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NDRI News

Director's Desk



High yielding indigeneous breed of Sahiwal breed at NDRI farm

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In India, milk production has registered impressive growth during the post independence era from 19.4 million tonnes in 1951 to 121.4 million tonnes in 2011. The demand of milk and milk products in India is also increasing at a steady pace and at the existing rate of growth in milk production, in next ten years supply is likely to fall short of the demand. Among the several bottlenecks in achieving the milk production targets, mastitis continues to remain as the most challenging impediment. The prevalence of mastitis is also increasing corresponding with increase in milk production. In India, the economic losses due to mastitis have increased about 115 folds in the last five decades and presently the loss due to mastitis is to the tune of ₹ 7165.51 crore per annum. Since mastitis affects the milk quality, its consequences are not restricted only to the farm but expand beyond the dairy farm. Increasing concerns among the consumers about the antimicrobial residues, antimicrobial resistance, milk quality and animal welfare further demand proper policies in place to effectively prevent and control mastitis. During the last decade, mastitis stood just next to FMD as the most challenging disease in high yielding dairy animals but recent evidences suggest prevalence of mastitis to be the highest in high yielder cross bred dairy cows. It has been seen that the average prevalence of mastitis in 1960s to early 1990s, was not more than 30 %. However, afterwards the prevalence increased to even more than 60 %. Two decades ago, the average incidence of clinical mastitis in India was 1-10% with subclinical mastitis ranging from 10-50% in cows and 5-20% in buffaloes, while recent studies reported high incidence of subclinical mastitis ranging from 20 to 83 % in cows and 45 % in buffaloes. More than 100 recent studies spread over 32 states of India indicate that the overall prevalence of mastitis ranges from 25 to 97 % with an average prevalence of 45 %.

The effect of mastitis is not restricted to only mammary system but also affects the



reproduction ability of the affected animals. Bacterial toxins released during mastitis influence conception and early embryonic survival in affected cattle by stimulating the production of prostaglandin F_{2α}, which subsequently causes luteal regression, thus, potentially causing the loss of an established pregnancy. Clinical mastitis also induces hormonal alterations like decreased pulsatile secretion of luteinizing hormone (LH), significant decrease of the ovulatory LH peak, decreased estradiol production leading to decreased estrous expression and failure of ovulation. It has been reported that the probability of conception decreased by 44% when mastitis occurred the week before insemination, by 73% when mastitis occurred the week of insemination, and by 52% when mastitis occurred the week after insemination. The effect of mastitis does not limit only to the affected animals but also continue on the developing fetus since the daughters born to the cows that suffered mastitis during gestation have reduced reproductive efficiency. Mastitis in pregnant cows could decrease the number of healthy follicles in the developing fetus and compromise future fertility. Anti-Mullerian hormone, a reliable bio-marker for potential fertility, is severely decreased in the developing fetus as the number of mastitis events during gestation of their dams increase.

Conventionally, efforts have been in place to evolve suitable therapeutic regime, early

diagnostic methods and tests, preventive strategies and post-occurrence management interventions. In spite of all these efforts, the incidence of mastitis and associated losses are increasing with the time. Traditionally, mastitis detection is carried out by estimation of somatic cell counts, an indication of inflammation, measurement of biomarkers associated with the onset of the disease (e.g. the enzymes N-acetyl- β -D-glucosaminidase and lactate dehydrogenase) and identification of the causative microorganisms, which often involve culturing methods. The standards of these parameters to detect subclinical mastitis have been developed elsewhere in highly organized farms but the suitability, practicability, sensitivity and specificity of these standards in unorganized sectors have not been studied in detail. Further, these methods have their limitations and there is a need for new rapid, sensitive and reliable assays, especially under field conditions where sophisticated instruments are not available. Unlike developed countries where automated systems of dairying are practiced in which screening of animals for milk somatic cell count is a routine practice, in our country it is not possible owing to smaller dairy units. Recently, significant advances have been made in identifying nucleic acid markers and other novel

biomarkers associated with mastitis. Proteomic studies on milk from mastitis animals and normal animals, although started recently, are the need of the day to develop mastitis specific markers. For large scale dairying, development of novel analytical platform enzymatic assays, immune assays, biosensors and nucleic acid tests could be a viable option. Also, development and standardization of "electronic tongue or nose" that could differentiate the mastitic milk based on the organic and inorganic cations and anions, and volatile substances, respectively would be reliable and sensitive methods to be applicable in automated milking farms. Genomic sequences of many of the mastitis-causing pathogens are now available and can be utilized to develop nucleic acid based testing methods. Similarly, proteomic characterization of mastitis-causing pathogens combined with the available information on enzymes, toxins, metabolites produced and differential expression of different proteins can be applied not only to the discovery of new therapeutic targets but also to the search of new diagnostic bio-markers.

A. K. Srivastava

(A. K. Srivastava)

RESEARCH

Gene Expression in Mouse Proliferating Brown Adipocytes

Smita Singh, Y. S. Rajput, Rajan Sharma, Amit K. Barui,
Division of Animal Biochemistry

Adipose tissue plays important roles in the regulation of energy homeostasis and metabolism. White adipose tissue (WAT) and brown adipose tissue (BAT) are functionally distinct cell types characterized by their opposing metabolic properties. The principal role of WAT is the storage and release of triglycerides in response to energy levels. By contrast, BAT is a unique fat depot in mammals for oxidation of dietary fuel substrates without production of chemical energy. Accordingly, BAT biology is an area of intensive interest in obesity research. Pharmaceutical-induced non-shivering thermogenesis in BAT results in the prevention and treatment of obesity in rodents and shows promise in human obesity. Expression pattern of developmental gene (regulates embryogenesis)

during proliferation of mouse brown pre-adipocytes was elucidated. In this study, proliferation and differentiation (*in vitro*) of brown adipocytes isolated from interscapular region of *Mus musculus* (4 week stage) were studied. Stroma-vascular fraction was obtained from BAT and cultured in respective medium for proliferation (5-6 days) and differentiation (12-15 days) stage. Fibroblast-like cells were observed in proliferation stage whereas, multilocular lipid droplets appears in differentiated cells (Fig. 1). RNA was isolated from proliferation stage. cDNA (for proliferation) was synthesized followed by their gene expression analysis using RT-PCR technique. It was found that during proliferation Hox A1, HoxA5, HoxC4, HoxC8, HoxC9, Gpc4, Sfrp2, Shox2, Thbd, En1, Tbx15, Nr2f1 developmental gene and pref1 marker were expressed during proliferation (Fig. 2). However, HoxA2 (reported in kidney) and HoxB1 (reported in subcutaneous WAT) developmental genes are not expressed (Fig. 3).

