

वार्षिक प्रतिवेदन  
**Annual Report**  
**2012-2013**



भारत  
ICAR

**राष्ट्रीय माँस अनुसंधान केंद्र**  
**National Research Centre on Meat**  
(भारतीय कृषि अनुसंधान परिषद)

(Indian Council of Agricultural Research)  
चेंगीचेर्ला, बोडुप्पल / Chengicherla, Boduppal Post  
हैदराबाद - 500 092 / Hyderabad - 500 092

[www.nrcmeat.org.in](http://www.nrcmeat.org.in)





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## PREFACE

The National Research Centre on Meat, Hyderabad is taking a pro-active stance on the range of issues facing the Indian Meat Industry. During the year 2012-13 the Institute has made significant contributions in the field of meat science research, trainings, workshops, awareness programs, entrepreneurship development programs, MoU/Agreements with private entrepreneurs, consultancy and organising a national seminar. It gives me immense pleasure to present glimpses of this wide range of diverse activities for the aforesaid period.

NRC on Meat has been working on important projects related to much needed traceability issues in meat sector, carcinogenesis with reference to smoked meat products, experiments on superchilling, packaging, retort pouch processing and storage stability, DNA based technologies for detection of adulteration of animal fats, utilization of poultry industry byproducts for pet food preparation, prevalence of brucellosis in food animals and meat industry personnel, animal feeding trails and meat quality evaluation, organic meat production are being undertaken in collaboration with CRIDA, Hyderabad, estimation of chemical residues in chicken and fish, feed, soil and water samples, development of ready-to-eat and value added meat products, dried meat products and other preservation techniques. The institute has filed two patents related to meat processing.

The Institute is also handling external funded projects from World bank (NAIP), Department of Science & Technology, contract research with private multinational companies. I am glad to inform that recently a new project has been sanctioned from Ministry of Statistics and Program Implementation, Govt. India. Besides these research projects, NRC on Meat has successfully completed a contract research project with Kancor Ingredients, Kerala. Five entrepreneurship training programs have been organised covering more than 100 entrepreneurs from different parts of India. Five training programs were organised for Asst. Directors and Veterinary officers from A.P, Veterinary officers from Allana Sons Exports, Zaheerabad and for other slaughterhouse personnel. One consultancy project and two MoU's have been signed with private entrepreneurs. NRC on Meat has also signed an MoU with Sri Venkateswara Veterinary University (SVVU), Tirupati.

It is a great pleasure to mention that NRC on Meat has successfully organised a National Symposium and 5<sup>th</sup> Annual Conference of Indian Meat Science Association from 7-9<sup>th</sup> February, 2013 wherein more than 200 delegates from academia and industry have participated. The Institute has been awarded with prestigious EPICURUS South India Hospitality Award for “Best Research Centre in Meat Processing”. The NRC on Meat gratefully acknowledges the valuable guidance and encouragement received from Dr. S. Ayyappan, DG, ICAR, Dr. K.M.L. Pathak, DDG (Animal Sciences), Dr.B.S. Prakash, ADG (AN&P), Dr. Vineet Bhasin, Principal Scientist (AGB), ICAR and other experts of meat science community. I appreciate the efforts of scientists and all other staff of NRC Meat in bringing out this report which will be of great use to the meat scientists, technologists, entrepreneurs and other extension workers.



**(V.V. Kulkarni)**

**Director**



## EXECUTIVE SUMMARY

With its mission to develop modern, organised meat sector through meat production, processing and utilization technologies, National Research Centre on Meat, Hyderabad has undertaken various activities related to meat sector. Applied and basic research in meat science, entrepreneurship development, consultancy, transfer of technologies, human resource development, awareness programmes, exhibitions, contract research, national seminars and several other activities have been undertaken to cater to the needs of meat industry personnel, meat exporters, entrepreneurs, students and consumers. The summary of the Institutes activities during the period from April 2012 to March 2013 is presented below:

- Experiments on quality meat production through different feeding strategies and approaches for organic meat production are being undertaken.
- Blood samples from cattle and buffaloes, meat industry personal, butchers, veterinarians were screened for presence of brucellosis. Five awareness programs were organised at several places across Andhra Pradesh.
- A project on buffalo meat traceability system using sixteen digit Radio Frequency Identification (RFID) ear tags, RFID reader and bar code is being carried out to effectively trace back the source of meat.
- An innovative super-chilling (storage at -1°C) and vacuum packaging process for chicken drumsticks which significantly improves the shelf-life upto 1 month without freezing compared to 4 days at refrigeration temperature was developed.
- Proteomics tools viz, 2-Dimensional electrophoresis and mass spectrometry were used to characterize tough and tender muscles of young and spent buffalo meat. Proteome changes were correlated with ultrastructural changes using scanning and transmission electron microscopy.
- Extraction and purification of buffalo myoglobin and their thermostability studies were conducted.
- Survey of different commercially available tandoor type products and their acceptability and experiments on accelerated curing using tumbling and preparation of smoked chicken has been undertaken.
- Optimized the process for retort pouch processing of Kashmiri speciality products “Rohan Josh” and “Rista Curry” and the shelf-life of these products were assessed.
- Estimation of organochlorine, organophosphorus and synthetic pyrethroids from chicken, byproducts, feed, water and certain varieties of fishes from kolleru region of A.P. has been undertaken.

- Experiments were carried out on emu meat quality, composition, packaging and storage stability. Exclusive training programs on further processing of emu meat was conducted.
- DNA based technologies for detection of adulteration of different animal fats with vegetable fats is being developed.
- Polymerase Chain Reaction-Restriction Fragment Length Polymorphism (PCR-RFLP) based molecular technique for detection of meat adulteration was developed.
- Varieties of shelf stable, sun dried chicken products with more than 1-2 year stability have been developed and the technologies are popularized through hands-on training programmes among interested entrepreneurs.
- Experiments were carried out to compare the carcass and meat quality characteristics of desi birds and broilers.
- The contract research project revealed that solubility of carnosic acid (CA) and rosmarinic acid (RA) extracted from dried rosemary leaves affects their antioxidant activity in raw and cooked ground chicken patties. The project established the relationship between the solubility, dosage and antioxidant capacity of CA in raw and cooked ground buffalo meat and chicken patties.
- Experiments are being conducted to develop acceptable and nutritious pet food product in the form of biscuits using poultry slaughter waste.

**Entrepreneurship training, consultancy, MoU, awareness programmes and extension activities:**

- Five hands-on entrepreneurial training programs on “Value added chicken products processing” for more than 100 small and medium scale entrepreneurs was organised.
- Two memorandum of understanding (MoU)/agreements were signed with entrepreneurs for licensing and test marketing of NRC Meat developed value added products.
- Undertaken two consultancy projects related to establishment of slaughter houses for emus.
- Exhibited NRC Meat technologies at Poultry India-2012, Directorate of Oilseeds Research and also at NAARM, Hyderabad.
- Six awareness campaigns on clean meat production, modern slaughter houses was organised across Andhra Pradesh.
- Developed liaisons/ collaborations and interacted with stake holders and experts from Animal Husbandry Dept., Greater Hyderabad Municipal Corporation, Pollution control board, export meat industries, Poultry and meat processors, University officials, Private entrepreneurs etc.
- NRC on Meat has been awarded with prestigious EPICURUS South India Hospitality Award for “Best Research Centre in Meat Processing”.



## INTRODUCTION

National Research Centre on Meat was established with its own building at Chengicherla, Hyderabad in the year 2007 with an overall objective to conduct basic and applied research, to promote quality meat production, value addition, training and entrepreneurship development and to provide policy support. Since 2007, NRC Meat is functioning with just 6-7 scientists and only in the year 2010-11 a total of 14 scientists were filled. Within a span of five years the NRC Meat has made enormous progress in creation of facilities, research, human resource development, entrepreneurship development, extension, TOT, consultancy and several other programs and the scientists of this centre were awarded with several national and international awards.

The NRCM is the only premier institution devoted fully to the meat research in the country. The centre was created with main emphasis on value addition, quality attributes of fresh and processed meat, imparting education, training and attention towards sanitary and phyto-sanitary measures in the slaughter of animals and meat production. These require scientific and technological support to develop knowledge and skills through participatory approach of farmers, entrepreneurs and scientists. Scientists of this centre have conducted various experiments on evaluation and improvement of quality of fresh and processed meat, analysis of chemical residues in meat and fish, biochemical understanding of tenderness, species and sex identification of meat, retort pouch packaging for ready to eat meat products, dried meat products development, microbiological quality evaluation of fresh meat and meat products, meat inspection and utilization of slaughter house waste.

Besides research projects, NRC on Meat is conducting entrepreneurial training programs, awareness programs, workshops and regular interactive meetings with officials from line departments. The Institute also undertakes contract (sponsored) research with private multinational companies, consultancy projects, analytical services and provides bankable project reports to interested entrepreneurs in establishing meat products processing units. The Institute also exhibit its technologies and different meat products at various locations for wider reach among public. Overall, NRC on Meat is striving hard to address the issues related meat animal producers, meat processors and consumers.



