faculties from different universities in India.

Publications

1. Jose, Jain, Bindu Lakshmanan, T. V. Aravindakshan, V. N. Hitaishi and Binu K. Mani. 2017. Evaluation of DNA extraction protocols from Ixodid ticks. *Int. J. Sci. Environ. Technol*. **6:** 1912-1917.
2. Jain Kollannur Jose, Bindu Lakshmanan, Karunakaran Syamala, Jose E. Praveena, and Thazhathuveetil Aravindakshan. 2017. High prevalence of small Babesia species in canines of Kerala, South India. *Vet. World.* **10**(11): 1319.
3. Jose, C., Jain, K., Bindu Lakshmanan, Lavinia Wahlang, K. Syamala, and T. V. Aravindakshan. 2018. Molecular evidence of haemoparasites in ixodid ticks of dogs-first report in India. *Vet. Parasitol. Regional Studies Reports* **13**: 177-179.
4. Jose, Jain, Bindu Lakshmanan, and T. V. Aravindakshan. 2018. Molecular characterization of Babesia vogeli and Ehrlichia canis isolates. *Indian J. Vet. Res.* **27**(1): 12-18.
5. Behera Anjan, R. Thirupathy Venkatachalapathy, and T. V. Aravindakshan. 2018 Identification of novel single nucleotide polymorphism at thyroid hormone responsive (THRSP) gene of native goat breeds of India. *Small Ruminant Res.* **163**: 68-71.
6. Bosewell, Anu, Thomas Naicy, T. V. Aravindakshan, and Elizabeth Kurian. 2018. Sequence characterization, structural analysis, SNP detection and expression profiling of SLC11A1 gene in Indian goats. *Small Ruminant Res.* **164**: 15-21.

7. Shyma, K. T, Surya Sankar, T. V. Aravindakshan, K. Krithiga, Anu Bosewell, N. Sarika, and M. Mini. 2018. Isolation and Molecular Detection of Infectious Bronchitis Virus Isolates from Chicken. *Int. J. Current. Microbiol. App. Sci* **7**(10): 2858-2866

8. Bosewell, Anu, T. V. Aravindakshan, G. Radhika, and Jinty Sukumaran. 2018 "Whole exome sequencing analysis of native dwarf cattle genetic groups of Kerala by next generation DNA sequencing. *Pharma Innov. J.* **7**(10): 131-135

9. Jain Jose, Bindu Lakshmanan, Hitaishi V. Nagaraj, Jose E. Praveena, Karunakaran Syamala, and Thazhathuveetil Aravindakshan. 2018. Detection of Babesia canis vogeli, Babesia gibsoni and Ehrlichia canis by multiplex PCR in naturally infected dogs in South India. *Veterinarski arhiv* **88**(2): 215-224.

3. School of Bio Energy and Farm Waste Management, Mannuthy

About the centre

The School of Bio-energy and Farm Waste Management was established with Dr. Francis Xavier (Professor Farms) as the Implementing officer and Dr. Joseph Mathew (Prof and Head CVAS, Pookode and Dr. Deepak Mathew (Assistant Professor, CVAS, Mannuthy to carry out teaching and research in the highly advanced and cutting edge technology of bio-energy (No.KVASU/DAR/R2/3579/2011 dated 27.04.2012) The school established an Animal Fat Biodiesel Laboratory, 1st of its kind in India at Pookode campus on 06/05/2014. The bio-diesel plant was established as a pilot plant to demonstrate the cutting edge technology of utilisation of waste for the production of renewable fuel, for further research and not as a commercial production plant.

Research Activities

i. Masters /Doctoral Research projects

MVSc Research Project

Name of Student	Year	Affiliation	Project
Dr. Deepak Mathew D. K.	2018	PhD Scholar, Dept. of LPM, CVAS, Mannuthy	Nutrient recycling potential of fly larvae for biowaste management

Dr. Jyothi. S.B. [15-MVP-23]	2017	MVSc Scholar, Dept. of LPM, COVAS Pookode	Evaluation and comparison of four different types of bio-gas pants utilising livestock waste

Mtech Research Projects

Manu V.R	2018	M. tech Propulsion Engineering, College of Engineering Thiruvananthapuram	Utilisation of bio-diesel from chicken oil in a variable compression ration diesel engine and its performance and emission characteristics
Abhilash. S Ajith. P	2017	M tech Thermal Science Dept. of Mechanical Engineering, College of Engineering Thiruvananthapuram	Calorific value and thermal efficiency of biofuels
Rajkiran T.R	2017	Mechanical Engineering Dept, Model Engineering College, Thrikakkara, Ernakulam	Transesterification of Rendered ChickenOil Using Calcium Oxide Catalyst

Major activities/Achievements

B.Tech students projects

Sabari Shajil Sreerag. S Thawfeek S	2018	8thSem Automobile Engineering, Noorul Islam Cente for Higher Education, Kanyakumari	Load performance test on I.C Engine
Ann Joe Jose Ronald Benny, Karthik Prasad Kiran S.R	2018	8thSem, Mechanical Engineering. Mar Athanasius College of Engineering Kothamangalam	Performance evaluation of bio-diesel in a variable compression ration engine
RivinVarghese Rahul Krinanan P	2018	8thSem, Mechanical Engineering. Government	Analysis and comparision of performance and emission

