

Technologies: Ready for Commercialization

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2. Ready for Commercialization

Animal Genetic Resources

Frozen Semen Doses of Progeny Tested Murrah Bulls



Salient feature

- Top ranking progeny tested bulls have been identified for nominated mating. 80,000 frozen semen doses from top ranking progeny tested bulls of Murrah breed are available for sale to agencies

Performance

- Percent superiority is up to 24.89 over their contemporary daughters on the basis of 305-day or less milk yield

Cost

- ₹ 20.00 to 500.00 per dose of 0.25cc as per the percent superiority of the bull

Impact and benefits

- 80,000 frozen semen doses from top ranking progeny tested bulls of Murrah breed are available for sale to breeding agencies
- 175,482 AI were performed in the field units under Network Project on Buffalo Improvement
- 20,076 female calves born in the field and 1,328 daughter have calved

Contact

Director

Central Institute for Research on Buffaloes
Sirsa Road, Hisar 125001 (Haryana)
Phone: 01662-276631 (0), Fax: 01662-275004
E-mail: cirb@asia.com

Frieswal



Salient features

- Frieswal animals having exotic inheritance of 62.5 % are suitable for rearing in different ecological conditions
- Production level is high. They need extra care in terms of feeding and health care

Performance

- Average total lactation milk yield of Frieswal cow is 3,355 kg and average 300 days milk yield is 3,273 kg with peak yield of 15.14 kg
- Fat percentage ranges from 3.7 to 4.20



Cost

- ₹ 14 per dose for 0.25 ml semen

Impact and benefits

- Production performance of Frieswal is better than the contemporary Friesian crossbred strains available in country
- The socio-economic status of the farmers utilizing Frieswal semen to breed their animals has improved

Contact

Director

Project Direct on Cattle

P.O. Box No. 17, Grass Farm Road

Meerut Cantt. 250001 (Uttar Pradesh)

Fax: 0121-2657134, E-mail: dirpdc@yaho.com

Superior Breeding Rams and Bucks



Malpura Ram



Avikalin Ram



Chokla Ram



Sirohi Goat

Salient features

- Superior breeding rams of Malpura, Patanwadi, Chokla breeds and Avikalin strain of sheep and bucks of Sirohi goat with better growth and productivity

Performance

- Performing well in field conditions

Cost

- For rams and bucks between 1-2 years of age (in ₹)

Avikalin	Chokla	Patanwadi	Malpura	Sirohi
4,300	4,200	4,200	4,200	4,500

Impact and benefits

- Great demand of rams among the farmers
- Comparison between progenies born out of farmers' rams/bucks and superior rams/bucks distributed from institutional flocks have shown a considerable improvement in farmers' flocks
- Avikalin has a great demand particularly in southern part of India for crossing local sheep

Contact

Director

Central Sheep and Wool Research Institute

Avikanagar 304501

Phone: 01437-220162, Fax: 01437-220163

E-mail: cswriavikanagar@yahoo.com

Vanaraja™



Nagaland



Manipur



Vanaraja female



Vanaraja male



Vanaraja birds

Salient features

- Vanaraja, a dual-purpose variety for free range (backyard) farming in rural and tribal areas
- Because of its multi colored plumage and brown eggs, it is well accepted and listed by the rural people and all states of the country
- The birds have good majestic appearance and attractive with well built body shape

Performance

- Vanaraja males weigh about 1.5 to 2.0 kg at 12 weeks and females lay up to 160 eggs under farm conditions and up to 110 eggs in free range condition in laying year
- Hardy with longer shanks and having better immunocompetence

- The birds were distributed across the country through Government agencies and Non Governmental Organization (NGOs)
- The commercial chicks are supplied to private firms but not the purelines

Cost

- ₹ 3-5 per egg and ₹ 100-120 per kg of meat

Impact and benefits

- Farmer can earn a net profit of about ₹ 100 /bird on males and ₹ 325/bird on female birds by rearing Vanaraja chicken
- A unit of 20 birds with 15 females and 5 males is ideal and viable for providing additional income for the family which will improve the livelihood status of the farmer
- These birds (backyard poultry) are part of traditional social life of the rural and tribal people
- Provides additional income for the family and improves livelihood status of the people

Contact

Director

Project Directorate on Poultry
Rajendranagar, Hyderabad 30

Phone: 040-24011313, Fax: 040-24017002

E-mail: rnch65@gmail.com

Gramapriya®



Salient features

- Gramapriya, a layer type coloured chicken variety was developed for free range (backyard) farming in rural and tribal areas
- Coloured plumage and lays bigger (52-58 g) and brown eggs
- Hardy and livability is high