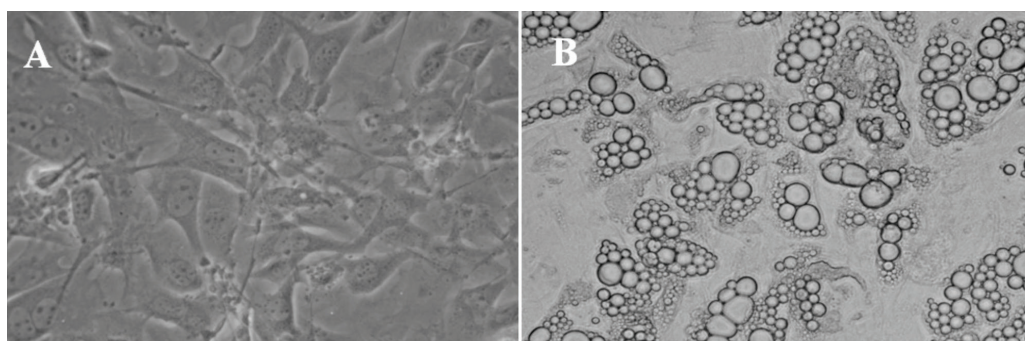


Fig. 1. (A) Proliferation (B) Differentiation of brown adipocyte of *Mus musculus* in monolayer cell culture

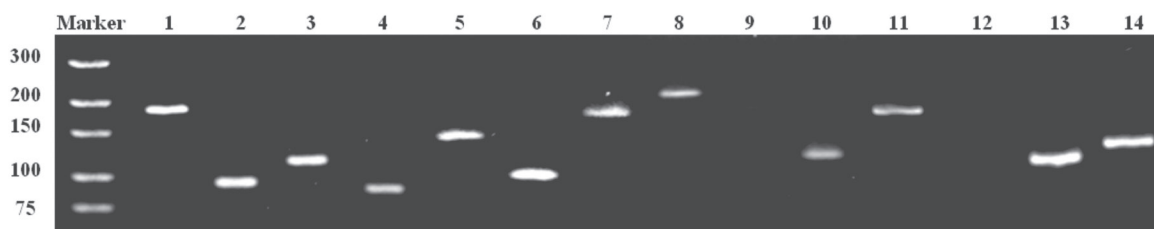


Fig. 2. Expression of developmental genes at proliferation stage

Lane 1, En1; Lane 2, Tbx15; Lane 3, Nr2f1; Lane 4, HoxC8; Lane 5, HoxA1; Lane 6, HoxA5; Lane 7, HoxC4; Lane 8, Shox2; Lane 9, HoxA2; Lane 10, Thbd; Lane 11, HoxC9; Lane 12, HoxB1; Lane 13, Gpc4; Lane 14, Sfrp2.



Fig. 3. Absence of expression of HoxA2 in proliferating brown adipocyte

Lane 1, pref1 (marker gene for proliferation stage of adipocytes); Lane 2, HoxA2 (Kidney; positive control); Lane 3, HoxA2 (proliferating brown adipocytes)

Modeling Lactation Curve in Sahiwal Cattle

V. B. Dongre and R. S. Gandhi,
Division of Dairy Cattle Breeding

The study reports lactation curve using weekly test day yields using various models in Sahiwal cattle. The five models namely exponential decline function (EDF), parabolic exponential function (PEF), inverse polynomial function (IPF), gamma type function (GF) and mixed log function (MLF) were used. The R^2 -values for EDF, PEF, IPF, GF and MLF were 67.7, 80.5, 99.8, 95.6 and 97.9%, respectively; while RMSE were 0.102, 0.078, 0.055, 0.037 and 0.025 kg, respectively. It was concluded that IPF was the best fit function for FL305DMY. The predicted FL305DMY with EDF, PEF, GF, MLF and IPF was 1983.85 ± 32.71 , 1986.60 ± 35.46 , 1991.51 ± 40.38 , 1993.23 ± 42.10 and 1976.04 ± 24.90 kg, respectively. The optimum equation for the prediction of FL305DMY by MLR had total six variables viz., TD6, TD7, TD9, TD10, TD11 and TD18, which gave an accuracy of prediction as 80.32%. The comparison between MLR and ANN revealed that ANN was better than MLR for prediction of FL305DMY. The average EBVs of sires from actual FL305DMY using LSM, SRLS, BLUP and DFREML were 1869.91, 1869.99, 1908.70 and 1923.87 kg. The respective estimates from predicted FL305DMY were 1880.85, 1887.55, 1879.55 and 1923.84 kg. The DFREML was the most efficient and accurate method for sire evaluation using actual and predicted first lactation 305-day milk yield.

Sexing In Vitro Fertilized Goat Embryos by PCR

Hrudananda Malik, Dhruva Malakar, Dinesh Kumar, Rahul Dutta and Mata Nagaraju,
Animal Biotechnology Centre

Primers yielding a 122 bp were used specific to the Y-chromosome in male goats. The in vitro produced

goat embryos were made zona free by treating with pronase and micromanipulation base technique to isolate one blastomere from embryo. The cell number in each embryo was counted before sexing. Single blastomere was taken and SRY gene was amplified by using PCR. In all, 188 biopsied embryos were used for sexing. Out of these, 85 (45.21%) were confirmed as male and 103 (55.79%) as female. PCR sexing protocols based on the SRY gene were found reliable and accurate for the determination of sex of goat embryos.

