



ANNUAL REPORT 2019



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भाकृअनुप
ICAR



भा.कृ.अनु.प. - राष्ट्रीय माँस अनुसंधान केंद्र
ICAR - National Research Centre on Meat

Chengicherla, Boduppal Post, Hyderabad - 500 092

An ISO 9001 : 2015, ISO/IEC 17025 : 2005 & FSSC 22000 Certified Organization





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PREFACE



I am pleased to present and interact through the Annual Report of ICAR-National Research Centre on Meat, Hyderabad for the year 2019. The year was remarkable for ICAR-NRCM with its new role as a “lead institute for foods of animal origin” under the FSSAI program on Network for Scientific Cooperation in Food Safety and Applied Nutrition (NetSCoFAN) and the FSSC 22000 Certification to the meat processing plant. I consider the year was most remarkable for ICAR-NRCM with several outreach activities, research and developments, technology development & commercialization, sponsored training programs and infrastructure development. Further, the NABL accreditation of meat species identification laboratory as per ISO 17025:2005 and certification of ICAR-NRCM as per ISO 9001:2015 is continued.

Meat and poultry production in India is substantially contributing towards nutritional security and sustainable development goals of the country. The research and innovations in the area of meat processing and value addition, meat authentication, meat quality & safety and business development have made rapid strides during last few years. Keeping with the latest trends in the research and innovations, ICAR-NRCM has initiated several new frontier research projects, trainings for stakeholders, consumer education and collaborative efforts to increase the income of livestock farmers and other stakeholders of meat industry.

During the year, strengthening of NABL accredited laboratory with scope enhancement and standard transition was continued and initiation was made for accredited Certified Reference Material producer as per ISO 17034. It is a matter of pride to bring your notice that FSSAI has further assigned the responsibilities of FoSTaC training partner status to our organization and provided financial grant to upgrade the Referral Food Laboratory for meat and meat products to National Reference Laboratory. Further, our Institute has successfully got funds from DBT, for research in cultured meat and NASF, ICAR for research in Antimicrobial Resistance.

During the year, R&D activities were focused on development of Real Time PCR based method and Loop Mediated Isothermal Amplification Technique for meat speciation and qRT-PCR and ddPCR on miRNA biomarkers for offal meat detection. Further, species specific proteins of myosin heavy chains were used as an aid in meat speciation. A novel value-added meat product named mutton Haleem ball was developed and ready for commercialization.



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Smart packaging technology for real-time monitoring of quality and safety of refrigerated chicken meat was developed. Rapid assays for detection of meat borne bacteria and *Listeria monocytogenes* in meat were also standardized. Trade mark for *Meat Treat* (Application No. 3705463) has been granted. A mobile app was developed to act as interface between stakeholders and the Centre

As part of outreach activities, exhibition of technologies and products of the Centre was arranged in various events across the country. Several trainings programmes on clean meat production and value-added meat products processing were organized. During the year, customized training program on “Good Food Laboratory Practices”, “Quality and safety challenges in Indian meat sector under Food Safety Act 2006 and ICAR sponsored short course on “DNA techniques in forensic food analysis” were organized. To support, business enterprises for establishment of meat production and processing plants, several MoU’s were signed and formalized. Centre along with Karnataka Sheep and Wool Development Corporation Ltd., trained 180 beneficiaries in mobile meat stalls and marketing. Further, a mobile meat van was operationalized at Siddipet, Telangana state under SCSP program.

Our institute has also taken initiatives to procure and install DNA sequencer, poultry processing line, rendering unit and pet food processing unit to support the identified R&D and entrepreneurship development programmes.

I would like to put on record the untiring effort of the scientists and other staff of the Institute and the hard work and dedication have been duly reflected in this report. I would like to acknowledge the support of Hon. DG, ICAR, DDG (Animal Science) and Principal Scientists of the animal science division of ICAR. I also acknowledged the RAC and IMC members for their constructive suggestions. The Institute invites suggestions from all stakeholders to improve its functions and services so that NRCM can be better equipped in addressing all the upcoming issues in meat sector.

S. Vaithiyanathan
Acting Director

प्रस्तावना

मुझे भा कृ अनु प -राष्ट्रीय मांस अनुसंधान केंद्र की वार्षिक - रिपोर्ट 2019 - 2020 पेश करते हुए अत्यंत प्रसन्न हो रही है। यह वर्ष कई प्रमुख घटनाओं एवं विभिन्न कार्यक्रमों के सफलतापूर्वक सम्पन्न होने के साथ बहुत सफलदायी रहा इस अवधि के दौरान संस्थान ने अनुसंधान एवं विकास के साथ-साथ प्रशिक्षण एवं बुनियादी सेवाओं के संदर्भ में अनेकों उपलब्धियां हासिल की है। भारत में मांस और पोल्ट्री उत्पादन देश की पोषण सुरक्षा और सतत विकास लक्ष्यों में महत्वपूर्ण योगदान देता है। मांस प्रसंस्करण, खाद्य प्रमाणीकरण, व्यवसाय विकास के क्षेत्र में अनुसंधान और नवाचारों ने पिछले कुछ वर्षों के दौरान तेजी से प्रगति की है। अनुसंधान और नवाचारों में नवीनतम रुझानों को ध्यान में रखते हुए, एनआरसी-मीट ने कई नए फ्रंटियर अनुसंधान परियोजनाओं, हितधारकों के लिए प्रशिक्षण, उपभोक्ता शिक्षा और सहयोगी प्रयासों की शुरुआत की है।

इस अवधि के दौरान यहाँ स्थित NABL मान्यता प्राप्त प्रयोगशाला को मजबूत रूप देना जारी किया गया। मुझे आपका ध्यान आकर्षित करते हुए गर्व महसूस हो रहा है कि FSSAI द्वारा नेटस्कोफैन की जिम्मेदारियों को भी हमारे केंद्र को ही सौंपी इसके अतिरिक्त अनुसंधान कार्यों हेतु DBT, भारत सरकार एवं NASF-ICAR द्वारा इस केंद्र ने समुचित धनराशि प्राप्त करने में सफलता प्राप्त करने में के साथ साथ सहयोगी प्रयासों की शुरुआत भी की है। वर्ष के दौरान, आरएंडडी गतिविधियां वास्तविक समय पीसीआर आधारित विधि, लूप की मध्यस्थता थियोथर्मल प्रवर्धन, miRNA बायोमार्कर और मांस प्रजातियों का पता लगाने के लिए मायोसिन भारी श्रृंखला-आधारित विधियों के विकास पर ध्यान केंद्रित किया गया था और एक मीट मूल्य वर्धित मांस उत्पाद मटन हलीम बॉल को ऑफल मीट बनाया गया था। विकसित और व्यावसायीकरण के लिए तैयार है। प्रशीतित चिकन मांस की गुणवत्ता और सुरक्षा की वास्तविक समय की निगरानी के लिए स्मार्ट पैकेजिंग तकनीक विकसित की गई थी। मांस में पैदा होने वाले बैक्टीरिया का पता लगाने के लिए रैपिड एसे और मांस में लिस्टेरिया मोनोसाइटोजेन्स को भी मानकीकृत किया गया। मीट ट्रीट के लिए ट्रेड मार्क प्रदान किया गया है। हितधारकों और केंद्र के बीच इंटरफेस के रूप में कार्य करने के लिए एक मोबाइल ऐप विकसित किया गया था।

आउटरीच गतिविधियों के तहत, देश भर में विभिन्न कार्यक्रमों में केंद्र की प्रौद्योगिकियों और उत्पादों की प्रदर्शनी का आयोजन किया गया। स्वच्छ मांस उत्पादन और मूल्य वर्धित मांस उत्पाद प्रसंस्करण पर कई प्रशिक्षण कार्यक्रम भी आयोजित किए गए। व्यवसायिक उदयमियों को मांस उत्पादन एवं प्रसंस्करण संयंत्रों की स्थापना हेतु सहयोग देकर कई समझौता ज्ञापनों पर हस्ताक्षर किए गए। साथ ही उन्हें औपचारिक रूप



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भी दिया गया। कर्नाटक भेड़ और ऊन विकास निगम लिमिटेड के साथ मिलकर इस केंद्र, द्वारा मोबाइल मांस स्टालों और विपणन में 180 लाभार्थियों को प्रशिक्षित किया। इसके अलावा, एससीएसपी कार्यक्रम के तहत तेलंगाना राज्य के सिद्दीपेट नामक स्थल पर एक मोबाइल मीट वैन का संचालन किया गया।

मैं भाकृअनुप- राष्ट्रीय मांस अनुसंधान केंद्र के सभी कर्मचारियों, भाकृअनुप, डी.डी.जी. (पशु विज्ञान), और भाकृअनुप के पशु विज्ञान प्रभाग के प्रधान वैज्ञानिक के समर्थन को स्वीकार करना चाहूंगा। मैं आरएसी और आईएमसी सदस्यों को उनके रचनात्मक सुझावों को भी स्वीकार करता हूँ। सभी हितधारकों से संस्थान के कार्यों और सेवाओं को बेहतर बनाने के सुझाव हेतु आमंत्रित करता हूँ।



एस. वैद्यनाथन
एस वैद्यनाथन
(कार्यकारी निदेशक)



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EXECUTIVE SUMMARY

The ICAR - National Research Centre on Meat, Hyderabad, a constituent Institution of Indian Council of Agricultural Research, Ministry of Agriculture, Government of India, New Delhi is a premier Institution on meat research working with the mission to develop modern, organized meat sector through meat production, processing and utilization technologies. Scientists of the Centre are working relentlessly to realize this mission. Consequently, Centre has made rapid strides in the area of research, training and extension activities in the year 2019.

Important research achievements of Centre during the period are as follows:

- Developed Real time PCR based quantitative detection of adulteration of beef and buffalo meat.
- A novel Alkaline Lysis – Loop Mediated Isothermal amplification technique was developed for simple and quick species identification of pork, beef, buffalo meat and mutton at field level.
- A technique to identify the presence of offal (liver, heart and gizzard) in minced chicken meat was developed by using tissue specific candidate miRNA biomarkers.
- A novel value-added meat product mutton Haleem ball was developed which was highly acceptable by sensory panellists, convenient to transport, use and store.
- Smart packaging technology based on Anthocyanin-gold-curcuminnan composite based strip-type indicator was developed which can be used for real-time monitoring of quality and safety of refrigerated chicken meat.
- A method for extracting species specific proteins MLC-I, MLC-II and MLC-III using Gelfree fractionation was standardized. These species specific proteins can be used for authentication of meat species using mass spectrometry.
- Rapid assays for detection of *Listeria monocytogenes* in foods was validated.
- Technique for ozone (O₃) based decontamination of poultry and sheep/goat carcasses was standardized.
- Rapid method for identification of meat borne bacteria was standardized using 16SrRNA genes
- Buffalo meat samples collected from market were analyzed for presence of oxytetracycline and chlortetracycline residues in buffalo meat samples using RP-HPLC. Analysis indicated that none of the samples contained above antibiotics above MRL.
- The levels of PAHs and HCAs compounds in the processed meat products collected from various parts of country are being estimated.



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- Trade mark for Meat Treat (Application No. 3705463) has been granted.
- Copy right certification was obtained for livestock traceability database .

Further, Centre has initiated research in frontier areas of meat science like production of cultured meat with funding from Department of Biotechnology, New Delhi in collaboration with CCMB, Hyderabad and in the area of antimicrobial resistance in poultry with funding from Indian Council of Agricultural Research under National Agricultural Science Fund. Centre also initiated multi Institutional project, Network for Scientific Co-operation for Food Safety and Applied Nutrition (NetSCoFAN) constituted by Food safety and Standards Authority. Centre will be leading this project comprising ten different Institutions. A contract research project on identification of bovines using artificial intelligence was also undertaken with funding and collaboration from Clonoid Pvt. Ltd., Hyderabad.

In addition to research activities, Centre is providing need based services to meat industry stakeholders. In the NABL accredited species identification laboratory of the Centre, about seventy forensic meat samples analyzed for meat species and reports submitted to different regulatory agencies. As part of outreach activities, exhibition of technologies and products of the Centre was arranged in various events across the country. A mobile app was developed to act as interface between stakeholders and the Centre. For capacity building of stakeholders, nine training programmes on clean meat production and value added meat products processing were organized and total of 183 participants. Three awareness programs on hygienic meat production was organized for meat industry workers. To support the entrepreneurs and startups eight MoU's were signed for providing consultancy for establishment of meat production and processing plants. For dissemination of information research results were published in various national and International journals. Books on "NRC on Meat Technologies for meat production, processing and authentication" and "Business prospects in meat production and processing – An entrepreneurial handbook" were also published. Scientists of the Centre were bestowed with recognitions and awards from various National level Academies and Associations including National Academy of Veterinary Science, National Academy of Biological Sciences, Indian Meat Science Association and Indian Association for Advancement of Veterinary Research.

Centre joined hands with Karnataka Sheep and Wool Development Corporation Ltd., Bangalore for implementation of mobile meat stall scheme under which 180 beneficiaries were provided well equipped mobile meat stalls along with hands on training on hygienic meat production and production of value added meat products. Further, a small scale meat product processing unit was established at Siddipet, Telangana state under SCSP program. With the support of the Centre, Women SHG members are producing and product and marketing them through the retail stall and a mobile meat retailing unit.



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कार्यकारी सारांश

भा कृ अनु प- राष्ट्रीय मांस अनुसंधान केंद्र, हैदराबाद स्थित भारतीय कृषि अनुसंधान परिषद, कृषि मंत्रालय, भारत सरकार, नई दिल्ली स्थित मांस शोध पर आधारित एक प्रमुख घटक संस्थान है जो आधुनिक तरीकों से आधुनिक संगठित मांस क्षेत्र को मांस उत्पादन, प्रसंस्करण और प्रौद्योगिकियों का उपयोग को विकसित करने के मिशन को साकार करने हेतु अथक प्रयास कर रहे हैं जिसका फलस्वरूप इस केंद्र ने वर्ष 2019 के दौरान अनुसंधान प्रशिक्षण एवं विस्तार जैसी गतिविधियों के क्षेत्र में तेजी से प्रगति की है।

उक्त अवधि के दौरान इस केंद्र की महत्वपूर्ण अनुसंधान उपलब्धियां निम्न प्रकार से है।

- गोमांस एवं भैंस के मांस की मिलावट को पी सी आर द्वारा मात्रात्मक आधार पर पहचान हेतु वास्तविक समय विकसित किया गया।
- सूअर मांस, गो मांस, भैंस मांस एवं मटन की सरल और त्वरित प्रजातियों की पहचान हेतु एक नॉवल एल्कालाइन लाइसेन्स लूप मेडियटेड आइसोथर्मल प्रबंधन तकनीक विकसित की गई।
- कीमा बने हुए चिकन मांस में ऑफल (यकृत, हृदय एवं जिजार्ड) की उपस्थिति की पहचान करने हेतु टिशू स्पेसिफिक मेंडिडेड बायोमार्कर के इस्तेमाल द्वारा तकनीक को विकसित करना है।
- एक अति उत्तम मूल्यवर्धित मांस उत्पाद के रूप में हलीम बौल्स विकसित किया गया जिसे संवेदी पेनलिस्टों द्वारा अत्यधिक पसंद किया गया जो कि सुविधाजनक उपयोग ट्रांसपोटेशन एवं भंडारण हेतु आसान है।
- एंथोसायनिन गोल्ड करक्यूमिनेन कंपोसित आधारित स्ट्रिप टाइप इंडिकेटर पर आधारित स्मार्ट पैकजिंग तकनीक विकसित कि गई जिसका उपयोग रेफ्रिजरेटेड चिकन मांस कि गुणवत्ता और सुरक्षा की वास्तविक समय की निगरानी हेतु किया जा सकता है।
- जेल-मुक्त विभाजन का उपयोग करते हुए प्रजातियों के विशिष्ट प्रोटीन MLC-I, MLC-II और MLC-III को निकालने हेतु एक विधि का मानकीकरण किया गया। इन प्रजातियों के विशिष्ट प्रोटीन का उपयोग किया जा सकता है या मांस स्पेक्ट्रोमेट्री का उपयोग करके मांस प्रजातियों का प्रमाणीकरण किया जा सकता है।
- खाद्य पदार्थों में लिस्टीरिया मोनोसाइटोजेन का पता लगाने हेतु तेजी से परख को मान्य किया गया था।
- कुक्कुटादि और भेड़ / बकरी शवों के परिशोधन हेतु ओज़ोन (ओ 3) आधारित तकनीक का मानकीकरण किया गया था।
- बाजार से एकत्र किए गए भैंस के मांस के नमूनों का विश्लेषण RP-HPLC का उपयोग करते हुए भैंस के मांस के नमूनों में ऑक्सीटेट्रासाइक्लिन और क्लोरेटेट्रासाइक्लिन अवशेषों की उपस्थिति हेतु किया गया था। विश्लेषण ने संकेत दिया की एमआरएल से ऊपर एंटीबायोटिक दवाओं में से कोई भी नमूना शामिल नहीं है।



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- मीट ट्रीट (एप्लीकेशन नंबर 3705463) हेतु ट्रेड मार्क प्रदान किया गया है।
- पशुधन ट्रेसबिलिटी डेटाबेस हेतु कॉपी राइट प्रमाणीकरण प्राप्त किया गया था।

इसके अलावा, केंद्र ने जैव प्रौद्योगिकी विभाग, नई दिल्ली के सहयोग से सुसंस्कृत मांस के उत्पादन जैसे मांस विज्ञान के प्रमुख क्षेत्रों में अनुसंधान शुरू किया है। CCMB, हैदराबाद और राष्ट्रीय कृषि विज्ञान कोष के तहत भारतीय कृषि अनुसंधान परिषद से वित्त पोषण के साथ पोल्ट्री में रोगाणुरोधी प्रतिरोध के क्षेत्र में केंद्र ने खाद्य सुरक्षा और मानक प्राधिकरण द्वारा गठित मल्टी इंस्टीट्यूशनल प्रोजेक्ट, नेटवर्क फॉर साइंटिफिक को-ऑपरेशन फॉर फूड सेफ्टी एंड एप्लाइड न्यूट्रिशन (नेटसोफैन) भी शुरू किया। केंद्र इस परियोजना का नेतृत्व करेगा जिसमें दस विभिन्न संस्थान शामिल हैं। कृत्रिम बुद्धिमत्ता का उपयोग करने वाले गोजातीय लोगो की पहचान पर एक अनुबंध अनुसंधान परियोजना भी क्लोनाइड प्राइवेट लिमिटेड, हैदराबाद से वित्त पोषण और सहयोग के साथ की गई थी। अनुसंधान गतिविधियों के अलावा, केंद्र मांस उद्योग के हितधारकों को आवश्यकता आधारित सेवाएँ प्रदान कर रहा है। केंद्र की एनएबीएल मान्यता प्राप्त प्रजातियों की पहचान प्रयोगशाला में लगभग सत्तर फोर्निसिक मांस के नमूनों का विश्लेषण मांस की प्रजातियों के लिए किया गया था और विभिन्न नियामक एजेंसियों को रिपोर्ट की गई थी। देश भर में विभिन्न कार्यक्रमों में केंद्र की प्रौद्योगिकियों और उत्पादों का आगे बढ़ने की गतिविधियों की प्रदर्शनी का आयोजन किया गया। हितधारकों और केंद्र के बीच इंटरफ़ेस के रूप में कार्य करने हेतु एक मोबाइल ऐप विकसित किया गया था। हितधारकों की क्षमता निर्माण के लिए, स्वच्छ मांस उत्पादन और मूल्य वर्धित मांस उत्पाद प्रसंस्करण पर नौ प्रशिक्षण कार्यक्रम आयोजित किए गए और कुल 183 प्रतिभागियों ने भाग लिया। मांस उद्योग के श्रमिकों हेतु स्वच्छ मांस उत्पादन पर तीन जागरूकता कार्यक्रम आयोजित किए गए थे। मांस उत्पादन और प्रसंस्करण संयंत्रों की स्थापना हेतु परामर्श प्रदान करने हेतु उदयमियों और स्टार्टअप्स के साथ आठ सम्झौता ज्ञापनों पर हस्ताक्षर किए गए। सूचना के प्रसार हेतु अनुसंधान के परिणाम विभिन्न राष्ट्रीय और अंतर्राष्ट्रीय पत्रिकाओं में प्रकाशित किए गए थे। “मीट प्रॉडक्शन, प्रोसेसिंग और ऑथेंटिकेशन हेतु राष्ट्रीय मांस अनुसंधान केंद्र टेक्नोलॉजीज” और “मीट प्रॉडक्शन एंड प्रोसेसिंग में व्यापार संभावनाएं – एन एंटरप्रेन्योर हैंडबुक” पर किताबें प्रकाशित की गईं। केंद्र के वैज्ञानिकों को विभिन्न राष्ट्रीय स्तर की अकादमियों और संघों से मान्यता प्राप्त थी, जिसमें नेशनल एकेडमी ऑफ वेटेरनरी साइंस, नेशनल एकेडमी ऑफ बायोलॉजिकल साइंसेज, इंडियन मीट साइंस एसोसिएशन और इंडियन एसोसिएशन फॉर एडवांसमेंट ऑफ वेटेरनरी रिसर्च शामिल है।

केंद्र ने कर्नाटक में भेड़ और ऊन विकास निगम लिमिटेड बेंगलूर के साथ मोबाइल मीट स्टाल योजना के कार्यान्वयन हेतु सहयोग किया, जिसके तहत 180 लाभार्थियों को अच्छी तरह से सुसज्जित मोबाइल मांस स्टाल प्रदान किए गए, साथ ही उन्हें हाइजेनिक मांस उत्पादन और मूल्य वर्धित मांस उत्पादों के उत्पादन पर प्रशिक्षण दिया गया। इसके अलावा, SCSP कार्यक्रम के तहत तेलंगाना राज्य के सिद्दीपेट नामक स्थल में एक छोटे पैमाने पर मांस उत्पाद प्रसंस्करण इकाई की स्थापना की गई थी। केंद्र के सहयोग से महिला एसएचजी सदस्य खुदरा स्टॉल और एक मोबाइल मांस खुदरा इकाई के माध्यम से उत्पादन और उत्पाद कर रही हैं और उनका विपणन कर रही हैं।



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INTRODUCTION

Meat and meat products play an important role in national economy, nutritional security and employment generation. Current meat production in India is estimated to about 8.14 million tones. The species wise contribution is 19% from buffalo, 8% from sheep, 14% from goat, 6% from pig and 49% from poultry. The overall meat economy is growing at 10 % and meat retail market at about 20 % per annum. Frozen buffalo meat and chilled poultry meat are being exported through APEDA inspected abattoirs. The meat produced for domestic meat consumption is being produced in municipal slaughter houses. There is a rapid growth in number of modern slaughter houses both in private and government sectors. Modern poultry processing plants are increasing rapidly due to high demand for chilled and semi-packaged poultry meat.

Further processing and value addition are the remunerative ways to get more benefits from the meat business. With recent trends of urbanization and demand for convenient meats, many entrepreneurs are venturing into the processing sectors. Small and big retail shops are improving their infrastructure to cater to growing demand for semi-processed and ready tocook and ready-to-eat meat products. Further, investment in machinery, manpower training, cold logistics, transportation vehicles and packaging would boost the employment generation and scale of operations in processed meat industry.

ICAR-NRC meat is spearheading a silent revolution in meat processing and marketing sector. With its renewed vigor, organization has established business center for entrepreneurial trainings and hand holding of new start-ups in this sector. Institute's novel methods of marketing like mobile marketing and on-line marketing are gaining popularity among consumers and new generation entrepreneurs. Institute's active collaborations with state and central government bodies is now bearing the fruits. Research capabilities of the Institutes are duly recognized by DBT, FSSAI and other central agencies and many agencies are coming forward to collaborate with ICAR-NRCM.