Sreerag Sreenivasan Sunil. S Thomas Francis		Engineering College, Thrissur	of IC engine fuelled with diesel and bio-diesel
R. Praveen, V. Prasanth B. Nantha kumar M. Naveen Kumar	2018	8thSem, Mechanical Engineering. Selvam college of Technolgy, Namakkal, Tamil Nadu	A study of engine performance, combustion, emission characteristics of various biodiesel blends
G. Sridhar K.S. Shriram K.Venkatesh	2018	3rd year, Mechanical Muthayammal Engineering College, Rasipuram, Tamil Nadu	I.C. Engine performance testing, emission testing using bio-diesel of various proportions.
Abhay V Ajay V Abishek P Vyshak I Mohammed Binshad C.K Nihal C.P	2018	8thSem, Mechanical Engineering. Vedavya Institute of Technology, Ramanattukara, Malapuram	Exercy analysis of biodiesel
R. S. Deepak B. Sriram T. JeyaMurugn P. Selva Kumar	2017	8thSem, Mechanical Engineering Kumarasamy College of Engineering, Karur, Tamil Nadu	I.C Engine performance using chicken oil Biodiesel

Publications

Chapter in Books published

- John Abraham, Ramesh Saravanakumar and Deepak Mathew 2017 Utilisation of broiler slaughter waste for biodiesel, carcass meal and glycerol production. Chapter 49 of Climate Change and Sustainable Food Production. ISBN 978-93-86724-13-7. Excel India Publishers. New Delhi.

Journal Articles

- Jyothi. S. B, John Abraham and Balusami. C 2017 Effect of climate on production and composition of bio-gas from different animal waste. *Invertis J. Renewable Energy.* **7(**4):208-210.
- John Abraham, Jyothi. S.B and Chintu Ravishankar 2017 Comparison of two new digester designs for bio-gas production using cattle dung as substrate. *Indian J. Animal Production Management.* **33**(3-4): 31-33
- Jyothi. S. B, John Abraham, Deepak Biradar and Sachin. S.P. 2017. Bio-gas production potential of ruminant and non-ruminant animal excreta. *Indian J. Anim. Prod. Management.* **33**(3-4): 82-85
- Rajkiran. T. R. Sreenivas, P and John Abraham. 2017. Production of Biodiesel from Bio-Waste. *Int. J. Innov. Res. Sci. Eng. Technol.* **6(**6): 169-174

4. School of Zoonoses Public Health and Pathobiology

About the School

Objectives

- To generate, transfer and apply knowledge in the concerned disciplines or the protection and promotion of animal and human health and their well-being in consonance with the theme of 'Health for all in 21st century' and the mission will be routed through: education, research, industry support and public and Institutional Services
- To promote an interdisciplinary approach on education, research and diagnosis of infectious, metabolic and toxic conditions
- To produce a database on the various diseases
- The collaborating departments: Dept. of Veterinary Public Health, Dept. of Veterinary Microbiology, Dept. of Veterinary Parasitology, Dept. of Veterinary Pathology and Dept. of Veterinary Epidemiology and Preventive Medicine

Trainings conducted

- World Zoonoses Day Celebration**:** An exhibition and seminar was organised for the farm workers, non teaching staff, students and faculty of College of Veterinary and Animal Sciences, Mannuthy on 6th July, 2018 to create awareness on zoonoses.
- The workshop on 'Culture of Responsibility was organized by the School of Zoonoses Public Health and Pathobiology, in association with the American

Society of Microbiology for the post graduate students and staff of Jubilee Mission Medical College, Amala Medical College and Government Medical College, Thrissur at College of Veterinary and Animal Sciences, Mannuthy on September, 18th 2017.

- The workshop on 'Culture of Responsibility was organized by the School of Zoonoses Public Health and Pathobiology for the Post graduate and PhD students at College of Veterinary and Animal Sciences, Mannuthy on March, 14th 2018.

Research Activities

i. KVASU Research projects

- Strengthening of School:- Impact of animals and population dynamics and environment on Leptospira infection in Alappuzha, Kerala. The transmission dynamics of Leptospirosis was studied in the endemic area of Allapuzha district, i.e. Kainaagiri panchayat. It was found that the backwaters were high in coliform count but Leptospira spp was not detected in the water samples by PCR. Among the 40, apparently healthy cattle, four urine and two blood samples were positive for Leptospira. The two cattle serum samples by MAT revealed the presence of *L. pomona*. Two human serum samples also revealed the presence of *L. icterohaemorrhagiae. The urine samples revealed the presence of saprophytic Leptospira organisms.*

Major activities/Achievements

An exhibition on "Know Zoonoses to no Zoonoses' , awareness class on zoonoses and workshop on techniques in identification of parasites was organized at St Xaviers College, Alwaye on March 13th , 2018

5. Centre for Advanced Studies in Poultry Science, Mannuthy

About the centre

Centre for Advanced Studies in Poultry Science (CASPS) was established in 1985 as recognition for its contribution in various fields of activities. Establishment of ICAR Revolving Fund poultry project, implementation of NATP on productivity enhancement of Ducks and successful conduct of IV World Water Fowl conference etc. are the significant milestones of the Centre.

Trainings conducted

Sl. No.	Title of the Programme	Place	Duration		Number of Participants
			From	To	
1	Training on Egger nursery and poultry farming for farmers	CAS in Poultry Science, Mannuthy	13-03-2018 to 14-03-2018		23 nos
2	Training on Current trends in Quail farming for Farmers	CAS in Poultry Science, Mannuthy	19-03-2018 to 20-03-2018		19 nos

Research Activities

KVASU Research projects

- Conservation and popularization and of native chicken varieties in Kerala – 13.125 lakhs
- Advanced Studies mycotoxin testing facilities for Poultry Feed – 8.75 lakhs
- Hatchery waste disposal and its effective utilization – 8.75 lakhs

Publications

- Association of Prolactin gene polymorphism with production traits in White Leghorn- M Azhaguraja, S Sankaralingam, P Anitha, Binoj Chacko & T V Aravindakshan, *J. Indian Vet. Assoc.* Vol 15, issue 2, August 2017 page no 12-14.
- Effect of different levels of Aflatoxin B1 on egg production of breeder Japanese Quails (Coturnix coturnix japonica)- T G Soma, Binoj Chacko, P Anitha, S Sankaralingam & K Ally, *J. Indian Vet. Assoc.* Vol 15, issue 2, August 2017 page no 20-24.
- Effect of low energy-protein and low phosphorus diets on the production performance of layer chicken-P Ponnuvel, P Anitha & Binoj Chacko- International journal of Advanced Research in Biological Sciences, Volume 5, Issue 1-2018.
- Leaf let: Muttakozhikalude paripalanam
- Chapter in book: Kozhivalarthal mekhalayile vyavasayika sadyathakal by
- Dr.Harikrishnan S in the book Samrambhakarkulla kaipusthakam by AHD, Kannur