Metabolizable Protein Availability from Different Feeds and its Requirement for Growing Sahiwal Calves

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Division of Dairy Cattle Nutrition

Crude protein content of tropical feed stuffs is low and its utilization can be further impeded in ruminants because of lesser availability of fermentable energy. Absorbable amino acids from feed origin together with microbial origin constitute metabolizable protein (MP), which is ultimately utilized by the animal. Limited information is available on the MP value of feeds of Indian origin and the Cornell net carbohydrate and protein system (CNCPS) can be used for the purpose. Seven feed ingredients (maize grain, groundnut cake, mustard cake, deoiled rice bran, wheat bran, berseem green and wheat straw) and three total mixed rations (having 15, 13.5 and 16.5% CP) were analyzed for their MP content. Average MP content of the feed ingredients was 8.13, 8.81, 9.86, 8.00, 9.16, 12.71 and 1.12 %DM, respectively. The MP content of these TMRs consisting of berseem: wheat straw: concentrate (40: 20: 40) was 8.69, 7.94 and 9.28%, respectively. It was found that the MP content of feeds was a better indicator of animal performance than CP. The results of a three month feeding trial

on fifteen growing Sahiwal calves (16 mon.) showed that 13.5% CP, 7.94% MP and 9.31 MJ ME/kg DM in total diet was sufficient to support their growth up to 800 g/d.

Oat and Milk Based Probiotic Fermented Products for Type-2 Diabetes

Seema Sangwan and Rameshwar Singh,
Division of Dairy Microbiology

Oat based probiotic fermented milk product containing *Lactobacillus rhamnosus* (LGG) was formulated and its effect on type II diabetes was studied *in vivo* using wistar rats. Type-2 diabetic rats showed significant decrease in blood glucose level (36.46%-45%), HBA1c, oxidative stress, cholesterol (8.04-13.58%) and triglycerides (18.66% - 30.38%) level during progression and induction study. However, the promising results were obtained in progression study. Further, the expression of certain genes like GLUT-4, IRS-2, ppar- γ was increased while it decreased in case of TNF- α and IL-6 during the study. It was concluded that oat and milk based probiotic fermented product showed the synergistic effect of probiotics and oats especially in case of progression of type 2 diabetes. Oat and milk based probiotic fermented product can be considered as an important dietary defense weapon to fight type 2 diabetes.

Azolla Meal: A Potential Feed Supplement for Calves

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Regional Station, Kalyani

Azolla is an attractive protein source for animal feed. An experimental azolla production unit has been established at ERS-NDRI Kalyani campus and the cultivation of azolla has been standardized. It is a fair source of plant protein (250.9g kg⁻¹). The mean concentration (% of DM) of crude fibre, ether extract, total ash, NFE, NDF and ADF in *Azolla microphylla* was 12.62, 4.06, 19.87, 38.37, 68.43 and 37.60, respectively. The mean calcium and phosphorus concentration (% DM) in *Azolla microphylla* was 4.30 \pm 0.16 and 0.63 \pm 0.01, respectively. A growth trial (105 days) was conducted on ten crossbred male calves distributed into two groups. The animals in control group (T₀) were fed with paddy straw (45 %), green fodder (15%) and concentrate mixture (40%). In the treatment group (T₁) dried *Azolla microphylla* meal was supplemented @ 60 g / animal (equivalent to 1 kg fresh azolla) replacing 10 % of concentrate mixture. There was no significant difference in DM intake and digestibility of nutrients in crossbred calves when Azolla was supplemented. The average daily live weight gain was significantly (P<0.05) higher in T₁ (423.6 g/d) than in T₀ (389.9 g/d). The growth rate (ADLG g/d) increased by around 9% in the treatment group. The feed conversion efficiency was also improved significantly in the treatment group. The study indicated that Azolla can be utilized as good alternative source of protein and other essential nutrients for the ruminants.

EXTENSION ACTIVITIES

KRISHI VIGYAN KENDRA (KVK) DAIRY TRAINING CENTER (DTC)

Training Programmes

- In all 55 training programmes (on-campus and off-campus & training-cum-visits) on different aspects of dairy production and processing, crop & vegetable production, vermi-culture, bee-keeping and home science were organized in which 1729 trainees including farmers, women, rural youth and extension functionaries were imparted training.
- KVK organized 15 sponsored training programmes on "Scientific Dairy Farming", "Clean Milk Production" and "Scientific Cultivation of Fruits and Vegetables" for 522 farmers, rural youth and extension functionaries. In these training programmes, 290 trainees from Bihar, 70 from Rajasthan, 60 from Assam, 72 from Himachal Pradesh and 30 from Gujarat state were imparted training.
- KVK also organized 18 study visits for 470 farmers and farm women from different districts

of Uttar Pradesh, Madhya Pradesh, Uttarakhand, Bihar, Rajasthan, Punjab, Haryana and Himachal Pradesh states.

Animal Fertility Management

In adopted villages of KVK, 473 cattle and 204 buffaloes were artificially inseminated and as a result 384 calves were born. Besides these, 36 animals were treated, 37 calves were dehorned and 21 animals were given infertility treatment.

Front Line Demonstrations (FLDs)

- During the summer session 2012, total 26 FLDs on summer moong using variety SML-668 in 10 ha. area were laid in different villages of Karnal district under irrigated condition.
- A total 11 FLDs on Jowar Fodder (multi-cut) using variety Sudax Chari-1 in 4 ha. area and 5 FLDs on maize fodder using variety African Tall in 2 ha. area were laid in different villages of Karnal district under irrigated condition.
- Two on farm trials on paddy in 2.20 ha. area in 8 locations using varieties Pusa-1121 and PB-1

(1460) were organized in different villages of Karnal district.

Revenue Generated by KVK

Source	Amount (₹)
Training Fee from KVK Courses	24,700
Training Fee from sponsored courses	3,47,449
Tuition fee from visits conducted	10,000
Room Rent from Farmers' Hostel	94,020
Vermi-compost Unit	200
Dairy Vikas Kendras	17,560
Fisheries Unit	5,643
Crop Production Unit	2,83,191
Bee-keeping Unit	1,600
Total	7,84,363

DAIRY EXTENSION

Dairy Education at Farmers' Door

Extension Education Programme "Dairy Education at Farmers' Door" was continued to strengthen the effective dissemination of dairy production and processing technologies among farming community. A team of scientists visited villages Khrijpur and Wazidpur Karnal district on 2nd Saturday of each month. Tick Control treatment was administered on the animals. The scientists educated the farmers about breeding and feeding practices for better milk yield.

