



# NDRI News

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## From the Director's Desk



*Dr. Trilochan Mohapatra, DG, ICAR  
planting sapling at Southern Campus of  
NDRI, Bangalore*



*NDRI student performing during  
Revirie-2K16*

With 160.35 million tonnes milk production in 2015-16, India enjoys the distinction of the highest milk producer across the globe amounting to 18.5% of the total milk produced in the world. This huge amount of milk is produced by around 298 million cattle and buffaloes, which constitutes 17.54% of the total world bovine population. In contrast, USA and New Zealand are producing 11.7 and 2.7% of milk from 9.47 and 1.1% of total world bovine population. On an average, the milk production/cow/year in countries like USA, Denmark, Sweden, Finland and the Netherlands is above 7500 kg whereas in India, the average milk production/cow/year is only 1200 kg. These figures eventually speak about the poor milk production per animal in the country along with other contributing factors. A well planned genetic improvement of dairy animals is the need of the hour to improve their productivity and production in the country.

In the past, efforts to implement systematic breed improvement programme in the country using progeny testing remained not so effective due to numerous constraints including limited infrastructure of organized herds, scattered small holding conditions, long generation intervals etc. The genetic improvement obtained with the traditional breeding programme is low. Recent developments in the field of gene biology have come up with the opportunity to identify animals of high genetic merit with high efficiency using Genomic Selection. India is blessed with a huge biodiversity of 40 indigenous cattle and 13 buffalo breeds, which have been selected over last hundreds of years for their suitability for specific purposes like milk producing ability, adaptability under heat stress conditions, efficient nutrient conversion ability, resistance against diseases and several other unique features. Adopting a Genomic Selection strategy will pave way for systematic and fast improvement of our indigenous livestock population. This promises to give a long term sustainable solution to about 70 million farmers of India for their livelihood and nutritional security.

Genomic selection programmes estimate a prediction equation in a reference population with genotype and phenotype data. This prediction equation can then be used to predict genomically estimated breeding values in animals without phenotype data. Thus, selection decisions in dairy cattle breeding can now be made on young animals with higher accuracy than that of a parent average breeding value. This has substantial implications for the design of breeding schemes, because rather than waiting until a bull has daughters with



phenotypic records, a process that typically takes 5–6 years, young bulls with no progeny can be used as sires. It is now envisaged that dairy cattle breeding organizations should consider replacing “conventional progeny-testing schemes” with “genomic selection breeding schemes”. Logically, now a simple four-pathway selection model for progeny testing with predicted accuracy of 0.75 and reduced generation intervals in the male pathways from 6–6.5 years down to 1.75 years is possible. Such genomic selection scheme results in an increase in response to selection by a factor of 2.17, compared with that in progeny testing. It has also been calculated that the costs of proving bulls could be reduced by 92%.

To start with a genomic selection scheme, the major challenge will be to record phenotypic values for traits of economic importance in a well-planned (and sufficiently large) reference population, which will ultimately dictate how efficiently we adopt a genomic selection breeding strategy. In view of the fact that availability of number of animals under organized institutional herds is only limited, we need to access the animal populations available with farmers. However, for maintaining the continuity of phenotypic recording, the identified animals need to be tagged with some unique identification device for its traceability. An active collaboration of research institutions, central and state level implementing agencies and other livestock development agencies will be required for this purpose.

Fabrication of Indian indigenous breed as well as buffalo specific SNP Genotyping Chip is also a priority. It will be imperative that exploring the genome of these indigenous breeds and searching for new SNPs will help in identification of root causes of defining how these animals are unique in existing production systems and prediction equations derived out of these SNPs will yield an association tool for long term use. Depending upon the strength of prediction parameters

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worked out, the next level of challenge will be to develop more than one variant of the SNP genotyping platforms to make them scientifically well justified as well as cost effective for use at different levels of screening the population and its use in the breeding programme. The other most important requirement is to recognize updating knowledge of existing human resources and exposing them to advance population genetic methodologies and international collaboration for exchanging knowledge and experiences.

Implementation of a well planned Genomic Selection programme in India will result in improvement in the genetic makeup of Indigenous breeds of cattle and buffaloes with resultant improvement in milk production. The plan can result in accelerating the annual genetic gain by a further 3-5 % of the current rate of progress. This in turn will boost the milk production by 1-2 % further every year. This programme is also expected to have a positive impact on the cattle population by paving the way for selection of breeding bulls, and in turn reducing the animal population by 4% every year while sustaining the growth in milk production, the much awaited goal of Indian dairy production

system. As a whole this is expected to enhance the overall milk production by 4.5%. The breeding bulls will be selected at an early age, without waiting for progeny records and they will be screened and culled for, if need be, against genetic diseases at the calf hood stage, thereby avoiding economic losses towards maintaining unproductive animals.

The recent initiatives of Government of India in this direction envisage many of the afore-mentioned steps for effective implementation through National Dairy Plan. The most crucial and key enabler will be concerted and convergent efforts from major scientific agencies like Indian Council of Agricultural Research, Department of Biotechnology, Department of Animal Husbandry, Research Institutes and development agencies like NDDDB, BAIF and State Government owned Livestock Development Boards. Let's understand each other's strength and make Genomic Selection of dairy animals possible in this country.

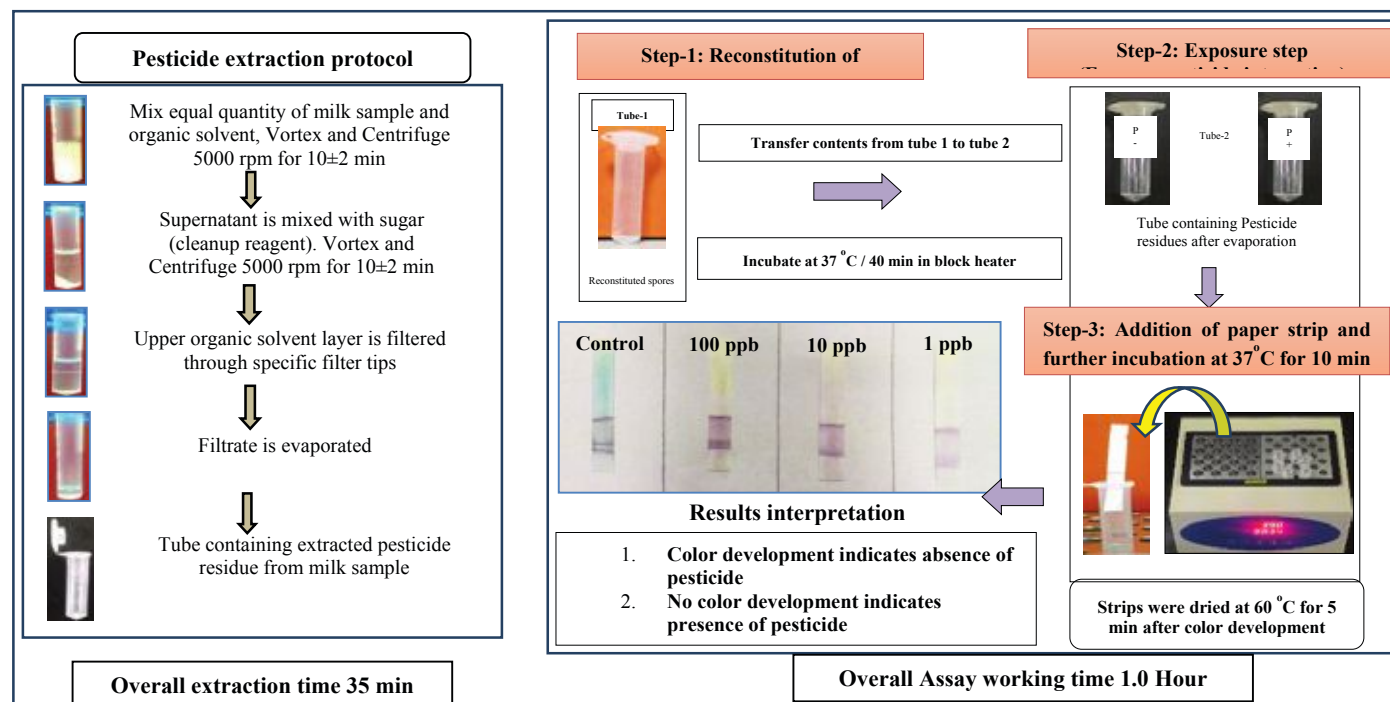
*A. K. Srivastava*  
(A. K. Srivastava)