Popular Article

- Kadaknath enna karinkozhy- Dr.Harikrishnan S, Kerala karshakan, July 2017

Full length articles in compendium

- Avian Psittacosis: Problem & Solution – Harikrishnan S & Irshad A, Compendium of National seminar on "Surveillance & control of rabies and other zoonotic diseases"2017 Page no .61 - 63.
- Avian Influenza virus: Poultry pathogen having zoonotic & pandemic threats- Harikrishnan S & Irshad A, Compendium of National seminar on " Surveillance & control of rabies and other zoonotic diseases "2017 Page no 78 - 85.
- Recent trends in Hatchery waste management- Harikrishnan S, Harsha Y S & Arsha V S, Compendium of AMST conference " Food adequacy and climate change : strategies for sustainable food production" on 3 & 4 Nov 2017 page no 534-535.
- Designer eggs: a way to improve human health- Arsha V S, Binoj Chacko, Harikrishnan S & Harsha Y S, Compendium of AMST conference " Food adequacy and climate change : strategies for sustainable food production" on 3 & 4 Nov 2017 page no 299-300.
- Poultry by-products utilization and waste management- Harsha Y S, Harikrishnan S & Arsha V S, Compendium of AMST conference " Food adequacy and climate change : strategies for sustainable food production" on 3 & 4 Nov 2017 page no 527-528.

6. Centre for Advanced Studies in Animal Genetics and Breeding, Mannuthy

About the centre

The Department of Animal Breeding and Genetics of College of Veterinary and Animal Sciences was upgraded and given the status of Centre for Advanced Studies in Animal Genetics and Breeding (CASAGB) in 1986 as recognition for its contribution in various fields of activities.· The major objectives of the centre are i) Improving the genetic potential of livestock for efficient growth and increased production ii) Research in molecular genetics, genomics and animal breeding iii) Conservation of native animal genetic resources and act as germplasm repository for domestic animals and iv) Undergraduate, Master's and Doctorate studies and research on Animal Breeding and Genetics The major components of CASAGB are i) Dept. of Animal Breeding & Genetics ii) Cattle Breeding - Vechur conservation, ICAR-Field Progeny Testing Schemeiii) Goat Breeding - ICAR- All India Coordinated Research Project (Malabari Field) and iv) Rabbit Breeding

Trainings conducted

- Training on Basic Molecular Biology Techniques and Introduction to Bioinformatics Tools (10 days)-1
- Training on Molecular Biology and Bioinformatics tools for Advanced Life Science Research -14 days Training Program- 2 Batches- 1) 19-10-2017 to 1-11-2017 2) 15-05-2018 to 28-05-2018

Research Activities

i. KVASU Research projects.

EAPs

- ICAR Field Progeny Testing Scheme -75per cent ICAR Share+ 25per cent State share (18 lakhs)
- AICRP on goat Improvement (Malabari) -75per cent ICAR Share +25per cent State share (11 lakhs)
- Characterization of Retinol Binding Protein 4 (Rbp4) Gene in Malabari and Attappady Black Goats of Kerala -KSCSTE - Fnancial Outlay 1 lakh
- Genetic Diversity Analysis among cattle genetic groups of Kerala using microsatellite markers KSCSTE - Financial Outlay 16.88 lakh
- Addressing the Production Challenges of Native Goat Breeds of Kerala through Genomic Approach – AHD- Financial Outlay- 17.6Lakhs

ii. Plan Projects

- Enhancing milk production potential of genetically superior cows through scientific intervention for producing better progenies" Plan project 2017-18 - 5 lakhs
- Popularisation of lntegrated Small Holder Rabbit Farming in Kerala- 26.25 lakhs
- Strengthening of "Centre for Advanced Studies in Animal Genetics & Breeding".- 4 lakhs
- Enhancing goat kid production to enhance the livelihood of farmers in Thrissur district- 3 Lakhs
- Establishment of a germplasm repository for domestic animal diversity of Kerala- 3 lakhs
- Conservation Centre for Vechur and Kasargode cattle- 43.75 lakhs

iii. Masters /Doctoral Research projects

MVSc

Anandakumar Ponnala	2018	Dr. Manoj M	Polymorphism of candidate genes in controlling temperament traits and their association on reproduction traits in vechur cattle
Prakash G	2018	Dr. Anilkumar K	Modelling of best fit lactation curve in crossbred cattle of Kerala
Changchup Dorjay	2018	Dr. Bindya Liz Abraham	Genetic variability of pituitary specific transcription factor-1 (POU1F1) gene and its association with growth and production traits in goats
Shalu Elizabeth Simon	2018	Dr. Radhika G	Double digest restriction associated DNA sequencing for identification of prolificacy related single nucleotide polymorphism markers in goats
Tina Sadan	2018	Dr. T. V. Aravindakshan	Rumen metagenome profiles and methane emission levels in Vechur and crossbred cattle under different dietary regimens

Major activities/Achievements

in ICAR- FPT scheme, 5163 inseminations were done using Frieswal semen (8.5per cent more than previous year) and 2183 pregnancies were confirmed (13per cent more than previous year). A total of 1270 calvings were reported and 623 female progenies were born. in 2017, 175 progenies reached first lactation and 150 progenies completed first lactation. Number of daughters which had completed first lactation has increased compared to last year and there was a substantial decrease in age at first calving of progenies.

in ICAR- AICRP sheme, total of 552 farmers have been registered including 376 women. 2098 adult female goats have been provided with insurance coverage under the project. Distributed 50 superior bucks to farmers for breeding. Population growth recorded was 88.30per cent. Genetic trend of body weights was positive for all age groups. Kidding rate was 1.69.As capacity building, 14 hands on training with 2 days duration to 155 farmers, 8 field trainings to 950 were organized.