## VISION

NRC on Meat as a premier institute of meat research to solve the problems and face challenges of meat and allied sectors development

## MISSION

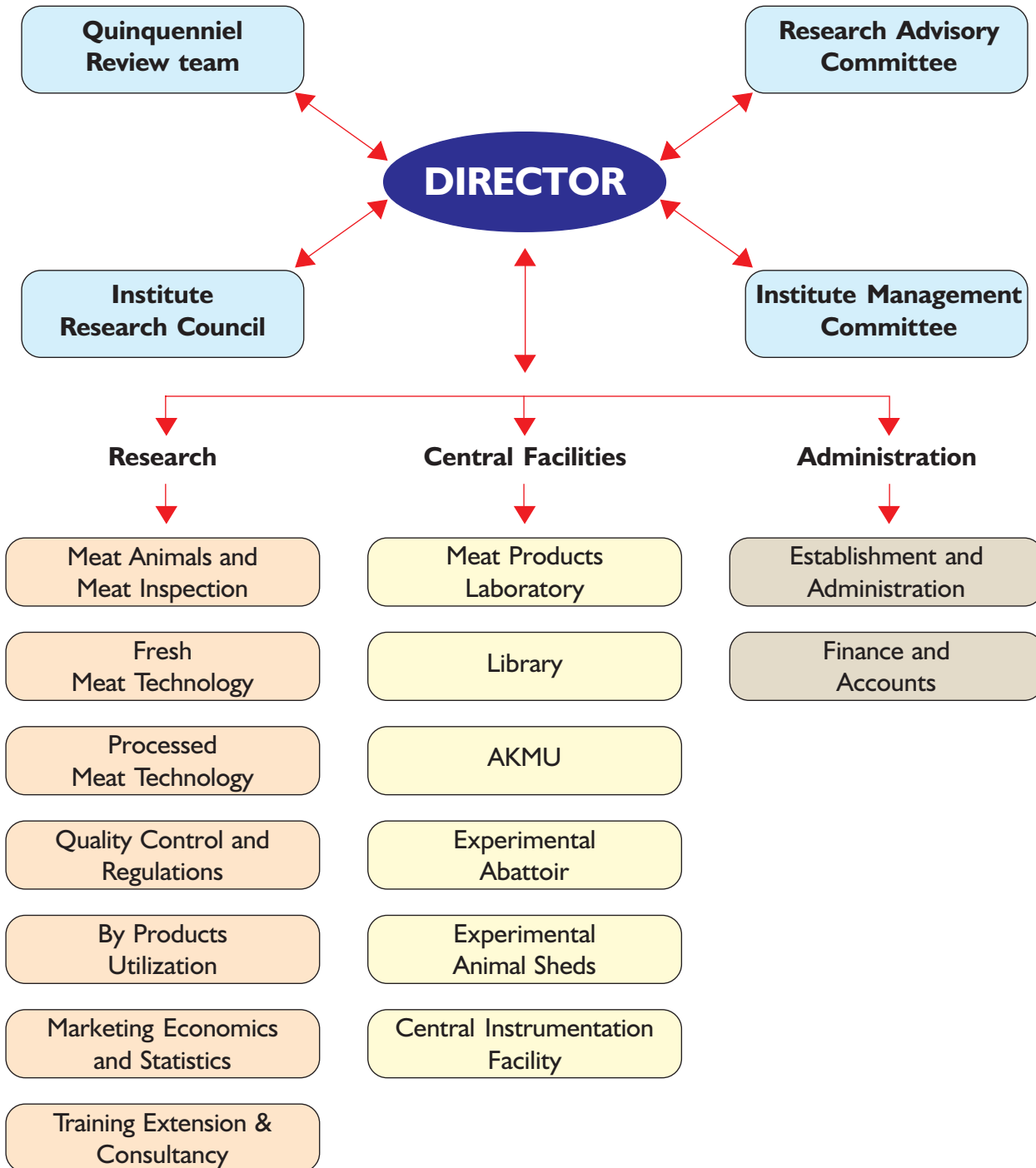
Development of modern organized meat sector through meat production, processing and utilization technologies to serve the cause of meat animal producers, processors and consumers.

## MANDATE

- To conduct basic and applied research in meat science and technology for development of a modern organized meat sector in the country
- To develop appropriate and relevant technologies/processes/practices for meat production, processing, value addition and utilization to contribute for sustained meat production and consumption
- To provide need based training for different levels of personnel in meat and allied sectors.
- To establish a liaison with industry, trade, regulatory and developmental organizations operating in meat sector.
- To support bilateral and international programmes
- To serve as a national repository of information in meat and allied sectors.



## ORGANIZATIONAL SETUP





## STAFF STRENGTH (2012-13)

Staff	Sanctioned	Filled
Scientific (Including Director)	15	14
Technical	5	5
Administrative	14	8
<b>Total</b>	<b>34</b>	<b>27</b>

## BUDGET (FY 2012-13) in Lakhs

Sr. No.	HEAD	PLAN		NON-PLAN	
		SANCTIONED	UTILIZED	SANCTIONED	UTILIZED
1	Establishment	0	0	250	244.15
2	Contingencies	92	91.87	38.93	38.72
3	Equipment	15	11.56	0	0
4	Furniture & Fixtures	0	0	0	0
5	Library	2	1.57	0	0
6	Works			0	0
7	TA	6	6	4.5	4.5
8	HRD	2	1.98	0	0
9	Misc & Others	0	0	2.57	2.53
10	P loans & Advances	0	0	0	0
11	Pension & ORB	0	0	10	6.98
12	IT	6	4.78	1	0.97
	<b>Total</b>	<b>123</b>	<b>117.76</b>	<b>307</b>	<b>297.85</b>



## RESEARCH HIGHLIGHTS

**Project title** : **Estimation of pesticide residues in pond reared fishes in Kolleru region of Andhra Pradesh**

**Principal Investigator** : **Dr. G. Venugopal, Principal Scientist**

A total of 185 samples were collected from Kolleru region i.e, four each mandals of West Godavari and Krishna dists, comprised of fishes - Rohu-43, Catla -25, Mrigala-1, Pangas – 22, Roop chand-5 ; soil-31, water -31 and feed-27. It was observed that residues of organo chlorine compounds were found in fish, water, soil and feed samples but organo phosphorous compounds were not in detectable levels. However, synthetic pyrethroids residues were seen in few samples of fish, water, soil and feed.

Out of 43 Rohu samples 42 showed presence of certain pesticide residues. In case of Catla, 22 out of 25 samples were positive for various pesticide residues. Both the Pangas (20/22) and Roop chand (5/5) fish samples contained pesticide residues in all the collected samples. In the case of Mrigala only one sample could be collected, which was also found positive. While 24 out of 31 soil samples, 25 out of 26 feed samples and 23 out of 31 water samples showed presence of certain pesticide residues. In total 91.72% of samples were positive for pesticide residues.

Though the levels of these pesticide residues recorded in most of the samples were lower than the maximum residue limit (MRL) prescribed by Food Safety and Standard Act, (2006), however in West Godavari dist four Rohu, four Catla and one Roopchand fish samples contained organochlorine compounds viz., endosulfan sulfate, dieldrin, heptachlor,  $\gamma$  HCH, residues level above MRL and in the range of 0.28 – 0.637 ppm. Similarly in Nandivada mandal of Krishna dist one sample of Rohu (yearling) was found to contain 0.388 ppm of dieldrin against MRL of 0.25 ppm. In the case of pond water only synthetic pyrethroid- deltamethrin of 0.591 ppm was detected in Nandivada mandal of Krishna dist, while the soil samples one each in Eluru mandal of west Godavari and Gudivada mandal of Krishna dist contained heptachlor of 0.345 and 0.458 ppm respectively. In respect of feed samples in West Godavari dist. three samples of Mogalthuru Mandal and one in Ganapavarm mandal contained various OC compounds viz., H- epoxide, aldrin, dieldrin, endrin,  $\gamma$ -HCH, endrinaldehyde above MRL and in the range of 0.26 - 0.66 ppm. While in Krishna dist only in one sample of Nandivada mandal DDT of 0.313 ppm was recorded.

**Project Title : Detection of animal derived materials in foods and feeds through molecular techniques**

**Principal Investigator : Dr. S. Vaithyanathan, Principal Scientist**

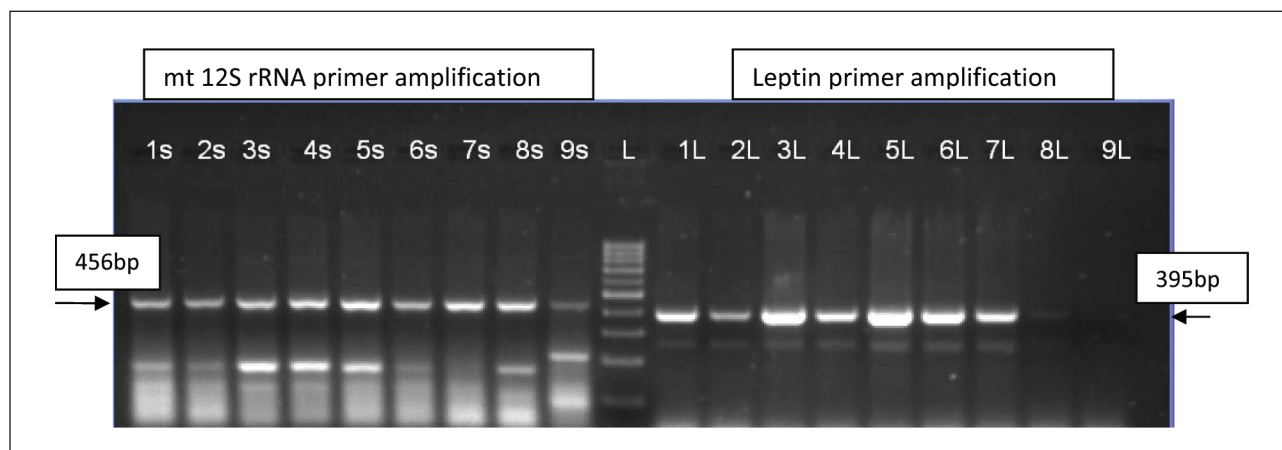
**Experiment 1: Efficiency of commercially available kit on DNA extraction**

The DNA extraction from fat sample (animal fat and milk fat) was followed as described by Epicentre kit, Chromous Biotech, Genei and Qiagen DNA extraction kits. The conventional method of PCI was also used to extract DNA. After extraction, DNA was quantified by Nanospectrophotometer.