Performance

- Male weighs around 1.2 to 1.5 kg at 14-15 weeks of age
- Female can lay up to 160-180 eggs per year in free-range conditions
- Hardy bird with better immunocompetence
- The birds were distributed across the country through government agencies and Non Governmental Organizations (NGOs)
- Birds are available in all parts of the country from Kashmir to Kanyakumari and Gujarat to North Eastern States

Cost

₹ 3-5 per egg and ₹ 100-120 per kg of meat

Impact and benefits

- Farmer can earn a net profit of about ₹ 100 /bird on males and ₹ 325/bird on female birds by rearing Vanaraja chicken
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Contact

Director

Project Directorate on Poultry
Rajendranagar, Hyderabad 30

Phone: 040-24011313, Fax: 040-24017002

E-mail: rnch65@gmail.com

Krishibro®



Bird



Krishibro flock

Salient features

- Coloured broiler suitable for small scale intensive farming
- Hardy bird with better immune competence

Performance

- Coloured broiler fetches high price and meat also resembles the native birds
- Body weight at 6 weeks was about 1.5 kg with 2.1 FCR
- Birds were distributed across the country through government agencies and NGOs

Cost

- ₹ 100-120 per kg of meat

Impact and benefits

- Distributed among the farmers of the country
- Birds are economical if the meat is sold as native birds' meat

Contact

Director

Project Directorate on Poultry
Rajendranagar, Hyderabad 30

Phone: 040-24011313, Fax: 040-24017002

E-mail: rnch65@gmail.com

Synthetic Strain of Pig for Productivity Enhancement

Salient features

- Body weight of synthetic pig is around 4 kg more than Large White Yorkshire pigs at 8 months of age with less expenditure on feed as the feed conversion efficiency is better in three-way synthetics

Performance

- Three-way synthetics performed better than Large White Yorkshire breed
- Leanness in meat which is reflected from the less back fat thickness (only 2.53 cm) than in Large White Yorkshire (4.70 cm) at 8 months of age
- Better feed efficiency compared to Large White Yorkshire pig

Cost

- ₹ 66 per kg

Impacts and benefits

- Majority of the pigs are reared by socially weaker sections in India
- Social upliftment of such down trodden people

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail: dr@tanuvas.org.in

Madhavaram Chicken-1



Salient features

- Madhavaram Chicken-I is a coloured dual purpose chicken developed through the cross between White Leghorn and Rhode Island Red and reciprocal crossing and pooling the population through sustained selection and breeding for five generations

- Multi coloured feather pattern
- Brown shelled egg producer
- Optimum egg number of 225 eggs per annum

Performance

Hen-day egg production (%)	: 65.28
Hen-housed egg production (%)	: 53.09
Annual egg number	: 191
Mean egg weight (g)	: 51.89
Feed efficiency per dozen of eggs (kg)	: 2.72

Cost

0 – 7 day-old chicks	: ₹ 15.0
8 – 14 days	: ₹ 20.0
3 - 4 weeks	: ₹ 40.0
5 – 7 weeks	: ₹ 50.0
8-10 weeks	: ₹ 80.0
11-20 weeks	: Male : ₹ 110.0 Female : ₹ 90.0
21-40 weeks	: Male : ₹ 130.0 : Female : ₹ 140.0

Impacts and benefits

- Suitable to backyard rearing for socio-economic and nutritional security of rural poor

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail : dr@tanuvas.org.in

Induction of Lactation in Infertile Buffaloes



Before Hormone treatment



After hormone treatment

Salient feature

- Dairy farmers can benefit by inducing infertile animals into lactation through hormonal therapy thus reducing herd culling losses and replacement costs

Performance

- About 70-75% buffaloes come into lactation after the treatment
- Lactation length following induced lactation is approximately 250 days; with an average 4-6 kg daily milk yield of providing earning of ₹ 35,000

Cost

- Approximately ₹ 1,2000 per animal

Impact and benefits

- Approximately 20% animals conceive after induced lactation
- Increased farmers' income by reducing losses for maintaining a non-productive animal

Contact

Director

Central Institute for Research on Buffaloes
Sirsa Road, Hisar 125001 (Haryana)
Phone: 01662-276631 (O), Fax: 01662- 275004
E-mail: cirb@asia.com

Complete Feed Blocks for Buffalo

Salient feature

- Complete feed blocks ensure higher dry matter intake per unit of volume due to increases in its bulk density. The complete feed blocks are made by feed block formation machine

Performance

- Feeding of complete feed blocks ensures 23-27 % more dry matter intake from poor quality roughages thus reducing the feeding cost and sparing same proportion of grains for human consumption
- Their feeding protect rapid degradation of valuable protein, minimized fermentation losses and stabilizes acetate to propionate ratio