By "addressing the Production Challenges of Native Goat Breeds of Kerala through Genomic Approach" project a panel breed discriminant genetic markers for Attappady Black and Malabari goats was developed. Selection signatures related to various production and reproductive traits in native goats of Kerala was identified. Potential genetic markers related to prolificacy trait in native goats were also determined.

By various plan projects of CASAGB,1) Feed and mineral mixture purchased and distributed to elite animals, Charts and leaflets prepared on scientific cattle rearing and distributed to farmers during training classes, Infertility / health camps conducted for milch animals. 2) More than 1500 numbers of parent stock rabbits were supplied to farmers. Technical knowhow and seed materials were provided to establish four satellite rabbit breeding farms among elite farmers. Purebred parent stock rabbits were also supplied to Animal husbandry farms at Kunnamkulam, Angamaly, Kuriottumala, Kodappanakunnu and KAU RARS station Ambalavayal. Three training sessions were conducted on rabbit production for entrepreneurs. 3)Supplied 10 breeding bucks to farmers of Pudukkad area of Thrissur district. Supplied feed supplements regularly (on every month) to each farmer (around 15 farmers). Conducted camps to control parasitic infections in goats. 4) Conducted training in the field of molecular genetics for future research and maintenance of a well-established laboratory with Molecular Genetics and Bioinformatics facilities. Development of Goat milk replacer and a Model medium goat shed for 20 goats for high rainfall area

Publications

- Shyma, K.T., Sankar, S., Aravindakshan, T. V., Krithika, K., Bosewell, A., Sarika, N. and Mini. M. 2018. Isolation and molecular detection of infectious bronchitis virus isolates from chicken. *Int. J. Curr. Microbiol. App. Sci.* 7: 2858-2866.
- Muhammed, E.M., Aravindakshan T.V., Maloney, S.K; Hawkins, N., Misselbrook, T.H., Sejian, V., Rivero, M.J. and Lee, M.R.F. 2018. Size does matter: Parallel

evolution of adaptive thermal tolerance and body size facilitates adaptation to climate change in domestic cattle. *Ecology and Evolution*, **8** (21): 10608-10620.

- Lakshmanan, B., Devada, K., Joseph, S., Gleeja, V. L., Aravindakshan, T. V., Himachala, K. and Sankar, S. 2018. Seroprevalence of bovine intestinal schistosomosis in different agro- ecological zones of south India using excretory-secretory antigen based ELISA. *Veterinary Parasitology*, 262: 51-55.
- Silpa, M.V; Naicy, T., Aravindakshan, T.V., Radhika, G., Boswell, A. Mini, M. 2018. Sirtuin3 (SIRT3) gene molecular characterization and SNP detection in 2 prolific and low prolific goats breeds. *Theriogenology*, doi: 10.1016/j.theriogenology. 2018.09.008.
- Jain, J.K., Lakshmanan, B., Wahlanga, L., Syamala K. and Aravindakshan T.V. 2018. Molecular evidence of haemoparasites in ixodid ticks of dogs- first report in India. *Veterinary Parasitology: Regional Studies and Reports*, 13: 177–179.
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- Jain, J.K., Lakshmanan, B., Hitaishi, V.N., Praveena, J.E., Syamala, K. and Aravindakshan, T.V. 2018. Detection of *Babesia canis vogeli. Babesia gibsoni* and *Ehrlichia canis* by multiplex PCR in naturally infected dogs in South India. *Veterinarshi Archiv*. **88** (2): 215-224.
- Shivakumara, P.N., Aravindakshan, T.V., Naicy, T., Anilkumar, K. and Uma, R. 2018. Molecular characterization and differential mRNA expression profiling of Toll-like receptor-2 gene in Vechur (*Bos indicus*) and crossbred (*Bos indicus* X *Bos taurus*) cattle of Kerala in response to anthrax vaccination. *Meta Gene*, 16: 15–20.
- Bosewell, A., Thomas, N., Aravindakshan, T.V. and Kurian, E 2018. Sequence characterization, structural analysis, SNP detection and expression profiling of SLC11A1 gene in Indian goats. *Small Ruminant Research.* https://doi.org/10.1016/j.smallrumres.2018.04.012

- Radhika, G; Aravindakshan, T.V; Jinty, S. and Ramya, K. 2018. Evaluation of Genetic Diversity, Population Structure, and Relationship Between Legendary Vechur Cattle and Crossbred Cattle of Kerala State, India, *Animal Biotechnology*, DOI: 10.1080/10495398.2017.1297719
- Vishnurahav, R.B., Ajithkumar, S., Usha, N.P; Madhvan, U.N; John, M.K.D. and Aravindakshan, T.V. 2018. Occurrence of cardiac diseases in dogs: A retrospective study. *J. Entomol. Zoo. Studies.* **6** (4): 1901-1903.
- Aparna, S., Radhika, G., Aravindakshan, T.V., Bindu, L. and Raghavan, K.C. 2018. Heritability estimation and the factors influencing resistance to gastrointestinal nematodes in goats. *Int. J. Sci. Environ. Tech*. **7**: 2011 – 2018.
- Anu, B., Aravindakshan, T. V., Radhika, G. and Jinty, S. 2018. Whole exome sequencing analysis of native dwarf cattle genetic groups of Kerala by next generation DNA sequencing. *Pharma Innov. J.* **7** (10): 131-135.
- Lali, F.A., Anilkumar, K and Aravindakshan, T.V. 2018. Novel SNP and Unique Sequences in ATP-binding Cassette Super Family-G Member-2 Transporter (*ABCG2*) Gene of Vechur cattle (*Bos indicus*). *Indian J. Anim. Res.* **52** (10): 1414-1415.
- Naicy T., Venkatachalapathy T., Aravindakshan T.V., Boswell, A and Silpa, M.V. 2018. Association of a SacII polymorphism in the NGF gene exon 3 with growth traits in Indian goats. *Small Ruminant Res.* **15**: 19-21.
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7. Centre for Animal Adaptation to Environment and Climate Change Studies