## RESEARCH

### Spore enzyme Sensor on Paper Strip for Rapid Detection of Pesticide Residues in Milk

(Naresh Kumar, Nimisha Tehri, Rajesh Gopaul, Pradeep Kumar Sharma, Brijesh Kumar, Spurti Morab and Raghu H.V.)

Pesticides are well known carcinogens and their impact on human beings and presence in different food products including milk are well known. The existing conventional chromatographic methods (LC/GC-MS) are time-consuming and laborious. Currently, new standards for pesticides have been developed by FSSAI and implemented for regulatory compliance in different food products including milk. For routine monitoring of pesticides under field application, spore enzyme sensor on paper strip has been developed based on "**spore germination and enzyme inhibition principle**". In case where analyte i.e. pesticide is absent, specific marker enzyme (s) are produced by spores during germination which will act specifically on chromogenic substrate resulting in coloured end product on paper strip, whereas complete inhibition of marker enzyme will take place when pesticides are present in food sample. The developed sensor is a novel alternative IP and has been protected (Application no. 3819/ DEL/ 2015). Strip sensor is rapid, cost effective, reproducible, selective and sensitive to larger groups of pesticides at their regulatory limits. Sensor has been connected with milk successfully through novel extraction process and can be applied in dairy industry after its comprehensive validation.



## Production of Bioactive Peptides through Fermentation of Soy Aqueous Extract by *Lactobacilli*

(Brij Pal Singh and Shilpa Vij)

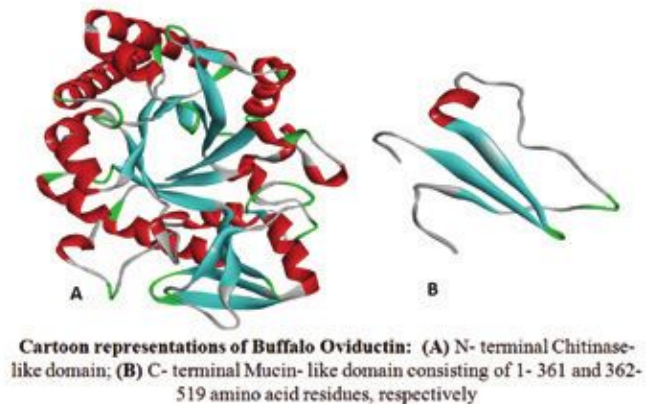
Bioactive peptides were generated from soy aqueous extract using seven *Lactobacillus* strains. All the cultures demonstrated ability to produce  $\alpha$ -Galactosidase, which is important for utilization of soy complex oligosaccharides and *Lactobacillus plantarum* C2 (LP C2) exhibited highest activity after 30h of fermentation. In addition, all the cultures reduced oligosaccharides significantly from the soy extract with fastest utilization of sucrose and raffinose while stachyose was utilized slowly. Highest proteolytic activity was shown by *Lactobacillus rhamnosus* C34 and NCDC 288. Antimicrobial activity was observed due to peptides produced by all the strains against food pathogens on soy extract fermentation with maximum activity by LP C2. This also showed highest antioxidant activity in addition to 73.986 % ACE Inhibitory activity. Therefore, LP C2 was selected for further study. Combination of factors, pH 7, 1% inoculum level, 1% sugar level and 30h of fermentation, was selected using Response Surface Methodology (RSM) for production of bioactive peptides. 10, 5 and 3 kDa fractions of bioactive peptides showed inhibition against food pathogens. About 136 peptides were identified from the 9 precursor soy proteins, majority by  $\beta$ -conglycinin, glycinin and lectin, with their reported bioactivities, antioxidant and ACE-Inhibitory. KP, VLP, DA, EG, SY, PQ, KE, QK, IE, FY, FR, VR, GR, VPP, PP, TF, YG, IAK, LAA, HHL, LA and VVPP were some common sequences found, they are well accepted as ACE-Inhibitors. In addition, peptides sequences KHH, HH, HL, LY, LHE, IR, PHA, SWN, PHI, KP, EL and LK were also found and identified as antioxidants. Thermal stability of bioactive peptides was observed up to 100°C. Peptides were stable in the presence of digestive enzymes. Bioactive peptides were stable at room as well as refrigeration temperature up to two weeks.

## Analysis of Three-Dimensional Structure of Buffalo Oviductin and its Binding Properties

(Suman Choudhary and A. K. Mohanty)

Oviductin is a high molecular weight oviduct-specific glycoprotein secreted by the non-ciliated epithelial cells of oviduct during estrous cycle and early pregnancy. It plays an important role during fertilization and early embryonic development. To understand its functional role, 3-Dimensional structure was determined by homology modeling. Oviductin has 2 domains namely chitinase-like domain and mucin-like domain. Model structures of both the domains were determined separately. The structures were built using various modeling programs and the model built by Modweb server was found to be highly optimal. The overall structure of the built model displays the typical fold found in other members of GH18 family which consists of a large  $(\beta/\alpha)_8$  TIM barrel domain and a small  $(\alpha+\beta)$  domain. Structural comparison of the built model with its structural homologues revealed some amino acid substitutions in substrate-binding groove and active site, changes in some loop conformations which were found to be conserved in other family members. Molecular docking of chitinase-like domain

model with its ligands revealed the role of different amino acids in various hydrophobic and polar interactions with sugar ligands. Ligand-binding was also confirmed through experimental fluorescence quenching assay where a significant quenching of fluorescence was observed upon ligand-binding with both native and recombinant oviductin.