**Experiment 2: DNA extraction from fat tissues and identification of species of meat animals**

The DNA extraction from 200mg fat tissue sample (cattle male, cattle female, buffalo male, buffalo female, sheep male, sheep female, goat male, goat female and chicken) was followed as described by Qiagen Kit-I. After extraction, DNA was quantified by Nanospectrophotometer.

The DNA extracted from the fat tissue samples were further verified for species specificity. Genomic DNA obtained from fat tissues were amplified by using universal mitochondrial mt 12S rRNA primer and leptin primer. The PCR results are given in Fig . 1.



**Fig. 1 : PCR amplification of mt 12S rRNA and leptin primers**

1s: cattle male; 2s: cattle female; 3s: buffalo male; 4s: buffalo female; 5s: sheep male; 6s: sheep female; 7s: goat male; 8s: goat female and 9s: chicken. 1L:cattle male; 2L: cattle female; 3L: buffalo male; 4L: buffalo female; 5L: sheep male; 6L: sheep female; 7L: goat male; 8L: goat female and 9L: chicken



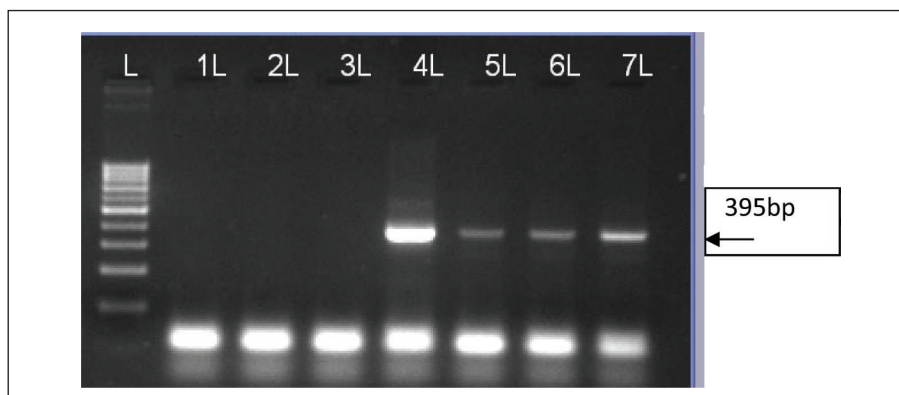
### Experiment 3: DNA extraction from binary mixtures of Tallow (obtained from industrial method) and Cow Ghee (obtained from NDRI) identification of species of meat animals

Tallow was mixed with cow ghee in different ratios (from 0 to 100 %) to make binary mixtures before DNA extraction. All the samples were extracted with Qiagen kit-I. After extraction, DNA was quantified by Nanospectrophotometer. Results are given in Table 1. Genomic DNA obtained from fat tissues were amplified by using leptin primer. The PCR results are given in Fig .2.

**Table 1 : DNA extracted from binary mixtures of Tallow (obtained from industrial method) and Cow Ghee (obtained from NDRI)**

	Binary mixture (%)						
	0	10	20	30	40	50	100
Tallow (obtained from industrial method) ( $\mu$ l)	0	20	40	60	80	100	200
Ghee (obtained from NDRI) ( $\mu$ l)	200	180	160	140	120	100	0
DNA (ng/ $\mu$ l)	6.15	5.84	12.83	5.69	3.83	8.25	4.06

From the above results, it is clear that DNA was extracted from the commercial ghee samples mixed with tallow.



**Fig. 2 : PCR amplification of leptin primers by DNA extracted from binary mixtures of cow ghee and tallow**

1=Cow ghee (NDRI, Bangalore)-100%; 2=Ghee 90% and Tallow 10%; 3=Ghee 80% and Tallow 20%; 4=Ghee 70% and Tallow 30%; 5=Ghee 60% and Tallow 40%; 6=Ghee 50% and Tallow 50% and 7=Industrial Tallow 100%

The amplification of leptin primer was seen from 30% tallow and beyond (Fig 2). These amplified DNA fragments were sequenced and found that the sequences were matching with the reported sequences of cattle and buffalo.



**Project title : Studies on safety of muscle food based products with reference to carcinogenesis**

**Principal Investigator : Dr. A.R.Sen, Principal Scientist**

A total of 112 consumers' at 8 restaurants throughout Hyderabad were surveyed for consumption pattern of tandoor type of muscle food based products. Most of the consumers prefer such type of product prepared from mutton. Tumbling had better effect in development of cured and smoked chicken leg with superior quality attributes. Further, we can reduce the processing time by decreasing the dipping time in brine solution (Table 1). Alternatively chicken tikka can be produced in hot air oven, rather than open flame/tandoor oven with higher yield and superior tenderness and other sensory scores (Table 2).

**Table 1 : Effect of tumbling and dipping on physico-chemical attributes of cured and smoked chicken leg**

Traits	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
pH	6.61±0.07	6.60±0.08	6.72±0.06
Shear force value(N)	11.19±1.20	13.35±0.82	11.34±1.30
Cooking yield (%)	62.85±1.53	65.91±1.15	63.78±0.95
Residual nitrite(ppm)	108.77±4.32	85±2.73	75.68±2.65
Salt (%)	2.22±0.11	2.19±0.09	1.97±0.10
Total pigment (%)	126.28±3.88	140.76±7.20	139.23±2.65
Nitroso pigment (%)	39.23±0.80	37.49±0.62	41.91±0.99
Moisture (%)	65.09±1.93	64.52±1.56	62.99±0.74
Fat (%)	2.99±0.05	3.22±0.08	3.09±0.04
Ash (%)	3.00±0.08	3.30±0.19	2.87±0.31

**Table 2 : Effect of cooking methods on physico-chemical attributes of chicken tikka**

Traits	Barbecued	Gas tandoor	Hot air oven
Cooking yield (%)	59.35±1.23	60.61±1.39	64.14±1.08
Shear force value (N)	27.43±2.42	20.39±1.73	21.33±3.74
Moisture (%)	58.78±0.25	57.22±1.81	56.45±0.77
Fat (%)	2.75±0.25	3.50±0.39	1.75±0.75
Ash (%)	5.47±0.25	4.99±0.21	5.20±0.06

**Project : Exploring feasibility and promotional avenues of dried meat products for entrepreneurial adoption in and around Hyderabad**

**Principal Investigator : Dr.Y.Babji, Principal Scientist**

Six training programmes were conducted for 27 below poverty line (BPL) and other people during the last one year of the project “Exploring feasibility and promotional avenues of dried meat products for entrepreneurial adoption in and around Hyderabad”. Dr.Prince Devadason and Dr.R.S.Rajkumar had been the co-principal investigators in this project. For every training programme, a 55% of laboratory work was carried out which included processing, preparation and evaluation of further processed dried meat products. The evaluation included physico-chemical (pH, TBA, water activity,) microbiological (APC, PPC, Coli forms, Enterobacteriaceae, Faecal streptococci, Lactic acid bacteria, Pseudomonas, Staphylococcus aureus, Salmonella, Yeast and Mould), proximate (Moisture, protein, fat and ash) and sensory parameters (colour, odour, spiciness, saltiness, crispiness and over all acceptability) before conducting and during conducting each training programme. Before conducting six training programmes, dried meat was each time prepared, processed in to 10 further processed value added products, evaluated for various parameters (Physico-chemical, microbiological, proximate and sensory evaluation) for ascertaining its safety, suitability and quality for human consumption and well being.



During six training programmes, we had actively engaged in lecture cum product demonstrations on various facets such as hygienic chicken meat production and hygienic procurement of fresh chicken meat from retail outlets in Hyderabad; Preparation of fresh chicken meat for sun drying with various spices and condiments; Production of sun dried chicken meat with optimum sensory characteristics; Further processing of dried chicken meat in to various value added meat products; cost-benefit ratio; avenues for marketing of dried meat products in and around Hyderabad villages; techno-economic feasibility of establishing rural cottage enterprises in villages through transfer of drying technologies. Throughout this research project, he proved himself as a excellent researcher, teacher and extension worker and positively motivated 27 below poverty line (BPL) people) to take up sun drying as a profitable cottage industry for their sustainable livelihoods.