About the centre

About the centre: Foreseeing the risks the livestock sector would be facing in the changing climatic scenario, the Kerala Veterinary & Animal Sciences University (KVASU) has established 'Centre for Animal Adaptation to Environment and Climate Change Studies (CAADECCS) to excel in climate change education, research and extension in the field of Animal Agriculture under the Directorate of Academics and Research with ICAR special grant during XI Plan. The CAADECCS is the first of its kind among the State Veterinary Universities of the country which serves as the nodal agency dealing with research and capacity building on all the aspects of climate risk management in relation to animal agriculture including weather insurance and provide information to the planners/ policy makers for implementing strategies to mitigate the ill effects of climate change/variability

so as to sustain and enhance the rural livelihoods through livestock production and management.

Trainings conducted

- Officers of the Animal Husbandry Department attended classes in CAADECCS on climate change and Animal Husbandry as a part of their three months training programme
- Farmer seminars and interactive sections on monsoon management of cattle were conducted at Mannamangalam and Valakkav milk societies of Thrissur district on 04-07-2017 and on 05-10-2017 respectively. Eminent faculties from various departments of KVASU delivered lectures for progressive milk farmers.
- A farmer seminar was conducted on the topic management of cattle during summer season for the dairy farmers of Mannamangalam milk society on 27-02-2017

Research Activities

State Plan Projects

- Livestock Advisory based on weather forewarning: An amount of 5 lakhs has been given for providing livestock advisory services to farmers. The whole amount was spent for this purpose and also for improving the facilities of the centre for effective dissemination of information to the farmers. in collaboration with KAU weekly bulletins containing tips on animal husbandry practices being distributed to farmers of Thrissur, Palakkad and Ernakulam districts using messengers, online services like email and Whatsapp. Farmer interfaces have been arranged at different milk societies for discussing the solutions and the precautions to be taken by them to counteract the weather based problems faced by them.

- Maintaining, Strengthening & Refurbishing CAADECCS for Climate Change Preparedness in Livestock Sector:- An amount of Rs 2 lakhs has been given to CAADECCS for Establishment of meteorological observatory and other expenses. An amount of Rs.149430/- (Rupees one lakh forty nine thousand and four thirty only) from the total allotment for this project has been transferred to the account of Executive Engineer, ID wing for the preparation of land for surface observatory and also for fencing the identified area. The remaining amount (Rs. 50,570/- Rupees fifty thousand five hundred and seventy only) has been utilised for the general maintenance and also for the maintenance of the equipments (including AMC) of the centre

Masters /Doctoral Research projects:

- One Ph.D. student is on roll. The sixth semester is in progress. As a part of the Ph.D. research programme, Physiological monitor (AD Instruments, Australia) has been standardised to measure the physiological parameters of cattle
- Three students of B.Sc.-M.Sc. (Integrated) Climate Change Adaptation, ACCER, KAU completed their elective course in CAADECCS. and one among them currently doing research work under the guidance of Dr. S. Harikumar

Major activities/Achievements

- Best Paper Award for the paper entitled "Impact of heat stress on carcass traits, plasma leptin profile and skeletal muscle HSP70 gene expression pattern in Malabari goats" by P.R. Archana, V.Sejian, G. Krishnan,M.Bagath, W. Ruban,G.B. Manjunathareddy, V.Beena, Indira Devi P and R.Bhatta 2017. in: 9th Kerala Veterinary Science Congress organized by Indian Veterinary Association, held at Flora International Hotel, Nedumbassery Cochin, Kerala, India between11-12th November, 2017.
- Best Paper Award for the paper entitled "Impact of heat stress on meat quality as evidenced by changes in physico-chemical properties, proximate composition and organoleptic attributes in Malabari goats" by P.R. Archana, V.Sejian, W. Ruban, M.Bagath, G.Krishnan, G.B Manjunathareddy, V.Beena, Indira Devi P and R.Bhatta 2017. in:National seminar on Food Adequacy & Climate Change: Strategies for Sustainable Food Production organized by Association of Meat Scientists & Technologists and Kerala Veterinary & Animal Sciences University held at Thrissur, Kerala on 3rd and 4th November 2017.
- Best Poster presentation Award for the paper entitled "Assessing the physiological adaptability of Malabari goats when shifted from its native tract to different agroecological zone" by J. Aleena, V. Sejian, M. Bagath, G. Krishnan, G.B. Manjunathareddy, V. Beena, P. Indira Devi and Raghavendra Bhatta 2017. in: Association of Meat Scientists and Technologists Conference organized by Department of Meat Science and Technology held at Pattikad, Thrissur, Kerala, India between 3-4th November, 2017.

Publications

Articles Published in Research Journals

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- Archana, P. R., Sejian, V., Ruban, W., Bagath, M., Krishnan, G, Aleena, J., Manjunathareddy, G, B., Beena, V and Bhatta, R. 2018. Comparative assessment of heat stress induced changes in carcass traits, plasma leptin profile and skeletal muscle myostatin and HSP70 gene expression patterns between indigenous Osmanabadi and Salem Black goat breeds".2018. *Meat Sci*. doi.org/10.1016/j.meatsci.03.015.
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Books Published

- Prasada Rao G.S.L.H.V., Girish Varma G. and Beena V 2017 "Climate Resilient Animal Agriculture Livestock Meteorology New India Publishing Agency. New Delhi.544p (ISBN: 978-93-85516-87-0).
- Prasada Rao G.S.L.H.V., Girish Varma G. and Beena V 2018 New India Publishing Agency. New Delhi.462p (ISBN:978-93-86546-18-0)

8. Centre for Livestock Development and Policy Research, Thiruvananthapuram

About the centre

The centres organize capacity building programmes for the various stakeholders of livestock sector, such as farmers and extension workers. Organise exhibitions and seminars on behalf of the University. Conduct need based researches in different fields. Provide consultancy services for farmers and entrepreneurs and sell publications of the University on request. Act as an intermediary between the headquarters of University and the Government departments at the Secretariat, Thiruvananthapuram.