In research front, organization has developed new techniques for meat speciation, bacterial identification, novel meat products, cutting edge technologies are being applied for meat quality and safety research. Applied and need based research on waste utilization, decontamination technologies, alternative meat sources, preservation and packaging technologies are being undertaken in active collaboration with industry partners.

VISION, MISSION AND MANDATE

VISION

NRC on Meat as a premier institution 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

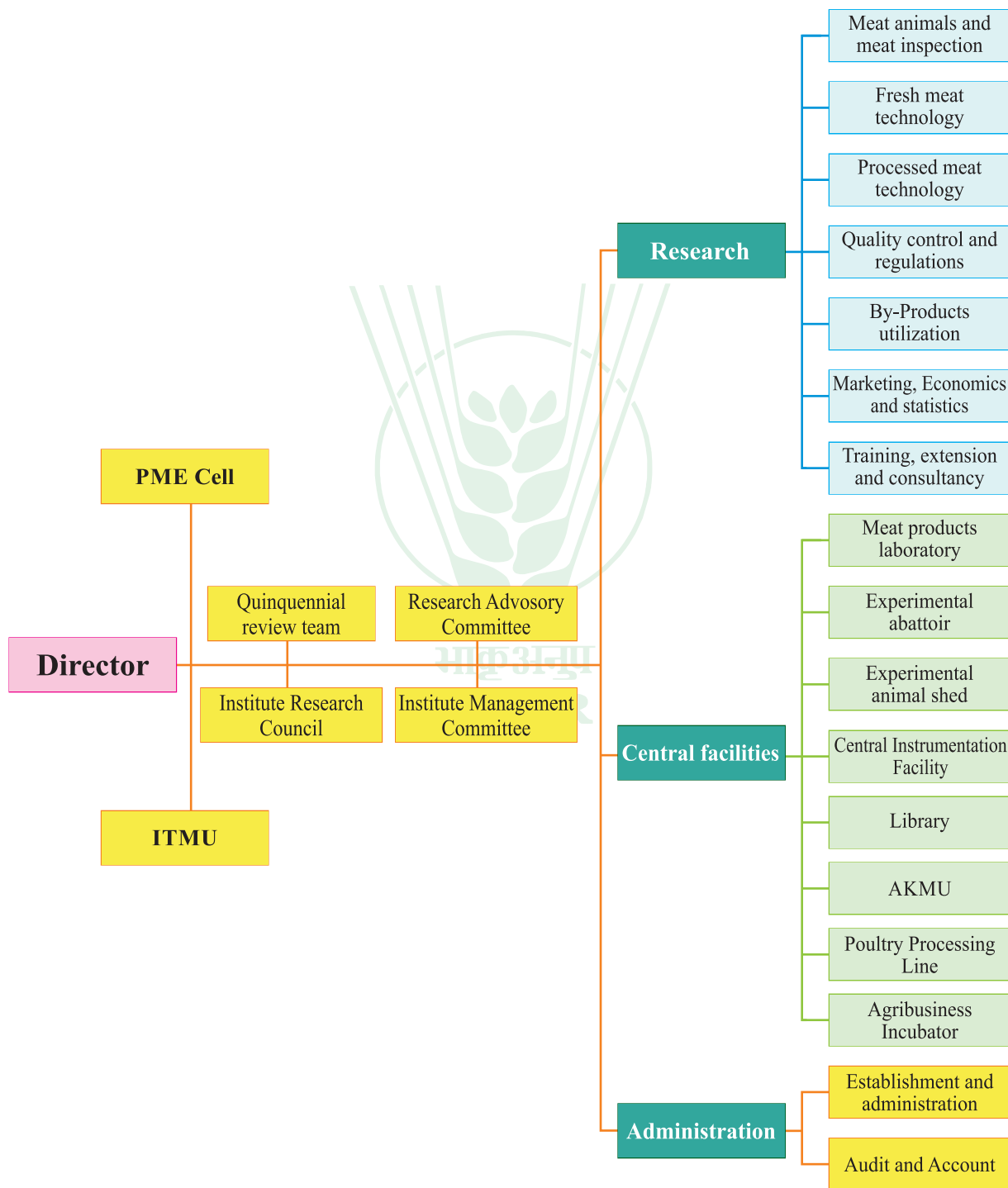
- Basic and applied research in meat science and technology for meat production, processing, value addition and utilization.
- Capacity development for different levels of personnel in meat sector.
- National repository of information in meat and allied sectors.



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ORGANIZATIONAL SET UP





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STAFF STRENGTH

Cadre Strength as on 31-12-2019

Staff	Sanctioned	Filled
Scientific	15	15
Technical	05	04
Administrative	14	06
Skilled Supporting Staff	01	0
TOTAL	35	25

BUDGET

(Expenditure Statement)

Budget Details In Lakhs			
S.No	Head	Budget	
		Sanctioned	Utilized
I	Grant In Aid-Capital		
1	Equipment	51.42	50.34
2	Furniture and Fixtures	3.00	3.14
3	Works	91.00	91.00
4	Library	1.00	1.00
	Total I	146.42	145.48
II	Grant in Aid-Salary		
1	Established	515.00	510.78
	Total II	515.00	510.78
III	Grant in Aid-General		
1	Contingency	248.45	247.28
	Total III	248.45	247.28
	Grand Total I+II+III	909.87	903.54
IV	Loans & advances		
1	Loans & Adv	140.00	25.10



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RESEARCH HIGHLIGHTS

ICAR-National Research Centre on Meat

EXTERNALLY FUNDED RESEARCH PROJECTS

1. Project title: Development of rapid immunochromatographic assay kit for field level detection of meat adulteration (Department of Biotechnology, Govt.of India)

PI : B.M. Naveena; Co-PI : Dr. S.B. Barbuddhe and Dr. Rituparna Banerjee

Optimization of extraction of total and myofibrillar proteins, standardization of gel-free electrophoresis using different kits viz, 5% (3.5-, 8% and 12% for enrichment of target peptides and identification of specie-specific peptides from raw and cooked meat of buffalo, pig and chicken was carried out. Meat mixes containing 90:10, 90:5, 99:1 and 99.5:0.5 Buffalo: Pork in both raw and cooked (at >80 °C for 30 minute) form were prepared, proteins were extracted and fractionated using GELFREE electrophoresis. Preliminary experiments revealed that, Gelfree fractionation is suitable for extracting MLC-I, MLC-II and MLC-III which can be used for authentication of meat species using mass spectrometry.



Figure 1 : 95:5 Buffalo : Pork, raw meat mix fractionated using GELFREE with 12% Kit and separated on 15% SDS-PAGE



2. Project title: Development of smart packaging nano-sensor for monitoring quality and safety of meat.(Department of Biotechnology Govt.of India)

PI: Dr. G. Kandeepan; Co-PI: Dr. Suresh K Devatkal, Dr. M.R. Vishnuraj

The objective of the project was to develop a strip-type indicator for detecting volatile amines released from chicken meat during refrigeration storage. The levels of anthocyanin, curcumin, sodium tetrachloroaurate, aqueous sodium hydroxide, and distilled water was standardized to develop a chromogenic solution that changes color on reaction with metabolites released from stored meat. Green synthesis of gold nanoparticle was done by following the standardized protocol with suitable modifications. The size of nanoparticles was analyzed through Atomic Force Microscopy. The heights of the particles showed a range of 20-200nm. The sensor strip was made of nitrocellulose membrane coated with a nanocomposite solution containing anthocyanin from red cabbage and curcumin-gold nanoparticle. The indicator strip (3.5x1.5 sq.cm) was first tested for its efficacy in an indicator-metabolite model, consisting of 20 microliter ammonia as meat metabolite. The test revealed that the strip changed color from dark pink to pale blue on contact with volatile ammonia. Evaluation of the response of the sensor was studied in chicken meat system. The ready to use strip was used as on-package sticker-type indicator in chicken meat packaged in polypropylene trays with polypropylene over wrap. The samples were stored in the refrigerator ($4\pm 1^{\circ}\text{C}$) and the response of the striptype indicator with the volatile amines released from chicken meat was studied. Different meat quality and safety parameters will be analyzed at suitable intervals to correlate the colour change in indicator sensor at refrigeration ($4\pm 1^{\circ}\text{C}$) storage.

The samples for analysis were drawn on alternate days during refrigeration storage. The results indicated that the color of the strip-type indicator changed from dark pink to whitish pale pink to bluish during the storage period with ΔE declining significantly from 39.79 to 18.53. The rate of discoloration increased as the concentration of volatile amines released from chicken meat increased from 6.46mg% to 26.16mg% during the progressive storage period. Simultaneous determination of quality parameters like total volatile basic nitrogen, free amino acid, tyrosine value, ammonia and pH in chiller stored chicken meat showed a significantly elevated levels of 22.59mg%, 43.08mg%, 4.36mg%, 18.84mg% and 5.94 respectively causing onset of deterioration of meat quality from day7. The color value ΔE significantly decreased to 18.99. Whereas, the standard plate, psychrophilic and pseudomonas counts of the microbial quality also indicated significantly.

increased levels of 6.19 log cfu/g, 6.03 log cfu/g and 5.79 log cfu/g respectively from the initial load. Meanwhile, the sensory quality of the chilled chicken meat declined significantly to an appearance score of 3.48, color score of 4.08, odour score of 2.72 and sliminess score of 4.50 on a 5-point descriptive scale. The correlation analysis indicated a significantly positive correlation of microbial load and physicochemical quality parameters with correlation coefficient of $r=0.81$. It is concluded that anthocyanin-gold-curcumin nanocomposite based strip-type indicator developed in this research can be successfully used for real-time monitoring of quality and safety of refrigerated chicken meat.

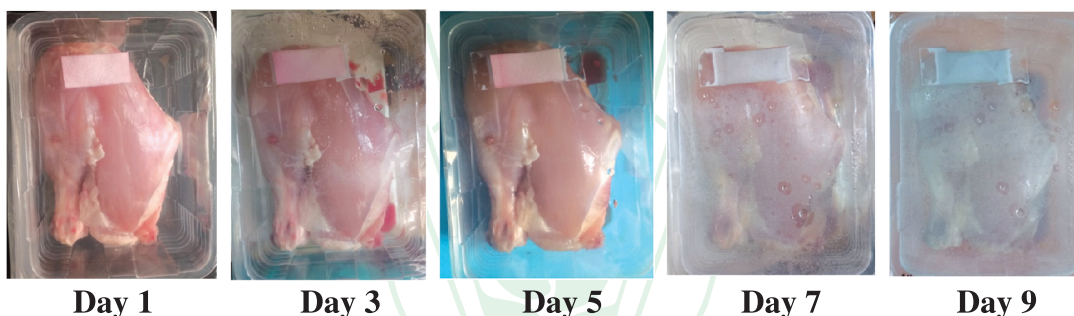


Figure 2 : Colour change in the sticker-type indicator (anthocyanin-curcumin-gold nanocomposite) during the refrigerator storage of chicken meat

The development of temperature abuse indicator sensor based on nanotechnology is under progress for detecting temperature abuse in frozen storage of chicken meat. This time temperature indicator sensor can detect the thawing of meat above its freezing point. As the duration of thawing increases, the color of the temperature abuse indicator sensor changes its original color indicating the degree of thawing. This color change is irreversible.



Figure 3 : Images of chicken meat and temperature abuse sensor subjected to different temperature fluctuations during frozen storage

3. Project title: Development of technological interventions and enhancement of quality, shelf-life and microbiological safety of traditional meat product- Hyderabad Haleem. (MoFPI)

PI: Dr. Suresh Devatkal; Co-PI: Dr. B.M. Naveena

Standardization of mutton Haleem preparation method to shorten the overall time required

Development of mutton Haleem balls: A value added meat product:

The traditional method of Haleem preparation involves selection of ingredients, cleaning and pre-processing of major ingredients like meat, broken wheat and pulse. Selected spices are added during pre-processing. Meat is cooked slowly for 8-10 hours and at the final stage, all materials are mixed and cooked for 1-2 hours. The weight and other measurements are not practiced and making it difficult to replicate the process in the laboratory. Further, the whole process is very long, cumbersome and involves manual works. In this study, we made technical observations on methods, ingredients, particle size, cooking methods, mixing and final end point of cooking. Accordingly, the laboratory method of standardization involved weight measurements, proper proportions of different ingredients particle reduction, cooking under pressure to reduce the time, through selection of ingredients and their particle size, simultaneous processes of cooking and finally mixing of all cooked materials and through mixing as per the traditional method. With this method, the Haleem could be able to prepare within 3-4 hours.



Figure 4 : Mutton Haleem balls

A Novel value-added meat product from Haleem was developed having highly acceptable sensory attributes Mutton Haleem balls are highly convenient to transport, use, store and gives impetus to Haleem enterprise.

4. Project Title: Estimation of carcinogenic and mutagenic compounds in meat products (FSSAI, New Delhi)

PI: Dr. M. Muthukumar; Co-PI: Dr. Rituparna Banerjee

Methods of extraction and quantification of 13 priority polycyclic aromatic hydrocarbons and 4 Priority heterocyclic amines from processed meat products using high performance liquid Chromatograph has been optimized and validated with recovery and reproducibility and other factors. HPLC parameters, such as mobile phase composition and flow has been standardized for determination of PAHs and HCAs using fluorescence detector and PDA detector respectively. Extraction and clean up was carried out by solid phase extraction (SPE). The concentration of 13 PAH and 4 HCA showed good linear relationship and linear correlation coefficient was ranged between 0.995 & 0.999 and 0.096-0.999, respectively. Analysis of PAH and HCA standard spiked samples resulted in recoveries between 70 & 100 % and 73 & 106 %, respectively. The method described is employed for determination of the PAHs and HCAs compounds in the processed meat products collected from various parts of country.

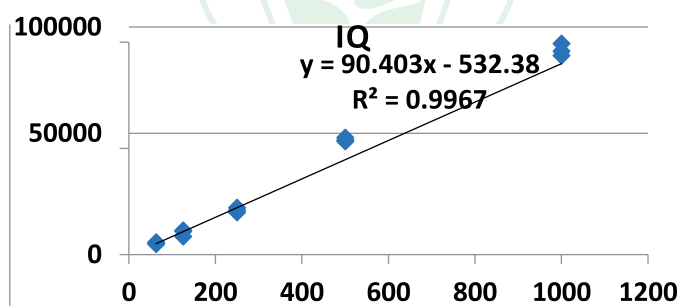


Figure 5: Linearity study for PAH compounds

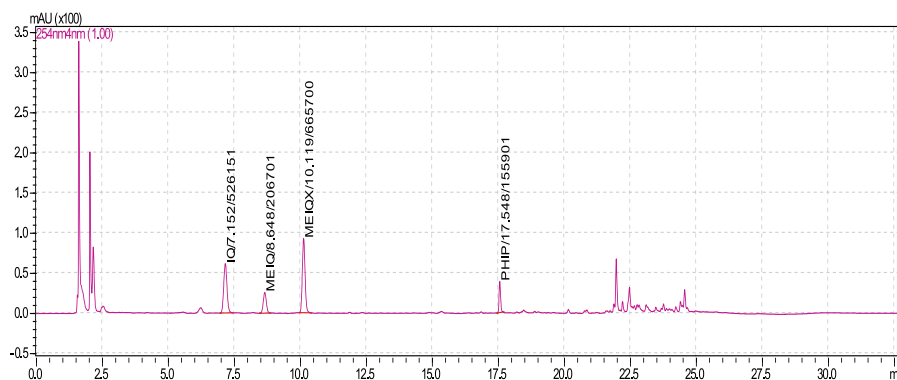


Figure 6: Chromatogram of HCAs standards



5. Project Title : Exploiting encapsulated nanoparticle conjugated phytochemicals to combat antimicrobial resistance in poultry (National Agricultural Science Fund)

PI: Dr. S.B. Barbuddhe, Co-PI: Dr. S. Girish Patil and Dr. B.M. Naveena

A project has been sanctioned in October, 2019 under National Agricultural Science Fund to target such approach using phytochemicals that may benefit from new understanding of the host–pathogen interactions with the objectives to identify specific phytochemicals against multi-drug resistant (MDR) pathogens, their conjugation and/or encapsulation using-appropriate nanoparticles and polymer for their targeted delivery.

6. Project Title: Enabling technologies in mammalian cell culture towards cultured meat (Department of Biotechnology (DBT) funded Inter Institutional collaborative research project)

PI: Dr. S. Girish Patil, Co-PI: Dr. S. Vaithyanathan

Three biopsies (muscle tissue) from young lambs and Four biopsies from slaughtered animal were collected and processed using enzymatic digestion (Collagenase + dispase). Pre- plating technique was used to collect and culture the myoblast cells (myosatellite cells) after the digestion of the biopsy. The cells were cultured in growth media (F12 + 10% Horse Serum). After reaching 80% confluence the cells were cultured in differentiation media (F12 + 2% Horse Serum) for the formation of myotubes. The formation of myotubes were observed and imaged. The Population Doubling Time (PDT) of the myoblast cells were estimated as 19 hrs by culturing and counting the cell number at different time points. The cells were checked for MyoD, Myosin Heavy Chain (MHC) and Desmin markers using immunostaining. The first two biopsies from young lambs were cultured up to passage 5. The third biopsy from young lamb cells were cultured up to passage 13. The two biopsies from the slaughtered animal got contaminated and the third biopsy was cultured up to passage 5. The fourth biopsy was cultured up to passage 12.

7. Project title: Mapping of skeletal muscle proteins from important buffalo breeds of India using high-throughput proteomic tools (ICAR-LBSYSA Project)

PI: Dr. B.M. Naveena

The study was undertaken with an objective to characterize buffalo meat proteins using gel free electrophoresis and mass spectrometry. The EXPEDEON GELFREE 8100 was designed to maximize protein recovery in liquid phase during molecular weight based fractionation as a quick alternative to routinely used SDS-PAGE. Total and salt soluble proteins were extracted from Longissimusdorsi muscles of water buffalo meat and purified using TCA-Acetone precipitation, filtered through 0.45 μ filters and quantification was done through BSA –BCA kit. Desalted and denatured protein samples (~500 μ g) mixed with 5X acetate sample buffer, 1 M-DTT and deionized water were loaded (150 μ l) onto a loading chamber of 12% (3.5-50 kDa) and 5% (3.5-500 kDa) Tris-Acetate expedeon cartridge. The 1X HEPES running buffer was filled into anode and cathode buffer chambers and the proteins were fractionated at 50-100 V and 3-11 mA. The instrument is paused at specific time intervals, and a total of 13 fractions were manually collected from collecting chamber using a pipette. For confirmation of protein separation, SDS-PAGE fractionation of all the 13 fractions was carried out. Current study indicates the suitability of gel-free fractionation as an effective protein separation tool for further characterization using mass spectrometry.

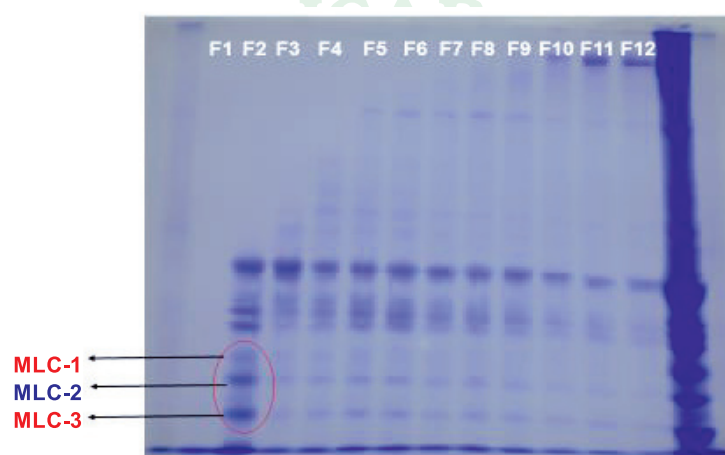


Figure 7 : GELFREE fractionation of total buffalo meat proteins (5% cartridge) separated on 12 % SDS-PAGE



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8. Project Title: National Agriculture Innovation fund (Agribusiness incubator (ABI) Centre & ITMU) (ICAR, New Delhi)

**PI: Dr. M. Muthukumar, Co-PI: Dr. K. Suresh Devatkal, Dr. B.M.Naveena
Dr. S. Girish Patil, Dr. G. Kandeepan, Dr. Rituparna Banerjee and Dr. MR. Vishnuraj**

Under the component I (Institute technology management unit) the intellectual properties generated in the institute are being protected through filling patents/copy right. The technologies developed at the centre are disseminated through participations in various exhibitions/melas. During the year 2019, one application was filed for copyright protection and one Patent application entitled “Novel loop mediated isothermal amplification assay primers for species identification of beef” is under process. Further, the technologies and activities of NRCM were displayed at 8 different exhibitions across the country.

Under the component II, the ABI centre is being established with the objects to generate employment opportunities and promote viable enterprises in meat / poultry processing. Five MoUs were signed with entrepreneurs for providing advisory consultancy for establishment of slaughterhouse and value added meat products processing unit and one contract research project.

9. Project Title: Setting - up Food Testing Laboratories - Species and Sex Identification of Meat (FSSAI, Govt of India)

PI: Dr. S. Vaithyanathan, Co-PI : Dr. M.R.Vishnuraj

1. 2 days transition training program on Laboratory Quality Management System has been completed by the Dr. S. Vaithyanathan and Dr. Vishnuraj, M.R.
2. We satisfactorily completed one Proficiency Testing program conducted by FAPAS, UK meat authentication.
3. Calibration of all equipment in the Meat Species Identification Laboratory as per ISO/IEC 17025:2005 completed.
4. Desktop surveillance audit for first year has been completed.
5. Technical services to clients in the field of meat species identification completed for 70 forensic evidence samples.