Activities	Nos. of Cases
A.I. in Cows	547
Conception Rate	42.00%
A.I. in Buffalos	184
Conception Rate	22.0%
Nos. of Crossbred Calves Born	96
Nos. of Buffaloes Calves Born	85
General Treatment	120

Sixteen (16) Veterinary Camps were organized and 537 cases were treated for reproductive disorders, various veterinary ailments ecto and endo-parasite control etc.

Kisan Sangosthies

Thirteen (13) Kisan Sangosthies were organized covering the various problems of animal husbandry at village level. In all, 55 male and 35 female farmers participated in these sangosthies.

Empowerment of Women

Nine (9) women empowerment trainings and campaigns were organized with the objective to create

awareness in the field of dairying and home science and also to impart skills in these areas so that farm women could generate more income from dairying and maintain healthy atmosphere in their respective families. By these programmes, 124 farm women were trained.

Programme	Village	No. of courses	Participants
Value added milk products	Kulwaheri Shahpur, Subri	4	59
Capacity building on scientific dairy farming	Wazidpur, Subri	3	45
Awareness campaigns and women empowerment through SHGs	Kharajpur	2	20
Total		9	124

Scientists and Resource Poor Farmers' Interaction

An interaction between scientists and resource poor dairy farmers was organized by Division of Dairy Extension on 23rd June, 2012. Forty one (41) resource poor dairy farmers from four villages (Wazidpur, Kharajpur Kulwaheri, and Mehmampur) actively participated in this interaction. Interaction was focused on dairy animal breeding and feeding, animal health care practices and animal management & marketing practices.

The key points emerged during the interaction were:

- Repeat breeding of crossbred cattle.
- Low conception rate in dairy animals due to poor quality of semen.
- Silent heat in buffalo.
- Appropriate stage of estrus for conception.
- Reducing peak yield as well as daily milk yield of dairy animals in last five years.
- Shortage of green fodder due to less availability of land for fodder.
- Feeding of mineral mixture.

REGIONAL STATION, BANGALORE

Extension

- Two twenty one (221) visitors in seven batches comprising students from various educational institutes, farmers and entrepreneurs of southern region, visited the institute. The visitors were taken round the Institute as per their needs and were explained the ongoing activities. Advisory

- services / technical advice was rendered to the needy clientele. Extension literature on dairy production and processing was also distributed to the needy clientele groups, visitors and trainees.
- An orientation programme was organised for the inplant trainees, B.Tech students from Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, Maharastra during June 2012.
 - Participated in GIM EXPO-2012, Global Investors Meet, held at BIEC, Bangalore from 6th - 8th June 2012 organized by Government of Karnataka. NDRI stall displayed innovative & educative information on dairy production & processing technologies, Indigenous breeds of South India & Indigenous dairy products of the region.

CONSULTANCY

REVENUE

(April to June 2012)

1. Contract Research

- i) Contract Research Project entitled "Evaluating corn hybrid on the quality of silage and performance in cross bred calves" Sponsored by Monsanto India Limited, Mumbai under (Dr. A. K. Tyagi, Principal Scientist, DCN Division) : Total project cost ₹ 8,50,413/- including S. Tax), Received 1st installment of ₹ 5,00,000/- including S. Tax (i.e S. Tax ₹ 55,002/-) = ₹ 4,44,998/-

₹ 4,44,998/-

- ii) Contract Research Project entitled "Evaluation of the effect of Keenan Mech Fiber System on the Lactation Performance of Buffaloes" Sponsored by Keventer Agro. Ltd. Kolkatta under (Dr. S. S. Thakur, Principal Scientist, DCN Division) : Total project cost

₹ 8,06,072/- including S. Tax), Received 2nd installment of ₹ 1,20,911/- including S. Tax (i.e S. Tax ₹ 13,310/-) = ₹ 1,07,610.

₹ 1,07,610

Sub Total (1)

₹ 5,52,608

2. Contract Services

- a. Analyses ₹ 29,950
b. Sale of CD ₹ 40,000

Sub Total (2)

₹ 69,950

3. Student Training Charges

₹ 2,05,000

4. Consultancy (Individual/General)

₹ 70,371

5. Transfer of Technology

- a. Royalty/Licensing (Low cholesterol ghee) ₹14,35,000

Grand Total

₹23,32,929

EVENTS

MAIN CAMPUS, KARNAL

SAARC Regional Training Programme

A ten day SAARC Regional Training Programme on "Quality Control of Milk during Production, Processing and Marketing and Introduction to Novel Technologies for Dairy Product Diversification" was inaugurated on 10th April, 2012 by Prof. A.K. Srivastava, Director, NDRI, Karnal. There were 21 participants from seven SAARC countries namely Afghanistan, Bangladesh, Bhutan, Nepal, Sri Lanka, Pakistan and India. Prof. A. K. Srivastava emphasised the need for strengthening the cooperation among SAARC nations as dairying is the livelihood for small and marginal farmers. He also highlighted the achievements of India in bringing the "White Revolution" through cooperative movement. However, low productivity of milch animals, poor attention to clean milk production and low level of value addition are some of the major issues faced by the dairy sector in all SAARC countries. Dr. Md. Nure Alam Siddiky, Programme Officer

(Livestock) SAC, Dhaka gave a brief account of the activities and programmes of SAC, Dhaka. He complimented the efforts of NDRI, Karnal in developing and disseminating technical know-how in production, processing and marketing of milk and milk products. A compendium consisting of lectures of the training programme was also released on this occasion.