Trainings conducted

Sl No.	Title of training	Duration	Location
1	Training programme for University faculty on Research Methodology & Project Preparation	20-11-2017 to 24-11-2017	IMG Trivandrum
2	Training programme for Kudumbasree groups on Scientific goat rearing	21.08.2017	Athiyannoor Gram Panchayat
3	Training programme for Veterinary Officers on Skill in clinical competencies	16.08.2017 to 17.08.2017	KSVC Trivandrum

Research Activities

KVASU Research projects

Sl No.	Project Title	Financial Outlay	Funding agency	Investigators	Status (completed/ On-going)
1	Capacity Building programmes for various stakeholders of livestock sector	7 lakhs		Coordinator	Completed

2	Pattern of consumption of livestock products among adolescent people in Kerala	4 lakhs	State plan Project		

Publications

- George, A. Jacob, S. K. Dennison, E. P. 2017. Pattern of consumption of livestock products among adolescents in Kerala. International Journal of Rural Development, Environment and Health Research, 1(1): 93-96.

9. Centre for One Health Education Advocacy Research and Training, Pookode

About the centre

COHEART was established at KVASU in the year 2014 as per the decisions of the 10th Academic Council and 26th Board of Management. COHEART envision to be a Global Centre for Excellence in One Health Education, Advocacy, Research and Training. The centre aims to support in achieving sustainable health of man, animal and its surrounding environment through leadership, partnership, research and training in One Health domains. The objective of the centre is (1) *EDUCATION* of a new cadre of health professionals about One Health - the linkages between animal, human and environmental health. (2) *ADVOCACY* for collaboration as an encouragement for professionals to work together. (3) Conducting *RESEARCH* to understand the health threats and disease processes that occur at the interface of human and animal activities and their effects on the environment. and (4) *TRAINING AND CAPACITY BUILDING* to improve community's preparedness and response to hazards affecting man, animal and the environment.

Trainings conducted

- COHEART& Dept. of Veterinary Pharmacology and Toxicology jointly organized National workshop on "Ethics and welfare concerns in research for human and animal health" at Kerala Veterinary and Animal Sciences University, Pookode, Wayanad, Kerala on 15.09.17.
- College of Dairy Science and Technology, Pookode, Wayanad and COHEART jointly organized the World Milk Day celebration, on 1st June 2017. As part of the celebrations one day seminar was organized at Thariyode Dairy Co-operative.
- World Zoonoses Day 2017 was celebrated in benefiting manner at CVAS, Pookode by airing a documentary show on zoonoses organized by COHEART and IVA (Pookode unit). A 2 D animated video film on "Glimpses of Zoonotic Diseases" designed and developed by COHEART was shown to the participants.

- COHEART Co-organized one-week educational program from June 1 to 5, 2017 as a part of World Environment Day 2017 with the theme "Connecting People to Nature". The program comprised of wild life photography exhibition, essay competition, versification, poster making competition and other competitions coupled with seminar, campus cleaning activities etc
- World Veterinary Day Celebrations, 2017 was celebrated as a week long program from April 29th to May 5th, 2017 by Indian Veterinary Association, Pookode Unit, COHEART & Students Union, CVAS, Pookode. The program included Essay competition for BVSc & AH students on the topic "Antimicrobial Resistance in Veterinary Practice", Poster Making Competition and Technical session on Anti-Microbial resistance- Awareness
- To introduce "One Health" concept among school children an educational awareness programme was conducted on 11th August 2017 at GHS Pulinjal for students of class VIII, IX and X. Similar Educational programme on Health Hygiene and Diseases for School students was organized at RC High School, Chundale, Wayanad Orphanage HSS, CMS High School Arapetta, Government High School Thrikkaipetta, Wayanad Muslim Orphanage VHSS, St Joseph's GHS, Meppady, Sarvodaya HSS, Lourdu Matha HSS Pallikkunnu, GHS Kolathara, GHS Nellarachal, GHS Pariyaram, Model Residential School, Pookode. The sessions covered topics like personal hygiene, community hygiene, zoonotic diseases, food and water related infections and its preventive measures. A quiz programme to evaluate the take home message for students was also held after the session. School Educational programme was also held at Govt. Vocational Higher Secondary School Karimkutty, Govt High school Achoor, Wayanad, Govt high school, Vythiri, SKMJ higher secondary school, GHS Kakkavayal, GHS Munderi, Government High School, Panamkandy, Government High School, Kaniyampetta, Government High School Kurumbala, GHS Thariode
- COHEART Co-organized an educational initiative called INSIGHT at Kannur from 4-6TH April 2016 at Vellore Govt. HSS, Payannur, Kannur. This was a three-day residential camp for post SSLC students to create awareness on higher education prospects in the different field including Veterinary Science, Dairy Science, Food Technology, Food Safety and public health. Various eminent experts took motivational and success oriented sessions.

Research Activities

Kerala Govt. State Plan

- Epidemiology of common enteric zoonotic pathogens in Wayanad district.
- Education of farmers and students on good animal husbandry practices and control of health threats through 2 D infographic animation technology
- Interface program for knowledge transfer on latest technologies and innovations in Veterinary Science, Animal Husbandry and Public Health.