10. Project Title : Species identification to check adulteration of cheaper quality meat in meat (FSSAI, Govt of India)

PI: Dr. S. Vaithyanathan

Development of real time PCR based method for species identification and for detection of quantity of cheaper quality meat in meat

A new nuclear gene, melanocortin receptor, primer for buffalo species detection was developed for realtime PCR assay. Another nuclear gene, cyclic GMP phosphodiesterase primer for cattle species detection and for reference gene myostatin, primer were used in the real time PCR assay. (Figure-8 and Figure-9)

Both the specific and the reference real-time PCR assay were calibrated by analyzing serially diluted DNA extracts from a model meat mixture containing the ratio of buffalo, cattle, pork:25:25:50. The DNA extract with a concentration of 25 ng/μl was diluted 1:4, 1:16, 1:64 and 1:256 with H₂O. Calibration curves were obtained by plotting the Ct value against the logarithm of the DNA concentration of buffalo/cattle (specific PCR assay) or total meat DNA (reference PCR assay). The efficiency of the real time PCR assay ranged from 95 to 105% (Figure -10)

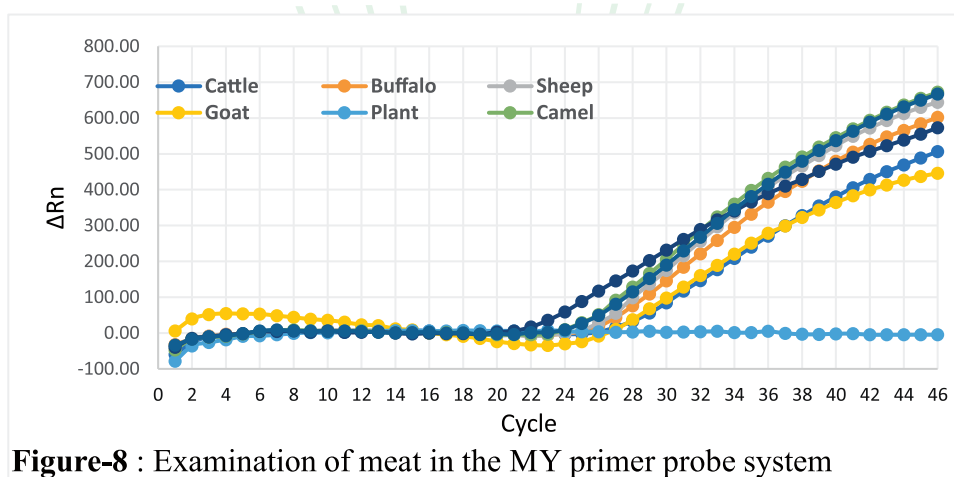


Figure-8 : Examination of meat in the MY primer probe system

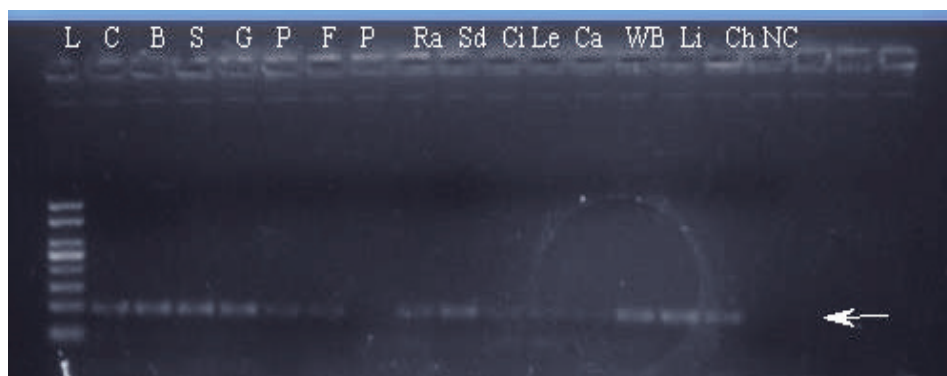


Figure-9 : Gel electrophoresis of PCR products using My primers
C=cattle, B=Buffalo, S=Sheep, G=Goat, P=Pig, PL=plant, Li=Lion, Ra=Rabbit, Sd=Sambar deer, Ci=civet cat, Le=Leopard, Ca=camel, NC=negative contro

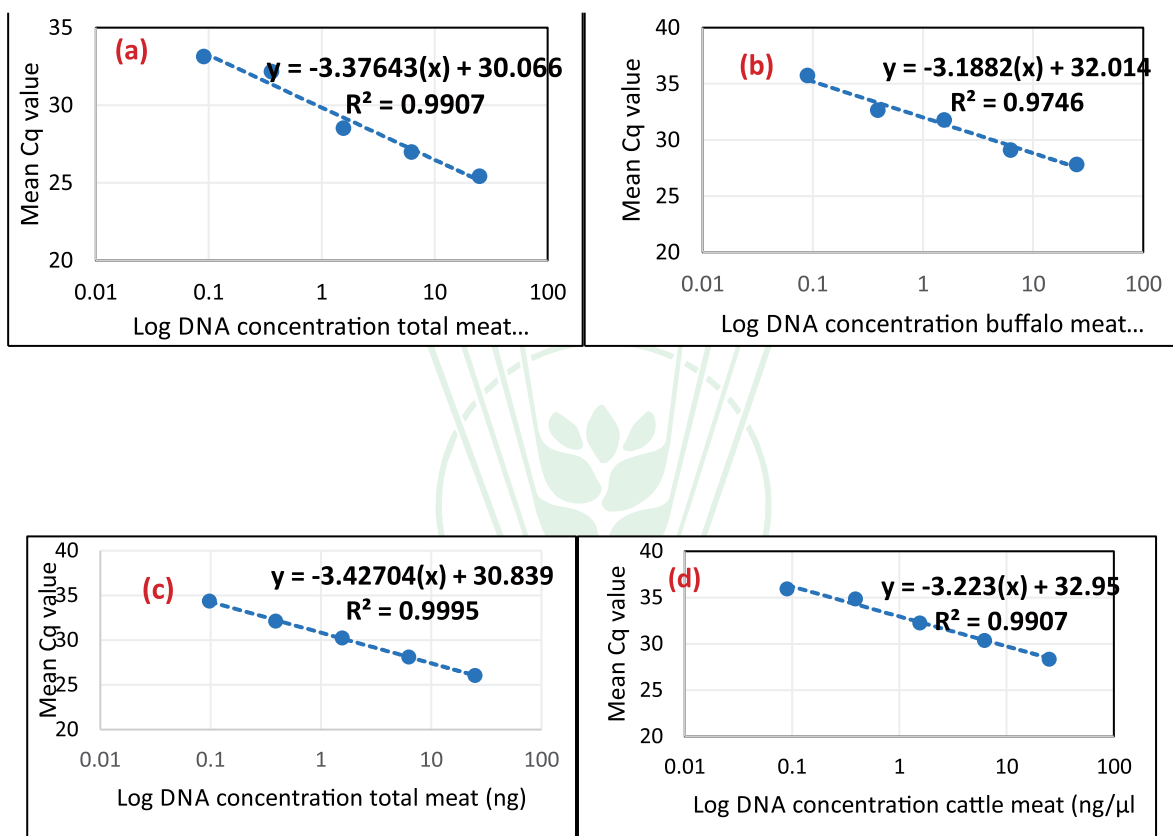


Figure 10 : Standard curve (a, b, c, d) of serially diluted DNA mixtures containing the ratio of buffalo, cattle and pork: 25:25:50 obtained with (a, b) the specific and reference PCR assay for buffalo meat and (c, d) the specific and reference PCR assay for cattle meat



INSTITUTE FUNDED RESEARCH PROJECTS

1. Project Title: Assessment of the occupational health hazards and food safety risks associated with abattoir personnel

PI: Dr. S.B. Barbuddhe, Co- PI: Dr. L R Chatlod and Dr. Sunil Pal Singh

During the year, a total 158 serum samples (117 from Hyderabad and 41 from parts of Kerala) were collected from occupationally exposed individuals namely, abattoir associated personnel. Thus, a total of 326 samples were collected till date. Of the 86 samples tested, a total of 5.81%, and 13.95% samples were positive for antibodies against leptospirosis and Q fever, respectively by ELISA. Data on personal hygiene and other epidemiological data were also collected. Three awareness programmes were organized for abattoir associated personnel. The serum samples were tested for brucellosis, leptospirosis and Q fever using serological tests. A total of 5.79%, 14.66% and 13.04% samples were positive for antibodies against leptospirosis, brucellosis and Q fever, respectively by ELISA. The persons engaged in slaughter house activities have not been found to wear personal protective gears. Further collection of samples and their testing for various occupational hazards are under progress.

भाकृअनुप

2. Project Title : Design and development of interactive Mobile app for disseminating crystalized information to meat industry stakeholders

PI: Dr. C. Ramakrishna, Co-PI: Dr. S. Girish Patil, Dr. M. Muthukumar and Dr. S. Kalpana

A research project is carried out with the objectives of 1) Designing of the broad framework of Meat App 2) Collection and orderly arrangement of information required to be uploaded on to Meat App and 3) designing, launching and updating of interactive app for the benefit of stakeholders. A Meat app is created and uploaded on Google Play store fulfilling above objectives. The App works in android platform in mobile phones. Further, the updating process is continuing.

3. Project Title: Development of miRNA Based Methods for Authentication of Meat and Meat Products with Respect to Organ Meats

PI: Dr. Vishnuraj M R, Co-PI: Dr. S. Vaithiyanathan, Dr. Suresh Devatkal and Dr. G. Kandeepan

A digital droplet (dd) PCR method for detection of offal materials in skeletal meat was standardized. The developed ddPCR method utilized tissue enriched expression of a panel of eight miRNAs in chicken offal like liver, heart and gizzard in comparison with skeletal muscle. EVAGreen based ddPCR assay was standardized in a QX200 AutoDG system for best annealing temperature and input volume for locked nucleic acid primers (Fig. 2 & Fig. 3). The candidate biomarker gga-mir-148a -3p, gga-mir-126 -5p and gga-mir-490 -5p were proven as organ specific marker for detection of chicken gizzard, gga-mir-122 -5p and gga-mir-27b -5p are for liver and gga-mir-218 -5p and gga-mir-499 -3p for heart. This method offers highly reproducible results with easy interpretation, unlike other reported chemo metrics methods, and can be combined with DNA techniques without requirement for any extra equipment, in regulatory laboratories for accurate detection of species and tissue origin of real world case work samples including cooked meat samples. Moreover, once established the conserved nature of the identified candidate markers, the same may be used for organ meat detection in other species too.

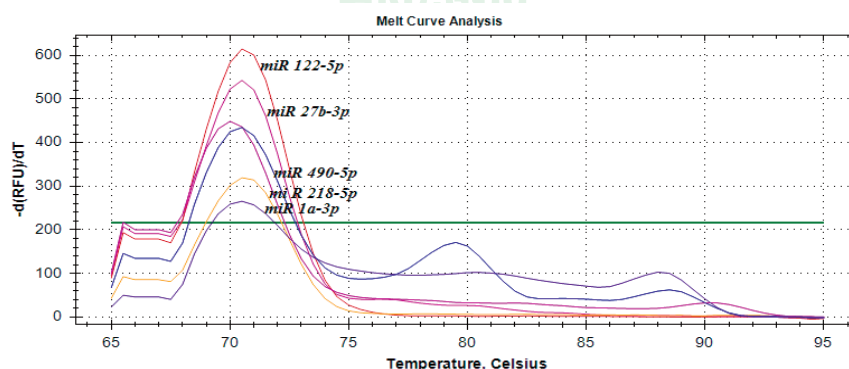


Figure 11 : Melt curve analysis of five selected miRNA primers in chicken liver template cDNA

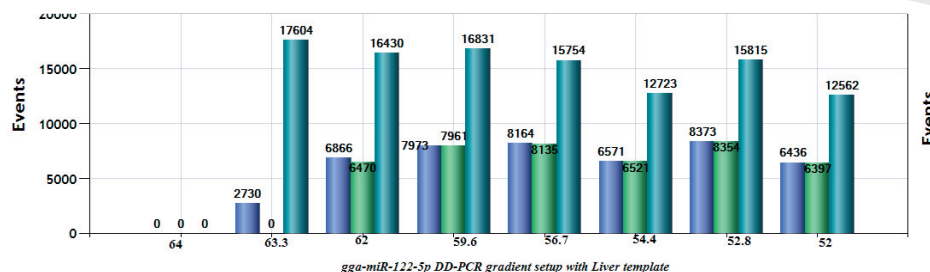


Figure 12 : Events (total and positive in both channel I & channel II) distribution of droplets generated during the gradient PCR setup using liver miRNA template & miR-122-5p at input level of 1µL

4. Project Title: Development of nanocomposite biodegradable packaging material for meat and meat products

PI: Dr. G. Kandeepan

There is a need for development of sealable, biodegradable, shelf stable, biobased packaging material with better packaging characteristics. This project aims to develop and characterize nanocomposite biodegradable packaging material and to determine the effect of this packaging material on the quality and shelf-life of meat and meat products. The biopolymers will be mixed with plasticizer, stabilizer and bioplastics to make a base material for film formation with better sealability and film characteristics. Nanoparticle sized antioxidants and antimicrobials will be incorporated into this solution to improve shelf- stability. Under the technical program of development and characterization of nanocomposite biodegradable packaging material, the standardization of the level of raw materials and processing conditions for the preparation of nanocomposite biodegradable packaging material is under progress.

5. Project Title: Development of Ozone (O₃) based decontamination technology for poultry and sheep/goat carcasses

PI: Dr. Suresh Devatkal

In these experiments, bacteria from meat processing environment were identified using PCR amplification and 16S rDNA gene sequencing. Sterile swabs were collected one from meat dressing table and goat thigh from experimental slaughter house of ICAR- NRCM, Hyderabad. Bacterial culture were isolated and major colonies were subculture and subjected to DNA isolation and PCR amplification. The PCR conditions used: initial denaturation 96°C for 5 min, denaturation 94°C for 45 sec.,

annealing 56°C for 60 sec., extension 68 °C for 1 min. and final extension 68°C for 5min and a total of 33 cycles. agarose gel electrophoresis (1.5 %) was used to visualize the amplified bands.

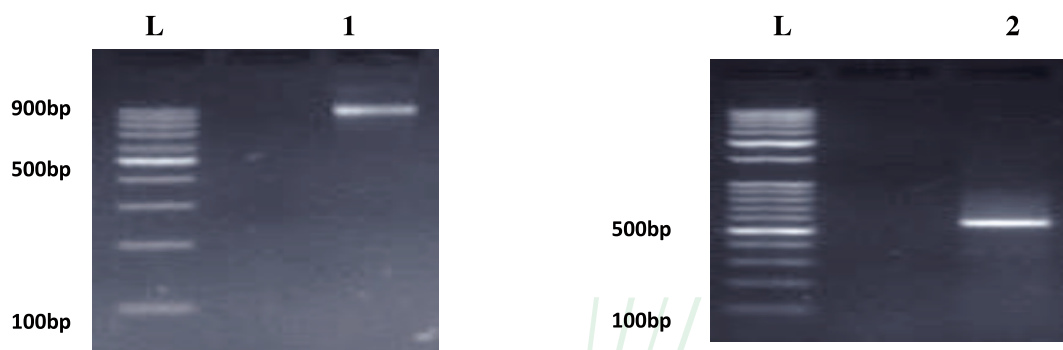


Figure 13 : PCR amplification of DNA samples

Lane L: 100bp Ladder; Lane 1: Bacteria from goat thigh (980bp); Lane 2: Bacteria from meat dressing Table (550bp)

PCR products were exposed to direct sequencing, both strands of PCR products were sequenced with sanger sequencing procedure with Big Dye Terminator Chemistry Version 3.1 and using 3730xl DNA Analyser (96 capillary, IRA Biotech Pvt Ltd, Habsiguda, Hyderabad). Sequences were analysed with the Basic Local Alignment Search Tool (BLAST) in National Centre for Biotechnology Information. (NCBI) website (<http://www.ncbi.nlm.nih.gov>). Results of sequence analysis indicated that bacteria from goat thigh carcasses was *Klebsiella pneumonia* and from dressing table belong to *Acinetobacter calcoacetus*.

Identification of most suitable microbial inactivation kinetics models during ozone processing

The bacterial population isolated from meat and meat products were treated with aqueous ozone (200 mg/hr or 0.1 mg/L) for 15 min with sampling at 0-, 0.5-, 1-, 2-, 4-, 8- and 15-min intervals. To describe the survival of different bacteria inactivation models available in the GInaFiT tool. Inactivation kinetics parameters related to the scale and shapes of inactivation curves for the models were calculated. The goodness of fit for each model was calculated based on root mean sum of squared error (RMSE) the lowest value of RMSE, near to zero indicates the best fit of the model.

Table-1. Predicted parameters of the Weibull, Weibull+tail, double Weibull and biphasic model and the time required to reach a 4 log reduction for different bacteria and model fit quality

Weibull model					
Bacterial species	p	delta (min)	Log ₁₀ N ₀	RMSE-RSE	4-D value (min)
<i>Proteus spp</i>	0.62	1.09	8.12	0.17-0.02	10.20
<i>Enterococcus spp</i>	0.42	0.32	8.43	0.32-0.10	8.55
<i>Citrobacter freundii</i>	0.44	0.59	8.19	0.07-0.01	13.80
<i>Providencia vermicola</i>	0.67	1.35	7.59	0.30-0.09	10.80
<i>Staphylococcus aureus</i>	0.49	0.45	8.43	0.20-0.04	7.5
<i>Listeria monocytogenes</i>	0.58	0.66	7.66	0.31-0.09	6.6
MSE/SEM					
Weibull+tail					
Bacterial species	p	delta δ	Log ₁₀ N ₀	Log ₁₀ N _{res}	RMSE-RSE
<i>Proteus spp</i>	0.74	1.42	8.03	3.09	0.05-0.01
<i>Enterococcus spp</i>	0.49	0.43	8.40	3.39	0.33-0.11
<i>Citrobacter freundii</i>	0.45	0.60	8.19	2.88	0.08-0.01
<i>Providencia vermicola</i>	0.90	1.94	7.46	2.76	0.17-0.02
<i>Staphylococcus aureus</i>	0.54	0.54	8.40	2.69	0.20-0.04
<i>Listeria monocytogenes</i>	0.69	0.88	7.58	1.54	0.31-0.09
SEM/MSE					

Means within a column with different superscripts differ significantly (p<0.05).

6. Project Title: Development of traceability based quality assurance methods for wholesome meat production

PI: Dr. Girish Patil, Co- PI: Dr. S. Barbuddhe, Dr. S. Vaithyanathan and Dr. C. Ramakrishna

Development of rapid, economical and field friendly technique for species traceability of meat

A novel, rapid, economical and species-specific DNA-based assay for the authentication of pork was developed in the project. The technique specifically amplified porcine mitochondrial D loop region by combining Alkaline Lysis (AL) method of DNA extraction and Loop Mediated Isothermal Amplification (LAMP). Visual detection of the reaction was accomplished by color development in the reaction with the addition of SYBR Green I dye. Dependable amplification was possible in thermally processed meat samples heated up to 121°C for 30 min. The assay was able to detect pork in beef up to the

level of 0.1% admixture and limit of detection of DNA was at 0.5 ng/μL. Cross-amplification of related species like cattle, buffalo, sheep, goat and chicken was excluded by incorporating their DNA in the reaction assay. The novel approach (AL-LAMP technique) was found to be robust and handy suitable even for resource compromised laboratories engaged in the food analysis. AL-LAMP assay was also standardized for mutton, buffalo meat and beef also.

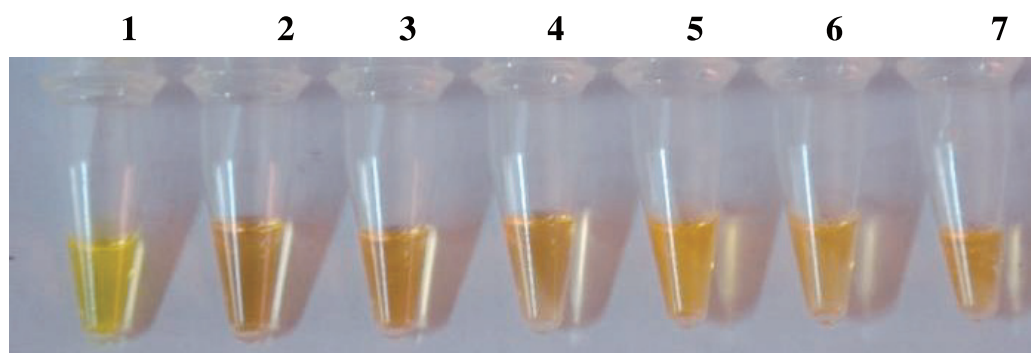


Figure 14 : Visualization of LAMP amplification after addition of SYBR Green I dye
1) Pig; 2) Cattle; 3) Buffalo; 4) Sheep; 5) Goat; 6) Chicken; 7) Negative control

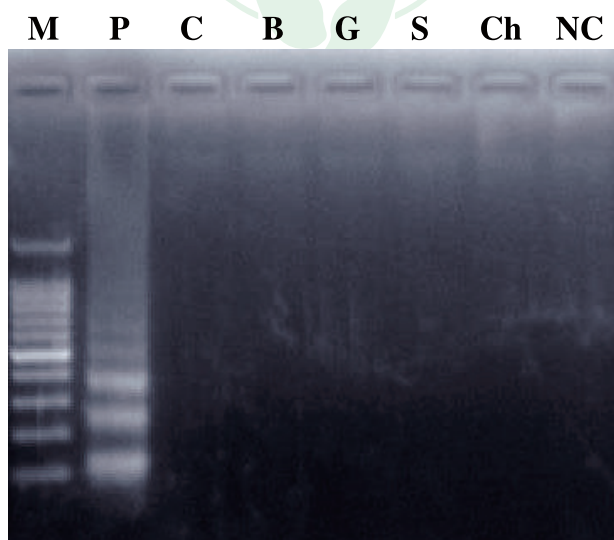


Figure 15 : Visualization of LAMP amplification on 2 % agarose gel

M:100 bp DNA ladder; P:Pig; C:Cattle; B:Buffalo; G:Goat; S:Sheep; Ch: Chicken; NC: Negative control

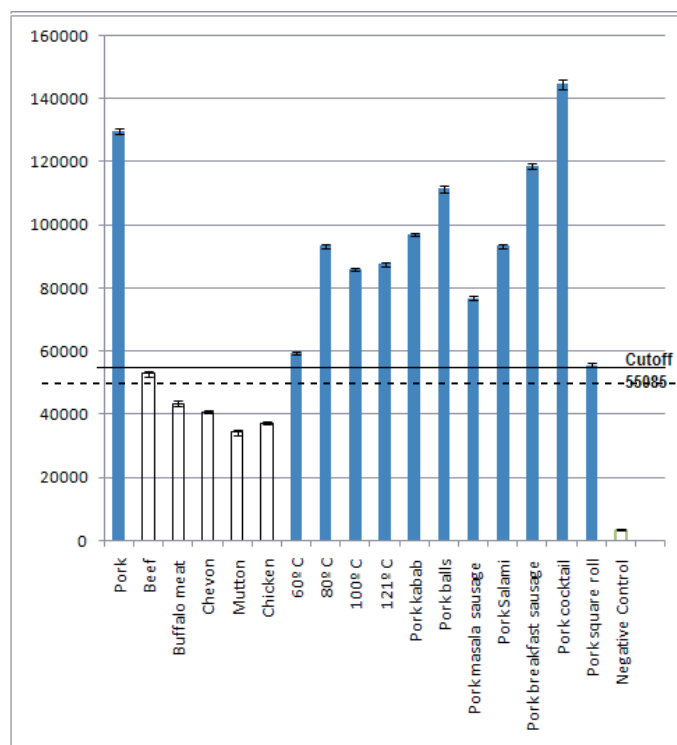


Figure 16 : Fluorometric values of LAMP assay obtained using SYBR Green I dye plotted (mean $\pm$ standard error indicated as bar) for different samples (dashed line indicate cutoff; mean+2x standard deviation of non-pork samples)

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7. Project Title: Development and validation of rapid assays for detection of *Listeria Monocytogenes* in foods

PI: Dr. S.B. Barbuddhe, Co- PI: Dr. L. R. Chatlod.

Out of 217 samples processed, 10 isolates were recovered. The isolates were characterized by PCR for the virulence associate genes. The overall occurrence of *Listeria monocytogenes* based on phenotypic, biochemical and PCR based analysis was 2.30%. The occurrence of *Listeria monocytogenes* based on phenotypic, biochemical and PCR analysis at abattoir level was 3.17% (4 out of 126) and at retail level 7.14% (1 out of 14). No samples collected from farm level showed positivity for *Listeria* spp

8. Project Title: Effect of superchilling and cryoprotectants on quality and storage stability of meat

PI: Dr. Rituparna Banerjee, Co- PI: Dr. B. M. Naveena.

This project was carried out to standardize the superchilling condition for enhancing the shelf-life of meat and observe its effects on quality and storage stability of meat. A superchilling cabinet has been developed with respect to temperature and humidity to optimize the superchilling condition of dressed carcass or meat in order to improve their quality and storage stability. Experiments were conducted on superchilling storage (-2 °C) of dressed chicken and sheep carcasses and its cut-up parts for pH, WHC, cooking yield, TBA value, instrumental color (L*, a* and b* value), % metmyoglobin, shear force value, total plate count (TPC).