**Project Title : Studies on prevalence of Brucellosis in slaughtered ruminants at Municipal abattoir, Hyderabad and its public health significance in abattoir personnel**

**Principal Investigator : Dr. C. Ramakrishna, Senior Scientist**

The project has been taken up with three main objectives a) to study the prevalence of Brucellosis in ruminants slaughtered at Municipal abattoir, Hyderabad b) to study the prevalence of Brucellosis in meat workers who are in direct / indirect contact with animals and c) to increase awareness in meat workers about the methods of transmission of Brucellosis from animals to human beings and its prevention. During the period under report (April, 2012 to March, 2013), the following observations were recorded.

#### **Prevalence in slaughter animals**

A total of 5,391 sera samples collected from 2730 Sheep and 2661 Goats during the period from April, 2012 to March, 2013, were screened for the presence of antibodies against *Brucella* infection by agglutination test. Three types of reagents i.e., 1) Rose Bengal Plate Test antigen procured from Indian Veterinary Research Institute, Izatnagar for detection of *Brucella sp.* 2) Antigen from Visat Diagnostics, Mumbai for detection of *Brucella abortus* and 3) Antigen from Visat Diagnostics, Mumbai for detection of *Brucella melitensis* were used. Overall, the percentage of small ruminants (Sheep and goats) positive for Brucellosis was 3.41% (184 out of 5391). The percentage of Brucellosis in goats (3.98%; 106 out of 2661) was higher than sheep (2.86%; 78 out of 2730). There was no significant difference in sex of sheep in the percentage of Brucellosis (Male sheep – 2.18%; Female sheep – 3.54%). However, the prevalence was higher female goats compared to male goats (Female goats – 6.24%; Male goats – 1.73%). Highest percentage of Brucellosis was recorded in April, May and June compared to other months.

**Table I : Month-wise prevalence of Brucellosis in small ruminants (Sheep and goats)**

Month	Total no. of small ruminants screened	No. of small ruminants positive for Brucellosis by RBPT	Percentage
April, 2012	192	17	8.85
May, 2012	624	66	10.58
June, 2012	405	31	7.65
July, 2012	432	15	3.47
August, 2012	480	12	2.50
September, 2012	480	0	0
October, 2012	426	18	4.23
November, 2012	480	0	0
December, 2012	432	9	2.08
January, 2013	480	4	0.83
February, 2013	480	3	0.63
March, 2013	480	5	1.04
<b>Total</b>	<b>5391</b>	<b>184</b>	<b>3.41</b>

#### Prevalence in abattoir personnel

Sera samples from a total of 107 meat workers (mainly butchers) of Sheep and Goats were collected at Rangareddy, Warangal and Nalgonda areas. All the sera samples were analyzed by agglutination test using the reagents procured from IVRI and Visat Diagnostics. All the positive samples of obtained by agglutination test were confirmed by Tube agglutination test (TAT). Out of 107 meat workers, sera samples belonging to 27 persons (25.23%) showed presence of antibodies either by agglutination test or by TAT.

#### Awareness programmes

A total of 3 awareness programmes were conducted in the districts of Rangareddy, Warangal and Nalgonda. The methods of transmission of disease from animals to humans and disease preventive measures were explained to all the butchers. Hygiene kits and brochures prepared in Telugu and English were distributed to them.

**Project Title : Process and quality evaluation of heritage meat products in retort pouches by thermal processing**

**Principal Investigator : Dr. I. Prince Devadason, Senior Scientist**

Rista Curry is a Kashmiri delicacy and also a component of the thirteen course Kashmiri meal called Wazwan. This product was prepared at our centre by a well trained chef called Waza. This product was prepared and filled in to retort flexible pouches and were hermetically sealed using an impulse sealing machine. Products were processed at a Fo value of 6.5 with a total processing period of 57 min.

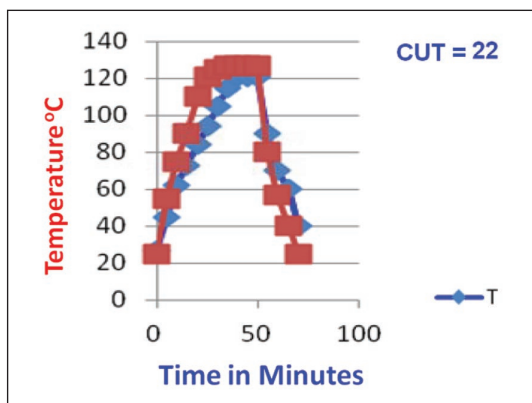


Fig. 1 : Heating curve of rista curry



Fig. 2 : Rista curry in retort pouches

Rista curry processed in transparent retort pouches

The proximate analysis revealed that the products are having a 69% moisture, 10.50% fat and 19.18% protein.

Proximate composition	Rista curry
Moisture	69.05 ± 0.54
Fat	10.59 ± 4.31
Protein	19.18 ± 2.35
Mean ± SD (n=6)	

The study indicated that the products were stable at ambient temperature for a period of 12 months.

**Project Title : Development of suitable packaging methods for meat and meat products**

**Principal Investigator : Dr. Naveena, B.M., Senior Scientist**

- Technology for super-chilling and vacuum packaging of fresh chicken drumsticks for extending the shelf-life upto 30 days under chilled conditions without freezing has been developed.



Super-chilling technology for chicken drumsticks

**Project Title : Emu meat quality, processing and product development towards a niche market**

- Experiments were carried out on emu meat quality, composition, packaging and storage stability. Exclusive training program on further processing of emu meat was conducted.
- Emu carcass characteristics clearly indicate that emus are significant source of lean meat, fat, skin and edible by-products. Emu meat has higher protein and ash content and lower fat, total lipids and cholesterol content.
- The pH, water holding capacity, collagen content and solubility, protein extractability, muscle fibre diameter and Warner-Bratzler shear force values of emu meat are similar to the earlier reports for meats from other food animals. Sensory evaluation of cooked emu meat curry revealed highly acceptable scores.



Fresh emu meat

Emu meat nuggets

Emu meat croquettes

## EXTERNAL FUNDED PROJECT

**Project Title : Proteomics of lipid oxidation induced oxidation of buffalo and goat meat myoglobins**

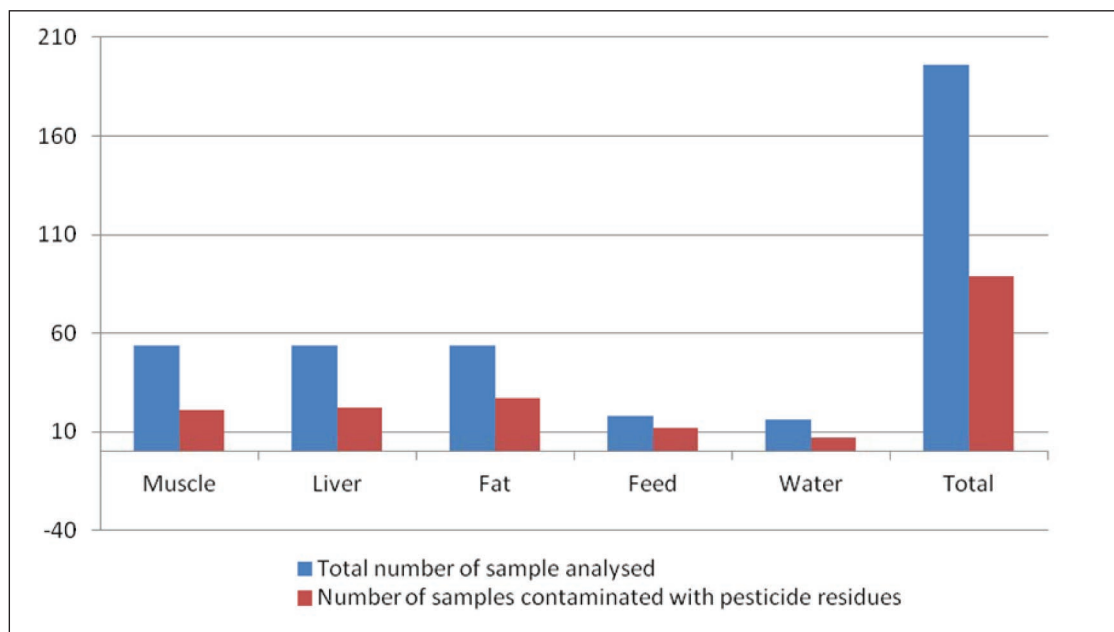
Department of Science & Technology (DST) funded project was initiated from April, 2012. Project deals with extraction, purification and characterization of myoglobin from Indian buffaloes and goats and their interaction with lipid oxidation products *in-vitro* and characterization using tandem mass-spectrometry (MS-MS). Proteomics laboratory is being established with facilities viz, two-dimensional gel electrophoresis (2-DE), 2-DE gel scanner and analyzing software and Flash-chromatography etc.