Major activities/Achievements

- Courses offered: PG Diploma in One Health, PG Certificate in One Health Surveillance and PG Certificate in Community based disaster management.
- Asian Regional spokesperson for One Health: Dr. Prejit was nominated as the Asian Regional spokesperson for One Health Day 2018 by One Health Commission, United States. The goal is to bring attention around the world to the need for One Health interactions. One Health Day is commemorated on November 3 and spokespersons duty is to propagate Indian Organizations and others in Asia to conduct activities to commemorate OH Day and this year there were good participation in Asian countries (Including India) to commemorate the One Health Day 2018
- PGDOH Dissertation work of Dr. Bibu John received Best Poster Award in the XVII Annual Conference of Indian Society of Veterinary Pharmacology and Toxicology held at Lala Lajpat Rai University of Veterinary and Animal Sciences, Haryana from Dec. 20-22, 2017. Dr. Bibu did the research work under the guidance of Dr. Usha PTA at Department of Veterinary Pharmacology and Toxicology, CVAS, Pookode
- The work done at COHEART on “ELISA-based evaluation of rabies antibody titre in veterinarians subjected to anti-rabies vaccination”, received best poster presentation award during Kerala Science Congress held on 28/01/2018.Dr. Hamna Hakim presented the paper. Dr. Hamna is PGDOH student of COHEART
- PGDOH Dissertation work of Dr. Sumanth Bedre received First Prize in poster competition for XVth Annual Conference of IAVPHS & National Symposium, on Intersectoral Approaches to combat zoonoses strategies and challenges held from 11th to 13th Oct. 2017 at Tirupati.

- Dr. Pankaj, PGDOH 2017-18 batch is recognized as a mentor under the pilot "International Student One Health Alliance- Mentorship Program" (ISOHA mentorship program). He is mentoring three international graduate students via distance learning mode
- COHEART participated in the workshop on Establishment of a South Asia (SA) One Health Disease Surveillance Network that was conducted from 11–13 December 2017 in Bangkok, Thailand. The workshop was organized by ECTAD, FAO-RAP in partnership with Ending Pandemics.
- COHEART faculty delivered a talk on (1) "Antimicrobial Resistance - from awareness to action" for the World veterinary day event organized by KGVOA on the 28thof April 2017 at Palakkad (2) "Prevention of Anti-microbial resistance- One Health Approach" for IVA-CVE program held on 3rd May 2017 at CVAS, Pookode (3) Importance of One Health Concept and Contribution of COHEART, KVASU' at Calicut in a CVE program that was organized by IVA (Calicut Unit) on 18/01/2018.
- Dr. Hamna Hakim received KSCSTE Springer Award during Kerala Science Congress held on 28/01/2018. This is received for the presentation of a COHEART project work for antibody titre estimation in veterinarians
- Dr. Savitha Rudrappa, PG Diploma student of One Health received Best Dissertation Award with a cash and citation. Her dissertation work was on "Occurrence of thermotolerant campylobacter in dogs in Thrissur, Kerala". The work was done at Dept. of Veterinary Public Health, CVAS, Mannuthy under the guidance of Dr. Bincy Mathew, Assistant Professor.
- Dr. Annie Navomi Philip, PGDOH student of COHEART is awarded with a 'Certificate of Merit' for International Essay competition conducted by Lloyd Law College as part of World Environment day. The essay submitted on the topic "Climate Change and One Health approach".

Publications

- Prejit. 2018. Development of A Novel Course and New Centre Dedicated to "One Health" to Support the Control of Zoonosis and Other Public Health Needs of the Country. *Journal of Foodborne and Zoonotic Diseases.* 18-22

- Annie Navomi Philip , Prejit, Asha K, Pratheesh P.T and Jess Vergis. 2018. Evaluation of the feasibility of OmpF proteins against Salmonella Typhimurium when used for vaccination trail in poultry model. *Indian Journal of Natural Sciences*. 15395-15401
- Nimisha Soman, Prejit, Pratheesh P. T, Mahesh, S. H. and V. K. Vinod. 2018. Cloning, Sequencing and in Silico Characterization of OmpF Protein of Salmonella Typhimurium for its ImmunePotential. *International Journal of Current Microbiology and Applied Sciences*. 7(5): 1991-2001
- Bojiraj Munisamy, Prejit, Praveena Sivanathan and Porteen Kannan. 2017. Knowledge Assessment through Surveying on Cattle Zoonotic Diseases in Dairy Farmers *Int. J. Curr. Microbiol. App. Sci* 2017 6(3)
- Mahesh S. H, Prejit, Vinod V. K, B. Sunil, Koshy John and Nimisha Soman. 2017. Prevalence and Molecular Characterization of Methicillin Resistant Staphylococcus aureus in Bovine Raw Milk and Beef Samples from Wayanad District of Kerala. *Indian J. Natural Sci.* 8(45)
- Sindhu K, Prejit and Sivan V. V. 2017. in vitro evaluation of polyherbal formulation (PHFM1) used in the treatment of sub clinical bovine mastitis. *Pharma Innov. J.* **6**(8): 407-411
- Jess Vergis, Sunil B., Prejit, Vinod V.K. and Asha K. 2017. Emerging Zoonoses- An Indian Perspective in Compendium of Training of Assistant Directors of Animal Husbandry. Vo. 2. 03/07/2017 to 03/10/2017
- Vinod, V. K. Prejit, Smitha. J. P and Asha. K. 2017. Quality Control of Milk. in Compendium of Training of Assistant Directors of Animal Husbandry. 2. 03/07/2017 to 03/10/2017
- Prejit, Asha K, Vinod V.K and Jess Vergis. K. Introducing The One Health Concept in Compendium of Training of Assistant Directors of Animal Husbandry. Vo. 2. 03/07/2017 to 03/10/2017
- Asha K, Prejit, Vinod V.K and Jess Vergis . Human–Animal Interaction and Its Importance in Compendium of Training of Assistant Directors of Animal Husbandry. Vo. 2. 03/07/2017 to 03/10/2017 2017
- Pratheesh PT, Prejit, Preethi Unnithan, Lincy KA and Vinod VK. 2017. Molecular Diagnostic Techniques for Detection of Zoonotic Diseases. in Compendium of Training of Assistant Directors of Animal Husbandry