## Camel Milk Beneficial under Type I Diabetic Conditions

(Sunita Meena, Y. S. Rajput, Rajan Sharma and Raghvendar Singh)

Research work conducted at NDRI, Karnal has established that physiological response to camel milk consumption in diseased condition differs to that from cow, buffalo and goat. Camel milk has distinct advantage in treating type I diabetes. This conclusion has been drawn after conducting studies on experimental rats which were first made type I diabetic after administration of streptozotocin and then subsequently offered milk from different species. Consumption of camel milk for one month impacted positively in reversing type I diabetes. The level of insulin, glucose and glycosylated haemoglobin in camel milk fed group to diabetic rats reached same level as noted for non-diabetic rats. This observation proved that camel milk is beneficial under type

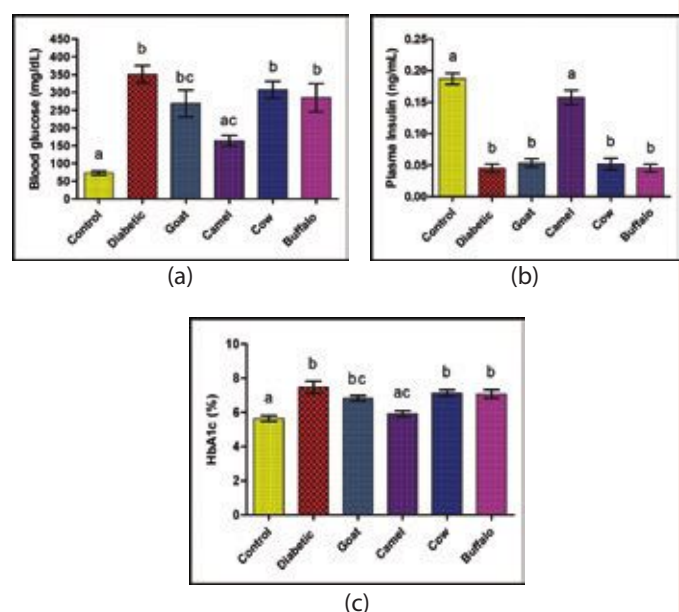


Fig: Effect of feeding of milk on the level of glucose, insulin and glycosylated haemoglobin



I diabetic conditions. Lipid profile and oxidative status under diabetic condition also change and camel milk has properties to reverse these changes. In fact, the level of oxidative damaged products viz. TBARS and protein carbonyls in pancreas of diabetic rats on consumption of camel milk became similar to levels noted in non-diabetic rats. Amongst diabetic patients, about 10% are type I diabetic while rests are & type II, diabetes.

## DAIRY DEVELOPMENT ACTIVITIES

### Trainings Programmes

- A training on "Milk and Milk Products Processing" was organized by BPD Unit for 17 participants during 21<sup>st</sup> – 30<sup>th</sup> April, 2016.
- Three training programmes on "Dairy and Food Processing" were organized by Dairy Technology Division for the participants of Lalukheri village, Muzaffarnagar during 18<sup>th</sup> – 28<sup>th</sup> April, 4<sup>th</sup> – 11<sup>th</sup> May and 6<sup>th</sup> – 10<sup>th</sup> June, 2016.

### Establishment of Dairy Processing Unit

A team of Scientists and Technical officer of Dairy Technology Division, NDRI visited KVK, Piprakothi, Motihari (Bihar) for the

establishment of Dairy Processing Unit under the aegis of Krishi evam Dairy Vikas Kendra. The Kendra will work for the benefit of farmers by imparting extensive training to the dairy farmers on dairy processing with backward and forward integration.



NDRI established dairy processing unit at KVK, Piprakothi, Motihari, Bihar

### Technologies Commercialized

During the period from April to June 2016, a total of 4 technologies were commercialized to four different industries. The details of the commercialized technologies are listed below.

S. No.	Name of the Technology	Inventors	Cost of the Technology (INR)	Date of Purchase	Firm
1.	A process for the preparation of low cholesterol ghee	Darshan Lal, Vivek Sharma, Raman Seth, Manoj Kumar and Amit Kumar	₹ 6.00 lakhs + 14.5% ST	06.04.2016	Sunrise Milk foods LLP, New Delhi
2.	Arjuna Herbal Ghee	Rajani Kant, G.R. Patil, R.R.B. Singh and A.A. Patel	₹ 1.50 lakhs + 14.5 % ST	23.05.2016	Hero Herbal Ghee & Dairy Research Products, Saharanpur, UP
3.	Exopolysaccharides producing lactic cultures for preparation of low-fat lassi	Pradip V Behare, Surajit Mandal, S. K. Tomar	₹ 1.00 lakhs + 15 % ST	08.06.2016	Renuka Milk and Dairy Product, Indore
4.	A process for the preparation of low cholesterol ghee	Darshan Lal, Vivek Sharma, Raman Seth, Manoj Kumar and Amit Kumar	₹ 6.00 lakhs + 15% ST	07.06.2016	Sri Vijaya Visakha Milk Producer's Company Limited – Visakha Dairy, Visakhapatnam
<b>Total Amount (INR)</b>			<b>₹ 14.50 Lakhs + ₹ 2,13,750 Service Tax = ₹ 16,63,750</b>		

S. No	Title of Patent	Inventors	Patent Application No.
<b>Patents Granted</b>			
1.	Spore germination based Detection Kit for $\beta$ -lactam group in milk.	Naresh Kumar, S. Das and Manju G.	Patent # 115/DEL/2009. Patent No. 273160 dated: 25/05/2016.
<b>Patents Filed</b>			
2.	Oil in Water Curcumin Nanoemulsion and Method of Preparation thereof	Bimlesh Mann, Rajan Sharma, Rajesh Bajaj, Pooja Waghmode and Ramesh Pothuraju	201611018434

## EVENTS

### Fourth Convocation of National Academy of Dairy Sciences (India) and a Seminar on Nutritional Security through Dairying

Fourth Convocation of National Academy of Dairy Sciences (India) and a Seminar on Nutritional Security through Dairying was organized on 6<sup>th</sup> April, 2016 at NDRI. Dr. P. D. Juyal, Vice Chancellor, Nanaji Deshmukh Veterinary Science University, Jabalpur inaugurated the function as chief guest and

Dr. H. Rahman, DDG (AS), ICAR was the guest of honour.

Dr. A. K. Srivastava said that malnutrition and undernourishment is affecting the health of the children and young mothers. He said that time has come to give emphasis on nutritional security of the population in the country. He expressed concern that 42% children below the age of 5 are underweight in India, which is much higher than Bangladesh (5%) and Pakistan (5%).

Dr. P. D. Juyal, Vice Chancellor, Nanaji Deshmukh Veterinary Science University, Jabalpur said that more than 70% of Indian population consume less than 50% of the recommended dietary allowances of micronutrients. He further said that 50% children under age of 3 years are under weight, 20% of them are severely malnourished. This deficiency will severely affect the productivity of this population in future.



*Dr. H. Rahman, DDG (AS), ICAR being conferred with fellowship of National Academy of Dairy Sciences*

Dr. H. Rahman, Deputy Director General (Animal Sciences), ICAR said that milk has an important role in curbing malnutrition. He said that milk accounts for 9.2% and 12.4% of protein intake in rural and urban areas, respectively. Further, milk an important source of Calcium, Magnesium, Potassium, Vitamin A, D and vitamin B12. Milk has many bioactive components which have been proven to have beneficial role in many life style diseases. On this occasion, 26 eminent dairy Scientists were felicitated with the fellowship of National Academy of Dairy Sciences (India). Further, 7 young scientists were elected as Associate Fellows of the Academy. Dr. R. K. Maik, Joint Director (Research) and Secretary of the Academy said that the Academy is a think tank in the area of dairying and its fellows are providing valuable suggestion in making policy papers.