Cost

- Complete feed blocks reduce significantly feed cost per kg milk

Impact and benefits

- Feed block technology reduces the feeding cost of animals and saves grain for human consumption because of more intake of dry roughage by animals
- Provides self-employment opportunity for rural and semi-urban youth
- Complete feed blocks will take less space to store hence handling and transport are easy

Contact

Director

Central Institute for Research on Buffaloes

Sirsa Road, Hisar 125001 (Haryana)

Phone: 01662-276631 (0); Fax: 01662-275004

E-mail: cirb@asia.com

Package of Practices for Raising Buffalo Broilers in Field

Salient feature

- Improved care of calves related in low calf mortality

Performance

- With an additional expenditure ₹ 4.22 a net weight gain of 128g per day can be achieved

Cost

- ₹ 33 per kg weight gain

Impact and benefits

- Higher weight gain per unit of time shall reduce cost of labour and other expenses for keeping the calf

Contact

Director

Central Institute for Research on Buffaloes

Sirsa Road, Hisar 125001 (Haryana)

Phone: 01662-276631 (0), Fax: 01662-275004

E-mail: cirb@asia.com

Ovsynch Plus Protocol for Oestrus Induction and Ovulation Synchronization in Anoestrus Buffaloes

Salient features

- Induction of oestrus in anoestrus buffaloes and heifers.

Performance

- About 50% treated anoestrus buffaloes respond to the treatment and around 30% of treated buffaloes become pregnant

Cost

- About ₹ 800 per animal

Impact and benefits

- Using Ovsynch Plus protocol, farmers can synchronize their buffalo to calve during summer when the price of milk is at the peak and a recently calved buffalo also carries a premium price-tag
- Fixed time insemination is possible without the need to go for estrus detection – which is rather difficult in buffaloes due to high incidence of silent estrus
- Increased farmers' income by reducing costs involved in maintaining non-productive animals

Contact

Director

Central Institute for Research on Buffaloes

Sirsa Road, Hisar 125001 (Haryana)

Phone: 01662-276631 (0), Fax: 01662-275004

E-mail: cirb@asia.com

Area Specific Mineral Mixture (ASMM) for the State of Haryana

Salient features

- Composition of ASMM is based on deficiencies of limiting minerals observed in feeds and fodder fed under the traditional feeding practices observed through mineral mapping in the state

Performance

- 5 -10% increase in milk production

Significant improvement can be observed in relation to :

- Heat symptoms, anoestrus conditions, and number of AI per conception (conception rate)
- 50% of animals conceived after 21 days of feeding ASMM and 75% of animals conceived after 42 days of feeding

Cost

- Additional cost of ₹ 2.00 per day for feeding of ASMM @ 50g per day

Impact and benefits

- Cost of feed per kg milk yield is reduced by ₹ 0.45
- Improved reproductive performance (i.e. early conception and reduced service period)

Contact

Director

Central Institute for Research on Buffaloes

Sirsa Road, Hisar 125001 (Haryana)

Phone: 01662-276631 (0), Fax: 01662-275004

E-mail: cirb@asia.com

Development of Post Milking Teat Dip Based on a Novel Herbal Formulation for the Prevention of Bovine Sub-Clinical Mastitis



Salient features

- Ingredients used are very commonly available medicinal herbs
- Preparation of polyherbal solution is easy and hassle free
- Application of post milking teat dip solution is easy and safe and application technique of the post milking teat dipping is fast
- Teat dip solution application forms a thin

film over the teat skin which repels the insects and application does not leave any smell to the milk

Performance

- Teat dip application reduces the somatic cell count and total bacterial count from the milk
- Teat dip application makes the teat skin soft and healthy
- Its a novel herbal formulation for post milking teat dip for prevention of bovine sub clinical mastitis
- The formula has antibacterial activity against coagulase negative *Staphylococci*, *Staphylococcus aureus*, *Streptococcus Sp.* and *Coliform bacilli*
- The formula is simple to store and does not require cold chain up to 12 months

Cost

- ₹ 5 lakh + 5% royalty for 15 years

Impact and benefits

- Teat dip application not only clears up existing infections or shortens their duration but also reduces spread of bacteria from infected cows to uninfected cows thus limiting the spread of infection and increasing milk production and income of dairy owners
- Eco-friendly and cost effective
- Herbal teat dip does not contaminate the milk with chemical residue

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Bioorganic-Mineral Formulation for Skin Ailments in Animal

Salient features

- Potent and unique skin formulation effective against skin diseases in all species of the livestock and pets
- Non toxic, eco-friendly, low cost ingredients easily available, easy application, good keeping quality with no side effect on the treated animals as well as humans handling it
- Strong potential for export