Sucrose, sorbitol and polyphosphates were chosen as cryoprotectants in this study to evaluate its effects in reducing ice-crystal formation during superchilled storage. The level of addition was standardized to 4% for sucrose and sorbitol and 0.3% for polyphosphates. Samples were analysed for pH, drip loss, WHC, cooking yield, shear force value, instrumental color, metmyoglobin % and TBA value on 0, 15th and 30th day of chilled storage (4±1 °C). Samples treated with the aforementioned cryoprotectants were analysed by scanning electron microscopy on 15th day of storage.

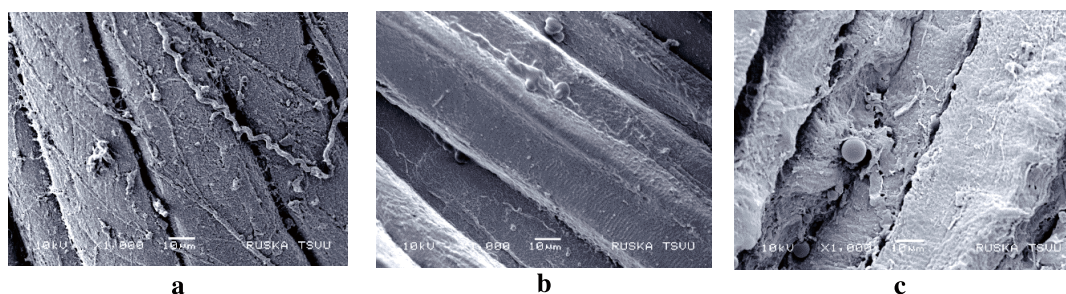


Figure 17 : Scanning Electron Micrograph of superchilled meat treated with
a) Sucrose b) Sorbitol and c) Polyphosphate

9. Project Title: Impact of Meat research on Livestock sector development: Role of Public Investment

PI: Mrs. K.Varalakshmi

To assess the impact of NRCM research on research community and research productivity of NRCM, bibliometric analysis was performed using data collected from WOS software for the period 2007-2017. H index, institutional collaboration, Author collaboration, citation analysis, productive author analysis was done and the results are given below in bibliometric networks, tables. Bibliometric networks were prepared for institutes, departments, productive authors, citations, keywords, Journals etc

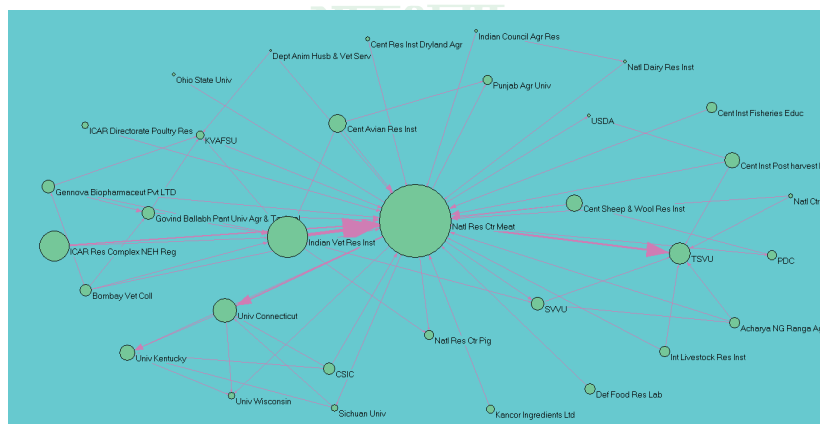


Figure 18 : Shared unit coupling of NRCM citations

H index regarded as the measure of research output visibility is calculated for all institutes collaborated with NRCM research all the authors, Journals, states, cities, departments, countries, top 5 productive institutes, Internal departments etc. H index growth is also calculated for all these parameters to depict the changes in the visibility over the years.

Table-2 : H index growth of NRCM for the period of 2007-16

h-index	Unit	Citation sum within h-core	All citations	All articles
12	2016	327	513	85
10	2015	241	396	76
9	2014	158	267	66
8	2013	119	190	53
7	2012	87	135	46
5	2011	51	93	42
4	2010	21	35	34
2	2009	4	6	23
1	2008	1	1	12
0	2007	0	0	2

Note : Only for the study period of 10 years.

Table-3 : H index of all the collaborating institutes of NRCM

h-index	Institute	Citation sum within h-core	All citations	All articles	h-index	Institute	Citation sum within h-core	All citations	All article
12	NRC on Meat	327	513	85	1	PAU	3	3	1
7	Univ Connect	79	81	8	1	CIFE	1	2	5
6	IVRI	84	121	22	1	UniWiscon	2	2	1
4	TSVU	26	31	14	1	ANGRAU	4	4	2
3	GBPUAT	26	26	3	1	SVVU	4	5	3
3	ICAR NEH	72	75	10	1	CRIDA	1	1	1
3	Gennova Bio	26	26	3	1	KVAFSU	6	6	2
3	CIPHET	95	95	4	1	ILRI	1	1	1
3	Univ Kentucky	37	39	4	1	DPR	3	3	2
2	Kancor Ingred	15	15	2	1	BVC	6	7	2
2	CARI	32	33	4	0	DAHD	0	0	1
2	CSIC	24	24	2	0	USDA	0	0	1
2	CSWRI	6	6	4	0	DFRL	0	0	1
1	Sichuan Univ	13	13	1	0	NCCS	0	0	3
1	NRC Pig	3	3	1	0	NDRI	0	0	1
1	Ohio State Univ	2	2	1	0	ICAR	0	0	1



ANNUAL REPORT 2019



10. Project Title: Organic Meat Production System for Sustainable Sheep Husbandry and Promotion of Consumer Health.

PI: Dr. P. Baswa Reddy, Co-PI: Dr. DBV Ramana, Dr. Pankaj, Dr. C. Rama Krishna, and Dr. M. Muthukumar

Breeding stock of sheep are being reared under cut and carry system with organically produced fodder. The feeding, health care and other animal rearing practices as per the norm under NPOP guidelines are being followed. The renewal audit of organic livestock (sheep) has been carried out and the organic scope certificate for the period from March 2019 to March 2020 has been issued by Jaipur based APEDA accredited organic certifying agency 'Onecert Asia'.

The yield of CO4 fodder was 71 tons/ ha with a crude Protein content of 8.5%. The total flock strength of the organic sheep unit as on 31st Dec 2019 was 49 including nine lambs. The average daily weight gain (ADG) in lambs in the organic unit during the reporting period was 55 ± 9.2 g while the ADG in the regular flock was 54 ± 7.6 g



Organic fodder certificate



Organic Livestock (sheep) certificate

11. Project Title: Performance study of Sheep markets in India

PI: Mrs. K.Varalakshmi, Co- PI: P. Baswa Reddy

India is world's 5th largest meat producer with 8.11 million tonnes (2018-19) accounting for 2.4% of world meat production. India ranks seventh in sheep and second in world goat meat production. It produced 1.78 million tonnes of mutton (10.98 lakh tons from goat and 6.78 lakh tons from sheep) in 2018-19 accounting for 22% of India meat production taking second place only next to poultry meat(50.06%).

Sheep and goats forms an important part of the Indian livestock sector. South India produces a large quantity 41.3% (7.34 lakh tons in 2018-19) of total domestic small ruminant meat output led by state of Telangana (41.07% & 16.98% of south India and Indian small ruminant meat production respectively) followed by Andhra Pradesh (28.29% & 11.7%) Tamil Nadu (16.75% & 6.92%), Karnataka (10.87% & 4.5%).

South India produces 74.7% of sheep meat and 20.8% of Indian goat meat.

Not only output, but also in sheep population South India accounts for major share. Again in south India Telangana accounts for major share both in terms of livestock and meat production of sheep.

Telangana accounts for 25.67% of sheep population of India. In terms of meat, it accounts of 46.74% of south India's sheep meat production which comes to 34.9% of India's total sheep meat production. Hence Telangana occupies important place as far as sheep meat is considered.

Not only production but also price is important in maximizing the returns for farmers. With the aim of *solving the problems of farmers, to support them and to safeguard the interest of the farmers*, supporting in getting fair price to the farmers by minimizing the number of middlemen and exploitation regulated markets i.e APMC were established under the APMC Act, 1966. These markets functioning under market committees are supposed assist the farmers in getting better price and returns for their produce.

In spite of the leader in population and meat production Telangana has only one APMC market for Sheep in Kodad, Nalgonda district.

With this back drop of importance of sheep for Telangana and lack of studies on livestock markets this study is taken up to explore functioning of sheep market and constraints in the marketing system.

The study involves both Primary & Secondary data (2009-19) on arrivals, prices, infrastructure, constraints collected from APMC, AGMARKNET and un regulated markets for comparison. Apart from Trend, ARIMA model will be used for forecasting prices and arrivals. Garrette's scoring method, Market concentration techniques will be

used for examining market structure, constraints.

Current status: Secondary data on arrivals and prices were collected and the analysis is in progress.

12. Project Title: Simultaneous quantitative determination of oxytetracycline and chlortetracycline residues in buffalo meat samples using RP-HPLC

PI: Dr. S. Kalpana, Co-PI : Dr. M. Muthukumar.

A liquid chromatographic method for the simultaneous quantitative measurement of oxytetracycline and chlortetracycline in buffalo meat was optimized. After extraction of the meat samples using McIlvaine buffer – EDTA solution and SPE clean up, the analysis of the antimicrobials was carried out using a reverse phase HPLC using UV detector. The chromatographic separation was accomplished with mobile phase consisting of 0.1M oxalic acid, methanol and acetonitrile (70:15:15, v/v) in an isocratic elution mode. The volume of injection and flow rate of the mobile were 1.5 ml/min and 50 μ l respectively detector was operated at a wavelength 360nm. Linearity, recovery, selectivity, limit of detection, limit of quantification was evaluated in buffalo meat matrix at drug concentrations ranging from 25-1000 ng/g. Mean extraction recoveries of oxytetracycline and chlortetracycline were in the range of 90-97 %. The limits of quantification for oxytetracycline and chlortetracycline were 38.30 and 36.63 μ g/kg, respectively. For monitoring purpose, about two hundred buffalo meat samples were collected from in and around Hyderabad city viz narapally, amberpet, charminar, cherlapally, uppal and extracted for analysis of oxytetracycline and chlortetracycline residues. None of the samples analyzed through RP-HPLC had the said residues at or above the current Codex maximum residue limit.

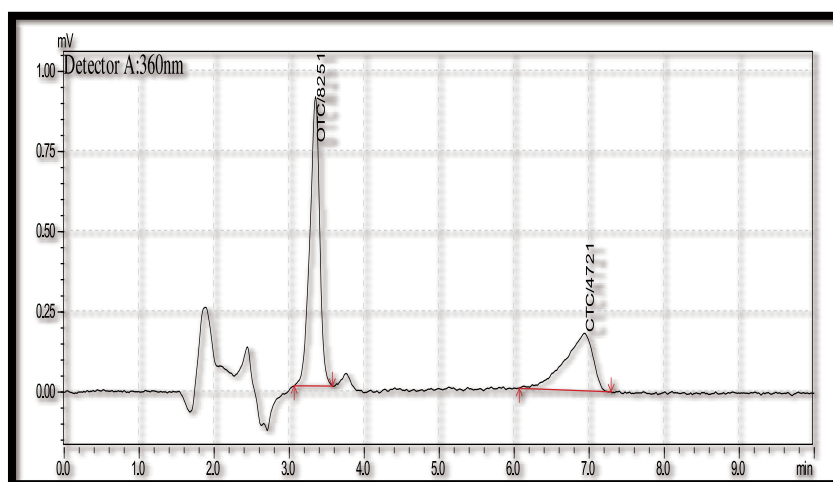


Figure 19 : Optimized representative Chromatogram of oxytetracycline and chlortetracycline

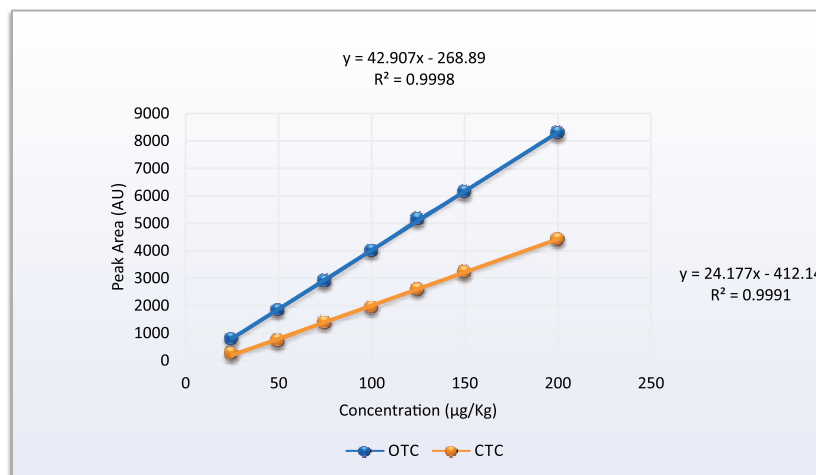


Figure 20 : External Calibration Curve in the range 25-200µg/Kg

13. Project Title: Species identification of Sarcocysts in buffalo meat

PI: Dr. C. Ramakrishna, Co-PI: Dr. S. Girish Patil, and Dr. S. Kalpana.

A research project is proposed to identify the species of Sarcocysts in buffalo meat. On gross / visible examination of Sarcocysts, the exact species of Sarcocysts cannot be identified. In the present project, it is proposed to identify the species of Sarcocyst by amplifying the genus specific target gene using PCR. The amplified PCR product is again subjected to gene sequencing for finding out the exact species of Sarcocyst. This will help in identifying the *S. hominis*, zoonotic Sarcocyst species in buffalo meat.

Meat samples from 202 slaughtered buffaloes were collected from retail buffalo meat shops located in and around Hyderabad city. On gross examination of all the collected meat samples, no visible Sarcocyst was observed. DNA was isolated from all the 202 meat samples and subjected to PCR for amplification of target gene for identification of Sarcocysts. The process was repeated for confirmation of results. However, none showed amplification.

Oesophagus samples from 420 slaughtered buffaloes were collected from local abattoir located in and around Hyderabad. Isolation of DNA from meat portion of esophagus samples is in process.

14. Project Title: Technological interventions for livelihood enhancement of socially backward people under SCSP

PI: Dr. P. Baswa Reddy, Co-PI: Dr. S. Girish Patil, Dr. C. Ramakrishna, Dr. M. Muthukumar, Dr. Kalpana and Mrs. K. Varalakshmi.

Under the Scheduled Caste Sub Plan (SCSP) component of the institute, the activities are taken up on project mode for the benefit of the people belonging to SC community through awareness and training programmes and critical input support for entrepreneurship development and livelihood improvement. The following programmes were carried out during the year under report.

For entrepreneurship development and income generation through preparation and sale of value added meat products, SC women Self Help Group (SHG) members of Jangaon district were selected through Society for Elimination of Rural Poverty (SERP), Govt. of Telangana and were trained on hygienic meat production and value addition for 5 days (8th to 12th July 2019) at NRC on Meat under SCSP component. Further, to assist them in establishing their business unit, the critical equipments and utensils required for establishment of small scale meat products processing unit were provided to the SHG group.



For entrepreneurship development and income generation through clean meat roduction and sale of value added meat products, SC women Self Help Group (SHG) members of Irkode village, Siddipet district were selected through Society for Elimination of Rural Poverty (SERP), Govt. of Telangana and were trained on hygienic meat production and value addition for 5 days (26th to 30th August 2019) at NRC on Meat under SCSP component.

After the training programme, the SHG members were provided with critical equipments and utensils required for establishment of small scale meat products processing unit.

For the purpose of improving the livelihoods of SC women through income generation, 17 SC women of Chinna Gundavalli village of Siddipet dist, Telangana were provided each with 20 back yard poultry chicks of 4 weeks age, 20 kg poultry feed, one poultry feeder and one polutry drinker.

15. Project Title : Effect of encapsulated essential oils for enhancing safety and quality of emulsion based chicken meat product.

PI: Dr. Y. Babji, Co-PI: Dr. S.Vaithiyanathan, Dr. P. Baswa Reddy, Dr. G. Kandeepan, Dr.S.Kalpana.

The likelihood of encapsulating cinnamaldehyde in an oil form using a 2% sodium alginate and a 0.25% Calcium chloride by the emulsion extrusion method was explored in this study. A 2% 100 ml Sodium alginate was stirred at 300 rpm for 15 minutes for proper mixing by a magnetic stirrer which was then kept at room temperature for 24 hours to disengage bubbles .A 37.5ml of 2% Sodium alginate pipetted in to a 100 ml breaker was subjected to stirring at 300 rpm for 45 minutes to which a 12.5 ml of cinnamaldehyde essential was added slowly for same period of time.The 50 ml sodium alginate cinnamaldehyde essential (3:1)was loaded in to a 50 ml capacity syring and released the solution slowly in to a 0.25% Calcium chloride solution, observing the formation of alginate cinnamaldehyde microspheres maintaining a distance of 2.5 cm from tip of the 22 G needle (length 51 mm, inner diameter 0.016"/ 0.41 mm,outer diameter 0.0283"/ 0.72 mm) to the surface of the calcium chloride solution.The resultant floating microspheres were allowed to settle in at the bottom of calcium chloride solution for 30 minutes.The hardened microspheres were sieved through a nylon sieve. The microspheres then were washed twice with distilled water and dried with tissue paper before they were subjected to further drying at 50°C for 24 hours in an oven.

There was no difference between encapsulation efficiency and yield. The sodium alginate cinnamaldehyde microspheres were of varied sphericity, smooth with good flowability. The yield was 73 % while the encapsulation efficiency was only 75 %. The cinnamaldehyde loading capacity was about 20 %. Emulsion extrusion method for producing cinnamaldehyde microspheres took 75 minutes. Further studies of evaluation of alginate cinnamaldehyde microspheres such as particle size, presence of any interaction between sodium alginate polymer and essential oil, surface morphology besides storage stability of microencapsulated emulsion based chicken nuggets at refrigeration temperature are under way.

16. Project Title : Prevalence and characterization of important food borne pathogens in buffalo meat production chain

PI: Dr. L. R. Chatlod; Co-PI: Dr. S. B. Barbuddhe.

A total of 217 samples were collected from the three stages of buffalo meat production chain. Isolation and characterization of *E. coli* was carried out as per ISO 16654 with modifications. The overall occurrence of *E. coli* based on culture, morphological, biochemical and PCR analysis was 17.97%. The occurrence of *E. coli* based on culture, morphological, biochemical and PCR analysis at farm level was 7.79% (6 out of 77), at abattoir level was 22.22% (28 out of 126) and retail level was 35.71% (5 out of 14). Isolation and characterization of *Salmonella* spp was carried out as per ISO 6579. The overall occurrence of *Salmonella* spp based on culture, morphological, biochemical and PCR was 1.84% (4 out of 217). The occurrence of *Salmonella* spp based on culture, morphological, biochemical and PCR based characterization at abattoir level was 3.17% (4 out of 126). No farm level and retail level samples were positive by PCR. The presence of the *invA* and *stx* genes were 44.44% and 100% respectively each by PCR. Two isolates were characterized as *S. Enteritidis*.

Antibiotic sensitivity/resistance pattern :

Ampicillin (100%) and Tetracycline (71.79%) showed higher resistance against *E. coli* isolates. Gentamicin (100%) was found to be most effective antibiotic followed by Cefotaxime (87.17%) and Ciprofloxacin (82.05%) against *E. coli* isolates. Ampicillin (100%) showed higher resistance against *Salmonella* isolates. Cotrimoxazole (100%) and Cefotaxime (75%) were found to be most effective antibiotics against *Salmonella* isolates.

CONTRACT RESEARCH PROJECT

Project Title : Artificial intelligence based muzzle recognition technology for individual identification of animals' is being implemented with funding from Clonoid Pvt. Ltd., Hyderabad.

PI: Dr. S. Girish Patil

The Clonoid Private Limited has developed a noninvasive Artificial Intelligence (AI) based muzzle recognition system for individual identification of animals which was field tested by ICAR NRC-Meat, Hyderabad. Method involves capturing image of the muzzle of bovine dairy animals using mobile camera (minimum 5 MP). The captured images can be uploaded on to the 'GoMukh' app with corresponding animal identification number. For confirming identification of the unknown animal, fresh images can be taken and compared with the pre-uploaded images.



Figure 21 : Muzzle imaging validating artificial intelligence based individual identification technology

Table 4. Details of the images collected, analyzed and the results of the muzzle images analyzed using GoMukh app

Image details	Result
Total number of animals imaged	198
Total number of images	6119
Avg number of images/animal	31 (≈ 30.90)
Total number of blur images (which were not accepted by the app)	467
Avg. number of blur images/animal	2 (≈ 2.358)
% of blur images	7.63%
Total number of app readable images	5,652
% of total readable images	92.36 %
% readable images assigned correctly to individual	5,540
% of images assigned correctly (among the readable images)	98.02 %
Total no. of readable images which could not be assigned to any individual	112
% of images not assigned to any individual (among readable images)	1.98 %
Number if images assigned wrongly to another individual	0



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MoU/MoA and REVENUE GENERATED

Sl. No.	Name of Technology/ Know-How	Name of Contracting Party	Mode of Partnership	Date of Licensing	Revenue Earned (Rs.)
1	Establishment of value added pork meat products processing unit. (Renewal)	P.V.Sateesh, M/s. Farm Fresh Pork Pvt. Ltd., Vijayawada, Andhra Pradesh	Consultancy	16-02-2019	25000/-
2	Designing and Fabrication of Mobile vehicle unit for Meat Business	M/s. Karnataka Sheep and Wool Development Corporation Ltd, Kuri Bhavana, Veterinary College Campus, Hebbal, Bangalore	MoA Consultancy	01.06.2019	50,000/-
3	Establishment of Value Added Meat Products Processing	M/s. Meatman., No.203/11/12, Navajothi Street, Kothanur, The Defense Enclave, Bangalore	MoA Consultancy	08.07.2019	50,000/-
4	Establishment of Slaughterhouse for Goat/Sheep	M/s. Are-Katika Mutually Aided Co-operative Society Limited, 14 2-154, Chansanwadi, Goshamahal, Hyderabad	MoA Consultancy	18.07.2019	50,000/-
5	Establishment of Value Added Meat Products Processing	M/s. Anaum Agrotech Pvt. Ltd., Chippalapally, Kandukur Mandal, Kandukur, Rangareddy Dist., Telangana State, India 501 359	MoU Incubatee	26.07.2019	55,000/-
6	Establishment of Value Added Meat Products Processing	M/s. Wasabak Global LLP Flat No. 209, 2nd Floor, Pleasant Apartments, Near SBI, Lanco Hills Road, Manikonda Hyderabad	MoU Incubatee	07-08-2019	55,000/-
7	Establishment of Value Added Meat Products Processing	M/s. Satyanarayana Spicy Foods Plot No.4, West Hanuman Nagar, Boduppal Post, Hyderabad, Telangana	MoU Incubatee	30-08-2019	55,000/-
8	Establishment of Value Added Meat Products Processing	RR Foods and feeds Plot No 262/1, Rd. No 78, Jubilee Hills Hyderabad	MoU Incubatee	04-11-2019	55,000/-

Total Revenue Generated during the year 2019-2020 is 22.92 lakhs



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PUBLICATIONS



ICAR-National Research Centre on Meat



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PUBLICATIONS

1. Original Research Papers

1. Bhattacharya, D., Kandeepan.G., Mendiratta, S., Vishnuraj, M., &Soni, A. (2019). Estimation of Microbial Load in Anthocyanin-CMC Based Edible Film Coated Chicken Meat Slices in Refrigeration Storage Using Fluorescein Di-acetate (FDA) Hydrolysis Assay. *International Journal of Livestock Research*, 9(6), 99-108. doi: 10.5455/ijlr.20190108070255.
2. Girish P. S., S. B. Barbuddhe, Aparana Kumari, Deepak B. Rawool, Nagappa S. Karabasanavar, M. Muthukumar, S. Vaithiyanathan (2020) Rapid detection of pork using alkaline lysis-Loop Mediated Isothermal Amplification (AL-LAMP) technique. *Food Control*, 110, 107015. <https://doi.org/10.1016/j.foodcont.2019.107015>
3. Kiran, M., Naveena, B.M., Smrutirekha, M., Baswa Reddy, P. Rituparna Banerjee, Praveen Kumar, Y., Venkatesh, Ch. And Rapole, Srikanth (2019). Traditional halal slaughter without stunning versus slaughter with electrical stunning of sheep (*Ovis aries*). *Meat Science*. 148:127-136.
4. Muthukumar, M., Rituparna Banerjee, B. M. Naveena and Divya Sangnabhatla. 2018. Identification and quantification of polycyclic aromatic hydrocarbons in processed chicken meat products. *Journal of Meat Science*, 13 (2): 48-53.
5. Naveena, B. M., Muthukumar, M., Banerjee, Rituparna., Shaju, V. A. and Ramesh, C. K. (2019). Oxidative stability of ground chicken patties enhanced with rosemary diterpene phenols relative to ascorbic acid. *Journal of Meat Science* 13(2): 54-60.
6. Reena Arora, Naveen Kumar S., Sudarshan S., Mohamed Nadeem Fairoze, Mandeep Kaur, Anju Sharma, Yashila Girdhar, Sreesujatha R. M., Suresh K. Devatkal, Sonika Ahlawat, Ramesh Kumar Vijh, Manjunatha S. S.(2019). *PLoS ONE*. 14(6): e0217461. doi.org/10.1371/journal.pone.0217461.
7. Suresh Devatkal, B. M. Naveena, and T. Kotaiah (2019). Quality, composition, and consumer evaluation of meat from slow-growing broilers relative to commercial broilers. *Poultry Science*. 98 (11): 6177-6186). .doi.org/10.3382/ps/pez344.
8. Suresh Devatkal, S. Kalpana and P. Baswa Reddy (2018). Estimation of Conjugated Linoleic Acid (CLA) Content in Ruminant Meat and Fats. *Journal of Meat Science* 13 (2): 30-33
9. Varalakshmi.K. (2019). Indian buffalo meat exports: Issues of growth, instability, concentration. *Buffalo Bulletin*, 38(3): 505-520, sep. 2019. <<http://158.108.80.26/kuojs-3.0.2/index.php/BufBu/article/view/541>>.