**Project Title : Estimation of pesticide residues from poultry feeds and foods**

**Principal Investigator : Dr. M. Muthukumar, Scientist (SS)**

**Detection and quantification of pesticide residues in samples from broiler farms.**

Samples of water (16), feed (18), muscle (54), liver (54) and fat (54) were collected from three commercial broiler farms located near Hyderabad were analysed for assessing the level of pesticide residues. Overall 45.40 % of samples were showed presence of pesticide residues. Among the samples, feed (66.66 %) and fat (50.0 %) showed higher level of contamination (Fig 1). Among the pesticides, residues of HCH (99 samples), DDT (65), aldrin (34) and endosulfan (33) were more frequently observed. However, the levels of these pesticide residues were lower than the maximum residue limit prescribed by FSSA(2006).



**Fig. 1 Incidence of pesticide residues in various chicken tissues, feed and water samples**





**Project Title : Effect of Zn and Se levels in Sheep diets on meat quality**

**Principal Investigator : Dr. P Baswa Reddy, Scientist (SS)**

The project was carried out as an inter institutional project between NRCM and CRIDA. A feeding trial was conducted in Sheep at HRF of CRIDA to study the effect of feeding different levels of Selenium in the diet on the growth performance, immunity and meat quality.

Twenty four weaned native ram lambs were divided into four groups with six animals in each group. They were reared for four months under stall fed conditions with adlib roughage along with concentrate feed @1% of body weight. Concentrate feed contained different levels of Selenium in different groups in the form of Sodium selenite. @ 0, 0.1,0.2 and 0.4g/100kg concentrate feed. Feed consumption and body weight gains were recorded. Humoral and cell mediated immunity were assessed in the animals. At the end the animals were slaughtered to study the carcass characteristics, meat quality parameters and fatty acid composition. Feed consumption was affected by selenium supplementation in the diet but the ADG was slightly improved. Animals in group 4 had highest immunity levels compared to other groups. Skin fold test (In -vivo delayed type hypersensitivity,DTH reaction) in response to phyto haemagglutinin increased with increase of Se level in the diet. The slaughter parameters and carcass characteristics of animals in different groups are presented in table 1. Fat percentage in the chilled carcass was found to be significantly lower in group 2 when compared to the control (group 1). Evaluation of TBARS in meat stored at refrigeration temperature under aerobic packing in LDPE bags on 0<sup>th</sup> 3<sup>rd</sup> and 6<sup>th</sup> day revealed significantly tower TBARS in 4<sup>th</sup> group on 6<sup>th</sup> day. Analysis of Fatty acid composition of LD muscle showed higher poly unsaturated fatty acids (PUFA) in group 2 when compared to control (Table 2).

**Table 1 : Carcass traits**

	Group 1	Group 2	Group 3	Group 4
Pre slaughter Live wt (kg)	23.47	25.13	26.03	25.97
Empty Body wt (kg)	20.34	21.44	22.67	22.19
Hot carcass wt(kg)	11.22	12.30	12.68	12.32
Chilled carcass wt(kg)	11.12	12.03	12.05	12.02
pH of fresh carcass	6.55	6.45	6.26	6.09
pH of chilled carcass	5.72	5.64	5.64	5.64
DP on LWB	47.80	48.94	48.72	47.43
DP on EBW	54.65	56.13	53.16	54.16
M:B Ratio	2.14	2.16	2.17	2.16
Fat % In chilled carcass	9.21 <sup>b</sup>	7.86 <sup>a</sup>	8.97 <sup>ab</sup>	8.40 <sup>ab</sup>

**Table 2 : Fatty Acid composition (%) of LD muscle**

Group	TSFA	MUFA	PUFA
1	54.35 ± 1.74	40.72 ± 1.44	4.93 ± 0.35 <sup>a</sup>
2	54.74 ± 1.12	39.92 ± 0.68	5.34 ± 0.48 <sup>b</sup>
3	54.03 ± 1.02	40.76 ± 1.02	5.21 ± 1.34 <sup>ab</sup>
4	55.29 ± 2.03	39.72 ± 1.86	4.99 ± 0.7 <sup>ab</sup>



**Project Title** : **Developing organic meat production system for promoting sustainable animal husbandry, enhancing income to producers and health benefits to consumers**

**Principal Investigator** : **Dr. Girish Patil, S., Scientist (SS)**

Research project on organic meat production has been initiated in collaboration with Central Research Institute for Dry Land Agriculture (CRIDA). Protocol for rearing sheep under organic system finalized. Recommended procedure by Agricultural & Processed Food Products Export Development Authority (APEDA) under National Program for Organic Production (NPOP) taken as guideline for finalizing the protocol. Twelve deccani breed lambs (six rams and six ewes) were put on organic system in Research Farm, CRIDA, Vanasthalipuram, Hyderabad. Organic fodder grown in the farm was fed ad-libitum and concentrate mix prepared from procuring organic ingredients from organic store were fed to lambs as supplementation. All the lambs were healthy after six weeks of rearing and showed average daily gain of 67 g. Experiment will be continued till the conversion period of the lambs is completed.

**Project Title** : **ICAR Lal Bahadur Shastri Young Scientist Award project: Developing traceability system for buffalo meat industry for quality assurance and augmenting exports**

**Principal Investigator** : **Dr. Girish Patil, S., Scientist (SS)**

**i) Buffalo meat traceability system devised – Interested entrepreneurs welcome to join the traceability system**

A buffalo meat traceability system has been designed under the project which includes animal coding system approved by International Committee for Animal Recording (ICAR) and data base for uploading of the animal information and retrieval system to enable consumers to trace back the origin of meat. Buffaloes will be identified by ICAR approved fifteen digit Radio Frequency Identification (RFID) device which will be put on to animal as ear tag. Code can be carried forward as bar code on to the meat. Traceability code has also been devised for registration of buffalo farms and slaughterhouses for effective tracing back of the meat. Livestock traceability database has been established. Registered farmers will have an added advantage of getting SMS alerts regarding vaccination schedule, disease outbreaks etc. The system will also help consumers to instantly trace back the origin of meat SMS messaging. Farmers can in real time upload the information pertaining to animals by using a hand held device or through mobile messaging. Effective following of the system will help farmers will have their production records handy and will help organize their farm in scientific way. NRC on Meat welcomes any interested farmer and meat producer to join the traceability system.

**ii) Breed traceability of buffalo meat by using microsatellite polymorphism**

Microsatellites, also known as Simple Sequence Repeats (SSRs) or short tandem repeats (STRs), are repeating sequences of 2-6 base pairs of DNA. It is a type of variable number tandem repeat (VNTR). One common example of a microsatellite is a  $(CA)_n$  repeat, where  $n$  varies between alleles. These markers often present high levels of inter- and intra-specific polymorphism, particularly when the number of repetitions is 10 or greater. Generally, high mutation rate makes them informative and suitable for breed identification of buffalo meat. Hence, an attempt was made in the project to develop a microsatellite based method for traceability of meat.



**Project Title : Characterization and utilization of by-products from livestock, poultry and fish**

**Principal Investigator : Dr. R.S. Rajkumar, Scientist**

- Formulation of dry pet food (Dog biscuits) has been done using the following ingredients and shelf life evaluation and proximate composition is being carried out.

S. No.	Ingredients	Quantity (%)
1.	Meat cum bone meal (Commercial)	15
2.	Wheat flour	45
3.	Bakery Waste	10
4.	Soya Bean Meal	4.5
5.	Broken Rice	5
6.	Maize	5
7.	DORB	12
8.	Fat	3.0
9.	Salt	0.5

- Similarly a procedure for the preparation of shelf stable thermally processed semi-moist pet food (bites in gravy) in retort pouches has been carried out and shelf life evaluation and proximate composition is being carried out.

S. No.	Ingredients	Quantity (%)
1.	Giblets (Liver, Heart, Gizzard)	10
2.	Spent Hen Meat	40
3.	Binder (Corn Flour)	05
4.	Chicken Fat	10
5.	Skimmed milk powder	05
6.	Spice mix	02
7.	Fibrous Vegetables	25
8.	Sugar	0.5
9.	Salt	0.5

- The gravy has been prepared utilizing the chicken frames. Soup is obtained from the frames and thickened using the flour and spice mix.