Interface Meeting on Detection of Adulterants in Milk

An Interface Meeting was organized on 22nd June, 2012 at NDRI, Karnal. Dr. Bangali Baboo, National Director, National Agricultural Innovation Project (NAIP) inaugurated one day interface of Dairy Industry, State Department, Enforcement Agencies and R & D Organizations. Research and development organizations involving NDRI, Karnal, Birla Institute of Technology, Goa, IIT Delhi and IIT Roorkee have developed a number of user friendly kit/tests for detection of adulterants and contaminants in milk. These kits can be used for detection of detergent, antibiotic residues, aflatoxin M1, Enterococci, Listeria monocytogenes in milk and biosensor based detection



Interface meeting on "Detection of adulterants and contaminants in milk"

of urea and pesticide residues in milk. The availability of these kits will help in ensuring milk quality. Dr. A. K. Srivastava, Director, NDRI informed that test developed for detection of detergent is simple, sensitive, colour based and results are obtained in two minutes. The developed test does not require any equipment and the cost of consumables and chemicals is about ` 3.00 per test. Officials from Nestle, Danone, Mother Dairy, Reliance, Milkfood, Punjab Milkfed, Haryana Dairy Development Cooperative Federation, Delhi Milk Scheme, Wockhardt, etc also graced this occasion. The President, Halwai Association of Punjab voiced their concern about malicious campaign against adulteration of sweets during festive season. Food Safety Standard Authority of India (FSSAI) officials explained the new FSSAI Act 2006 with special reference to adulteration of milk.

Indo-New Zealand Workshop

Dairy Technology Division organized Indo-New Zealand workshop on "Food and Agriculture", 25th - 26th May, 2012 sponsored by Department of Science and Technology, Govt. of India and Ministry of Science and Technology, New Zealand. Interactive sessions on food processing and post harvest food system, dairy processing and novel dairy products, dairy farming systems, pesticides/ insecticides application and organic farming, seed technology and functional foods: bioactive peptides and probiotics were organized. Presentations were made by Prof. Harjinder Singh, Prof. Jullan Heyes, Dr. Jaspreet Singh, Prof. Travis Glare, Prof. John Hampton, Director, Dr. A. K. Srivastava and Lead Scientists of NDRI, Karnal.

Technology Business Incubator

Technology Business Incubator (TBI) established with the support of DST in the name of "Society for Innovation & Entrepreneurship in Dairying" conducted two training programs, "Prospects of Dairying for Rural Dairy Farmers" & "Breeding & Health Management in Dairy Animals" and also organized one Entrepreneurship Development Program on

"Commercial Dairy Farming" during the quarter. An Incubatee Company, M/s. Agati Healthcare Pvt. Ltd. is also operating under TBI to manufacture Colostrum Powder.

World Milk Day

In order to create awareness among people and spread the goodness of Milk, NDRI, Karnal in collaboration with National Academy of Dairy Science (India) and Indian Dairy Association (Haryana Chapter) celebrated "World Milk Day" on 1st June, 2012, which was presided over by Prof. Dr. A. K. Srivastava, Director and Vice-Chancellor, NDRI, Karnal. Sh. S. Bhalerao, IAS, Special Secretary, AH, DDF & SVVU, Govt. of Andhra Pradesh and Dr. M. V. Reddy, Director, Animal Husbandry, A.P. were invited as special guests on this occasion. Prof (Dr.) Srivastava delivered a special lecture on "Milk Borne Zoonotic Diseases" on this occasion.

Research Advisory Committee Meeting of NDRI

The meeting of the Research Advisory Committee of NDRI, Karnal was held on 14th May 2012 under the chairmanship of Dr. K. Pradhan, Ex-Vice Chancellor, OUA&T Bhubaneswar and RAU, Bikaner. RAC evaluated all the completed and ongoing in-house and externally funded research projects of the Institute. Some important Strategic Research Programmes to be taken up by NDRI during the 12th plan such as "Research on Control of Sex Ratio at Birth in Crossbred Calves in India" and "Optimization of Buffalo Cloning" and programmes for improving the livelihood through dairy farming in North Eastern Hill region of India were also presented before RAC. It was also recommended that NDRI should prepare a document on technologies including (a) technologies ready for transfer or commercialization (b) technologies that need refinement and (c) technologies in pipeline.

ICAR Inter-institutional Staff Sports Tournament

The ICAR Inter-institutional Staff Sports Tournament (North Zone)-2012 was organized at NDRI from 25th - 28th April, 2012. The great festivities that adorned the NDRI campus for the last four days were celebrated by not only the players but also all the residents of the NDRI campus and the city. Dr. S. S. Thakur, Chief Convener of the organizing committee welcomed the



Champion team with the chief guest

Chief Guest, Dr. Gurbachan Singh, Chairman, ASRB and Dr. A. K. Srivastava, Director & Vice Chancellor, NDRI during closing ceremony. Dr. Gurbachan Singh congratulated the winners and gave away the prizes to the winners. NDRI bagged maximum number of prizes and remained overall champion.

Study Visit of Parliamentary Standing Committee on Agriculture

The Parliamentary Standing Committee on Agriculture visited NDRI on June 20, 2012. Hon'ble Sh. Basudeb Acharya, Chairman was accompanied by eight



Director NDRI demonstrating a technology of milk whey protein-millet biscuits to Chairman, Parliamentary Committee on Agriculture

REGIONAL STATION BANGALORE

Lead Auditor Course on Food Safety Management Systems

Lead Auditor Course on Food Safety Management Systems was organized by Alumni Association, NDRI Bangalore from 17th - 21st April, 2012. The Training was conducted by IRQS, New Delhi. Seventeen participants representing different organizations took part in the Training Programme.