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2. Review/Technical/Popular articles

1. Barbuddhe, S. B. 2019. ICMSF standards and sampling plans for meat and meat products. In compendium of ICAR sponsored short course on DNA techniques in forensic food analysis held at ICAR–National Research Centre on Meat Chengicherla, Hyderabad during 14- 23 October, 2019.
2. Barbuddhe, S. B. 2019. WTO - Sanitary and Phytosanitary Agreement (SPS) Measures to assure biosecurity in the global food chain. In compendium of ICAR sponsored short course on DNA techniques in forensic food analysis held at ICAR- National Research Centre on Meat Chengicherla, Hyderabad during 14- 23 October, 2019.
3. Baswa Reddy P, DBV Ramana and PK Pankaj (2019) Scope of organic livestock and meat production in India. In: Training manual on 'Quality and safety issues in Indian meat sector with reference to food safety act 2006' Organized at ICAR-NRC on Meat from 2nd to 9th September 2019.
4. Kandeepan.G (2019). Packaging and storage practices for ensuring quality and safety of meat. In Training manual on Quality and safety issues in meat sector with reference to food safety act 2006, ICAR NRC on Meat, Hyderabad and Directorate of Extension, Govt. of India. P.48-62.
5. Muthukumar, M. (2019). Quality and safe meat and meat products. Presented at ASEAN-India Training workshop on “Emerging Technologies for Young Biotech. Professionals from ASEAN MS” from 20-28th September, 2019 held at CSIR- Institute of Genomics and Integrative Biology, Sukhdev Vihar, Mathura Road, New Delhi- 110025.
6. Muthukumar, M. and Naveena, B.M. (2019). Traditional meat products – Scopes for scale up and business plan. In the souvenir of Rural Business summit and trade fair 2019 held during 2-6th October, New Delhi. Organized by MSME Export Promotion Council, New Delhi.
7. Naveena, B.M., Muthukumar, M. and Banerjee, R. (2018). Issues and indicators of meat sector in India. Journal of Meat science, 13(2): 1-5.

3. Training manuals

1. P Baswa Reddy and Y Babji (2019) Technical manual in telugu on 'Kuteera parishramaga mamsa utpattula tayari - Vyapara namuna' for the training programme on 'Entrepreneurial skill development for women SHGs on hygienic meat production and value addition' at ICAR-NRC on Meat from 8th to 12th July 2019.



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2. Girish Patil, S., Desai, B. A., Nagappa, S. Karabasanavar, Muthukumar, M. and Vaithiyanathan, S. (2019) Mamasa mattu mamsada utpannagala nirvahane, shekarane mattu samskarane kuritada kaushalya abhivruddhi tarabeti karyakrama. Training manual in Kannada prepared as part of training program organized at Veterinary College, Shimoga and Hassan in March, 2019. Published by Agri Business Incubator, ICAR – National Research Centre on Meat, Hyderabad.
3. Girish, P. S. and M. Muthu Kumar (2019) Training manual for training program on, 'Safe meat production, processing and value addition' organized at Veterinary College, Shimoga and Hassan on 11th and 12th March 2019, 12th and 13th March 2019 respectively, 102 pages.
4. Muthukumar, B. M. Naveena and Girish Patil, S. (2019) Training manual for training program on, 'Entrepreneurship training on value added meat products processing' organized at ICAR – National Research Centre on Meat, Hyderabad from 18th to 22nd February 2019, and 106 pages.
5. Babji, Y, Kandeepan, G (2019). Entrepreneurship Development Program on Value Added Meat Products Processing 09th to 13th December 2019 at ICAR-National Research Centre on Meat.
6. Vaithiyanathan, S., Barbuddhe, S. B., Girish Patil, S. and Vishnuraj, M. R. (2019). ICAR Sponsored short course on "DNA Techniques in Forensic Food Analysis" dated 14-23rd October, 2019 at ICAR-National Research Centre on Meat, Hyderabad.

4. Folders/Brochure etc.

1. Muthukumar, M., Naveena, B.M., Rituparna Banerjee et al. (2019). NRC on Meat technologies for meat production, processing and authentication. Technology Inventory No. 2, Agri-Business Incubator, ICAR-NRC on Meat, Hyderabad (72 pages).
2. Vaithiyanathan, S. and Vishnuraj, M. R. (2019). Meat species identification laboratory (MSIL). Dos and don'ts while collecting and forwarding samples for meat species identification to MSIL. Published by Meat species identification laboratory ICAR-NRC on Meat, Hyderabad.

5. Books/Book Chapters:

1. Barbuddhe S.B. Vergis, J. and Rawool D.B. 2019. Immunodetection of bacteria causing brucellosis. In: Methods in Microbiology doi.org/10.1016/bs.mim.2019.11.003, Elsevier B.V.
2. Girish Patil, S, Muthukumar, Naveena, B.M., Suresh K Devatkal and Vaithiyanathan, S. (2019). Business prospects in meat production and processing –



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- An entrepreneurial handbook. Agri-Business Incubator, ICAR-NRC on Meat, Hyderabad.
3. Girish, P. S. and Nagappa, S. Karabasanavar (2019) Molecular techniques for speciation of meat. In: Meat Quality Analysis – Advanced evaluation methods, techniques and technologies, 1st Edition, Published by Academic Press, Elsevier, USA.
 4. Girish, P. S. and S. B. Barbuddhe (2019) Meat traceability and certification in meat supply chain. In: Meat Quality Analysis – Advanced evaluation methods, techniques and technologies, 1st Edition, Published by Academic Press, Elsevier, USA.
 5. Kiran Mohan, Rituparna Banerjee and Naveena Basappa Maheswarappa (2019). Recent developments in post-mortem aging and evaluation methods. In: Meat Quality Analysis: Advanced Evaluation Methods, Techniques, and Technologies. Ashim Kumar Biswas and Prabhat Kumar Mandal (Eds.). Academic Press, London, UK. ISBN: 978-0-12-819233-7
 6. Muthukumar, Girish Patil, Naveena, Kandeepan, Rituparna, Suresh K Devatkal (2019). NRC on Meat Technologies for meat production, processing and authentication. Book published by Institute Technology Management unit, ICAR-NRC on Meat, Hyderabad.
 7. Prabhat Kumar Pankaj, D.B.V. Ramana, S. Girish Patil, M. Muthukumar and Baswa Reddy (2019) Organic processing of meat and meat products in India. Published by Daya Publishing House (ISBN: 9789388982030, 369 – 387).
 8. Ramanathan, R., Mafi, G.G., Yoder, L., Perry, M., Pfeiffer, D.L., Van Overbeke and Naveena B. Maheswarappa. (2019). Biochemical Changes of Post-mortem Meat during the Aging Process and Strategies to Improve the Meat Quality. In, Meat Quality Analysis, ISBN: 978-0-12-819233-7, Academic Press, Elsevier (Chapter 5; pages 67-80).
 9. Vaithiyanathan, S., Vishnuraj, M. R., Girish Patil, S. & S. B. Barbuddhe (2019) Molecular techniques for forensic analysis of foods of animal origin. Published by ICAR – National Research Centre on Meat, Hyderabad (ISBN No. 978-93-5391-239-0)



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6. Videos/Audio produced during 2019

1.	Documentary on meat processing https://www.youtube.com/watch?v=PBD6ts_CRy0
2.	Documentary Short Film on NRC Meat https://www.youtube.com/watch?v=_-1dikZfw7U
3.	Formulation and process for Curing of meat https://www.youtube.com/watch?v=DmJVOH7YhtU
4.	Formulation and process for preparation of Chicken Burger https://www.youtube.com/watch?v=3Ti-_ouA2pY
5.	Formulation and process for preparation of Chicken hot dog https://www.youtube.com/watch?v=sEej_VJSmVc
6.	Formulation and process for preparation of Chicken meat balls - https://www.youtube.com/watch?v=HwU6bgagaf0
7.	Formulation and process for preparation of Chicken Nuggets - https://www.youtube.com/watch?v=hmJrRbfxHTA&t=44s
8.	Formulation and process for preparation of Enrobed Chicken wings https://www.youtube.com/watch?v=Y_gmV9NyKFQ
9.	Formulation and process for preparation of Smoked Chicken https://www.youtube.com/watch?v=oekTjLethPg
10.	Quality and Safety issues in meat sector- https://www.youtube.com/watch?v=w-_6erXS9Ls



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7. Technologies developed

1. A processing technology for Mutton Haleem ball was developed. This is a novel meat product with tremendous potential for the commercialization. Annual turnover for mutton Haleem is estimated to be about Rs. 1500 Crores. A ten percent of this value for mutton Haleem ball will translate into 150 crores per annum. This novel product was highly acceptable to consumers and sensory panelists.
2. A formulation for ready to use Haleem spice mix was also developed for commercialization. Haleem spice mix is the major ingredient for Haleem preparation. It is estimated that about 10% of total Haleem cost goes towards spice mix. Therefore, it is about 100 Crore value in a year. To tap this business opportunity, NRC-Meat has come up with a ready to use Haleem spice mix prepared from 10-15 premium ingredients.
3. Developed a rapid, simple, economical and point-of-care test for species identification of beef, buffalo meat, mutton and pork by Alkaline lysis – Loop mediated isothermal amplification (AL-LAMP) technique. Technique takes only 120 min for completion of the test, can be undertaken by semiskilled person as interpretation is by colour change only and economical as it requires only dry bath for the experiments.



AWARDS AND RECOGNITIONS

1. Dr. S B Barbuddhe has been granted Membership of National Academy of Biological Sciences.
2. Dr. Girish Patil S., Principal Scientist Awarded 'Fellow of Indian Meat Science Association' in the IX Indian Meat Science Association Conference .
3. Dr. Girish Patil, S., Principal Scientist awarded 'Associate Fellow of NAVS' in the 18th Convocation cum Scientific Convention.
4. Dr Girish Patil, S., Principal Scientist awarded First best oral presentation award in the XVI Annual Symposium of Indian Association of Veterinary Pubic Health Specialists and National Conference. MAFSU, Nagpur from 26th and 27th November 2019.
5. Dr Girish Patil, S., Principal Scientist Awarded First Best oral presentation award and Third Best Poster presentation Award in the IX Indian Meat Science Association Conference held at CSK HPKV, Palampur, Himachal Pradesh from 06th to 08th November 2019.



Dr Girish Patil, S., Principal Scientist receiving 'Associate Fellow' award.



Dr Girish Patil, S., Principal Scientist receiving 'Fellow of Indian Meat Science Association' in the IX Indian Meat Science Association Conference.

6. Dr. Naveena, B.M. was elected as a Fellow of National Academy of Biological Science (NABS)-2018.
7. Dr. Naveena, B.M. was awarded with "Nakula Award-2019" for outstanding contribution in veterinary sciences from Karnataka Veterinary Association (KVA), Bengaluru.



8. Vishnuraj, M. R., has qualified the Food Analyst Examination (FAE) 2019 and declared as QUALIFIED FOOD ANALYST by FSSAI as per the Food Safety and Standards Act, 2006.
9. First prize in oral presentation award: Sanjay Kumar, Kandeepan. G, ArvindSoni and Vishnuraj (2019). Intelligent packaging: an enzyme substrate based TTI for monitoring the quality of frozen chicken in supply chain.
10. Second prize in oral presentation award: Kandeepan. G, Swaroopa G., Gouthami B., and Babji Y (2019). Nano-sensor for meat quality: Development and evaluation.
11. Kandeepan. G, Certificate of Excellence: Certified Peer Reviewer Course, Elsevier Researcher Academy, 17th September 2019.
12. Oral presentation award (first) to Dr.S.Kalpana for the paper presented on “Extraction method for HPLC analysis of enrofloxacin and ciprofloxacin residues in buffalo meat” at fourth convention of Association of meat scientists and technologist and national seminar on “food sovereignty: Innovations at intersection of technology, quality and production” held at NTR college of Veterinary Science, Gannavaram, during 6-7, February, 2019.
13. Oral presentation award (third) to Dr.S.Kalpana for the paper presented on “Simultaneous determination of oxytetracycline and chlortetracycline residues in buffalo meat using RP-HPLC” at International symposium during 6-8th November, 2019.
14. Dr. M. Muthukumar is awarded with best paper presentation on “Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security”.
15. Dr.M.Muthukumar received Journal of Meat Science best paper award on “Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security”.



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16. Dr.Rituparna Banerjee received Young Scientist Award at 19th Indian Veterinary Congress and XXVI Annual Conference of IAAVR for presentation on “Superchilling concept enabling shelf life extension of meat: A potential alternative for chilling and freezing”, 1-2nd February, 2019.
17. Naveena B.M., Barbuddhe S.B., Banerjee R., Varakumar P. and Sowmya D received 2nd best paper presentation award in IMSACON-IX, 6-8th November, 2019.
18. Dr. Suresh Devatkal has been awarded the International Certified Professional certification in Bio risk management by International Federation of Biosafety Association (IFBA), Ottawa, Ontario, Canada.
19. Dr. Suresh Devatkal has Completed International certification courses in Bio-risk management, Laboratory Bio risk management, implementing bio risk management system conducted by Frontline Healthcare Workers Safety Foundation, Ltd. (Frontline Foundation, Fort Worth, Texas, USA in collaboration with Society for Biosafety, India.





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HRD

HUMAN RESOURCE DEVELOPMENT

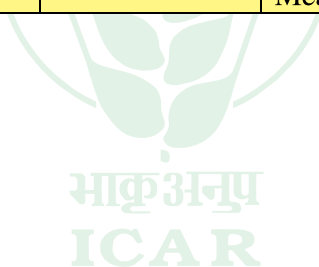
ICAR-National Research Centre on Meat

TRAINING AND CAPACITY BUILDING

1. Trainings attended by the staff during the year 2019

Sr No	Name	Designation	Training program attended
1	Dr.Y.Babji	Principal Scientist	MPD on Leadership Development from 11-22, June 2019 at ICAR-NAARM, Hyderabad
2	Dr.S.B.Barbuddhe	Principal Scientist	ICMR-ICAR Antimicrobial resistance surveillance, hands on workshop from 9-11 September, 2019 at CMC, Vellore
3	Dr.P.Baswa Reddy	Senior Scientist	'Emotional intelligence at workplace for scientists and technologists, organized by Centre f Organization Development (COD), Hyderabad from 18th to 22nd February 2019
4	Dr.GirishPatil.S	Principal Scientist	Mammalian cell culture from 6-10, April 2019 at CCMB-Hyderabad
5	Dr.M.Muthukumar	Senior Scientist	workshop on “Chemical risk analysis framework for food safety” at IITR, Lucknow from 21-24 th Oct, 2019.
6	Dr.Kandeepan.G	Senior Scientist	Sensors and Actuators: Design and characterization from 6-10 May, 2019 at IIS-Bangalore
7	Dr.Kalpana.S	Senior Scientist	ICMR-ICAR Antimicrobial resistance surveillance, hands on workshop from 9-11 September, 2019 at CMC, Vellore
8	Dr.L.R.Chatlod	Scientist	ICMR-ICAR Antimicrobial resistance surveillance, hands on workshop from 9-11 September, 2019 at CMC, Vellore
9	Dr. Vishnuraj.M.R	Scientist	Short Term Mission on Risk Assessment under the BTSF Initiative of FSSAI from 27-31 May, 2019
10			3 rd PTP/RMP Conclave of NABL from 30-31 August, 2019

11	Ms. Kanchana Kommi	Technical Assistant (T-3)	“Entrepreneurship Development Programme on Value added meat and meat products processing” 08-12 th July, 2019 at NRC Meat,Hyderabad
12	Mr. P.Phani Kumar	Technical Assistant (T-3)	“Entrepreneurship Development Programme on Value added meat and meat products processing” 08-12 th July, 2019 at NRC Meat,Hyderabad
13	Mr. B.V.D.Srinivasa Rao	Technical Assistant (T-3)	“Entrepreneurship Development Programme on Value added meat and meat products processing” 08-12 th July, 2019 at NRC Meat,Hyderabad
14	Mr. M.Srinivas	Technician (T-2)	“Entrepreneurship Development Programme on Value added meat and meat products processing” 08-12 th July, 2019 at NRC Meat,Hyderabad





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2. Seminar/Symposium/Conferences/meetings/workshopsetc attended by employees

Dr. Y.Babji		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	An International symposium and 9 th Conference of Indian Meat science Association (IMSACON-IX) on“Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security” held at the Department of Livestock Products Technology, Dr. G. C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, Distt. Kangra (H.P.)	6 th to 8 th November 2019
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
Lead paper		
2	Systems of Food Preservation: A paradigm shift towards natural preservatives for enhancing safety and quality assurance of meat and meat products.	6 th to 8 th November2019
Invited lecture		
3	Trends in Natural Preservatives in Assuring Safety and Quality of Meat and Meat Products in quality and safety issues in Indian Meat Sector with reference to food safety act 2006, DOE training manual,pgs 78-88.	2 nd to 9 th September 2019
Dr. S. B. Barbuddhe		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s. no	Program Attended	Date
1	“Foodborne zoonotic diseases” organized by NAAS at NASC Complex, New Delhi	21 st November, 2019
2	Meeting on scientific cooperation on Food Safety and Applied Nutrition held at FSSAI HQ, New Delhi	27 th November, 2019
3	Annual Conference of Indian association of Medical Microbiologists, MicroCon 2019 held at Nehru Centre, Mumbai	15 th March to27 th September 2019
4	India-Denmark Government to Government Seminar on the challenges of Antimicrobial Resistance in Agricultural and Food Production held at Embassy of Denmark, New Delhi	11 th to 12 th December, 2019
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		



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5	Agroecology and zoonoses. Compendium of National conference on “Challenges and Opportunities for tackling Veterinary Public Health Issues at the Human, Animal & Environment Interface” organized by Nagpur Veterinary College, Nagpur	26 th to 27 th February, 2019.
6	Translational genome sequencing in public health microbiology. Compendium of National conference.	
7	Zoonotic and neurozoonotic infections in central India: Impact of ICMR funded project. Compendium of National conference.	
8	Alternate approaches to combat AMR. Compendium of National conference.	
9	Epidemiological investigations of risk of occurrence of Coxiellaburnetii in India. Paper presented at National conference.	
Lectures delivered		
10	“The concept of One Health to counter zoonoses” at a training program on “Recent advances in livestock sector” for the extension functionaries of State Department of Animal Husbandry, Tamilnadu at MANAGE, Hyderabad	28 th January to 03 rd February, 2019, 31 st January, 2019.
11	“The concept of One Health Approach to counter zoonoses” at National Institute of Agriculture Extension Management, Hyderabad for the extension functionaries of State Department of Animal Husbandry, Tamilnadu on 24 April, 2019 and 8 May, 2019.	24 th April 2019 and 8 th May 2019
12	“WTO & GATT: Sanitary and Phytosanitary Measures (SPS Agreement) ”	24 th April, 2019 and 8 th May, 2019.
13	“Importance of food safety management systems in meat processing plants” at training programme on “Value added meat products processing” at ICAR-National Research Centre on Meat, Hyderabad	7 th May, 2019
14	“Agroecology and zoonoses” at National Training programme on "Advances in Zoonoses Diagnosis" organized at Nagpur Veterinary College, MAFSU, Nagpur	12 th to 16 th March, 2019



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Dr. P. Baswareddy		
Participation in Seminar/Symposia/workshops/trainings/conferences		
1	National Seminar and IV convention of Meat Scientists and Technologists on 'Food sovereignty : Innovations at intersection of technology, quality and production' held at NTR college of vety.science, Gannavaram	6 th to 7 th February 2019
2	9 th IMSACON & International Symposium on "Advances in production, processing and Quality assurance of muscle foods for improved health and nutritional security", DrG.C.Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur (HP), India	6 th to 8 th November 2019
3	Participated in Poultry India Expo 2019, at HITEX, Hyderabad.	27 th to 29 th , November 2019
4	Participated the interface meeting organized by the Department of Agriculture, govt. of Telangana to discuss and suggest technological interventions to overcome drought situation at the office of the Agriculture commissioner, Govt. of Telangana	24 th July 2019
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
Abstracts		
5	Production of Selenium enriched functional meat through supplementation of different sources of Selenium in Total Mixed Rations (TMR) of sheep. Oral presentation In : Fourth Annual Convention of Association of Meat Scientists and Technologists and <i>National Seminar on "Food Sovereignty: Innovations at intersection of Technology, Quality and Production "</i> held at NTR College of Veterinary Science, Gannavaram	6 th to 7 th February 2019.
6	Production of Selenium enriched functional meat: Effect of supplementing different doses of selenomethionine in Total Mixed Rations (TMR) of sheep. Oral Presentation in : IX IMSACON & International Symposium on "Advances in production, processing and Quality assurance of muscle foods for improved health and nutritional security", DrG.C.Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur (HP), India	6 th to 8 th November 2019