## PUBLICATION AND RESOURCE MATERIAL DEVELOPMENT

### Research papers

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#### **Lead papers**

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2. Kulkarni, V. V., and Girish Patil, S. 2013. Meat science research in India: Need to bring paradigm shift. In: *Souvenir of 5<sup>th</sup> Annual Conference and National Symposium of Indian Meat Science Association (IMSACON-V) on 'Emerging technological changes to meet the demands of domestic and export meat sector'*, 7-9 February, 2013.
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21. Naveena, B.M. and Usha Rani, K. (2013). Extraction and purification of myoglobin from cardiac or skeletal muscles of Indian buffaloes (*Bubalus bubalis*). In: Proceedings of the 5<sup>th</sup> Annual conference and National symposium of Indian meat science association (IMSACON-V) 7 to 9 Feb 2013, organized by National Research Centre on Meat, Hyderabad. Pp 295.
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3. Muthukumar, M and Muthulakshmi, M. 2012. Abattoir management in relation to food safety. In: compendium on “International workshop on strategies in value addition and safety aspects pertaining to dairy and food industry”. Department of Dairy Science, Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University, Chennai.
4. Muthukumar, M. and Girish Patil, S. 2012. Legislation pertaining to meat sector in India. In: Summer school on opportunities in value addition and challenges in quality control in meat products including slaughterhouse byproducts. Veterinary College and Research Institute, Namakkal.
5. Baswa Reddy, P., and Prince Devadason, I. 2012. Application of HACCP in thermal processing In: Training manual on Thermal Processing of Ready to Eat (RTE) meat products in retort pouches. Organized by NRC on Meat, Hyderabad, 23-26 April-2012.
6. Baswa Reddy, P., Girish Patil, S., Ramakrishna, C., and Mooventhan, P. 2012. Intensive Ram lamb rearing for quality meat production.
7. Baswa Reddy, P., Girish Patil, S., Venugopal, G. and Ramakrishna, C. 2012. Broiler rams lamb rearing with complete feeds – Economics of Production.
8. Baswa Reddy, P., Ramakrishna, C. and Ramana Reddy Y. 2012. Saandhra Paddatilo broiler taraha pottelu pillala pempakam (InTelugu).
9. Baswa Reddy, P. 2012. Scientific feeding of Ram lambs. In: Training programme on ‘Scientific managerial practices and establishing of Sheep and Goat farms in commercial way’ organized by The Andhra Pradesh Sheep and Goat Development Cooperative Federation Ltd., on 20.11.2012 at VPC Campus, Seetarampet, Hyderabad.
10. Baswa Reddy, P. and Vaithyanathan, S. 2012. Economic feeding system for profitable sheep rearing. In: Training programme on ‘Integrated Production system for sustained profitability in Sheep Husbandry’. Organized by NRC on Meat, Hyderabad under NAIP from 8<sup>th</sup> to 10<sup>th</sup> August 2012.
11. Girish Patil, S., Rajkumar, R. S., Shailesh Bagale and Kulkarni, V. V. 2013. Traceability system for buffalo meat industry: An overview. Food Marketing and Technology, 4 (4), 32 – 33.



### **Video documentation:**

1. Muthukumar.M., and Ravi. S. 2013. CD on Hyderabad Haleem: A Deccan Delight

### **Trainings attended**

1. Vaithyanathan, S. and Girish Patil, S. attended the Winter short course on 'Recent Development in Epigenetics, Structural and Functional Genomics for Animal Genetic Resource Conservation vis-à-vis Augmentation of Productivity in Poultry and Livestock Species'-17-26 November 2012 at PDP, Rajendranagar, Hyderabad.
2. Prince Devadason attended training on «Intellectual Property Rights and Biotechnology», from 21.09.2012 to 24.09.2012 NAARM, Rajendranagar, Hyderabad.
3. Prince Devadason attended training on Capacity Building Workshop on Agropedia and Open Access Institutional Repository held at ICRISAT, Patancheru, Andhra Pradesh during 11-12th March, 2013
4. Baswa Reddy attended Workshop - cum - Installation training / programme on SAS 9.3 for the consortia - based research project "Strengthening statistical computing for NARS" at NAARM, Hyderabad, 27 June 2012.

## **AWARDS**

1. Sen, A. R., Bhattacharya, T. K., Nair, P. N., Vaithyanathan S., and Girish Patil, S. 2013. Association between meat quality and calpastatin (CAST) gene polymorphism in Nellore and Deccani sheep breed. Best oral presentation awarded at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.
2. Prince Devadason, I was awarded the best oral presentation on Physical, chemical, microbiological and sensory characteristics of chicken curries processed in retort pouches at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.
3. Prince Devadason, I was awarded the best poster presentation on Sodium salts and their antimicrobial and antioxidant effects in vacuum packed chicken leg cuts under refrigeration at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.
4. Prince Devadason, I was awarded the best poster presentation on Shelf life quality characteristics of chicken nuggets processed in retort pouches by thermal processing at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.



5. Muthukumar, M., Vaithyanathan, S. and Sureshkumar, K. 2013. "Organochlorine pesticide residues in chicken muscles, fat, feed and water samples collected from broiler farms". Best oral presentation awarded at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.
6. Baswa Reddy, P., Ramana, D.B.V., Sushma, Naveena, B.M., and Sen, A.R. 2013. Effect of different levels of Selenium in sheep diets on carcass characteristics and meat quality. Best oral presentation awarded at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013.
7. Girish P.S., Baswa Reddy, P., Ramakrishna, C., Naveena, B. M., Ramana Reddy, Y., Venkateshwarulu, M., Venugopal, G. and Kondaiah. N. 2013. Value chain approach for augmenting quantity and quality of sheep meat production: A success story. Best oral presentation awarded at Indian Meat Science Association Conference held at NRC on Meat, Hyderabad during 7-9 February 2013. .
8. Best oral presentation (First prize) award for a paper "*A novel superchilling and vacuum packaging process for improving the shelf-life of fresh mutton chunks*" presented at 5<sup>th</sup> Annual Conference & National Symposium of Indian Meat Science Association, held at NRC on Meat, Hyderabad from February 7-9, 2013.
9. Best poster (First prize) award for a paper "*Effect of ageing on the quality of buffalo meat from young and spent animals*" presented at 5<sup>th</sup> Annual Conference & National Symposium of Indian Meat Science Association, held at NRC on Meat, Hyderabad from February 7-9, 2013.
10. Best oral presentation (Third prize) award for a paper "*Characterization of buffalo meat proteome using 2-Dimensional gel electrophoresis*" presented at 5<sup>th</sup> Annual Conference & National Symposium of Indian Meat Science Association, held at NRC on Meat, Hyderabad from February 7-9, 2013.

### **Recognitions:**

Prince Devadason, I. has been selected as Editor- Muscle foods for Journal of Food Science and Technology published by Springer Publishers, U.K.

## MEETINGS/EVENTS ORGANIZED

### WORKSHOPS/TRAININGS/AWARENESS PROGRAMS CONDUCTED

#### Training programmes organized

Organized a Farmers' training programme on "Scientific ram lamb rearing with complete feeds" on 10<sup>th</sup> May 2012 at the Rural Feed Processing unit, Chennur. 25 farmers and local veterinarians attended the programme.

#### NRC on Meat conducted series of Brucellosis awareness programs

"Awareness programmes on Brucellosis disease" for meat workers (including butchers) were conducted at Rudraram, Warangal, Chengicherla, Kazipet, Tirupati and Hanamkonda areas of Andhra Pradesh. Butchers were explained about the transmission of disease from meat animals to butchers, preventive measures, diagnosis of disease, treatment etc.

#### Entrepreneurship training programme for small and medium scale meat processors was organised

A four day paid Entrepreneurial training program on "Chicken products processing for small and medium scale entrepreneurs" was organised at National Research Centre on Meat, Hyderabad from April 16-19, 2012. Fifteen participants from different parts of the country including Delhi, Chandigarh, Kerala and Andhra Pradesh have attended this training

#### Entrepreneurs from Jammu and Kashmir were trained at NRC on Meat

A four day paid training program on "Thermal processing of ready to eat meat products in retort pouches" was organised at NRC on Meat from 23-26<sup>th</sup> April, 2012. Five participants from Srinagar, J&K state and two from Hyderabad have participated in the training program.

#### Sponsored training program for Animal Husbandry Dept. Officials

Five day sponsored training program was organised at NRC on Meat for two officers from quality assessment laboratory, Dept. Animal Husbandry, A.P. on "Estimation of pesticide residues in animal feeds and products from May 7-11, 2012.

#### Inauguration of NRC on Meat experimental slaughter house

Experimental Abattoir constructed at NRC on Meat, Hyderabad was inaugurated by Dr. K. M. L. Pathak, Deputy Director General (Animal Sciences) on 17<sup>th</sup> April, 2012 in the presence of Dr. G. Venugopal, Director (Acting), National Research Centre on Meat,



Inauguration of NRC on Meat experimental slaughter house

Dr. S.L.Goswami, Director, NAARM, Dr. R.Chatterjee, Project Director (Acting), PDP, Dr.Sudhakar Reddy, Associate Dean, College of Veterinary Sciences, SVVU, Hyderabad and scientists from different ICAR institute of Hyderabad, entrepreneur trainees and NRCM staff.

### **Institute Research Council Meeting was held at NRC on Meat on 2/05/2012**

The Institute Research Council (IRC) Meeting of National Research Centre on Meat was held on 02.05.2012 in the seminar hall of this centre. Dr.A.S.R.Anjaneyulu (Retired Emeritus Scientist and PS NRC on Meat) acted as the external expert member.

### **Research Advisory Committee Meeting**

The NRC Meat has conducted “Research Advisory Committee” (RAC) Meeting on 08/05/2012 in its seminar hall. Dr.A.T.Sherikar (chairman), Dr. J.J. Robinson, Dr.V.D.P.Rao, Shri.Ahamed Alam Khan, Dr.G.Venugopal and Dr. S. Vaithyanathan (Member Secretary) were present in the meeting. All the scientists of the Institute have presented their research achievements.

### **I. Meat Tech Conference-2012**

National Research Centre on Meat (NRCM), Hyderabad, collaborated as knowledge partner with Tamil Nadu Technology Development and Promotion Centre (TNDPC) of Confederation of Indian Industry (CII) and successfully conducted the Meat Tech-2012 conference at Chennai on 08.06.2012.