Training Programmes

- Twenty one day Training was conducted on "Livestock genomics and IP protection in livestock Biotechnology" from 17.05.2012 to 06.06.2012.
- One week training was conducted on "Commercial Dairy Production" from 21.05.2012 to 26.05.2012.
- Six final year B.Tech DT students from College of Dairy Tehnology, Pusad and Latur (Maharastra) underwent in-plant training from 28.1.2012 to 27.5.2012.
- Fifteen students of B.Tech. (Agri. Engg.) from Dr. Annasaheb Shinde College of Agricultural Engineering, Mahatma Phule Krishi Vidyapeeth,

members of the Committee including Sh. Nirpendra Acharia, Sh. Narendra Budania, Sh. Shashi Bhushan Behera, Sh. Rajpal Singh Saini, Smt. Ashwamedh Devi, Sh. Narayan Singh Amlabe, Sh. S. Thangavelu and Sh. Naranbai Kachhadia. The Hon'ble members interacted with Director, Heads of Divisions and senior faculty of NDRI on activities of NDRI and issues related to National Agricultural Research System. The committee visited some of the important facilities such as Livestock Farm, Animal Breeding Research Centre and Model Dairy Plant and appreciated the work being carried out at the Institute.



Hon'ble members of the Parliamentary Committee on Agriculture being shown the dairy products developed at NDRI

Rahuri, Ahmednagar (MS) were imparted one month "Summer Placement Training" with effect from 01.06.2012.

Inauguration of Auditorium

Dr. A. K. Srivastava, Director, NDRI Karnal inaugurated the Auditorium at SRS of NDRI, Bangalore on 19th May, 2012. The manual on "Dairy Bacteriology" was also released in presence of Dr. G. R. Patil, Joint Director (Academic). Dr. C. S. Prasad, Director, NIANP, Dr. Venkata Raman, Joint Director, IVRI Bangalore, Dr. Rehman, Project Director, PDADMAS, Dr. G. R. Patil.

REGIONAL STATION KALYANI

World Veterinary Day

World Veterinary Day was celebrated on 28th April, 2012 by the Eastern Regional Station of National Dairy Research Institute (ERS-NDRI), Kalyani to create awareness on the importance of animal health management in relation to antimicrobial resistance and to publicize the importance of livestock and livestock products in socio-economic upliftment of resource-poor dairy farmers in eastern India. The programme was organized in the village Muratipur (near Kalyani, West Bengal).

Approximately 200 people including livestock farmers, students, trainees, scientists, technicians and local officials attended the celebration. Various programmes were organized throughout the day viz. Cattle Health- cum- Fertility Camp, Cattle Show and Judging, Distribution of medicines and Mineral Mixture to the livestock owners, Display of Transferable Technologies through Posters, Quiz on Dairy Cattle Management, Distribution of bilingual (English and Bengali) Technical Folders to the dairy farmers, Lectures on the importance of World Veterinary Day, Expert lectures on Antimicrobial Resistance in Livestock, Distribution of prizes to the best cattle owners /dairy farmers. Seventy Five (75) dairy farmers registered for the Animal Health camp and Cattle show. Total number of 55 cows, 38 heifers and 29 calves were rendered health check up and treatment during the programme.

World Milk Day

World Milk Day was celebrated on 1st June, 2012 by the ERS-NDRI, Kalyani, Nadia, India to create awareness on the importance of milk on human health, clean milk production from dairy animals *etc.* and to publicize the importance of livestock and livestock products in socio-economic upliftment of resource-poor dairy farmers in the region.

Training Programme on Scientific Dairy Farming

One 15 day training programme was organized at ERS of NDRI, Kalyani on *Scientific Dairy Farming* for unemployed rural youth and dairy farmers. The course was conducted from 25.04.12- 09.05.12 in which 7 trainees from different districts participated.

INFRASTRUCTURE DEVELOPED

- The Wi-Fi system was installed to extend the campus intranet through Local Area Network (LAN) connectivity alongwith the Internet access, to the hostels, viz., Brahmaputra, International, Kavery (for Girls), Krishna and Sutlej hostels of the Institute at its main campus at Karnal.
- A new Unified Threat Management (UTM) system with 1500-user capacity, throughput of 4.5 Gbps and 1100000 Concurrent Sessions was installed.
- The new switches were installed throughout the Institute so as to fully utilise high speed Internet connectivity (1 Gbps) through the National Knowledge Network (NKN) node.
- An IBM Intel Xeon 4 Processor 6 Core Rack Mounted Web server was installed in the ARIS Cell.
- The security of NDRI intranet system was also enhanced in order to protect the email and Web-server (hosting the Institute Website) against hackers' and virus attacks. Also, every user was allotted a unique user name with password for the intranet/internet access to keep a check against any misuse (or cyber crime).
- Institute Tenders are now being e-published/uploaded regularly on the Central Public Procurement Portal (CPPP) besides Institute Website for e-procurements.
- The PC Lab was equipped with new 64-bit state-of-the-art all-in-one personal computers to fulfill the teaching and training requirements of Institute students/staff.

AWARDS/HONOURS

- **Dr. Archana Verma, Mr. Bharat Kumar, Mr. Indrasen Chuhan, Dr. I. D. Gupta and Dr. R. S. Gandhi** received "**Best Paper Award**" for Research paper on **Molecular characterization of fore-brain embryonic zinc finger like gene in Murrah buffalo** presented during National conference on Biotechnology, Bioinformatics and Bioengineering at Kolhapur from 24th – 25th February, 2012.
- **Mr. Umesh Kr. Shandilya**, pursuing Ph.D. under the supervision of **Dr. Rajeev Kapila**, Senior Scientist, Animal Biochemistry Division, delivered oral presentation entitled "**Orally induced tolerance to caseins and whey proteins in mice with cow milk allergy**" at International Conference on Frontiers in Immunology

Research-2012 organised FIRN, USA from 1st – 4th July in Salzburg, Austria.

- Two M.Sc students, **Mr. Renjith Sebastian** and **Mr. Vivek Phani Varma D.** under **Dr. Rajeev Kapila**, Senior Scientist, Animal Biochemistry Division, were awarded "**First Prize**" in immune response therapy session for presentation of paper entitled "***Lactobacillus helveticus* fermented milk modulates innate immunity by activating macrophages and neutrophils**" in Biotech-2012 "Current advances in Biotechnology and Medicine" organized by Institute of liver and Biliary Sciences, New Delhi from 24th - 25th February, 2012.
- **Dr. B. K. Bajaj**, Senior Assistant Professor, School of Biotech, University of Jammu

worked in the lab. of **Dr. A. K. Puniya**, Principal Scientist, D.M. Division, NDRI, Karnal w.e.f. 31st May to 30th June, 2012 as Indian National Science Academy (INSA) visiting fellow and conducted experiments in the area of Rumen Microbiology.