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Lead Paper		
7	Sheep and goat production approaches and strategies to enhance meat production and productivity; Invited lead paper presented during Fourth Annual Convention of Association of Meat Scientists and Technologists and <i>National Seminar on "Food Sovereignty: Innovations at intersection of Technology, Quality and Production "</i> held at NTR College of Veterinary Science, Gannavaram during 6-7 Feb 2019.	6 th to 7 th February 2019.
Lecture Delivered		
8	Scope of organic livestock and meat production in India. In : Training manual on 'Quality and safety issues in Indian meat sector with reference to food safety act 2006' Organized at ICAR-NRC on Meat from	2 nd to 9 th September 2019
9	Training programme for the women SHG members of Jangaon dist on 'Entrepreneurial skill development for women SHGs on hygienic meat production and value addition' at ICAR-NRC on Meat under SCSP project from	8 th to 12 th July 2019
10	Training programme for the women SHG members of Irkode village, Siddipet dist on 'Entrepreneurial skill development for women SHGs on hygienic meat production and value addition' at ICAR-NRC on Meat under SCSP project from	26 th to 30 th August 2019
Dr. S. Girish Patil		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	Participated in Meat and meat products including poultry Organised by Food Safety & Standards Authority of India, New Delhi	15 th March to 27 th September 2019
2	'Future of Protein Summit' held at New Delhi.	11 th and 12 th November 2019
3	Stakeholders meeting organized by Punjab Animal Husbandry Department in association with Punjab Agro Industries Corporation, Chandigarh on 'Pig production and processing	12 th September 2019
4	FSSAI Round table meeting on cell based meat at FSSAI Bhawan, New Delhi.	13 th May 2019
5	Interactive meeting on Computer Science based research in ICAR system at New Delhi	06 th March 2019
6	II meeting of Regional Agricultural Fair at Professor Jayshankar Telangana State Agricultural University, Rajendranagar	04 th February 2019



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Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
7	Cultured meat: An Indian perspective. Compendium of IX Indian Meat Science Association Conference held at CSK HPKV, Palampur, Himachal Pradesh	06 th to 08 th November 2019
8	Artificial intelligence based muzzle recognition technology for individual identification of animals. Compendium of IX Indian Meat Science Association Conference. (Oral presentation)	
9	A rapid and simple method for species identification of sheep (<i>Ovisaries</i>) meat by Loop-mediated isothermal amplification targeting mitochondrial D loop region. Compendium of IX Indian Meat Science Association Conference. (Poster presentation)	
10	Species identification of meat samples originated from black buck (<i>Antilopercervicapra</i>) by species specific PCR targeting mitochondrial cytochrome c oxidase I. Compendium of IX Indian Meat Science Association Conference. (Poster presentation)	
11	Rapid method for halal authentication of meat using lamp based molecular technique. XVI Annual Symposium of Indian Association of Veterinary Pubic Health Specialists (IAVPHS) and National Conference on "Challenges and opportunities for tackling Veterinary Public Health issues At the human, animal and environment Interface" organized at Veterinary College, MAFSU, Nagpur Oral presentation – Got best presentation award	26 th to 27 th November 2019
12	Meat safety assurance microbial risk analysis across supply chain. In the Compendium of Conference of IV Convention of Meat Scientists & Technologists organized at Veterianary College, SVVU, Gannavaram, Andhra Pradesh	06 th to 07 th Feb 2019
13	Development of techniques for species verification at field level of fresh and processed pork product. In International Conference on, 'Animal agriculture for doubling farmers income – Technology, policy and strategy options' organized at Veterinary Collge, AAU, Guwahati	27 th to 29 th February 2019
14	Approaches for Doubling Farmers Income in North Eastern India through Meat Production and Processing. In International Conference on, 'Animal agriculture for doubling farmers income – Technology, policy and strategy options' organized at Veterinary Collge, AAU, Guwahati Lead Paper	27 th to 28 th February 2019



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15	A Database for Buffalo Meat Traceability in India. In the compendium of 18 th Convocation cum Scientific Convention on 'Futuristic technologies in animal health and production' organized at INFLIBNET Centre, Gandhinagar, Gujarat	26 th to 27 th December, 2019
Lectures delivered		
16	'ICT application in Animal Husbandry' at NAARM, Rajendrangar, Hyderabad on 20 th May 2019 in the training program on, 'ICTs for livestock development'	16 th to 21 st May 2019.
Dr.S. Kalpana		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	SCAFi sponsored "World brackishwateraquaculture conference 2019" held at ICAR-Central institute of Brakishwater aquaculture, Chennai, Tamil Nadu	22 nd to 25 th January, 2019
2	National seminar on "food sovereignty: Innovations at intersection of technology, quality and production" held at NTR college of Veterinary Science, Gannavaram, AP,	6 th to 7 th February, 2019
3	ICMR-ICAR hands-on Workshop on "Laboratory Surveillance of Antimicrobial Resistance" held at Christian Medical College, Vellore, Tamil Nadu.	9 th to 11 th September, 2019
4	International symposium and 9th conference of Indian meat scientist association on "Technological innovations in muscle food processing for nutritional security, quality and safety" held at College of Veterinary and Animal sciences, Palampur, Himachal Pradesh	6 th to 8 th November, 2019
5	National Conference on "Pharmacogenomics in the development and validation of indigenous drugs" held at College of Veterinary and Animal sciences, Mannuthy, Kerala	18 th to 20 th December, 2019
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
Lead Paper		
6	Antimicrobial residues in foods of animal origin: existing regulations and guidelines for rational use. Lead paper presented in National seminar on "food sovereignty: Innovations at intersection of technology, quality and production" held at NTR college of Veterinary Science, Gannavaram, AP,	6 th to 7 th February, 2019.



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Abstracts		
7	Simultaneous determination of oxytetracycline and chlortetracycline residues in buffalo meat using RP-HPLC. Paper presented at International symposium and ninth conference of Indian meat scientist association on “Advances in production, processing and quality assurance of muscle foods for improved health and nutritional security” held at College of Veterinary and Animal sciences, Palampur, Himachal Pradesh.	6 th to 8 th November, 2019
8	Quantitative determination of residual tetracyclines in field buffalo meat samples using RP-HPLC. Paper presented in National symposium on “Pharmacogenomics in the development and validation of indigenous drugs” held at College of Veterinary and Animal sciences, Mannuthy, Kerala.	18 th to 20 th December, 2019
Lectures Delivered		
9	Xenobiotic Residues in Food: Concerns and Consequences. Directorate of Extension, Ministry of Agriculture, sponsored 8 days training on Quality and Safety Issues in Indian Meat Sector with Reference to Food Safety Act 2006. ICAR-NRC on Meat, Hyderabad.	2 nd to 9 th September, 2019.
10	Identification and Quantification of Antimicrobial Residues in Meat using HPLC. Directorate of Extension, Ministry of Agriculture, sponsored 8 days training on Quality and Safety Issues in Indian Meat Sector with Reference to Food Safety Act 2006. ICAR-NRC on Meat, Hyderabad.	2 nd to 9 th September, 2019.
Dr. G. Kandeepan		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s. no.	Program Attended	Date
1	9 th IMSACON & International Symposium on “Advances in production, processing and Quality assurance of muscle foods for improved health and nutritional security”, Dr G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur (HP), India.	6 th to 8 th November 2019



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2	3 rd International Conference on “Nanobiotechnology for Agriculture NANOFORAGRI 2019 Translational Research for Future Food and Agriculture Technologies”, Aerocity, New Delhi organized jointly by TERI-Deakin University and DBT, Ministry of Science and Technology.	21 st to 22 nd November 2019
3	Poultry India Expo 2019, at HITECH, Hyderabad.	27 th to 29 th , November 2019
4	Geosmart India, HICC, Hyderabad	3 rd to 5 th December 2019
5	Brain storming session on Access and Benefit sharing for research stakeholders. GEF ABS UNDP Project, NBPGR, Regional Station, Hyderabad.	15 th June 2019
6	QIP short term course on “Sensors and Actuators: Design and Characterization” Centre for Continuing Education, Indian Institute of Science, Bengaluru.	6 th to 10 th May 2019
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
7	Development and evaluation of Nanosensor for meat quality. 3 rd International Conference on “Nanobiotechnology for Agriculture NANOFORAGRI 2019 Translational Research for Future Food and Agriculture Technologies” at Aerocity, New Delhi organized jointly by TERI-Deakin University and DBT, Ministry of Science and Technology.	21 st to 22 nd November 2019
8	Intelligent packaging: an enzyme substrate based TTI for monitoring the quality of frozen chicken in supply chain. 9 th IMSACON & International Symposium on “Advances in production, processing and Quality assurance of muscle foods for improved health and nutritional security”, Dr G.C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur (HP), India.	6 th to 8 th November 2019
9	Systems of Food Preservation: A paradigm shift towards natural preservatives for enhancing safety and quality assurance of meat and meat products. 9 th IMSACON & International Symposium.	6 th to 8 th November 2019
10	Comparison of meat and by-products yield and value from major food animals. 9 th IMSACON & International Symposium.	6 th to 8 th November 2019
11	Nano sensors for the assurance of quality and safety of meat and meat products in supply chain.	6 th to 8 th November 2019
12	Nano-sensor for meat quality: Development and evaluation. 9 th IMSACON & International Symposium.	6 th to 8 th November 2019



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Dr. M. Muthukumar		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	IMSACON IX 2019 on “Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security Dr. G. C. Negi College of Veterinary and Animal Sciences, Palampur, HP.	6 th to 8 th November, 2019
2	The Nutricereals Conclave- 2019, at Hyderabad international convention centre	29 th to 30 th November 2019
3	“Laboratory quality system management and internal audit as per ISO/IEC – 17025 : 2017” at National Institute of Plant Health and Management, Hyderabad	25 th to 29 th March, 2019
4	Training of Trainers Program on “Chemical Risk Analysis Framework for Food Safety” organized by Food Safety and Standards Authority of India (FSSAI) at Indian Institute of Toxicological Research, Lucknow	21 st to 24 th October, 2019.
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
5	“Animal waste management” at one day workshop on “Business opportunities and entrepreneurship in waste management” organized by National Solid Waste Association of India at Hotel Amrutha Castle, Hyderabad.	11 th June 2019
6	“Entrepreneurship opportunities in pork production and processing” at State level seminar on “Present status, challenges and future scenario of pig farming in Tamil Nadu organised by TANUVAS at Coimbatore	22 nd to 23 rd June 2019
7	Role and experience of ITMU with analytical samples / customer services” at the Training on “DNA Techniques in Forensic Food Analysis” held at NRC on Meat, Hyderabad	14 th to 23 rd October 2019
8	“Entrepreneurship opportunities in meat sector”	6 th to 8 th November, 2019
9	“Identification of common processed food and processing methods pertaining to meat products” at the workshop on “Fixation of Tolerance Limits of Pesticide Residues in Processed Foods” organised by FSSAI at New Delhi.	12 th and 13 th December, 2019



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Abstracts		
10	Determination of polycyclic aromatic hydrocarbons and heterocyclic amines in processed meat products by reverse phase HPLC. In: Souvenir of IMSACON IX 2019 on “Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security” held at Dr. G. C. Negi College of Veterinary and Animal Sciences, Palampur. Page No. 265.	6 th and 8 th November, 2019
Dr. B.M. Naveena		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	Attended Brainstorming session on “Sustainability of livestock and fishery production systems in India” held at NDRI, Karnal	20 th April, 2019.
2	Attended the “Meeting for revision of EFC/SFC documents of animal science Institutes” held at Animal Science Section, ICAR, KrishiBhawan, New Delhi.	27 th to 29 th May, 2019
3	Attended the “26th General Body Meeting of National Academy of Agricultural Sciences, New Delhi” held at NASC complex, New Delhi	4 th to 5 th June 2019
4	Participated in “11th National Academy of Biological Sciences Conference and National seminar on Climate Change Driven Challenges on Indian Biodiversity: Innovative Solutions for Sustainable Development” held at Pondicherry	25 th to 27 th September, 2019.
5	Participated in one day workshop for “FoSTaC-empowered training partners” held at FSSAI, New Delhi	15 th October, 2019.
6	Participated in “Hyderabad city cluster project launch meeting” at Hotel Trident, Hyderabad organized by Research and Innovation Circle of Hyderabad (RICH).	18 th October, 2019
7	Participated in Workshop on “Fixation of tolerance limits of pesticide residues in processed foods” at FSSAI, New Delhi	12 th to 13 th December, 2019.
Presentations in Seminar/ Symposia/ workshops/trainings/conferences.		
8	Presented a lead paper on “Supply chain management in meat sector” on 24th July, 2019 at MANAGE, Hyderabad during a training on “Extension skills for supply chain management in agriculture and allied sector”	22 nd to 26 th , July 2019
9	Presented a lead paper on “Application of proteomic tools for understanding and improving meat quality and safety” at NAARM, Hyderabad during National workshop on bioinformatics in agriculture	26 th July, 2019

10	Presented lead paper on “Sustainability of meat sector in India” during DoE sponsored training on “Quality and safety issues in Indian meat sector with reference to Food Safety Act- 2006” held at National Research Centre on Meat, Hyderabad.	2 nd to 9 th , September 2019
11	Presented a lead paper on “Application of proteomic and metabolomics tools for understanding and improving meat quality and safety” on 20th September, 2019 at NAARM, Hyderabad during “National Training Programme on Recent Bioinformatics Tools for Genome and Proteome Analysis” from held at NAARM, Hyderabad	17 th to 21 st , September 2019
12	Presented invited paper “Application of proteomic tools for meat species identification” during ICAR-sponsored short course on “DNA techniques in forensic food analysis” on held at ICAR-NRC on Meat, Hyderabad from 14-21 October, 2019 (pp. 48-53).	19 th October 2019
13	Presented a lead paper on “Entrepreneurship development opportunities in meat value chain” at NAARM	25 th October, 2019
14	Implementation of GFSI accredited food safety management system for meat processing plant. International Symposium and 9th Conference of Indian Meat Science Association, Palampur, India. pp-87-91.	6 th to 8 th November 2019

Dr. Rituparna Banerjee

Participation in Seminar/ Symposia/ workshops/trainings/conferences

s.no	Program Attended	Date
1	19th Indian Veterinary Congress, XXVI Annual Conference of IAAVR and National Symposium entitled “Innovative progress in animal health and production for safe and secured food under One Health perspective” at Kolkata	1 st to 2 nd February, 2019

Presentations in Seminar/ Symposia/ workshops/trainings/conferences.

Lead papers

2	Strategies for development of functional muscle foods through nutritional maneuvering. ICAR sponsored Winter School on Recent Biotechnological Advances for Precision Feeding of Livestock and Poultry. Department of Animal Nutrition. WBUAFS, Kolkata,	4 th to 24 th September 2019.
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Dr.Suresh K Devatkal		
Presentation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	Nutritional value and consumer preference of meat from Slow and Fast-growing Chicken Genotypes” during Annual conference of Nutrition Society of India: Kerala(oral presentation)	7 th to 9 th November 2019
2	Conjugated Linoleic Acid (CLA): Quantification in Ruminant Meat and Fats” during International Conference on Animal Nutrition 2019, Kolkata(oral presentation)	17 th to 19 th December, 2019
3	Presented a business plan on “ I-Ethnic Meats”- A societal enterprise during NAVIC business plan coemption organized by NIVEDI, Bangalore under ABI-RAFTAR.	27 th September 2019.
Dr. S. Vaithiyathan		
Participation in Seminar/ Symposia/ workshops/trainings/conferences		
s.no	Program Attended	Date
1	2 days training on “Transition training on Laboratory Quality Management System as per ISO 17025:2017” at BIS Chennai.	6 th to 7 th January 2019
2	Meeting on “Roadmap for Utilization of Bio resources towards Bio economy” ‘Meat and Dairy Animals’. At Indian National Science Academy (INSA), New Delhi.	4 th to 5 th February, 2019
3	National seminar and IV Convention of Meat Scientists and Technologists on Food sovereignty: Innovations at intersection of technology, Quality & production Gannavaram, Andhra Pradesh.	6 th to 7 th February 2019
4	one day Assessor’s Conclave at Bangalore organized by NABL, New Delhi	5 th May 2019
Presentation in Seminar/ Symposia/ workshops/trainings/conferences		
5	Species, sex and tissue level authentication of meat and meat products: Current Status and Future Developments. International symposium & conference “IMSACON-IX” (2019) on “Advances in Production Processing and Quality Assurance of Muscle Foods for Improved Health and Nutritional Security” is to be held at the Department of Livestock Products Technology, Dr. G. C. Negi College of Veterinary and Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, Distt. Kangra (H.P.)-176062.	6 th to 8 th November, 2019
6	The road to NABL (ISO/IEC 17025:2005) laboratory accreditation: experiences of ICAR-NRC on Meat with a novel scope. National seminar and IV Convention of Meat Scientists and Technologists on Food sovereignty: Innovations at intersection of technology, Quality & production, Gannavaram, Andhra Pradesh	6 th to 7 th February 2019



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7	Roadmap for Utilization of Bio resources towards Bio economy 'Meat and Dairy Animals'. At Indian National Science Academy (INSA), New Delhi.	4 th to 5 th February, 2019
8	Use of droplet digital PCR in the detection of adulteration in pure milk fat (cow ghee). Invited paper oral presentation at XIV Agricultural Science Congress Innovations for Agricultural Transformation NASC Complex & IARI Campus, organized by National Academy of Agricultural Sciences, New Delhi & ICAR-Indian Agricultural Research Institute, New Delhi	20 th to 23 rd February 2019

Mrs. K. Varalakshmi

Participation in Seminar/ Symposia/ workshops/trainings/conferences

s.no	Program Attended	Date
1	4th National workshop of officer incharge, Data Management	10 th to 11 th December 2019
2	Training Programme on "Animal Disease Economics" jointly organized by ILRI and ICAR-IVRI at ICAR-IVRI, Izatnagar.	8 th to 10 th January 2020

Dr. M.R. Vishnuraj

Participation in Seminar/ Symposia/ workshops/trainings/conferences

s.no	Program Attended	Date
1	The National seminar and IV Convention of Meat Scientists and Technologists on Food sovereignty: Innovations at intersection of technology, Quality & production at Gannavaram, Andhra Pradesh.	6 th to 7 th February 2019.
2	the 6 th Meeting of Empowered Committee for Strengthening of Food Testing System in the Country at FSSAI, HQ, New Delhi	22 nd February, 2019
3	14 th Agricultural Science Congress (ASC) and Agri Tech at National Agricultural Science Congress, New Delhi.	20 th to 23 rd February 2019
4	5 days 2 nd Short Term Mission on Better Training for Safer Food (BTSF) mission of European Union (EU) in India on Risk Assessment at ICAR-CIFT, Kochin.	27 th to 31 st May 2019
5	3 rd PTP/RMP Conclave of NABL organized at Hyderabad	30 th to 31 st August 2019

Presentation in Seminar/ Symposia/ workshops/trainings/conferences

Lectures delivered		
6	"Meat adulteration and differential diagnostic interventions" at TSVBRI, Hyderabad during the refresher course for ADDL staff	24 th July 2019



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7	“Genomic Approaches for Forensic Food Fraud Analysis” at College of Veterinary & Animal Sciences, Parbhani, Maharashtra during the 21 days training program on Recapitulation of omics technologies having field applicability in the veterinary and animal sciences for doubling the income from dairy and poultry entrepreneurship,	2 nd to 22 nd May 2019
8	“Requirements for Accredited Food Analytical Laboratories” during the Model training course at ICAR-NRC on Meat, sponsored by DoE on Quality and safety issue in Indian meat sector with reference to Food Safety Act, 2006,	2 nd to 9 th September 2019
9	“Testing of Quality and Safety Parameters in Food Samples as per FSSAI” during the FSSAI sponsored training at ICAR-NRC on Meat on “Good Food Laboratory Practices”	25 th to 27 th June, 2019
10	“Glassware Calibration and its role in day to day analytical work & Preparation of SOPs, Implementation and Documentation” during the FSSAI sponsored training at ICAR-NRC on Meat on “Good Food Laboratory Practices”	25 th to 27 th June, 2019
11	“Introduction to adoption of ISO/IEC 17025 in food testing laboratories” and “Introduction to miRNA techniques in meat authenticity study for tissue level identification” during the ICAR sponsored short course at ICAR-NRC on Meat on “DNA techniques in forensic food analysis”	14 th to 23 rd October 2019
Abstracts		
12	Validation of DNA macro array chip (Chipron Meat 5.0) for forensic meat analysis. Paper presented in National seminar and IV Convention of Meat Scientists and Technologists on “Food sovereignty: Innovations at intersection of technology, Quality & production” NTR College of Veterinary Science, Gannavaram	6 th to 7 th February 2019.
13	Identification of Potential RNA Biomarkers for Tissue Level Authentication of Chicken Meat & Meat Products. Paper presented in International Symposium and 9 th Conference of Indian Meat Science Association (IMSACON), at Dr. G C Negi College of Veterinary & Animal Sciences, CSK Himachal Pradesh Agricultural University, Palampur, India.	6 th to 8 th November 2019



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3. Training/workshop/Seminar etc. Organized for the stakeholders

<i>S No</i>	<i>Name of Programme (Training/workshop/Seminar etc.) Organized</i>	<i>Days of Programme (Date from-to)</i>
1	Entrepreneurship Development Programme on value added meat products processing	6 th to 10 th may, 2019
2	Skill development training in hygienic handling storage processing of meat and meat products	1 st to 3 rd July ,2019
3	Skill development training in hygienic handling storage processing of meat and meat products	4 th to 6 th july,2019
4	Entrepreneurship Development Programme on value added meat products processing	8 th to 12 th July 2019
5	Skill development training in hygienic handling storage processing of meat and meat products	15 th to 17 th july,2019
6	Skill development training in hygienic handling storage processing of meat and meat products	18th to 20 th July, 2019
7	Skill development training in hygienic handling storage processing of meat and meat products	30 th July 2019 to 01 st august,2019
8	Quality and safety issues in Indian meat sector with reference to food safety Act,2006	2 nd September to 09 th ,2019
9	Skill development training in hygienic handling storage processing of meat and meat products	11 th September to 13 th 2019
10	Skill development training in hygienic handling storage processing of meat and meat products	30 th October, 2019 to 1 st November2019
11	Entrepreneurship Development Programme on value added meat products processing	09 th to 13 th December2019
12	Three awareness programme on clean meat production and hygienic slaughtering practices were programmes were organized on for the butchers working at slaughterhouses in Hyderabad city.	15 th May, 2019, 25 th July, 2019 and 25 th November, 2019



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13	ICAR Sponsored short course on “DNA Techniques in Forensic Food Analysis” at ICAR-National Research Centre on Meat, Hyderabad.	14 th to 23 th October, 2019
14	FSSAI sponsored training program on “Good Food Laboratory Practices” at ICAR-National Research Centre on Meat, Hyderabad.	25 th -27 th June, 2019
15	Training programme for the women SHG members of Jangaon dist on ‘Entrepreneurial skill development for women SHGs on hygienic meat production and value addition’ at ICAR-NRC on Meat under SCSP project .	8 th to 12 th July 2019
16	Training programme for the women SHG members of Irkode village, Siddipetdist on ‘Entrepreneurial skill development for women SHGs on hygienic meat production and value addition’ at ICAR-NRC on Meat under SCSP project.	26 th to 30 th August 2019

भारत सरकार
ICAR

OTHER EVENTS ORGANIZED

International Yoga Day

ICAR-National Research Centre on Meat, Hyderabad celebrated International Yoga Day on 21 June, 2019. Scientist and staff of the Centre participated in the event. Mr. Harinath, Patanjali Peeth, Hyderabad systematically demonstrated and explained the benefits of each Aasan. He advised all the participants recharge themselves everyday by practicing yoga and make it a part of their life. On the occasion Dr.Suresh.K.Devatkal Principal Scientist elaborated the benefits of the yoga and gave background information and importance of the event.



Scientist and Staff of the Centre practicing yoga

- Seminar on “Indian Constitution & Dr.B.R.Ambedkar”, organized by ICAR-NRC on Meat, Hyderabad on 13th December 2019.