### Inter-University Youth Festival (Reverie - 2K16)

Inter-University Youth Festival (Reverie - 2K16) was organised at NDRI Karnal from 11<sup>th</sup> – 13<sup>th</sup> April, 2016. Dr. Trilochan Mohapatra, Secretary (DARE) and Director General (Indian Council of



*Dr. Trilochan Mohapatra, Secretary (DARE) and DG, ICAR inaugurating Inter-University Youth Festival (Reverie 2016) at NDRI*

Agricultural Research) gave the valedictory address and gave away the awards to the winner. Dr. Mohapatra advised students to take part in extracurricular activities as it helps in shaping their personality. He said that apart from being fun, such activities are one of the way to socialize with peers and can enhance students' time management and act as stress busters.

Five universities participated in the youth festival and about 150 students took part in various activities which included theater,



singing, dance, music, literary and fine arts, Quiz, skit. Mime etc.

Overall championship trophy of this event was presented to NDRI, Karnal and Indian Veterinary Research Institute (IVRI), Izzatnagar.

### ICAR-Inter-Institutional Sports Tournament - 2016

ICAR Inter-Institutional Sports Tournament-2016 was held at NDRI, Karnal. In this tournament, more than 900 players (including more than 50 women) from 24 ICAR affiliated Institutes participated in various events from 16<sup>th</sup>-19<sup>th</sup> April, 2016. Sh. Pankaj Nain, IAS, Superintendent of Police, Karnal inaugurated the event. He said that participation in organized sports reduces anxiety and depression, and enhances self-esteem and thus will enhance the productivity of an organization. Prof. A. K. Srivastava, Director & Vice Chancellor of NDRI, Karnal hoisted the flag and affirmed that participation of such a large number of players would also enhance social interaction among staff of various Institutes for inculcating team spirit. There were seven team events including Football, Volleyball Shooting & Smashing, Basketball, Badminton, Table Tennis and Kabaadi. Apart from this, other sports such as Chess, Carom and a large number of various athletic events were also organised.



*Dr. A. K. Srivastava, Director NDRI inaugurating ICAR-Inter Institutional Sports Tournament by hoisting sports flag*



## World Health Day

Special lectures were organized on the occasion of "World Health Day" at NDRI, Karnal on 7<sup>th</sup> April, 2016. The theme of the day in 2016 was "Beat Diabetes". The main aim was to increase awareness about rise in diabetes, its consequences and also to suggest the effective and affordable action to prevent diabetes. On this occasion, Director and Vice Chancellor, NDRI also addressed the scientists.

It was advised that through diet management and regular exercise or through change in the life style, the risk of developing diabetes can be controlled. Scientific data confirms that milk and milk products have their effective role in beating diabetes. On the occasion, Dr. Sunita Grover, Head, Dairy Microbiology Division talked about role of gut microbiota in management of diabetes and Dr Sumit Arora, Principal Scientist, Dairy Chemistry Division delivered lecture on artificial sweeteners used in dairy products and their safety and stability issues.

## Lecture Series on Nutritional Pharmacology

Dr. Trilochan Mohapatra, Secretary, Department of Agricultural Research and Education (DARE) and Director General, Indian Council of Agricultural Research (ICAR) inaugurated a series of lectures on Nutritional Pharmacology at NDRI, Karnal on 6<sup>th</sup> April, 2016. These lectures were organized under the aegis of National Academy of Dairy Sciences, India (NADSI). Dr. Mohapatra released an emblem of the Academy. While addressing the Scientists and Fellows of NADSI, he said that although the initiative for the dairy development in the country was taken up under the leadership of Dr. Verghese Kurien, the recent stride in milk production is mainly because of the quality manpower produced by Institutes like NDRI. He also emphasized that development of science leads to development of technology and technology led development and policies can only take India forward towards self-sufficiency. He motivated the scientists to solve the problems of dairy farmers and dairy industries through technology driven approach. On this occasion, Dr. A. K. Srivastava, Director and Vice-Chancellor, NDRI informed that the mission of the Academy is to achieve recognition as a credible think tank, providing views on the policy issues relating to promotion of the scientific and technological talents and to encourage and promote the pursuit of excellence in the field of Dairy Science. Within a short span of 5 years, Academy has published many policy papers to address the issues linked with dairy business.

The first lecture in this Nutritional Pharmacology series was delivered by Dr. S. P. S. Saini, Professor, Guru Angad Dev Veterinary and Animal Sciences University (GADVASU) on the Pharmacodynamics & pharmacokinetics of iron wherein he discussed the iron intake vis-a-vis iron deficiencies in Indian population.

## World Veterinary Week

World Veterinary Week - 2016 was celebrated from 23<sup>rd</sup>- 30<sup>th</sup> April, 2016 at NDRI, Karnal. The focus of this programme was animal health and production and to publicize the importance of livestock and livestock products in socio-economy of rural India. A series of lectures, veterinary camps, exposure visits to students of other colleges in Karnal and several competitive events including extempore debates were organized.

This year the theme chosen was "Continuing Education with a one Health focus". Speaking on this occasion, Dr. Suresh S.

Honnappagol, Animal Husbandry Commissioner, Government of India highlighted the role of the veterinarian who ensures that animal products such as meat, dairy products and egg come from healthy animals and are disease free, free from contamination and therefore, safe for human consumption.

Dr. A. K. Srivastava, Director and Vice-Chancellor, NDRI informed that there are 1407 pathogens, out of which 816 originate from the animals. In the last decade, 70-75% of the infected diseases of human originated from the animals. He specifically spoke about the recent developments in an economically important zoonotic disease "Brucellosis" which is affecting about 5% cattle and 3% buffaloes in India. The disease is affecting farmers as it causes 100% abortion, 60% repeat breeding and 10% retained placenta in infected animals. He stressed the importance of creating awareness among the farmers, veterinarians, para-veterinarians and animal handlers about this deadly zoonotic disease. In spite of the fact that a single vaccination against the disease is sufficient to impart lifelong immunity, farmers are not properly practicing vaccination against Brucellosis. He also elaborated how this disease affects human being and what are the therapeutic and control measures. He also requested all the veterinarians to work for control of the disease through active collaboration with all the stakeholders. A total number of 140 participants including scientists, veterinarians and students attended the programme.

## Training Programme on Project Formulation on Climate Change Mitigation and Adaptation

Division of Dairy Economics, Statistics and Management, NDRI, Karnal in collaboration with Bankers Institute of Rural Development, Lucknow organized a training programme sponsored by NABARD on "Project Formulation on Climate Change Mitigation and Adaptation" from 27<sup>th</sup> June to 1<sup>st</sup> July 2016. A total number of 28 participants from various parts of the country attended the training. The purpose of the programme was to impart basic expertise to the NGOs and State Government Officials for preparing and submitting projects under the National Adaptation Fund for Climate Change (NAFCC) and the Green Climate Fund (GCF). Government of India has established NAFCC with the objective of assisting the States and Union Territories that are vulnerable to adverse effects of Climate Change, in meeting the cost of adaptation. The focus of the fund is to assist adaptation projects and programmes that involve concrete adaptation activities aimed at reducing the effects of climate change faced by the communities and sectors. The GCF within the framework of the UNFCCC, founded as a mechanism to assist developing countries in adaptation and mitigation practices to counter climate change will also support projects, programmes in the public and private sectors that contribute to achieving at least one of the eight strategic impacts of the fund. In view of the Climate Change challenges being faced by us, it is important to understand the investment framework, proposal approval process, results management framework and process of preparing and submitting concept notes/proposals under NAFCC and GCF. On 27<sup>th</sup> June 2016, there was registration, inauguration and icebreaking brief about NDRI and DESM activities which was Chaired by Dr. R. K. Malik, Joint Director (Res.), NDRI, Karnal.