- **Ms. K. Jayalakshmi** and **Dr. B.V. Balasubramanyam** won the “**Best Poster Paper Award (Third Prize)**” for the poster paper entitled “Effect of use of concentrated and lactose hydrolysed whey on sensory quality of bread” presented at Seminar on “Subhiksha – 2012” organized by Kerala Chapter of Indian Dairy Association (SZ) and Kerala Agril. Univ., Mannuthy, during 13th - 14th April, 2012.
- **Ms. K.C. Neethu, Dr. F. Magdaline Eljeeva Emerald, Dr. B. Surendra Nath, Dr. M. K. Vedavathi, Dr. Rekha**

Ravindra Menon, Dr. P. Heartwin Amaladhas and Dr. B.V. Balasubramanyam got “**Poster Award – Third Prize**” for the poster entitled “Sensory evaluation modeling of buttermilk drinks using fuzzy-logic approach” presented in the National Conference on Appropriate Technologies for Indian Food Processing Industries during 5th – 6th March, 2012.

- **Ms. K.C. Neethu, Dr. F. Magdaline Eljeeva Emerald, Dr. Pushpadass Heartwin A., Dr. Rekha Ravindra Menon, Dr. K. Jayaraj Rao, and Dr. B. Surendra Nath** got “**Poster Award - Second Prize**” for the poster entitled “Modeling the moisture transport of *pantoa* during deep-fat frying”. Subhiksha Dairy and Food Industry Conference, Thrissur during 11th - 13th April, 2012.

FOREIGN VISIT

- **Dr. A. K. Srivastava**, Director NDRI participated in the Workshop for CGIAR, Research Programme on Dryland System, Integrated

Agricultural Production System for the Poor and Vulnerable in Dry Area from 25th – 28th June, 2012 at Dubai.

PERSONALIA

JOINING

- **Ms. Sarita Yadev**, joined as Admn. Officer at NDRI, Karnal w.e.f. 12.06.2012.

PROMOTIONS

- **Dr. (Mrs.) Meena Malik**, Asstt. Prof. (English) promoted to the post of Associate Prof. (English) w.e.f. 08.07.2005.
- **Mr. Braj Kishor**, Technical Officer T-5 (P&E) promoted as T-6 (P&E) w.e.f. 04.05.2011.

RETIREMENTS

- **Mr. Satnam Singh**, T-7-8 (W/S) Dairy Engineering Division retired from Council's service on superannuation on 31.03.2012.
- **Mr. Sohan Lal**, T-5 (W/S) Farm Section retired from Council's service on superannuation on 31.05.2012.
- **Mr. Anand Prakash Dabas**, T-9 (F/FT) Dairy Cattle Breeding Division retired from Council's service on superannuation on 30.06.2012.
- **Mr. Jagpal Singh**, T-5 (F/FT) Farm Section retired from Council's service on superannuation on 30.06.2012.

- **Mrs. Pushpa Rani**, T-5 (Library) retired from Council's service on superannuation on 30.06.2012.
- **Mr. Kailash Rabidas**, T-5 (F/FT), ERS, Kalyani retired from Council's service on superannuation on 30.04.2012.
- **Mr. S. C. Haldar**, T-5, ERS, Kalyani retired from Council's service on superannuation on 30.06.2012.

TRANSFERS

- **Dr. A. P. Ruhil**, Sr. Scientist (Computer Application) relieved from NDRI, Karnal to join at ICAR, H.Q., New Delhi w.e.f. 09.04.2012.
- **Sh. Pushpanayak**, Chief Admn. Officer relieved from NDRI, Karnal to join at ICAR Research Complex, Patna w.e.f. 21.05.2012.
- **Dr. S. Jeyakumar**, Scientist (SS) (Animal Science) joined at SRS of NDRI, Bangalore on his transfer from CARL, Port Blair w.e.f. 18.06.2012.
- **Sh. Manjunath M.**, Scientist (AS&PE) joined at SRS of NDRI, Bangalore on her transfer from CIPHET, Ludhiana w.e.f. 28.05.2012.
- **Mr. Naresh Kumar Dahiya**, Technical Officer T-6 (Computer) joined at NDRI, Karnal after transfer from ERS, Kalyani on 11.06.2012.

DISTINGUISHED VISITORS

12.04.2012	Two member delegation from Ministry of Agriculture, Irrigation and Livestock, Kabul Afghan led by Dr. Khuswant Singh Sethi, Capacity Development Advisor, UNDP, Kabul.		Administrative Reforms and Civil Service Commission (The Afghan Counterpart of DoPT).
	<ul style="list-style-type: none"> • Mr. Humayun Nawabi, OSD, to Deputy Minister. • Ms. Muzaghan Sadat, Director, Ministry of Agriculture, Irrigation and Livestock 		<ul style="list-style-type: none"> • Mr. Sultan Hajiyeve, Project Manager, NIBP, UNDP. • Mr. Khushwant S. Sethi, Capacity Development Advisor, Afghan Ministry of Agriculture. • Ms. Serwat Parwaiz J.D., Advisor of the Director General.
20.04.2012	US experts from American Embassy, India for interactive meeting with NDRI, Scientist.	11.05.2012	Sh. K. Chandramouli , Chairman, FSSAI (Food Safety and Standards Authority of India) Ministry of Health & Family Welfare, Govt. of India, FDA Bhawan, Kotla Road, New Delhi.
	<ul style="list-style-type: none"> • Dr. R. Thomson Wright, Attache for Agriculture Affairs, India, Bangladesh, Sri Lanka. • Dr. Ritambhara Singh, Agriculture Specialist. 	14.05.2012	Seven member delegation from Bhutan, Ministry of Agriculture Forest led by Mr. Sithar Dorji , Project Director.
25.05.2012	Thirty four member delegation from Australia led by Mr. Gregory Thomas Cahill .	18.05.2012	Six member delegation from FONTERRA Cooperative Group Ltd., New Zealand and IFFCO.
02.05.2012	A group of 24 farmers, industry representatives and academicians sponsored by Texas Agricultural Leadership Program (TALL), USA led by Mr. Jim Mazurkiewicz , Leadership Program Director and Professor.	22.05.2012	Four member delegation from University of Abadan (Nigeria) led by Prof. H. S. Gaur , Dean & Joint Director, (Edn). IARI, New Delhi.
09.05.2012	A four member high level delegation from Afghanistan:	15.06.2012	Four member delegation from Ministry of Agriculture, Government of the Republic of Mozambique.
	<ul style="list-style-type: none"> • Mr. R. Osmani, Director General, GDPDM, Independent 	20.06.2012	Members of the Parliamentary Standing Committee on Agriculture.