An awareness programme was conducted for the sheep farmers at Rural feed Processing unit, Chennur village, Gudur mandal of Nellore dist. on 10/05/2012.

### **Celebration of Hindi Sapta at NRC on Meat**

Hindi sapta was celebrated at NRC on Meat from September 22-29, 2012. Different events including debates, essay writing, singing, storytelling etc. pertaining to Hindi language was organised.



### **Institute Research Council Meeting was held at NRC on Meat on 19/10/2012**

Half-yearly Institute Research Council meeting of NRC on Meat was held on 19/10/2012 and the meeting was chaired by Dr. V.V. Kulkarni, Director NRC Meat and Dr. A.S.R. Anjaneyulu, Former emeritus scientist, NRC on Meat acted as expert.

### **Vigilance week was celebrated at NRC on Meat**

Vigilance week was celebrated at NRC on Meat from October 29 to November 3, 2012. Director and all the staff of NRC on Meat took oath.

### **Submission of final contract research project report**

The contract research project with Kancor Ingredients Ltd., Ernakulum, Kerala on “*Evaluation of Oxikan™ in enhancing qualities and shelf-life of meat and meat products*” was successfully completed and the final project report was submitted on 27/11/2012.

### **Training Program on ‘Integrated Production System for Sustained Profitability in Sheep Husbandry’ was organized at NRC on Meat from 08<sup>th</sup> to 10<sup>th</sup> August 2012**

A three day training program on ‘*Integrated production system for sustained profitability in sheep production*’ was organized under World Bank funded National Agricultural Innovation Project, ‘Value chain for clean meat production from sheep’ was organized from 8-10<sup>th</sup> August, 2012. A total of 32 participants mainly Assistant Directors of Animal Husbandry Department and A.P. Sheep & Goat Cooperative Federation including 4 entrepreneurs participated.

### **Signing of Memorandum of Understanding**

- The NRC on Meat has signed agreement with M/s Platinum Health Products, Hyderabad on 29/05/2012 to provide consultancy for construction of emu slaughter house, emu meat quality evaluation and packaging for better marketability.
- National Research Centre on Meat, Hyderabad signed Memorandum of Understanding with Mr. Ramesh, Miryalguda for construction of sheep slaughterhouse. The MoU was signed on 01<sup>st</sup> November 2012. Scientists of the Centre visited the site of proposed construction of slaughterhouse and provided technical inputs for establishing the slaughterhouse.
- Mr. Vijay Kumar, M/s. VAH Food Industries, Secunderabad signed agreement with NRC on Meat, Hyderabad on 29<sup>th</sup> August, 2012 seeking consultancy and technical help for establishing primary and secondary poultry processing unit.
- Mr. Muralidhar, Hyderabad signed an MoU with NRC on Meat on 15/10/2012 for test marketing of NRC on Meat smoked meat products and utilization of NRC on Meat pilot plant facilities.
- NRC on Meat has displayed its technologies and participated in the Farmer’s Day celebration and exhibition at the Directorate of Oilseeds Research, Hyderabad on 02/09/2012.



- National Research Centre on Meat, Hyderabad showcased its technologies at the “POULTRY INDIA-2012” organised by Indian Poultry Equipment Manufacturers Association at Hitex Exhibition Centre, Madhapur, Hyderabad from 28-30 November, 2012. The NRC on Meat stall was visited by thousands of entrepreneurs, poultry processors, students, consumers etc. both from India and participants from more than 50 countries.
- NRC on Meat has showcased its technologies on 7/1/2013 at the event held at National Academy of Agricultural Research Management (NAARM), Hyderabad. Honourable Shri. Tariq Anwar, Union Minister of State for Agriculture and Food Processing Industries visited and enquired about NRC Meat activities and prospects of value addition, further processing and entrepreneurship development in India. He appreciated the role of NRC on Meat for developing organised meat sector in India.



**Honourable Shri. Tariq Anwar, Union Minister of State for Agriculture and Food Processing Industries visited NRC on Meat stall**

- Institute Management Committee meeting of NRC on Meat was held on 23<sup>rd</sup> January, 2013 in the seminar hall of NRC on Meat. Dr. V.V. Kulkarni, Director, NRC Meat acted as chairman, Dr. K. Sudhakar Reddy, Associate Dean, College of Veterinary Sciences, SVU, Hyderabad, Dr. Jagannatham Challa, Principal Scientist (Retd.), NAARM, Mr. Ahmed Alam Khan, Private Entrepreneur, Dr. Srinivas Gopal, Director, Central Institute of Fisheries Technology, Cochin and AO, NRC on Meat acted as members.
- The 6<sup>th</sup> Research Advisory Committee (RAC) meeting of NRC on Meat was held on 24<sup>th</sup> January, 2013 in the seminar hall of NRC on Meat. Dr. A.S. Bawa, Former Director, Defence Food Research Laboratory, Mysore acted as a chairman; Dr. V.V. Kulkarni, Director, NRC on Meat; Dr. B.S. Prakash, ADG (ANP), ICAR; Dr. J. Sahoo, Professor, Veterinary College, Ludhiana; Dr. S. Biswas, Professor & Head, Veterinary College, Kolkata; Dr. V. Kesava Rao, Professor & Head (Retd.), Rajiv Gandhi College of Veterinary Sciences, Pondichery, and S. Vaithyanathan, Principal Scientist acted as members.
- Director and all the staff of NRC on Meat celebrated the Republic day on 26<sup>th</sup> January, 2013 at NRC Meat campus.

## IMPORTANT VISITORS

- Mr. Thom Wright, Attache for Agricultural Affairs -India, Bangladesh and Sri Lanka and Dr. Ritambhara Singh, Agricultural specialist, USDA visited NRC Meat on 28<sup>th</sup> June, 2012 and discussed about the status and prospects of buffalo meat exports from India. Dr. A.R. Sen, Principal scientist, presented the overview of NRC Meat activities and buffalo population, meat consumption and export figures. They also visited NRC Meat pilot plant and discussed about the meat processing activities.
- Dr. R.M. Acharya, Former DDG (Animal Sciences) visited NRC on Meat on 22<sup>nd</sup> November, 2012.
- Dr. Renuka Prasad, Vice Chancellor, Karnataka Veterinary, Animal and Fisheries Science University visited NRC on Meat on 30<sup>th</sup> November, 2012.
- Dr. R. Prabakaran, Vice Chancellor, Tamil Nadu University of Veterinary and Animal Sciences, Chennai visited NRC on Meat on 6<sup>th</sup> December, 2012. He visited all the laboratories, pilot plant and slaughterhouse of the Institute and interacted with the Director and all the scientists and appreciated the facilities created and research and training work carried out at the Institute.
- Four member delegate including Dr. Suresh Kumar, Managing Director, Kerala Livestock Development Board; Mr. E.J. Auguslthy, Chairman Meat Products of India Ltd., Govt. Kerala, Dr. Suresh, Dr. Saji Eassow, Manager (Production); John Wilfred, Senior Consultant, KITCO Ltd., Kerala visited NRC on Meat on 15<sup>th</sup> December, 2012 for discussion regarding technical help for construction of multispecies abattoir and to propose contract research project with NRC on Meat.
- Dr. N.V. Patil, Director, NRC on Camel, Bikaner visited NRC on Meat on 20<sup>th</sup> December, 2012 and interacted with scientists.
- A four member delegation including Mr. Ghidey Gebremedhin, Director General, Ethiopian Meat and Dairy Technology Institute, Debre Zeit, Ethiopia visited NRC on Meat on 28<sup>th</sup> December, 2012. Director NRC Meat welcomed the guests and the scientists have presented different topics on meat animal production, processing, consumption patterns in India and export potential.



- Dr. Surendranath P. Suman, Associate Professor, Department of Animal and Food Sciences, University of Kentucky, USA has presented a paper on “*Modified atmospheric packaging and antioxidant strategies to improve fresh meat colour*” in the seminar hall of NRC on Meat on 10<sup>th</sup> January, 2013. He has visited different laboratories and discussed with scientists about the research projects. After the presentation he addressed the group of Master’s and Ph.D students from College of Veterinary Sciences, SVVU, Rajendranagar, Hyderabad about the opportunities for higher education and research programs at USA.
- Dr. K.M.L. Pathak, DDG (Animal Sciences) visited NRC on Meat on 18<sup>th</sup> January, 2013. He visited pilot plant, experimental slaughter house and different laboratories of the Institute, interacted with scientists and enquired about their ongoing projects and different activities being conducted.



Dr. K.M.L. Pathak, DDG (Animal Sciences) interacting with scientists and staff of NRC on Meat

## NEW ENTRANTS

- Dr. Vivek Vinayak Kulkarni, Professor & Head, Dept. Meat Science and Technology, Veterinary College and Research Institute, Namakkal, Tamil Nadu joined as Director, NRC on Meat on 29<sup>th</sup> September, 2012. All the scientists, administrative, accounts and other staff of NRC on Meat welcomed the newly joined director.