Celebration of Constitution day & Citizens' Duties Day

The constitution day and citizens' duties day was celebrated on 26th November 2019 at ICAR-National Research Centre on Meat, Hyderabad to commemorate the 70th year of adoption of Indian Constitution by the Parliament. The program began with a welcome address by Dr.Y.Babji, Principal Scientist & event nodal officer, emphasizing the significance of constitution day. This was followed by reading out of Preamble of the constitution of India by Dr. S. Vaithiyanathan, Acting Director, ICAR-NRC on Meat, Hyderabad and all the staffs of the institute recited it.



A meeting with Gram panchayat officials and localites was organized at Keesara Village on 14.02.2020 by ICAR-National Research Centre on Meat, Hyderabad. The event was held in the premises of Gram Panchayat Office, Keesara village. The theme of the meeting was “Creation of awareness on clean meat production and entrepreneurial avenues in meat sector”. The participants interacted with the scientists for the clarification of doubts in clean meat production and value added meat products. The meeting ended with vote of thanks followed by distribution of snacks for the participants



ICAR-NRC on Meat officials with Keesara gram panchayat officials

Food safety day

ICAR-National Research Centre on Meat, Hyderabad organized the first ever World Food Safety Day on 7th June 2019 under the theme “Food Safety, Everyone’s Business” to commemorate the initiative of Food and Agriculture Organization of the United Nations.

DISTINGUISHED VISITORS

1. Shri T. Harish Rao, honorable finance minister, Govt of Telangana visited ICAR-NRC on Meat on 30th August 2019
2. Shri Kesineni Srinivas, Honorable Member of Parliament, Vijayawada constituency visited ICAR-NRC on Meat on 20th December 2019.
3. Dr. Anoop Kollanoor Johny, Assistant Professor, University of Minnesota, USA visited NRC on Meat and gave a presentation on "*Recent Research on Safeguarding Meat Supply from Drug Resistant Salmonella*" and interacted with scientists, students and faculty members on 19th August, 2019 at NRC on Meat, Hyderabad.





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PERSONNEL

Scientific

1	Dr. S. Vaithyanathan	Acting Director
2	Dr. S. B. Barbuddhe	Principal Scientist
3	Dr. Y. Babji	Principal Scientist
4	Dr. Suresh Devatkal	Principal Scientist
5	Dr. Girish Patil	Principal Scientist
6	Dr. B.M. Naveena	Principal Scientist
7	Dr. C. Ramakrishna	Senior Scientist
8	Dr. Deepak B. Rawool	Senior Scientist (Since 9-12-2019)
9	Dr. M. Muthukumar	Senior Scientist
10	Dr. P. Baswa Reddy	Senior Scientist
11	Dr. Kandeepan, G.	Senior Scientist
12	Dr. S. Kalpana	Senior Scientist
13	Dr. L. R. Chatlod	Scientist
14	Mrs. K. Varalakshmi	Scientist
15	Dr. Rituparna Banerjee	Scientist (On Study leave)
16	Dr. Vishnuraj, M.R.	Scientist

Administrative

1.	Mr. B.P.R. Vithal	Private Secretary to Director
2.	Mr. Marisetti N.V. Rao	Assistant Finance and Accounts Officer
3.	Mr. Jitender Singh Gaite	Assistant Administrative Officer
4.	Mrs. C. Padmaja	Personal Assistant to Director
5.	Mr. T. Devender	Assistant
6.	Miss Kola Alekhya	Assistant
7.	Mr. Sri Harsha	Assistant
8.	Mrs. V. Kalpana	Upper Division Clerk



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Technical

- | | |
|-----------------------------|---------------------------|
| 1. Mrs. Kanchana Kommi | Technical Assistant (T-3) |
| 2. Mr. P. Phani Kumar | Technical Assistant (T-3) |
| 3. Mr. B.V.D. Srinivasa Rao | Sr. Technician (T-3) |
| 4. Mr. Mandala Srinivas | Technician (T-2) |





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COMMITTEES

Quinquennial Review Team (QRT)

- | | |
|---|------------------|
| 1. Dr. J. Abraham, Consultant Meat Technologist,
“Sharon”, Santosh Nagar, Mannuthy, Thrissur, Kerala. | Chairman |
| 2. Dr. Sarfaraz Wani, Dean, Veterinary College,
SKUAST Kashmir, Shuhuma Campus, Srinagar | Member |
| 3. Dr. K. N. Selvakumar, Dean,
Veterinary College and Research Institute,
Orathanadu, Thanjavur, Tamil Nadu | Member |
| 4. Dr. K. C. Varshney, Head, Department of Veterinary Pathology
Rajiv Gandhi Institute of Veterinary Education & Research,
Kurumbapet, Puducherry | Member |
| 5. Dr. Chetan Kumar Thota, Director (International Business)
Allanasons Ltd, Surya Towers, Block -F, 5 th Floor,
105 Sardar Patel Road, Secunderabad | Member |
| 6. Dr. Manish Kumar Chatli, Head, Division of LPT
GADVASU, Ludhiana | Member |
| 7. Dr. S. Vaithyanathan, Principal Scientist
ICAR-NRC on Meat, Hyderabad | Member Secretary |

Research Advisory Committee (RAC)

- | | |
|--|------------------|
| 1. Dr. A. T. Sherikar, Former Vice Chancellor, MAFSU, Nagpur
6, Sherikar Niwas, Atlanta Cooperative Society, Plot No.9, Sector-40,
Nerul (Seawoods), Navi Mumbai | Chairman |
| 2. Dr. B.C. Patnayak, Ex-Director, CSWRI, S/30, Maitree Vihar, Phase I,
Chandrashekharapur, Bhubaneswar | Member |
| 3. Dr. Ashok Kumar, ADG (AH), ICAR, New Delhi | Member |
| 4. Dr. A. S. R. Anjeneyulu, Former Emeritus Scientist, Flat No .113,
NRSA colony, Hydernagar, Hyderabad | Member |
| 5. Dr. Meena Kataria, Head, Division of Biochemistry, ICAR –IVRI,
Izatnagar | Member |
| 6. Dr. Nitin V. Kurkure, Professor and Head, Department of Pathology,
Nagpur Veterinary College, Nagpur | Member |
| 7. Dr. Ashwin Raut, Principal Scientist, ICAR-National institute of High
Security Animal Diseases, Anand Nagar, Bhopal | Member |
| 8. Sh. Subash Chanderji, R/o. H. No. 16-1-289, Saidabad, Hyderabad | Member |
| 9. Sh. Ravi Kumar, R/o H.No.5-8-61, Gadwal House, Station Road,
Nampally, Hyderabad | Member |
| 10. Dr. S. Vaithyanathan, Director (Acting), ICAR-NRC on Meat, Hyderabad | Member |
| 11. Dr. S. B. Barbuddhe, Principal Scientist & I/c PME Cell,
ICAR-NRC on Meat, Hyderabad | Member Secretary |



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Institute Management Committee (IMC)

- | | |
|---|------------------|
| 1. Vaithiyathan, Acting Director, National Research Centre on Meat, Hyderabad | Chairman |
| 2. Director, Animal Husbandry Department, Govt. of Telengana, Shantinagar, Hyderabad. | Member |
| 3. Director, Animal Husbandry Department, Govt. of Andhra Pradesh. | Member |
| 4. Dr. K. Kondala Reddy, Associate Dean, Sri P.V. Narasimha Rao Telengana State University for Veterinary Animal Fishery Sciences, Administrative Office Rajendranagar, Hyderabad - 500 030 | Member |
| 5. Dr. S.V. Rama Rao, Principal Scientist, ICAR-Directorate of Poultry Research, Rajendranagar, Hyderabad. | Member |
| 6. Dr. Subeer S. Majumdar, Director, National Institute of Animal Biotechnology (NIAB), Miyapur, Hyderabad | Member |
| 7. Dr. Ganesh Kumar, Principal Scientist, ICAR-NAARM, Rajendra Nagar, Hyderabad | Member |
| 8. Dr. Ravishankar C.N., Director, ICAR-CIFT, Cochin | Member |
| 9. Dr. Ashok Kumar, Asst. Director General (AN & P), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi | Member |
| 10. The Controller, ICAR-NAARM, Rajendra Nagar, Hyderabad | Member |
| 11. Shri Jitender Singh Gaite, Assistant Administrative Officer, National Research Centre on Meat, Chengicherla, Hyderabad. | Member Secretary |



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Institute Animal Ethics Committee

- | | |
|---|---|
| 1. Dr. S. Vaithyanathan, Acting Director
ICAR-NRC on Meat, Hyderabad | Chairman |
| 2. Dr. A. Gopala Reddy, PVNR Veterinary University,
Hyderabad | Main Nominee |
| 3. Dr BDP Kalakumar, PVNR Veterinary University
Hyderabad | Link Nominee |
| 4. Dr. Jayashree Chiring Phukon, CSIR- CCMB, Hyderabad | Scientist from outside the Institute |
| 5. Dr. K. Venkaiah, ICMR- National Institute of Nutrition,
Hyderabad | Socially Aware Nominee |
| 6. Dr C. Ramakrishna, ICAR-NRC on Meat, Hyderabad | Veterinarian |
| 7. Dr Kandeepan Gurunathan, ICAR-NRC on Meat, Hyderabad | Biological Scientist |
| 8. Dr Kalpana Starling, ICAR-NRC on Meat, Hyderabad- | Scientist from different biological
discipline |
| 9. Dr. P. Baswa Reddy, ICAR-NRC on Meat,
Hyderabad | Scientist In-Charge cum Member
Secretary |

Institute Bio-Safety Committee

- | | |
|---|--------------------|
| 1. Dr. S. Vaithyanathan, Director, ICAR-NRCM, Hyderabad | Chairman |
| 2. Dr. Ravikumar G.V.P.P.S, Principal Scientist, NIAB, Hyderabad | DBT Nominee |
| 3. Dr. T. K. Bhattacharya, National Fellow & Principal Scientist,
Directorate of Poultry Research, Hyderabad | Outside Expert |
| 4. Dr. K. Madhava Reddy, Consulting Medical Officer, ICAR-NRCM,
Hyderabad. | Bio-Safety Officer |
| 5. Dr. S.B. Barbuddhe, Principal Scientist, ICAR-NRCM, Hyderabad | Internal Member |
| 6. Dr. Suresh Devatkal, Principal Scientist, ICAR-NRCM, Hyderabad | Internal Member |
| 7. Dr. Vishnuraj M.R, Scientist, ICAR-NRCM, Hyderabad | Internal Member |
| 8. Dr. Girish Patil S, Principal Scientist, ICAR-NRCM, Hyderabad | Member Secretary |



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Institute Technology Management Committee

1. Dr. S. Vaithiyanathan – Acting Director, ICAR- NRC on Meat, Hyderabad - Chairman
2. Dr. S. B. Barbuddhe, Principal Scientist, ICAR- NRC on Meat, Hyderabad –Member
3. Dr. Girish Patil, S -Principal Scientist, ICAR- NRC on Meat, Hyderabad –Member
4. Dr. P. Baswa Reddy – Senior Scientist, ICAR- NRC on Meat, Hyderabad –Member
5. Dr. S. K. Soam, Principal Scientist, ICAR- NAARM, Hyderabad –Member (IPR Expert)
6. Dr. M. Muthukumar - Senior Scientist, ICAR- NRC on Meat, Hyderabad - Member Secretary

Internal Complaints Committee (ICC)

- | | |
|--|-------------------|
| 1. Dr. B. Shobha, Associate Professor, University of Hyderabad | Presiding Officer |
| 2. Smt. C. Padmaja, Personal Assistant, NRCM | Member |
| 3. Shri. B.P.R. Vithal, Private Secretary (PS) to Director | Member |
| 4. Smt. Dheram Usha, President, Abhaya Association for Empowerment of Women, Hyderabad | Member |

भारत
ICAR



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STUDENTS CORNER

Sl. No.	Name of the student	Research Project Topic	Members of Advisory Committee
1	Dr. Ranajit Kundu, M.V.Sc. Scholar, Division of Veterinary Public Health, ICAR-IVRI, Izatnagar	Studies on the occurrence and characterization of <i>Salmonella</i> , <i>Listeria monocytogenes</i> , and <i>Escherichia coli</i> in buffalo meat production chain	Dr. S. B. Barbuddhe, Principal Scientist
2.	Dr. Faruk Hussain, M.V.Sc. Scholar, Dept. of Poultry Science, College of Veterinary Sciences, Rajendranagar, Hyderabad	Effect of dietary inclusion of nanozinc oxide in commercial broilers	Dr. P. Baswa Reddy, Senior Scientist
3.	Dr. Shivaji Arabati, M.V.Sc. Scholar, Dept. of LPT, College of Veterinary Science, Rajendranagar, Hyderabad.	Development of time temperature indicator for monitoring quality of chicken meat at different temperature abuse conditions	Dr. Kandeepan, G., Senior Scientist
4.	K.Santosh Kumar, M.V.Sc. Scholar, Dept. of LPT, College of Veterinary Science, Rajendranagar, Hyderabad.	Decontamination of poultry carcass with chlorine dioxide	Dr. M. Muthukumar, Senior Scientist
5.	Ms. Mounica, M.V.Sc. Scholar, Dept. of LPT, College of Veterinary Science, Rajendranagar, Hyderabad.	Development of highly specific, rapid and sensitive loop mediated isothermal amplification assay (LAMP) for species identification of mutton	Dr. Girish, P.S., Principal Scientist
6.	Dr Jagadish Swamy, Ph.D. Scholar, Dept. of LPT, College of Veterinary Science, Rajendranagar, Hyderabad	Development of PCR based molecular techniques for species identification of important wild animals	Dr. Girish, P.S., Principal Scientist

LIST OF ON-GOING RESEARCH PROJECTS

Institute Funded Projects

SI No	Project details	PI	Co-PIs
1	Assessment of the occupational health hazards and food safety risks associated with abattoir personnel	S. B. Barbuddhe	L. R. Chatlod and Sunil Pal Singh
2	Development of Ozone (O ₃) based decontamination technology for poultry and sheep/goat carcasses	Suresh K. Devatkal	
3	Development of traceability based quality assurance method for wholesome meat production	Girish Patil S.,	S. B. Barbuddhe, S. Vaithiyanathan and C. Ramakrishna
4	Species identification of Sarcocysts in buffalo meat	C. Ramakrishna	Girish Patil, S. and S. Kalpana
5	Organic Meat Production System for Sustainable Sheep Husbandry and Promotion of Consumer Health	P. Baswa Reddy	D. B. V. Ramana, Pankaj, Ramakrishna, C. ad M. Muthukumar
6	Impact of meat research on livestock sector development-Role of public investment	K. Varalakshmi	
7	Development of miRNA based methods for authentication of meat and meat products with respect to organ meats	Vishnuraj M.R,	S. Vaithiyanathan, Suresh Devatkal and Kandeepan G.
8	Effect of essential oils for enhancing safety and quality of emulsion based chicken meat products (Institute Project)	Y. Babji	S. Vaithiyanathan, G. Kandeepan, S. Kalpana and P. Baswa Reddy
9	Development and validation of rapid assays for detection of <i>Listeria monocytogenes</i> in foods (Institute Project)	S.B. Barbuddhe	L. R. Chatlod
10	Simultaneous quantitative determination of oxytetracycline and chlortetracycline residues in buffalo meat samples using RP-HPLC (Institute Project)	S. Kalpana	M. Muthukumar
11	Prevalence and characterization of important food borne pathogens in buffalo meat production chain (Institute Project)	L. R. Chatlod	S. B. Barbuddhe
12	Establishment of ISO/IEC17025 compliant Meat quality testing laboratories	M. Muthukumar	S. B. Barbuddhe
13	Design and development of Interactive Mobile app for disseminating crystalized information to meat industry stakeholders	C. Ramakrishna	Girish P.S., M. Muthukumar and S. Kalpana
14	Development of nanocomposite biodegradable packaging material for meat and meat products.	G. Kandeepan	

Externally Funded Projects

Sl No	Project details	Funding Agency	PI	Co-PIs
1	Setting – up Food Testing Laboratories- Species and Sex Identification of Meat	MOFPI through ICAR	S. Vaithiyanathan	Vishnuraj M.R.
2	Species identification to check adulteration of cheaper quality meat	FSSAI	S. Vaithiyanathan	
3	Mapping of skeletal muscle proteins from different buffalo breeds of India using high throughput proteomic approaches	ICAR LBSYSA	B. M. Naveena	
4	Agri-business Incubator project	ICAR	M. Muthukumar	Suresh K. Devatkal, B. M. Naveena, Girish Patil, S., Kandeepan, G., Rituparna Banerjee and Vishnuraj M.R.
5	Development of smart packaging nano-sensor for monitoring quality and safety of meat	DBT	Kandeepan G.	Suresh K Devatkal and Vishnuraj M.R.
6	Estimation of carcinogenic and mutagenic compounds in processed meat	FSSAI	M. Muthukumar	Rituparna Banerjee
7	Development of rapid immunochromatographic kits for field level detection of meat adulteration	DBT	B. M. Naveena	S. B. Barbuddhe and Rituparna Banerjee
8	Development of technological interventions for enhancement of quality, shelf-life, and microbiological safety of traditional/ethnic meat products	MoFPI	Suresh K. Devatkal	B. M. Naveena
9	Training and capacity building in sheep and goat value chain	National Livestock Mission, DADF	P. Baswa Reddy	M. Muthukumar
10	Enabling technologies in mammalian cell culture towards cultured meat	DBT	Girish Patil, S.	S.Vaithiyanathan
11	Exploiting encapsulated nanoparticle conjugated phytochemicals to combat antimicrobial resistance poultry	NASF	S B Barbuddhe	Girish P.S. and B. M. Naveena

RAJBHASHA IMPLEMENTATION

राजभाषा क र्णान्वयन

हिन्दी कार्यशाला

भा कृ अनु प – राष्ट्रीय मांस अनुसंधान केंद्र में हिन्दी की कार्यशाला का आयोजन 29 जून 2019 को प्रातः 11 बजे किया गया । जिसमें राजभाषा हिन्दी का कार्यालयीन अनुप्रयोग के महत्व को समझाया गया । मुख्य अतिथि श्रीमति अनीता पांडे, सहायक निदेशक (राजभाषा), राष्ट्रीय ग्रामीण विकास एवं पंचायती राज संस्थान, राजेन्द्रनगर, हैदराबाद द्वारा हिन्दी के महत्व को समझाया गया कार्यालय में राजभाषा हिन्दी अधिकाधिक प्रयोग हेतु जानकारी दी । केंद्र के सभी वैज्ञानिकों, अधिकारियों और कर्मचारियों इत्यादि को हिन्दी के अनुप्रयोगों के सरल माध्यम से कार्य करने हेतु प्रेरित किया । इस कार्यशाला हेतु मुख्य अतिथि द्वारा विभिन्न प्रकार से हिन्दी में कार्य करने हेतु बल दिया गया और बताया की हिन्दी संवैधानिक रूप से भारत की प्रथम राजभाषा है जो सबसे आसान तरीके से बोली और समझी जा सकती है । हिन्दी राष्ट्रभाषा विश्व भाषा बनने की ओर अग्रसर है । हम सभी को मिलकर हिन्दी बोलने और हिन्दी का प्रयोग करने में बहुत गर्व करना चाहिए ।

संस्थान के सभी वैज्ञानिकों, अधिकारियों एवं कर्मचारियों को हिन्दी में अधिकाधिक टिप्पणी / प्रारूप लेखन हिन्दी शिक्षण योजना के तहत सभी को प्रबोध, प्रवीण, प्राज्ञ और पारंगत की शिक्षा लेने सभी को हिन्दी में हस्ताक्षर करना और संस्थान के सभी पत्रों का हिन्दी में रूपान्तरण करने हेतु प्रयास पर बल दिया गया ।



हिन्दी चेतना पखवाड़ा - २०१९

हर वर्ष की भांति इस वर्ष भी भा.कृ.अनु.प राष्ट्रीय मांस अनुसंधान केंद्र में “हिन्दी चेतना पखवाड़ा” का आयोजन १३ सितंबर से २८ सितंबर २०१९ तक की अवधि के दौरान किया गया। हिन्दी चेतना पखवाड़ा का शुभारंभ १३ सितंबर २०१९ को संगोष्ठी कक्ष में भा.कृ.अनु.प राष्ट्रीय मांस अनुसंधान केंद्र के निदेशक महोदय डॉ एस. वैद्यनाथन, के कर कमलों द्वारा हुआ हिन्दी चेतना पखवाड़ा में विभिन्न कार्यक्रमों का आयोजन किया गया जिसका वर्णन इस प्रकार है।

1. उद्घाटन समारोह
2. हिन्दी निबंध प्रतियोगिता (शीर्षक- जनसंख्या नियंत्रण के लाभ और हानी)
3. श्रुतलेख
4. प्रश्नोत्तरी
5. हिन्दी में गायन एवं कविता पाठ
6. हिन्दी अनुवाद प्रतियोगिता
7. समापन समारोह

प्रतियोगिताओं में संस्थान के सभी वैज्ञानिकों, अधिकारियों, कर्मचारियों, आर ए, एस आर एफ, जे आर एफ, विद्यार्थीगण एवं संविदा कर्मचारियों ने उत्साहपूर्वक भाग लिया और प्रथम, द्वितीय, तृतीय एवं सातवना पुरस्कार प्राप्त किए। हिन्दी चेतना पखवाड़ा का समापन २८ सितंबर २०१९ को किया गया जिसमें मुख्य अतिथि श्री आर चन्द्रशेखर पूर्व वरिष्ठ हिन्दी अधिकारी [उपनिदेशक(राजभाषा)] द्वारा पुरस्कार वितरण किया गया।





ANNUAL REPORT 2019



MEERA GAON MEERA GAURAV

Nodal Officer: Dr.P Baswa Reddy

Group leaders: Dr. Y Babji, Dr. S Girish Patil, Dr. P Baswa Reddy,

Mera Gaon Mera Gaurav programmes of ICAR- NRC on Meat are carried through three teams of scientists by adopting different villages for dissemination of knowledge to the stakeholders on agriculture and allied fields.

During the year under report, 17 visits were made to the adopted villages by the teams of scientists and advisories were provided to 277 stakeholders. Seven awareness programmes were conducted for the farmers, butchers, meat entrepreneurs etc., to educate them about the latest developments in the fields of livestock and poultry farming, clean meat production, entrepreneurial opportunities in livestock and meat sector etc., Seven interface meetings were conducted with the stake holders to get the first hand information about the challenges being faced by them in the field and provide suitable advisories to overcome such challenges. Demonstrations on preparation of seven different varieties of value added meat products were conducted in Kothur village to educate the rural women about the scope of value addition to meat as an entrepreneurial opportunity. A training programme on hygienic meat production for the meat handlers of Keesara and adjoining adopted villages was conducted at ICAR- NRC on Meat and hygiene kit comprising of aprons, gum boots, cap, first aid kit etc., were provided to the trainees.

Success story under MGMG

A group of interested women SHG members of Irkode village, Siddipet were organized into a Joint Liability Group (JLG) and registered in the name of 'IrkodeMahilaSamakhya'. They were given intensive hands-on training at ICAR-NRC on Meat for five days on hygienic meat production, processing, value addition, packaging and marketing. After the training, the women surveyed the area and found that they can sell the non-vegetarian pickles and snacks in different villages and in different places of Siddipet town in a mobile vehicle. Shri Harish Rao, Honorable Finance minister of Telangana who represents Siddipet constituency provided initial financial support for a vehicle to market the products. ICAR-NRC on Meat designed the 'Meat on Wheels' with facilities for freezing & storing the products, cooking, washing, carcass hanging etc., After obtaining fssai licence, the group members formed themselves into three groups to look after raw material procurement, products preparation and marketing. The retail outlet and 'Meat on wheels' was inaugurated by the Honorable Finance Minister of Telangana and now they are successfully producing and marketing different value added meat products and non veg pickles in 'Rythu Bazar' as well as surrounding villages and in different localities of Siddipet. They are now catering to bulk orders from different places. Due utmost attention given towards maintaining the quality and hygiene, the brand 'Siddipet Non veg Pickles' has become a hot selling product in the state within a short period.