- Preethi Unnithan, Prejit, Pratheesh P.T and Vinod V.K. 2017. Antimicrobial Resistance: A Global Threat. in Compendium of Training of Assistant Directors of Animal Husbandry. Vol. 2. 03/07/2017 to 03/10/2017 2017
- Book Chapter on "One Health- Vision for future" in: Veterinary Public Health: One Health, Edited by Sushovan Roy *et al*. 2017. New Delhi Publishers
- Smitha J.P, Preethi Unnithan, Prejit, Asha. K. Transboundary Diseases in Compendium of Training of Assistant Directors of Animal Husbandry. Vol. 2.
- Prejit, Asha K, Vinod V.K. Ethical consideration for one Health One Medicine. in: National Workshop On Ethics and welfare concerns in research for human and animal health- Sept. 15, 2017

10. Centre for Pig Production and Research, Mannuthy

About the centre

The major objective of the centre is to conduct research on different aspects of pig production, to operate as an instructional farm to students, to function as a demonstration unit to farmers, to maintain purebred nuclear stock of animals for supply of quality piglets to farmers. Centre also conserves indigenous Ankamali pigs, to evaluate the performance of indigenous animals and their crosses with exotic pig breeds.

ICAR funded All India Coordinated Research Project has been under operation since 1993 to evaluate the performance of indigenous pigs and their crosses with exotic breeds. Mega seed project on pigs funded by ICAR has started functioning since 2015. The strategic breeding programmes for more than two decades evolved a new crosbred variety of pig with remarkable disease resistance, heat tolerance, lean meat production and feed conversion efficiency. The new pig variety Mannuthy white, with better adaptability and growth rate was developed and released from this centre. The three breed crosses of pigs with better growth rate and lean meat are also produced and distributed to farmers for fattening purpose.

Training conducted

- Two farmers' trainings were conducted and a total of 40 participants were benefited
- Internship training to final year students

Research Activities

i. KVASU Research projects.

Name of Project	Financial outlay (lakhs)
Scaling up of production of piglings	53.36
Artificial insemination for improving reproductive efficiency in pigs	4.06
Conservation and maintenance of Ankamali pigs of Kerala	7.98
Effect of dietary supplementation of xylanase and B-glucanase on growth performance	9.50
Evaluation of performance of crossbred pigs (25per cent share of AICRP on pigs)	21.41
Effect of different levels of energy supplementation on breeding performance in gilts	10.00
Wastewater management for eco-friendly swine production	17.50
Strengthening of the Centre for Pig Production and Research	17.50
Total	**131.32**
EAPs	
AICRP on pigs (75per cent Share)	73.46
Mega seed project	57.98
Total	**131.38**

ii. Masters /Doctoral Research projects

- Dietary incorporation of cooked barley and spent grapes as energy source in LWY sows.
- A comprehensive approach for diagnosis of leptospirosis in domestic pigs.

Major activities/Achievements

The center has distributed more than 5500 piglets (breeding and fattening) to farmers and has generated over 2 crores internal revenue during 2017-18. The centre distributed 150 piglets to 60 tribal families in Malakkappara and Varandarappilly tribal colonies utilizing the recurring contingency of Rs. five lakhs each in the projects AICRP on Pigs and Mega seed (TSP Component).

11. Centre for Wildlife Studies, Pookode

About the centre

KVASU Centre for Wildlife Studies, Pookode, was established in 2011 as a multidisciplinary station of the University. Here, intramural veterinary, wildlife biology and molecular biology experts work with extramural multidisciplinary subject area experts to train students who are passionate about conservation, in a truly interdisciplinary manner. The Centre runs the Master of Science (Wildlife Studies) course open for all bioscience graduates since 2011. Thirty six students have completed the course since its inception. There are currently forty three students. The alumni work in various organizations like Wildlife Institute of India – Dehradun, Kerala Forest Research Institute – Peechi, SACON-Coimbatore, Kerala State Forest Department, UNDP *etc*. Others pursue PhD/higher studies at reputed universities like KVASU, IIITM-K, IISER, Central University of Kerala & Tamil Nadu *etc*. The priority of the Centre is training and empowerment of all bioscience graduates, including veterinarians, for conservation action and research. Many of the alumni are recipients of national and international awards like Young Scientist award of KFRI/KSBB and fellowships like INSPIRE, Young Woman Scientist Award of DST, CSIR JRF *etc*. The Centre is also involved in social outreach activities aimed at the empowerment of youth from tribal and other socio-economically backward communities of Wayanad as well as helping farmers suffering from human-wildlife conflict.

1. Research Activities

i. Masters /Doctoral Research projects

Phylogrouping and determination of antimicrobial resistance of Escherichia coli isolates from faeces of Sloth Bear (melursus ursinus) in Wayanad Wildlife Sanctuary reported the antibiotic susceptibility testing of E. coli isolates showed that all isolates were 100 per cent resistant to ciprofloxacin and clindamycin. Individual identification of conflict leopards, their diet composition and prey density were studied in South Wayanad Forest Division. The leopard scats contained hairs of nine species of animals. Among wild animals, the most predated one was Sambar Deer, followed by the Black-naped Hare, Barking Deer, Bonnet Macaque and Nilgiri Langur. Dogs, cattle and domestic cats were the domestic animals This showed that major diet composition of leopards in the South Wayand Forest Division composed of mainly wild animals.

KERALA VETERINARY AND ANIMAL SCIENCES UNIVERSITY

Pookode, Wayanad, Kerala