NABARD has been appointed as National Implementing Entity (NIE) and is responsible for implementation of adaptation projects under the NAFCC. Keeping this in view, an exclusive programme on "Project Formulation - Climate Change Mitigation and Adaptation for" has been planned for the State Government Officials and NGOs involved in various sectors.

### An Awareness Programme on Pulse Production for Nutritional Security

An awareness programme for a group of agricultural graduates, farmers, NGO and YPARD, India workers & scientists on "Pulse Production for Nutritional Security" was organized at NDRI, Karnal on 24<sup>th</sup> June, 2016. In this programme, the participants were given awareness and importance of pulse production on global level. The present situation of pulse production in India, price trends, per capita availability and strategies for pulse production were discussed in this programme. Pulse production helps to improve soil health and nutritional security of the population especially for vegetarian people. After that a field visit was organised at Trawadi, the village of the Karnal District to show the crops of legumes in fields of YPARD member and volunteer that supports small-scale farmers to generate incomes through pulse production and marketing. NDRI Scientist Dr. Gopal Sankhala and progressive farmer Mr. Vikas Choudhary explained the participants/delegates about cultivation practices of summer Moong (*vigna radiata*) & Daincha (*sesbania sesban*) and its nutritional values in human life and animal feed followed by soil health.

### VISITS ABROAD

**Dr. T. K. Datta**, Principal Scientist, Animal Biotechnology Centre was deputed to attend "Livegene Program Strategic Review and Planning Meeting" at ILRI, Nairobi, Kenya from 16<sup>th</sup> – 17<sup>th</sup> May, 2016.

**Mr. Vaibhao Lule Patil** presented paper entitled "Zinc Enrichment of *Lactobacillus pp.* and Assessment of its Bioavailability in Caco-2 Cell Culture Model: New Biological Approach with Improved Bioavailability" at International Conference on "Beneficial Microbes: Microbes for the Benefit of Mankind" 2016 from 31<sup>st</sup> May - 2<sup>nd</sup> June 2016, Heldin Phuket, Thailand.

### DISTINGUISHED VISITORS

**Delegation of Nepal:** A delegation of Nepal Agriculture Research Council, Nepal visited NDRI, Karnal on 17<sup>th</sup> June, 2016.

The objective of the visit of high level delegation to NDRI was to understand the functioning of the NDRI and its relationship with ICAR and other organizations. The delegation interacted with the Director and other Senior Faculty members of the Institute. They also visited different research facilities in the Institute. They took keen interest in the academic programmes being run at this Institute. The delegation expressed its desire to train its manpower in different areas of Dairy Production and Dairy Processing of NDRI, Karnal.

**Ethiopian Delegation:** A high level 12 member delegation led by HE Dr. Mebrahtu Meles Gebru, State Minister, Ministry of Industry, Government of Ethiopia visited NDRI on 6<sup>th</sup> June, 2016 to take preliminary assessment and share experiences for developing the visit into twinning partnership/programmes. The delegation spent whole of the day visiting different facilities including Artificial Breeding Research Centre at NDRI. They also interacted with the Director and other Faculty Members of the Institute.

### AWARDS

- **Education Leadership Award** was given to NDRI, Karnal during World "Education Congress" organised on 23<sup>rd</sup> June, 2016 in Mumbai. The award was received by Dr. R. K. Malik, Joint Director (Research), NDRI Karnal.



- **Dr. A.K. Srivastava**, Director, NDRI was awarded **100 Most Influential Directors of India (Education) Award** by World Education Congress 2016 held on 23<sup>rd</sup> June 2016 at Hotel Taj Land End, Mumbai.

## PERSONALIA



### Joining/Appointments

- **Dr. K. P. Ramesha**, Principal Scientist was appointed to the post of Head, Southern Campus of NDRI, Bangalore w.e.f. 13.4.2016.
- **Dr. Brajendra Singh Meena**, Sr. Scientist, Dairy Extension promoted to the post of Principal Scientist w.e.f. 19.11.2014.
- **Sh. Kamal Gandhi** joined his duties as Scientist (Dairy Chemistry) on 01.4.2016.
- **Sh. Ankit Deep** joined his duties as Scientist (Agricultural Process Engineering) on 11.4.2016.
- **Sh. Manoj Kumar C.T.** joined his duties as Scientist (Dairy Technology) on 11.4.2016.
- **Dr. (Ms) Sangita Ganguly** joined her duties as Scientist, (Dairy Technology) on 11.4.2016.

- **Dr. (Ms) Heena Sharma** joined her duties as Scientist (Livestock Products Technology) on 11.4.2016.

## Retirements/Relieving

- **Sh. S. George**, Comptroller, relieved from NDRI to join at ICAR-National Academy of Agricultural Research Management, Hyderabad on 13.6.2016.

- **Sh. D. D. Verma** joined his duties as Comptroller at ICAR-NDRI Karnal after his transfer from NAARM Hyderabad on 13.6.2016.
- **Dr. Khajan Singh**, Principal Scientist and Head Dairy Extension retired from the Council's services w.e.f. 30.6.2016.
- **Sh. R. K. Bansal**, Admn. Officer retired from the Council's services w.e.f. 30.6.2016.



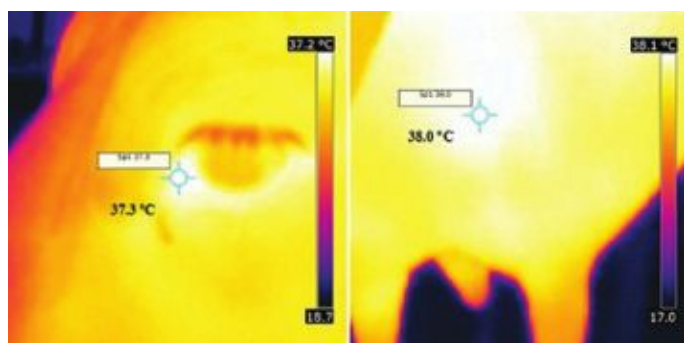
## SOUTHERN CAMPUS, BANGALORE

### RESEARCH

#### Infrared Thermography Technology for Early Detection of Subclinical and Clinical Mastitis Condition in Crossbred Cows – A Case Study

*(M. Sathiyabarathi, S. Jeyakumar, Heartwin A. Pushpadass, A. Kumaresan, S. S. Lathwal, A. Manimaran and M. Sivaram)*

Increasing dairy farm size and automation in dairy herd management require new methods and technologies to monitor udder health status in dairy cows. Studies were conducted to evaluate the ability of infrared thermography (IRT) technique for the early detection of mastitis. A total of 200 quarters of lactating Karan Fries (Holstein Friesian × Tharparkar) crossbred cows (n=50) were monitored for body temperature (i.e. eye temperature) and udder skin surface temperature (USST) prior to milking using FLIR i5 (forward-looking infrared) camera. Milk samples were collected from each quarter and screened for mastitis using Somatic Cell Count (SCC), Electrical Conductivity (EC) and California Mastitis Test (CMT). Thermographic images were analyzed by using FLIR Quick Report 1.2. Data on body and USST were compiled and analyzed statistically using SPSS 16.0. In the present study incidence and early detection of subclinical and clinical mastitis was successfully detected in eleven quarters out of 200 udder quarters screened by IRT technology and the diagnostic reliability was also well correlated with other mastitis indicators viz. SCC, CMT and EC. Therefore, it is suggested that infrared thermal imaging technology could be used as a potential non-invasive, quick cow-side diagnostic technique for screening and early detection of subclinical and clinical mastitis in crossbred cows and has potential application in precision dairying.