FEATURE ARTICLE

SIMPLIFIED DETECTION METHODS FOR ADULTERANTS IN MILK

Rajan Sharma and Y.S Rajput

Milk is one of the food items being adulterated most frequently. In the recent past, the menace of adulteration has taken serious proportion as highlighted by many media reports as well as by the report of Food Safety and Standards Authority of India (FSSAI). During festival season, the electronic media is flooded with reports of milk and milk products adulteration. Although, India is the largest milk producer in the World with 121 Million MT of milk production per annum, the scarcity of milk is felt during lean season and festival days. Among the milk producing animals, buffalo and cow are main source and to small extent goat milk is also available in India. Due to difference in composition of cow and buffalo milk, unscrupulous persons take advantage of the situation. Perhaps, addition of water to buffalo milk is most commonly practiced. The image of milk has been considerably deteriorated due to the reports of its adulteration with harmful chemicals.

Media reports indicate the adulteration of milk with 'milk-like-preparation' using ingredients like urea, salt, soda, fertilizers, maltodextrin, glucose, starch, sucrose, vegetable oils and skim milk powder for the preparation of such formulations and such preparations have fat and SNF content similar to genuine milk. Due to this, adulteration of milk with such preparation becomes difficult.

Microorganisms multiply rapidly in milk stored at ambient temperature. Due to their activity, lactic acid is formed in milk. An increased acidity may curdle the milk. Unscrupulous traders add neutralizers to nullify the effect of increased acidity which is not permissible under law. Addition of neutralizers can be detected easily. On addition of few drops of rosolic acid to 4 ml of milk and alcohol mixture (in equal ratio), the development of pink colour indicates addition of neutralizers to milk. If the colour remains yellow, the neutralizers are considered absent. In certain

situations, alkalinity of ash may be required to rule out the possibility of addition of neutralizers to milk.

Addition of starch to milk is done to increase the thickness in milk. The presence of starch in milk can be detected easily. In 1 ml milk, add few drops of iodine solution. The development of blue colour indicates adulteration of milk with starch.

Urea is added to milk to increase the SNF content in milk. The natural milk also contains small amount of urea which is usually less than 50 mg/100 ml. As per Act, if urea content in milk is more than 70 mg/100 ml, milk is considered to contain externally added urea. The presence of added urea in milk can be ascertained by a simple test. In 1 ml milk, add 1 ml dimethylaminobenzaldehyde. Intense yellow colour indicates addition of urea in milk. In genuine milk, a light yellow colour develops.

Addition of pond water in milk has also been reported. Pond water contains high amount of nitrate from the use of fertilizers in the agricultural field. The presence of nitrate in milk can be established by diphenylamine test. Take 2 ml milk in a test tube. Rinse the tube with the milk and drain the milk from the test tube. Add two-three drops of the diphenylamine reagent along the side of the test tube. Deep blue color will be formed in presence of nitrate in the milk sample.

Ammonium sulphate and other salts of ammonium in milk have also been reported in the milk to increase its SNF content. Detection of ammonium compounds in milk can be done in milk easily. Take 5 ml of milk sample into a test tube. Add 1 ml of Nessler's reagent. Mix the contents of the tube thoroughly. Appearance of yellowish or grey color confirms the presence of added ammonium salts in milk.

The presence of glucose in milk can also be detected. Take 1 ml of milk sample in a test tube. Add 1 ml of modified Barfoed's reagent. Heat the mixture for exact 3 min in a boiling water bath. Rapidly cool under tap water. Add one ml of phosphomolybdic acid reagent to the turbid solution. Immediate formation of deep blue color after adding phosphomolybdic acid reagent indicates the presence of added glucose in the milk sample. In case of pure milk only faint bluish color can be observed and due to which it is necessary to run the test of genuine milk simultaneously.

Sodium chloride may be added to milk to increase the lactometer reading of milk. i.e. to increase the SNF content of milk. This can be detected by the use of silver nitrate and potassium chromate. Take 5 ml of suspected milk sample into a test tube. Add 1 ml of 0.1

N silver nitrate solution. Mix the content thoroughly and add 0.5 ml of 10% potassium chromate solution. Appearance of yellow color indicates the presence of added salts, whereas, brick red color indicates the milk free from added salt.

NDRI is working proactively for developing various analytical techniques and simpler methodology for



Detection kit for checking adulteration in milk

the detection of adulteration in milk and milk products. A kit developed in the Division of Dairy Chemistry for the detection of various adulterants in milk is in high demand among dairyman across the country. The kit contains reagents for detection of 11 adulterants in milk viz., neutralizers, urea, pond water, starch, sugar, glucose, salt, formalin, ammonium compounds, hydrogen peroxide, hydrogenated vegetable oil, etc. Recently, a simple test has been developed for the detection of the presence of detergent in milk. The test is capable of detecting all brands (shampoo, liquid as well as powder detergents used for washing clothes, etc) of detergent available in the market. The test is simple and results are available in about 2 minutes. The test can be easily performed at Milk Collection



*Detection of detergent in milk.
P: pure milk; A: adulterated milk*

Center. The test can detect 2- 3 liters of synthetic milk in 100 liters of milk. This test can detect presence of 'milk like preparations' in milk supplies. Sensitive tests have also been developed for the detection of presence of soyamilk in milk and maltodextrin in milk. The technologies of these tests are available from NDRI on commercial basis.

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