- Mr. Shaik Rukman joined NRC on Meat as UDC from 17/10/2012

### **Institute Technology Management Unit**

Institute Technology Management Unit (ITMU) has actively involved commercializing the technologies developed by Institute. The Unit has immensely contributed for production of various value added meat products through hands-on-training programs followed by signing MoU with different entrepreneurs. Consultancy processing cell of ITMU has been processed few consultancy projects during the period of 2012-2013. ITMU section has facilitated in registration of two patents, developed by the scientists of NRC meat. ITMU has also initiated to do liaison with other government organizations/ Institutes/University. The Unit is always supporting the technical guidance to the farmers and other clients in the area of animal production and meat technology.

### **Training programme organized:**

This Unit has organized a number of training on Chicken product processing for small and medium entrepreneurs. Besides a couple of programme had been organized on various areas like thermal processing, pesticide residues, emu meat processing, clean meat production and quality management etc.



### Training Programme organized

S. No	Name of the Training Program	Duration	Number of Participants	Revenue Generated (Rs.)
1.	Chicken product processing for small scale units	16 <sup>th</sup> to 19 <sup>th</sup> April-2012	15	15000/-
2.	Thermal Processing of ready to eat meat products in retort pouches	23 <sup>rd</sup> to 26 <sup>th</sup> April – 2012	7	35000/-
3.	Estimation of Pesticide residues in animal feeds and products	7 <sup>th</sup> to 11 <sup>th</sup> May – 2012	2	10,000/-
4.	Principles and production of sundried chicken meat products	14 <sup>th</sup> to 16 <sup>th</sup> May – 2012	3	---
5.	Principles and production of sundried chicken meat products	18 <sup>th</sup> to 20 <sup>th</sup> June – 2012	3	---
6.	Principles and production of sundried chicken meat products	25 <sup>th</sup> to 27 <sup>th</sup> June – 2012	5	---
7.	Clean meat production using modern slaughter facility	2 <sup>nd</sup> – July – 2012	9	---
8.	Clean meat production using modern slaughter facility	4 <sup>th</sup> – July – 2012	9	---
9.	Emu Meat Processing	4 <sup>th</sup> to 6 <sup>th</sup> July – 2012	11	11,000/-
10.	Clean meat production using modern slaughter facility	6 <sup>th</sup> to 10 <sup>th</sup> July – 2012	24	---
11.	Integrated production system for sustained profitability in sheep husbandry	8 <sup>th</sup> to 10 <sup>th</sup> August – 2012	32	32,000/-
12.	Meat Inspection and quality management	20 <sup>th</sup> to 22 <sup>nd</sup> – Sep'ber-2012	2	20000/-
13.	Chicken product processing for small scale units	24 <sup>th</sup> to 26 <sup>th</sup> Sep'ber - 2012	29	29000/-
14.	Chicken product processing for small scale units	6 <sup>th</sup> to 8 <sup>th</sup> March, 2013	19	19,000/-



### Intellectual Property Rights (Patenting)

S. No	Title and inventors	Application Number	Date
1	A Packaging process for improving the shelf life of meat Naveena, B.M., Sen, A.R., Muthukumar, M. and Vaithyanathan, S.	2334/CHE/2012	12 – 06 – 2012
2	Process for preparation of chicken-gongura pickle and chicken soup Naveena, B.M., Muthukumar, M., Muthulakshmi, M., Ramakrishna, C., Sen, A.R. and Babji, Y.	3502/CHE/2012	24 – 08 – 2012

### Technical Guidance

S.No.	Name of Firm/Client	Name of Area	Date	Revenue No
1	A shfaq Hussain , Hyderabad	Sheep Farming	20-04-2012	Nil
2	Ravikiran, Hyderabad	Establishment of sheep farm	09-07-2012	Nil

### Revenue generated:

S.No.	Particulars	Amount (Rs.)
1	Technology licence fee	15,000
2	Consultancy projects	1,000,00
3	Training	1,52,000
4	Contract research	1,75,000
	Total	4,42,000



## PERSONNEL

### Scientific, Technical and Administrative staff

Dr. V. V. Kulkarni	Director
<b>Scientific</b>	
Dr Venugopal	Principal Scientist
Dr S. Vaithiyathan	Principal Scientist
Dr A.R. Sen	Principal Scientist
Dr Y. Babji	Principal Scientist
Dr C. Ramakrishna	Senior Scientist
Dr I. Prince Devadason	Senior Scientist
Dr B. M. Naveena	Senior Scientist
Dr M. Muthukumar	Scientist (SS)
Dr P. Baswa Reddy	Scientist (SS)
Dr S. Girish Patil	Scientist (SS)
Shri P. Mooventhan	Scientist
Dr R.S. Raj Kumar	Scientist
Dr Susita	Scientist
Dr M. Muthulakshmi	Scientist
<b>Technical</b>	
Ms Kanchana Kommi	Technical Assistant T-3
Shri Phanikumar	Technical Assistant T-3
Shri B.V.D. Srinivasa Rao	Technical Assistant T-2
Shri Pushpesh Khulbe	Technical Assistant T-1
Shri M.D. Srinivas	Technical Assistant T-1
<b>Administration</b>	
Shri Gopal	Admn. Officer
Shri Chandrashekar	Asst. Admn. Officer
Shri B.P.R. Vithal	Personal Secretary
Smt G. Prameela Bai	Assistant
Shri Nitin	Assistant
Shri M.N.V. Rao	Junior Accounts Officer
Shri M. Sridhar	Assistant
Smt Padmaja	Personal Assistant
Shri T. Devender	Upper Divisional Clerk
Shri Rukhman	Upper Divisional Clerk



## COMMITTEES

### Institute Management committee

1. Director, NRC on Meat, Hyderabad - Chairman
2. Director of Animal Husbandry, Govt. of A.P., Shantinagar, Hyderabad –Member
3. Managing Director, West Bengal, Livestock Development Corporation Ltd., LB-2, Sector III, Salt Lake City, Kolkata – -Member
4. Associate Dean, College of Veterinary Sciences, SVU, Rajendranagar, Hyderabad -Member
5. Shri Ahmed Alam Khan, Managing Director, Super Dairy Farm, Satar Bagh, Musheerabad, Hyderabad -Member
6. Shri Rohit R. Pawar, CEO Baramati Agro Ltd., Implital Baramati, Dist. Pune –Member
7. ADG (AP&B), ICAR, New Delhi –Member
8. AF&AO, NRCM, Hyderabad –Member
9. AO, NRCM, Hyderabad –Member Secretary

### Research Advisory Committee

1. Dr. A.S. Bawa, Former Director, Defence Food Research Laboratory (DRDO), Mysore - Chairman
2. Dr. V. Kesava Rao, Ex-Prof & Head, Rajiv Gandhi College of Veterinary and Animal Sciences, Puducherry - Member
3. Dr. S. Biswas, Prof & Head, Department of LPT, Veterinary College, West Bengal University of Animal and Fisheries Sciences, Kolkata - Member
4. Dr. J. Sahoo, Prof & Head, Department of LPT, GADVASU, Ludhiana - Member
5. Dr. Lal Krishna, Ex-ADG (AH), C-302, Exotica Elegance, Ahimsa Khand-II, Plot No.9A, Indrapuram, Ghaziabad- - Member
6. Dr.V.V.Kulkarni, Director, NRC on Meat, Hyderabad - Member
7. Dr. B. Prakash (AN&P), Animal Science Division, ICAR, Krishi Bhavan, New Delhi - Member





8. Shri Rohit Pawar Executive Director, M/s Baramati Agro Limited, Pimpali, Baramati, Maharastra - Member
9. Shri Ahmed Alam Khan, Managing Director, M/s Super Dairy Farm, Satar Bagh, Mursheerabad, Hyderabad, Andhra Pradesh - Member
10. Dr. S. Vaithyanathan, Principal Scientist, NRC on Meat, Hyderabad – Member Secretary

### **Quinquennial Review committee**

1. Dr. Sushilkumar, Ex-Director, NDRI, Karnal - Chairman
2. Dr.A.S. Bawa, Ex-Director, DFRL, Mysore- Member
3. Dr.A.Subba Rama Naidu, Ex-Scientist F, CLRI, Chennai - Member
4. Dr.A.S.R.Anjaneyulu, Rtd Principal Scientist, NRC on Meat, Hyderabad - Member
5. Dr.M.V.Subba Rao, National Project Consultant, FAO, New Delhi
6. Dr.A.R.Sen Principal Scientist, NRC on Meat, Hyderabad – Member Secretary



# IMSACON - 2013



National Research Centre on Meat, Hyderabad successfully organised the 5<sup>th</sup> Annual Conference and National Symposium of Indian Meat Science Association (IMSACON-V) on “*Emerging technological changes to meet the demands of domestic and export meat sector*” from February 7-9, 2013. The event was a grand success with around 210 participants from across the country.



हर कदम, हर उमर  
किसानों का हमसफर  
भारतीय कृषि अनुसंधान परिषद

*AgriSearch with a human touch*



Dr. K. M. L. Pathak, Deputy Director General (Animal Sciences)  
inaugurated experimental Abattoir of NRC on Meat



**राष्ट्रीय माँस अनुसंधान केंद्र**  
**National Research Centre on Meat**  
(भारतीय कृषि अनुसंधान परिषद)

(Indian Council of Agricultural Research)  
चेंगीचेर्ला, बोडुप्पल / Chengicherla, Boduppall Post  
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[www.nrcmeat.org.in](http://www.nrcmeat.org.in)