*Infrared thermogram of eye and mastitis affected udder quarter surface*

### Training Programmes

- Seven students from St. Aloysius College, Mangalore undertook project work in Dairy Technology, Dairy Chemistry and Dairy Engineering Section for period of two months from May to July 2016.
- Five students from Mar Athanasios College for Advanced Studies (MACFAST) Tiruvalla, Kerala undertook project work for period of three months from 4<sup>th</sup> April to 3<sup>rd</sup> July, 2016.
- Five students of College of Agricultural Engineering, Madaksira, Ananthpur District, Andhra Pradesh underwent In-plant Training at our Institute for a period of four month from 16<sup>th</sup> June to 15<sup>th</sup> October, 2016.
- Eleven B.Tech Students of Dept. of Farm Machinery & Power, Dr. Annasaheb Shinde College of Agricultural Engineering, Mahathma Phule Krishi Vidyapeeth, Rahuri Dist. Ahmednagar, Maharashtra were imparted Summer Training for period of one month from 1<sup>st</sup> – 30<sup>th</sup> June, 2016.
- Livestock Research Centre of SRS of NDRI, Bangalore successfully conducted three days training programme on "Cattle Rearing and Livestock Management" for 100 field veterinary extension officers of Department of Animal Husbandry, Tamil Nadu sponsored by SAMETI-ATMA from 9<sup>th</sup> May to 1<sup>st</sup> June, 2016. The training was conducted in five batches consisting 20 trainees per batch. The training was organized by Dr. S. Jeyakumar as Course Director and the Veterinary Assistant Surgeons from different district of Tamil Nadu participated. They were imparted training on recent advances in dairy animal management.

### EXTENSION ACTIVITIES

#### Visitors/Advisory Services

A total number of 227 visitors in 6 batches comprising students from various educational institutes and entrepreneurs of Southern Region visited the institute. The visitors were taken to various sections of the station as per their needs and they were explained about the ongoing research and extension activities. Advisory services/technical advice was rendered to seven of the needy clientele during personal visits to the institute and mail enquires / phone queries on information regarding transferrable technologies for field extension personnel and dairy farmers, training programmes on commercial dairy farming, indigenous



dairy products, guidance to set-up a new dairy farm and short-term training programme for students.

### Dairy Education at Farmers' Door

The 'Dairy Education at Farmers' Door' as a new initiative was organized and visits were made by the multidisciplinary team on Second Saturdays to villages viz., Kottur and Kimmannahalli, Varthur Taluk, Bangalore South and visited individual households and interacted with the farmers regarding dairy farm management and the problems faced in dairy farming. Necessary technical advice was provided on various aspects of scientific dairy farming, green fodder production, clean milk production and dairy animal management aspects to the farmers and farm women at their doorsteps.

### Farmers' Exposure Training

An Exposure cum Training programme was organised for two batches of farmers and farmwomen of 20 nos. each from Coimbatore and Theni Districts of Tamilnadu, under 'Support to State Extension Programmes for Extension Reforms' (SSEPERs) under Agricultural Technology Management Agency (ATMA) scheme. The trainees were made aware of technical know-how of scientific dairy farming aspects in breeding, feeding and healthcare aspects by lecture / presentations, farm/dairy plant visits; with special emphasis on clean milk production, a demonstration session of machine milking and recommended package of practices on clean milk production was organised for the benefit of farmer trainees. Exposure/Field visits were organised to Model Integrated Farming system, GKVK, Farmer's Model Integrated Farm and KVK, Doddaballapura; visit to mega dairy and Nandhini Milk Products plant of KMF for updation of innovative aspects on dairy farming and processing.

## EVENTS

### 94<sup>th</sup> Foundation Day Celebrations

NDRI celebrated its 94<sup>th</sup> Foundation Day on 1<sup>st</sup> July at its Southern Campus, Bangalore. The Foundation Day Celebration began with paying tributes to Father of the Nation Mahatma Gandhi by the dignitaries. Justice Rama Jois, Former Chief Justice of Punjab & Harayana, High Court, Former Governor of Jharkhand & Bihar, Former Member of Parliament (Rajya Sabha) was the Chief Guest. Dr. S. Abdul Rahman, President, Common Wealth Veterinary Association was the Guest of Honour and Dr. R. K. Mallik, Joint Director (Research), NDRI, presided over the function.

About 270 participants including guests, Alumni of NDRI, staff & students of Southern Campus of NDRI and staff of other ICAR institutes attended the function. Justice Rama Jois emphasized the importance of indigenous cattle for rural prosperity. Dr. S. Rahman emphasized that NDRI is playing a catalytic role in providing technologies for quality milk production and processing towards fulfilling animal protein requirement for alleviating poverty and hunger of the people. Dr. R. K. Malik narrated the role played by NDRI for several decades for the dairy sector in the country. He also informed that this historical Institute witnessed the presence of leaders of Nation like Mahatma Gandhiji and Madan Mohan Malaviyaji to acquaint with cow rearing. This Institute has played key role in dairy education in the country and produced many great personalities in dairy industry including Dr. Verghese Kurien,

Sh. D. N. Khurody and many more.

The first session of Brain storming on "Scope of Indigenous breeds of cattle towards sustainable production and livelihood in the current climate change scenario" was chaired by Dr. R. Nagarcenkar, Former DDG (AS & Edu.) ICAR, New Delhi and Former Director, NDRI, Karnal. Two eminent personalities in the field of Animal Genetics and Breeding viz., Dr. V. Prabhakara Rao, Former Vice-chancellor, SVVU, Tirupathi and Dr. P. Thangaraju, Former Vice-chancellor TANUVAS, Chennai delivered lectures on the topics of "Status and contribution of indigenous cattle breeds towards sustainable production and livelihood with special reference to Southern India" and "Strategies for improvement of indigenous breeds of cattle towards sustainable production and livelihood under climate change scenario", respectively in the session.

The second session of the Brain Storming session was chaired by Dr. V. Prabhakara Rao. The panelists emphasized the urgent need for genetic improvement of native breeds of cattle, organic milk production, A2 milk production, conservation of indigenous cattle and scientific validation of utilization of cow produce including dung and urine for treatment purpose. Detailed discussions on strategies for development of indigenous cattle towards sustainable production and livelihood under climate change scenario was held wherein progressive farmers actively participated. The plenary cum valedictory session was chaired by Dr. R. K. Mallik, Joint Director (Res), NDRI. The following recommendations emerged from the brain storming session:

- Data recording in farms and farmers' herds and pure breeding of native breeds are absolutely required.
- Breed evaluation and genetic improvement programmes for propagation and enhancement of productivity of indigenous cattle and A2 milk production in a sustainable manner to be taken up on priority. Formation of Indigenous Cattle Breeders' Association be encouraged.
- Sire evaluation through breed wise progeny testing programme along with genomic selection should be taken up.
- Fodder development, Animal welfare and Insurance for the benefit of cattle rearers need have to be addressed adequately.
- Centre for excellence for improvement of indigenous cattle be established at Southern Campus of NDRI, Bangalore for effective implementation of programme for the development of indigenous cattle in Southern India.