(This success story was published in ICAR website)





ANNUAL REPORT 2019



SWACHATA MISSION

Swachhta Pakhwada Report (16th Dec- 31st Dec, 2019)

In pursuance of Councils instructions “Swachhta Pakhwada” campaign was celebrated at National Research Center on Meat, Chengicherla, Hyderabad from 16th to 31st December, 2019 with great enthusiasm and all the staff members actively participated in the campaign.

The program began with Dr.S.Vaithianathan, Director NRC on Meat, administering the Swachhta shapath. All the scientific, technical, administrative and contractual staff took pledge.

Every day Shramdaan was performed by all the staff of the Centre throughout the campaign period.

16-12-2019

In pursuance of Councils instructions “**Swachhta Pakhwada**” campaign began with Dr. S.Vaithianathan, Director NRC on Meat, administering Swachhta shapat at 04.00PM on 16-12-2019.

All the scientific, technical, administrative and contractual staff took pledge.

After the Swachhta pledge all the staff performed shramdaan near Madhuban and cleaned the area.

17-12-2019

In pursuance of Councils instructions under “**Swachhta Pakhwada**” campaign Swachh Bharat Abhiyan was performed on 17-12-2019.

Shramdaan was performed near **Madhuban** picnic spot.

18-12-2019

Under the Swachhta Pakhwada Abhiyan cleaning activities were undertaken in Laboratories and different sections of the office.

20-12-2019

As a part of Swachhta Pakhwada campaign plantation of trees was done on 20-12-2019 at National Research Center on Meat, Hyderabad.

Shri Kesineni Srinivas, Honble Member of Parliament, Vijaywada planted a sapling on this occasion.

21-12-2019:

To commemorate the Swachhta Pakhwada an awareness procession was taken out from NRC on Meat gate to Chengicherla village on 21st Dec, 2019. Many placards-slogans/quotes and banner about Swachh Bharat were carried by the staff. The procession traversed many streets of the village .

31-12-2019

In pursuance of Councils instructions under “**Swachhta Pakhwada** ” campaign Swachh Bharat Abhiyan was performed on 31-12-2019.

Shramdaan was performed near Mango orchard and Madhuban.



2 HYDERABAD The Hindu, 26 April, 2019

Clean meat research at CCMB gets a shot in the arm

DBT to give ₹4.5 crore for two-year work as initial grant

SPECIAL CORRESPONDENT HYDERABAD

The country's first project to research on cell-based meat, also called clean meat, would be taken up at the Centre for Cellular and Molecular Biology (CCMB) with the Department of Biotechnology (DBT) deciding to give ₹4.5 crore for the two-year work as the initial grant.

The National Research Centre on Meat, which has a unit at Chengicherla abate here, would partner with the CCMB in the pioneering work to develop cultured meat, which is said to be equivalent to conventional animal meat in terms of taste and feed, with the only difference being in the method of production.

Clean meat would be produced through cellular agriculture with cells sourced from animals and cultivated into meat. Hence, it promises to revolutionise the food system by providing protein without harming the environment, said CCMB Director Rakesh Mishra here on Thursday.

The cell-based meat production is scalable and the DBT funding is a major initiative by any government body across the world, he said and pointed out that the funding has come almost a year after the CCMB, in association with the Human

NEW APPROACH

• National Research Centre on Meat to partner with CCMB

• Clean meat to be produced through cellular agriculture with cells sourced from animals and cultivated into meat

• Atal Incubation Centre of the CCMB and Human Society International to develop and promote the clean meat sector

• AIC and ISI announce the launch of Centre for Predictive Human Model System

Society International (HSI) and Good Food Institute (GFI), held the first-ever meet to discuss clean meat last year.

The Atal Incubation Centre (AIC) of the CCMB has been partnering with the HSI to develop and promote the clean meat sector. "Our aim is to be feed 10 billion people globally by 2050 by creating a platform for tasty,

gies in life sciences research in India as it has been happening in the West.

It would be involved in developing a scientific and policy framework for the advanced non-animal science since it is still at a nascent stage here, said AIC CEO Madhansudan Rao, deputy director of HSI/Atal Alokparna Sengupta, and her colleague Jitendra at a press conference on Thursday.

Though animal testing for research has been in practice for decades, science has progressed in using computational and in-vitro models, which are resource friendly and come at a lower cost, besides being accurate at predicting human outcomes, they explained.

The fledgling centre would facilitate training courses in research, conduct workshops, offer fellowship programmes, develop a network of scientists to promote the paradigm shift in research and funding, and support PhD students in their research.

"This sector of predictive human biology is ripe for investment and the CCMB is a natural alignment to our objective of supporting innovations," said Dr. Rao. "We want this to be the pioneer in promoting ethical, advanced and reliable science," said Ms. Sengupta.



City lab's reports help solve 243 meat cases

Lab runs test on a molecular level to identify species of meat

CORRENA SUARES | DC HYDERABAD, JUNE 9

Laboratory reports issued by the National Research Centre on Meat (NRCM), Hyderabad, have helped investigations into 243 highly sensitive cases registered across India.

The only meat research centre in India that does DNA and species identification of meat, it has helped its clients which include police, food safety authorities, and the forest department in resolving sensitive cases, including that of lynching or violence over sale of beef in states where it is banned (though whether or not the meat in question is beef or not should make no difference to the conviction and punishment of the perpetrators of the killings).

The largest number of samples the Centre has received is from Madhya Pradesh, followed by Karnataka, Delhi and Uttar Pradesh. In one case reported from Hyderabad, the centre's report helped solve the curious case of 'no dog meat' served at Shah Ghose Hotel.

HELPING HAND

The National Research Centre on Meat is an arm of the Indian Council of Agricultural Research. The NRCM was established as an exclusive research and identification centre on meat. The NRCM in Hyderabad is the only meat testing laboratory in India that does DNA based identification.

A senior scientist with NRCM told this newspaper, "This is the only lab in India that tests meat samples based on DNA. The process based on DNA method involves three types, namely Universal PCR followed by DNA Sequencing, Restriction fragment length polymorphism (RFLP), and species specific, where the species of the meat is identified."

He said the lab can identify if the meat sample is

Between 2014 and 2019, NRCM laboratory tested 243 samples.

The well-equipped laboratory located in Hyderabad has tested samples submitted by police for identification of species, forest department for identifying wild life meat, and from food safety authorities to check for adulteration.

from a cow or bull or bullock and also the sex of the species.

According to a source, in a majority of cases where the sale or transportation of beef was suspected, the results turned out to be negative. This helps investigations in states where beef is banned. Even if the sample is adulterated by a minute per cent, the lab can identify it because the testing is done at molecular level, so each cell of the meat is tested. Also,

the testing process does not need a large chunk of the meat sample and it can be raw or cooked," the scientist said.

The central government body charges ₹10,000 per sample. The testing takes a week to 10 days. The institution only accepts samples submitted by the police, courts, airport authorities. In 2017, the most number of samples came from Karnataka. In 2018, more samples came from Madhya Pradesh.

THE TIMES OF INDIA

Most of 'cow meat' caught in country was that of bull

U.Sudhakarreddy @timesgroup.com

Hyderabad: A very small portion of the meat that police and animal husbandry officials caught across the country between 2014 and 2017 was that of the cow. Most of it was found to be bull (male cattle) and buffalo meat.

This has been established after Hyderabad-based National Research Centre on Meat (NRCM) completed DNA analyses of the 123 samples it received from across the country. Only eight samples, or 7%, were cow meat. NRCM is a joint venture of the Indian Council of Agricultural Research (ICAR) and the Government of India.

The meat species identification laboratory issued samples sent by the state police and animal husbandry departments of Uttar Pradesh, Maharashtra, Bihar, Karnataka, Kerala, Madhya Pradesh, Punjab, Chhattisgarh and Goa, Andhra Pradesh and Telangana from 2014 to 2017.

NRCM officials said most samples were the washed by UT Maharashtra and Bihar. They

MEATY ISSUE

Total samples received between 2014 & 2017

- DNA extracted from 112
- Cow 8 Buffalo 22
- Bull (male cattle including a male calf) 63
- Sample mixture of cattle and buffalo 11
- Camel 3
- Sheep 2
- Chicken 2
- Goat 1

Source: NRCM

also received a few samples from customers, the Food Safety and Standards Authority of India and animal quarantine authorities at airports.

The research institute had, in fact, received 159 samples, but only 123 were suitable for DNA extraction and one was stored in Baramulla and therefore DNA could not be extracted.

NRCM officials said most samples were the washed by UT Maharashtra and Bihar. They

80 meat samples received in 2018

► From P1

The initial suspicion of the various state authorities was that 69 samples were cow meat, in 34 samples there was no clarity on whether to categorise them as "other cattle" or "buffalo". Five were buffalo samples, four were male cattle and one was suspected to be dog meat.

The findings were published in the latest issue of the journal Biocatalysis and Agricultural Biotechnology under the title "Application of DNA technology to check misrepresentation of animal species in illegally sold meat" by scientists Dr S Vaitheyanathan, Dr M R Vishnu Raj and Dr G Narendra Reddy of NRCM.

"Interestingly, three samples suspected to be of cow were found to be camel meat and the sample suspected as that of a dog was found to be sheep," the researchers said in the paper.

In some states, both cow and male cattle consumption is banned while in other states only cow slaughter is banned, which is why the institute received separate requests.

The researchers received another 80 samples in 2018, taking the total number of samples to 206. The analysis is yet to be published but the results have followed a similar trend.

The researchers said they did species-specific polymerase chain reaction tests to identify the species. They also conducted sex-specific PCR to identify the gender.

Ahimsa meat encouraged to help reduce carbon footprint

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Now, cell-based mutton to be produced

► From P1

Hyderabad: India's first cell-based meat project took off on Thursday with the Department of Biotechnology of the Union government investing ₹4.5 crore initially. City-based Centre for Cellular and Molecular Biology (CCMB) and National Research Centre on Meat (NRCM) will develop the lab meat without rearing animals. The cultured meat, known as Ahimsa meat, is nutritionally equivalent to conventional meat and tastes, smells, looks and feels the same.

The project is a follow up of the summit organised in August 2018 in Hyderabad on the Future of Protein and Food Technology Revolution. Clean meat development

CCMB director Dr Rakesh Mishra on Thursday said the institute will develop technology to take laboratory cell culture process to cell-based meat production, so that it can be used at the industry level. Governments in the Netherlands, Japan and Israel have been supporting clean meat companies. Regulatory authorities in countries like the United States are working on developing a legal framework and standards for lab grown meat. "CCMB with cell biology experts is an asset for the project where it is expected to produce cell-based mutton," said Alokparna Sengupta, director of Human Society International-India.

from stem cells of animals would be a major innovation, experts believe.

While private players including cell-based meat companies are investing across the world, India is one among few countries where the government funds it. Union Minister Maneka Gandhi

had advised CCMB last year to make the cell-based meat available in the next five years. Alokparna Sengupta, director of Human Society International-India, said, "CCMB is an asset for the project. The investment in this project is the biggest by a govt for such technology."

తీనిమణి

విజయవరం 30-1-2020
చిహ్నం 16 బిల్డింగ్ 1441 టైంస్ గ్రూప్ పేజీ 4

ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు

తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.



ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.

ఇయర్కాకామరై వివసాయత్తిల ఇంతియా మున్సోరాయాక తిక్కిరిక్తి

ఁరంఘాతి శ్రులొశకర్ తకవల

తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.



ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.

THE HINDU

FRIDAY, JANUARY 31, 2020

Awareness programme held

An awareness programme on organic livestock production was held at the Veterinary College and Research Institute here on Wednesday. The programme was sponsored by Agricultural and Processed Food Products Export Development Authority under the National Organic Programme. Bir Singh Negi, Adviser, APEDA, P. Baswa Reddy, senior scientist, National Research Centre on Meat, Hyderabad, and other experts took part in the event, a release said. Livestock farmers also took part in the programme and they were made aware of organic rearing practices.

నోరూరించే పచ్చళ్లు రడి!

మీదటి 12 రూరీకామరై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.



ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.

మహిళా సంఘాలకు మైక్రోఫోన్స్ పంపిణీ

మైక్రోఫోన్స్ పంపిణీ అంధజన్మ మంత్రి పోలిరావు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.



ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.

Relish this! Shortly, 'ahimsa meat' will be on your plate

U.Sudhakarreddy @timesgroup.com

Hyderabad: India's first laboratory meat project took off on Thursday with the Hyderabad-based Centre for Cellular and Molecular Biology (CCMB) and National Research Centre on Meat (NRCM) coming together to produce 'ahimsa meat'.

With an initial funding of ₹4.5 crore by the department of biotechnology, scientists will develop mutton and chicken from stem cells, without actual rearing of animals.

While private players, including cell-based meat companies are investing across the world, India is one among few countries, where the government is funding the project to produce cell-based 'ahimsa meat' on a commercial scale in the next five years.

Experts said using the technology and producing meat in the lab would mean there would be no need to rear and slaughter animals for meat. It not only gives food security but will help in animal welfare and carbon footprint reduction.

Cell-based mutton: P4

తొక్కుల తయారీ పరికరాల అందజేత

రామచంద్రాపేట: సిద్ధిపేట గ్రామీణ మండలం జిల్లాపట్నం చెందిన రెండు మహిళా సంఘాలకు మంజూరు, విదేశీ చట్టాల తయారీ చేసే పరికరాలను రాష్ట్ర ఆర్థిక మంత్రి తన్నీరు హరి కొర్రావు అందజేశారు. రూ.1.50 లక్ష విలువ కలిగిన ఈ పరికరాలను తాళియ మండల పరిశోధన సంస్థ సమకాలిని, సిద్ధిపేటలో సోమవారం పీఠిని సంఘాల ప్రతినిధులకు అందజేశారు. కార్యక్రమంలో డి.ఆర్.డి. గోపాలరావు, సుధా వైద్యన్ మారెడ్డి రమేందరెడ్డి, సర్పెట్ల వెంకటేశ్వర్లు, ఎన్. ఆర్. ప్రొ.పావన్ బహురెడ్డి తదితరులు పాల్గొన్నారు.

Date : 24/09/2019 EditionName : TELANGANA(SIDDIPET) PageNo : Page 11

మహిళా సంఘాలకు మైక్రోఫోన్స్ పంపిణీ

మైక్రోఫోన్స్ పంపిణీ అంధజన్మ మంత్రి పోలిరావు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.



ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు. తామిళం, తులం, ఇంగ్లీషు భాషలలో ఇయర్కాకామరై కాలనడై ఒరపత్తి విధిపరణాంకం కరక్తరంగు.

మహిళా, ఇతర తొక్కుల తయారీ పరికరాల అందజేసిన మంత్రి

సిద్ధిపేట, సెప్టెంబరు 23 సిద్ధిపేటలోని తన సాహసంలో మహిళ, ఇతర తొక్కుల తయారీ చేసే పరికరాలను సోమవారం ఇల్లో గ్రామ మహిళా సంఘాలకు మంత్రి పోలిరావు అందజేశారు. ఆ గ్రామంలోని 2 మహిళా సంఘాలకు మంత్రి తన పరిశోధన పాఠశాల మహిళ, ఇతర తొక్కుల తయారీ పరికరాలను అందజేశారు. కార్యక్రమంలో 'సుధా' వైద్యన్ రమేందరెడ్డి, కమిటీ సభ్యులు మారెడ్డి లక్ష్మి, కొర్రావు సునీత, బాలయ్య, సున్నా, మల్లం, రామ్మ, పద్మ, డి.ఆర్.డి. గోపాలరావు పాల్గొన్నారు.



పరిమితి దాటలేదు.. ప్రమాదమేమి లేదు కోళ్లలో స్టెరాయిడ్స్ వినియోగంపై క్లారిటీ

హైదరాబాద్, వెలుగు:

కోళ్లలో పరిమితికి మించి స్టెరాయిడ్స్ ఉపయోగించడం లేదని నేషనల్ రీసెర్చ్ సెంటర్ ఆన్ సన్సరీ స్టెంట్స్ నియర్ బస్సారెడ్డి స్పష్టం చేశారు. నాన్ వెజ్ అంటే ముందుగా గుర్తుకు వచ్చేది చికెన్. భోజన ప్రియుల నోటికి అంతగా రుచిపందించేకొడి మాంసం పరిమితికి మించి రసాయనాలతో నిండిపోయిందనీ, హార్మోన్లు అధికంగా వాడుతూ కోళ్లను బరువెక్కిలా చేస్తున్నారని ఇటీవల ఊహాగానాలు దావానంలా వ్యాపించాయి. దీంతో నేషనల్ రీసెర్చ్ సెంటర్ ఆన్ మీట్ సన్సరీ కలుగజేసుకొని పౌల్ట్రీలో రసాయనాల వినియోగంపై ఆరా తీసింది.

నగర శివారులతోపాటు సిటీలోని ఐదు జోన్లలో ఉన్న పౌల్ట్రీ పరిశ్రమల్లో శాంపిల్స్ సేకరించడం మొదలుపెట్టింది. దశలవారీగా 400కుపైగా శాంపిళ్లను సేకరించిన సన్సరీ హార్నిస్టాయిలో నివేదికను సిద్ధం చేసినట్లుగా తెలుస్తోంది. నివేదికపై సీనియర్ స్టెంట్స్ బస్సారెడ్డినివెలుగు ప్రతినిధి వివరణకోరగా నగరంలో చాలా చోట్ల శాంపిల్స్ సేకరించామని తెలిపారు. పౌల్ట్రీ పరిశ్రమలో యాంటీ బయోటిక్స్, స్టెరాయిడ్స్ పంటిరసాయనాలను వాడాలి ఉంటుందని తెలిపారు. తాము చేసిన సర్వేలో రసాయనాల పరిమితి దాట లేదని తెలిపినట్లు చెప్పారు. అందోళన చెందాల్సిన అవసరం లేదని పేర్కొన్నారు.

16 నమస్తే తెలంగాణ

బుధవారం 11, డిసెంబర్ 2019, సిద్దిపేట

ntnews.com ntsiddipet.com

- మన సిద్దిపేట ట్రాంక్తో మాంసం పచ్చళ్లు
- ప్రజలకు నాణ్యమైన మాంసావశర వదాలాలు
- ప్రత్యేక వాహనంలో ఇంటింటికీ ఉత్పత్తులు
- ఇల్లోను మహిళా సమాఖ్య సభ్యుల తయారీ
- రైతుబజారులో స్టాల్, మీట్ అన్ పీల్డ్ వాహనం
- అల్లూ తాళా మంత్రి తల్లిరు హరికేరావు

'సిద్దిపేట మాంసం పచ్చళ్లు' నోరూరాలిందే..

కర్ణాటక, నమస్తే తెలంగాణ : మన సిద్దిపేట ట్రాంక్తో మాంసం ఉత్పత్తులను ప్రజలకు నాణ్యమైన అవశర వదాలాలు అందించడానికి జాతీయ మాంస పరిశోధన సంస్థ, సిద్దిపేటలో మాంసం పచ్చళ్లతోపాటు ఇతర ఉత్పత్తులను మార్కెట్లోకి తెచ్చామని అల్లూ మంత్రి హరికేరావు సెల్స్ గా. మంగళవారం తెలంగాణలో సిద్దిపేట రైతుబజారులో జన్మి ప్రెవెన్షన్ రోజు శిల్ప జాతీయ మాంసం పరిశోధన సంస్థ ప్రెవెన్షన్ ప్రెవెన్షన్, సీనియర్ శాస్త్రవేత్త రామచంద్ర

బస్సారెడ్డి, సిద్దిపేట అసెంబ్లీ కమిటీ మీట్ అన్ పీల్డ్ వాహనం, రైతు బజారులో ఏర్పాటుచేసిన స్టాల్ ప్రారంభించారు. ఈ సందర్భంగా మంత్రి హరికేరావు మాట్లాడుతూ, ఇల్లోను మహిళా సమాఖ్య సభ్యులకు స్వయం ఉపాధి కల్పించడానికి వారికి ప్రత్యేక శ్రద్ధ ఇచ్చి మాంసం పచ్చళ్లతోపాటు ఇతర వదాలాలను తయారు చేయించి విక్రయిస్తున్నట్లు పేర్కొన్నారు. మాంసం పచ్చళ్లు, ఇతర వదాలాలను త్రవ్వకరంగా అందించే రైతుబజారులో ప్రత్యేక స్టాల్ ఏర్పాటు చేసేమన్నాన్నారు. ప్రజలకు నాణ్యమైన, స్వచ్ఛమైన అవశర వదాల



మీట్ అన్ పీల్డ్ వాహనాన్ని ప్రారంభిస్తున్న మంత్రి హరికేరావు, జన్మి ప్రెవెన్షన్ రోజు శిల్ప



రైతుబజారులో స్టాల్ ప్రారంభిస్తున్న మంత్రి హరికేరావు



మాంసం ఉత్పత్తులను విక్రయించడానికి ప్రత్యేకంగా ఏర్పాటు చేసిన మీట్ అన్ పీల్డ్ వాహనం

కోమటి చెరువు, బస్సారెడ్డి, జనవాన రస్త్ ప్రాంతాల్లో మాంసం ఉత్పత్తులను విక్రయిస్తారని పేర్కొన్నారు. చికెన్ మాంసం, తాజా ఉత్పత్తులు ఇంటింటికీ విక్రీ క్రయవిక్రయాల ఇరిగలా రూపక లానై శోమని మంత్రి హరికేరావు పేరించారు. మహిళా సంఘం వద్ద 230 గ్రామాల మనస్ పచ్చడిని రూ.300కు మంత్రి హరికేరావు కొనుగోలు చేశారు. మంత్రితోపాటు అల్లూ మంత్రి ప్రజాప్రతినిధులు పచ్చళ్లను కొనుగోలు చేశారు.

ఈ సందర్భంగా జాతీయ మాంసం పరిశోధన సంస్థ ప్రెవెన్షన్ ప్రెవెన్షన్ మాట్లాడుతూ, మహిళలకు శ్రద్ధ ఇచ్చి రాయితీ ఆందుబాటులో మాంసాన్ని తప్ప చేసే మంచి ఉత్పత్తులను తయారుచేసి ప్రజలకు అందుబాటులోకి తెచ్చామని పేర్కొంది. మొదటిసారిగా సిద్దిపేటలో ఈ కార్యక్రమాన్ని ప్రారంభించి, రాష్ట్రంలోని అదర్లంగా నిలవనున్నదాన్ని కార్యక్రమంలో సుదా ప్రెవెన్షన్ రిటెయిలర్స్, డిలెవర్స్ మీట్ గోపాలరావు, మార్కెట్ కమిటీ ప్రెవెన్షన్ పాల సాయదాం, మున్సిపల్ ప్రెవెన్షన్ అధికారి, సిద్దిపేట రూరల్ మండల ఎంపీ శ్రీదేవి, మహిళలు పాల్గొన్నారు.

1. అమెన్ పీల్డ్ రూ.80
2. అమెన్ పీల్డ్ రూ.80
3. అమెన్ పీల్డ్ రూ.80
4. అమెన్ పీల్డ్ రూ.100
5. మనస్ పచ్చడి (230 గ్రాములు) రూ.300
6. అమెన్ పీల్డ్ (230 గ్రాములు) రూ.240
7. మీట్ బాల్స్ రూ.80
8. ఎవోలెట్ ఎస్ రూ.30



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