### Industry Meet

An Institute – Industry Meet was organized at Southern Campus of NDRI, Bangalore on 21<sup>st</sup> April, 2016 for a Brainstorming Session on "Composite Dairy Foods". Scientists of NDRI and 45 representatives of more than 15 industries interacted in the Meet. The industries participants included KMF, ITC, Britannia Industries, ABT Industries, MTR Foods Pvt Ltd., Parag Milk Foods, Hatsun Agro Products Ltd., Danone Nutricia India, Aavin, Tetrapak India Ltd., Milky Mist Dairy Food Pvt Ltd. and other industries including food consultants. The Brainstorming Session was inaugurated by Sri M. Balasubramaniam, Chairman of ABT Industries Ltd., Coimbatore

and the programme was presided over by Dr. R. K. Malik, Joint Director (Res) and Dr. R. R. B. Singh, Joint Director (Academic), NDRI, Karnal was the Guest of Honour. A booklet consisting of technologies developed by NDRI, Karnal was released on this occasion. It was commonly agreed that composite dairy foods, which are the foods made with dairy and non-dairy ingredients, could be used as vehicles to supplement and complement the dairy foods. The scientists presented various technologies developed by NDRI and some representatives from Industries also presented their perspective of composite dairy foods. The participants expressed that technologies being developed were no doubt useful to the industry but their regulatory aspects have also to be addressed simultaneously. However, after discussion, it was felt that the regulatory aspects of the products developed have to be pursued with FSSAI by the party concerned who adopt the technology for commercialization. Dr. R. R. B. Singh suggested that Industry should make use of provision of Technology Business Incubator facility at NDRI, Karnal. Dr. R. K. Malik expressed satisfaction at the response of the industry and emphasized the need to organize such Institute – industry interactive meet regularly.



*A booklet consisting of technologies developed being released during Industry Meet*

## International Yoga Day

Staff and students of the Southern Campus practiced Yoga coinciding the International Yoga Day on 21<sup>st</sup> June, 2016. A noted Yoga teacher, Shri B. D. Karanth was invited for the function. Shri Karanth made a brief presentation highlighting the importance of yoga in human life. The presentation was followed by practice of

a few yogic exercises by staff and students.

## Visit of Dr. Trilochan Mohapatra, Hon'ble Secretary (DARE) and Director General (ICAR), New Delhi

Dr. T. Mohapatra, Hon'ble Secretary (DARE) and Director General (ICAR) New Delhi visited Southern Campus of ICAR-NDRI, Bangalore on 19<sup>th</sup> May, 2016. Dr. Mohapatra laid Foundation Stone for the proposed 'Krishna Wing of Hostel' at the premises of the Students Hostel in the presence of Dr. H. Rahman, Deputy Director General (Animal Sciences) ICAR, New Delhi and Dr. A. K. Srivastava, Director & Vice-Chancellor, ICAR-NDRI Karnal. Dr. Mohapatra and other dignitaries then visited the Livestock Research Centre of the Campus and observed Deoni & Malnad Gidda breeds of indigenous cattle and Holstein Friesian crossbred cattle. Dr. Mohapatra addressed the scientists and students of Southern Campus of NDRI, Bangalore. Dr. Mohapatra particularly advised the students to be vigilant of their rights and equally be mindful of the responsibilities as well. Dr. A. K. Srivastava, Director, ICAR-NDRI felicitated Dr. T. Mohapatra and Dr. H. Rahman on their maiden visit to the Campus.



*Dr. Trilochan Mohapatra, DG, ICAR laid foundation stone for proposed Krishna Wing of Hostel at Southern Campus of NDRI*

## Visit of Hon'ble Shri Sunil Shastri on 22<sup>nd</sup> July 2016

Shri Sunil Shastri, Former Member of Parliament (Rajya Sabha) and Former Minister, Uttara Pradesh, visited Southern Campus of NDRI, Bangalore on 22<sup>nd</sup> July, 2016. He appreciated the research work carried out on indigenous cattle at Southern Campus of NDRI, Bangalore.

# EASTERN CAMPUS, KALYANI

## RESEARCH

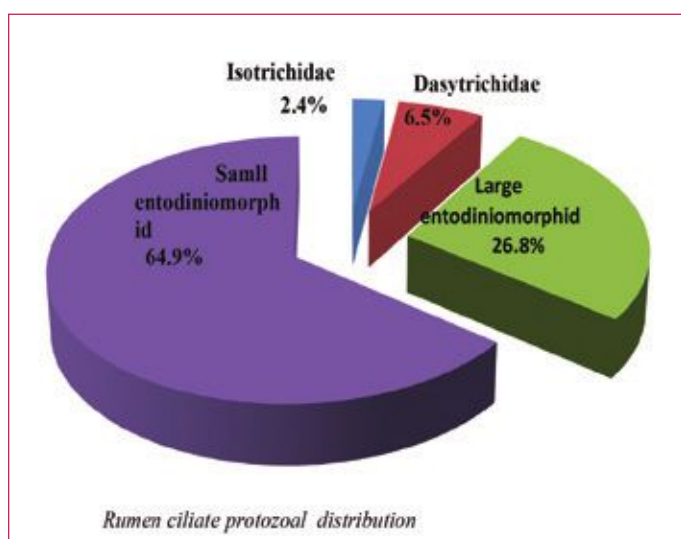
### Effect of Some Eastern Himalayan Tree Leaves on Rumen Ciliate Protozoal Population *In Vitro*

*(M. Lotha, A. Santra, S. K. Das and T. K. Dutta)*

Manipulation of rumen microbial ecosystem for reducing ruminal methane production and ciliate protozoal population for efficient utilization of dietary energy and protein is the useful strategy

to improve production efficiency of ruminant animals. North-eastern part of India possesses wide variety of tree leaves which are not yet tested to observe their effect on rumen protozoal population. Eight tree leaves e.g., Agar (*Aquilaria agallocha*), Sonal (*Cassia fistula*), Polita mother (*Erythrina variegata*), Glyricidia (*Glyricidia maculata*), Barun (*Crataeva nurvala*), Kamela (*Mallotus philippensis*), Harbarai (*Phyllanthus acidus*) and Nageswar (*Mesua ferrea*) were collected from Tripura for studying their effect on rumen protozoal population *in vitro*.





Ciliate protozoa present in the collected rumen liquor and incubation medium was B type population. Spirotrich protozoa comprised 91.7% of total rumen protozoal population. Holotrich protozoa comprised only 8.9% of the total rumen protozoal population. Overall rumen total protozoal number varied from  $9.8$  to  $19.4 \times 10^3$  per ml incubation media where as spirotrich protozoal number varied from  $9.1$  to  $17.3 \times 10^3$  per ml incubation media, respectively. Lowest ( $P < 0.01$ ) number of holotrich, spirotrich and total rumen protozoal count was observed due to incubation of kamela tree leaves followed by nageswar and harbarai tree leaves. Highest number of rumen protozoal count in the incubation media was observed due to incubation of Polita mother tree leaves followed by Glyricidia and Barun tree leaves. It was concluded from the study that Kamela (*Mallotus philippensis*) tree leaves might be used as feed additives to manipulate rumen fermentation for reducing ruminal protozoal population for efficient utilization of dietary protein to improve the productivity of the ruminant animals.

### Egg Yolk Free - Soybean Lecithin Based Chemically Defined Semen Extender for Black Bengal Buck Semen Cryopreservation

(M. Karunakaran, Mohan Mondal, Ajoy Mandal, C. Bhakat and S. K. Das)

The use of non animal origin, chemically defined medium is the method of choice in assisted reproductive technology. Egg yolk is a main component in extenders for cryopreservation of semen in most mammalian species. The cryoprotectant fraction of egg yolk is related to the low-density lipoprotein. However, possible disadvantages of using egg yolk, including bacterial contamination and variability, have been reported. On the other hand, soybean contains a high component of low-density lipoprotein like lecithin or egg yolk-like lecithin. The current study was an attempt to compare sperm parameters of freeze-thawed Black Bengal buck semen using soybean lecithin or egg yolk in Tris extender.

A total of 120 semen ejaculates were collected from Black Bengal bucks, out of which 96 ejaculates were found suitable for preservation. Each time four ejaculates were pooled together and

extended with Tris extender containing either 15% (v/v) egg yolk (control) or 1% soybean lecithin (1% SL)/ 1.5% soybean lecithin (1.5% SL) / 2% soybean lecithin (2% SL; w/v). Semen samples were diluted with the extenders @ 1:5 dilution (v/v) ratios and frozen by conventional freezing method. The *in-vitro* sperm characters such as sperm motility, viable count, functional membrane integrity and abnormal count were assessed after freeze and thawing of the cryopreserved samples. Semen samples cryopreserved in 1% soybean lecithin were able to maintain vital *in-vitro* sperm characters such as sperm motility, viable count, functional membrane integrity and abnormal count at par with egg yolk based extender (Figure). While the increased levels of soybean lecithin ( $> 1\%$  SL) were not able to support cryopreservation of buck semen samples and this might be due to elevated viscosity and changes in the osmolality of the extenders.

### Utilization of Dried Rice Distillers Grain With Solubles (RDGS) as Major Protein Source in the Diet of Lactating Jersey Crossbred Cattle

(Anupam Chatterjee, Dipak Dey, Arvind Singh Yadava, D. K. Mandal, C. Bhakat, M. K. Ghosh and T. K. Dutta)

Research has shown that distillers' grains are considered good sources of protein for dairy cattle. Fiber, protein and fat are concentrated approximately 3-fold in distillers grains (DG) when starch is fermented to produce ethanol, thus DG can replace the protein source in diets of cattle. Rice Distillers Grain with Solubles (RDGS) is an important agro-industrial by-product of the distillers industries in Asian countries. In the present work, efforts have been made to evaluate the chemical composition of Rice Distillers Grain with Solubles (RDGS) and the effect of supplementing RDGS on milk yield and milk composition of Jersey crossbred cows. Chemical analysis indicated that it is a good source of protein. A lactation trial of 15 weeks was conducted on 12 Jersey crossbred cattle divided in to 2 groups. In the treatment group, soya bean meal was totally replaced by RDGS in concentrate mixture. There was no significant difference in total DMI and CP intake. The average milk yield was slightly higher in the treatment. However, the difference was not statistically significant. The average percentage of milk fat, milk protein, SNF, total solid





and ash showed no significant difference between two groups. From the present study, it can be concluded that there was no adverse effect of replacing SBM by RDGS on Intake, Milk Yield or composition and thus economize the ration keeping in view the lower cost of RDGS in comparison to SBM.

## EXTENSION ACTIVITIES

### Training Programme

One training programme entitled 'Scientific Dairy Farming' for educated unemployed tribal youth was organized during 14<sup>th</sup> to 18<sup>th</sup> June, 2016. Six trainees participated in the aforementioned training programme.

### Veterinary Health-cum-Vaccination Camp

Three Veterinary health-cum-vaccination camps were organized in adopted villages (Dhakkhin Chandamari and Muratipur, Nadia) as well as in selected village (Ghoshaldanga and Birbhum) under TSP during April to June 2016. A total number of 1096 animals were treated in these Campus.

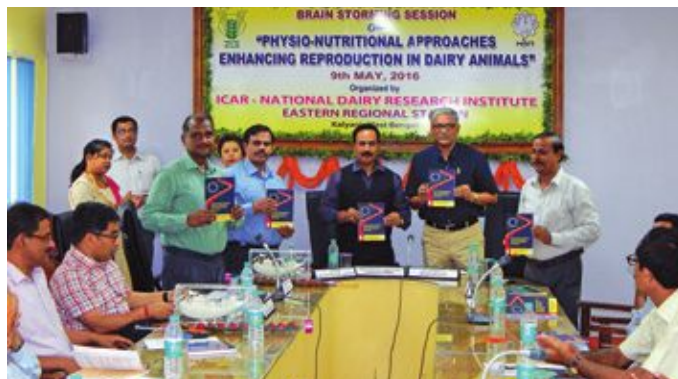
### World Veterinary Day Celebrated

World Veterinary Day was celebrated on 30<sup>th</sup> April, 2014 by the Eastern Campus of NDRI, Kalyani, with the theme of "Continuing education with one health focus" to create awareness on the importance of animal health and its welfare. The programme was organized with expert lectures and farmers-scientists-students interaction on animal welfare issues prevailing at this region.

### Brain-storming Session on Eastern Campus Physio-nutritional Approaches: Avenue for Enhancement of Reproductive Efficiency in Dairy Animals

Brain Storming Session on "Physio-nutritional Approaches for Enhancing Reproduction in Dairy Animals" was organized at ICAR-NDRI- Eastern Campus, Kalyani on 9<sup>th</sup> May, 2016 under the Chairmanship of Prof. (Dr.) A. K. Srivastava, Director and Vice-Chancellor, NDRI, Karnal. Prof. Purnendu Biswas Vice-chancellor, WBIAFS, Kolkata, Dr. N.V. Patil, Director, NRC on Camel, Bikaner, Dr. R. R. B. Singh, Joint Director (Academic), NDRI, Karnal, Dr. T. K. Dutta, Head, NDRI, Eastern Campus, Kalyani and eminent scientists and professors in the field of animal nutrition, physiology, reproduction, biotechnology, animal genetics and breeding participated in the event. Detailed discussions on the present status of infertility in dairy cows and buffaloes, their causes and ways to ameliorate the infertility problem were held. The importance of proper feeding strategies for the high yielding dairy cows especially during transition period, different

biotechnological and physiological tools to augment fertility, to overcome delayed onset of puberty, to reduce the inter-calving interval were also discussed. Finally, the need for developing qualified human resource to implement the artificial insemination technology in the field was also stressed in the session.



A lecture compendium being released during Brain Storming Session

### Sports Event Organized

Sports events comprising cricket, 100 m race, relay race and long jump were organized for the post graduate and diploma students of the Eastern Campus. Winners were presented with a trophy and certificate by Dr. A. K. Srivastava, Director and Vice Chancellor, ICAR-NDRI, Karnal and Dr. N. V. Patil, Director, ICAR-NRC on Camel, Bikaner on 8<sup>th</sup> May, 2016.



Director NDRI with students of ERS Campus

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Tel.: 0184-2252800 | Fax: 0184-2250042 | E-mail : dir@ndri.res.in | Gram : DAIRYRESEARCH