Performance

- Recovery period: 5 to 10 days

Cost

- Cost of treating one small animal is ₹ 4.5 and large animal ₹ 9.0

Impact and benefits

- Formulation is highly effective against skin diseases
- Beneficiaries are livestock owner, farmer, ultimate consumer, manufacturer of drug companies and common people
- Eco-friendly and cost effective

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

A Phyto-Pharmaceutical Preparation for the Control of Acaricide Resistant Tick Infestations in Animals



Salient features

- Characterized herbal extract and effective against synthetic acaricide resistance ticks, lice
- Safe for animal use and stable at room temperature
- Cost is low in comparison to available technology

Performance

- Developed herbal acaricide (8%) killed 60-100% susceptible ticks of IVRI-I line with 92.2% inhibition of oviposition. It showed 52-75% mortality of acaricides resistant ticks (resistance factor 25-35) with 30-40% inhibition of oviposition
- Also possesses anti-dog tick and anti-lice properties giving 60-80% efficacy

Cost

- ₹ 5 lakh + 5% royalty for 15 years

Impact and benefits

- Technology is based on low cost input and is sustainable; the entrepreneurs shall benefit for long time. The herbs can be grown in any agronomical conditions without any significant input.
- Herbal preparation, ecofriendly and cost effective
- No adverse effect on animals, no residual toxicity, non hazardous for humans

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

IVRI Anti Diarrheal Herbal Formulation



Salient features

- Herbal formulation with the plants available in both rural and urban areas
- Safe for the animals without any toxicity
- Effective as a primary as well as supportive therapy in non infectious and infectious diarrhea respectively

Performance

- Effective against non infectious and infectious diarrhea in livestock with almost complete recovery by 3 days period

Cost

- ₹ 5 lakh + 5% royalty for 15 years

Impact and benefits

- Reduced treatment cost
- Utilization of herbal medicine along with modern therapies shall give added advantage of providing effective supportive therapy
- Product can be marketed not only in India but also in other tropical countries
- Beneficiaries are livestock owner, farmer, ultimate consumer, manufacturer of drug companies and common people
- Herbal preparation, eco-friendly and cost effective

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Mineralized Urea Molasses Liquid Supplement (MUMLS)

Salient features

- Mineralized urea poly packs can be easily transported and distributed among village livestock owners for mixing with their daily quota of fodder as “*Sani*” to overcome the chances of urea toxicity inducing gradual supply of urea nitrogen and also supplementation of critical deficient nutrients in the diets of ruminants

Performance

- MUMLS have been used by several livestock owners (Villages Dhaureramafi, Delapir and Chhoti Bihar) for feeding their animals

cost

- ₹ 2 lakh + 3.5 % royalty for 15 years

Impact and benefits

- This technology could be adopted by the feed industries as well as by the livestock owners
- MUMLS technology is healthy and environment friendly
- Technology is very useful for drought affected area/scarcity regions/ villages

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Compressed Complete Feed Blocks (CCFB)



Salient features

- Suitable amount of complete feed mixture consisting of wheat straw, molasses, crushed maize, deoiled ground-nut meal, mineral mixture, sea salt and vitablend is fed into compaction chamber of the machine and compressed at 250kg/cm² pressure to form CCFB, which can be stored until fed to animals
- Provides a great potential for an efficient utilization of available crop residues and agro industrial by-products including waste materials as low cost as well as ready-to-eat ruminants-diet in scarcity conditions

Performance

- Production of CCFB was up scaled by using automatic feed compressing machine and these blocks have been popularized among livestock owners/ Institutes by selling them through ATIC mobile van and feed industries and dairy co-operatives by demonstrating the advantages and the profitability of technology

Cost

- ₹ 1 lakh + 5% royalty for 15 years

Impact and benefits

- Useful technology by which surplus feeds of one area can easily be transported to deficit area or hilly and border areas and finally feed bank can be established at different locations of the country
- Reduces the environmental pollution caused due to threshing of straw

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Molasses and Concentrate Mixture Impregnated Urea-Ammoniated Wheat Bhoosa Based Diet

Salient features

- Supplementation with molasses increases the nitrogen retention that can be utilized for growth and milk production purposes
- Wheat straw after treatment with ammonia can meet the DCP and TDN requirement of ruminants (cattle and buffaloes) for maintenance.

Performance

- Improved bio-availability of DCP and TDN

Cost

- ₹ 2 lakh + 3.5% royalty for 15 years

Impact and benefits

- Very useful technology by which nutritional quality of poor roughages can be improved that can fulfill the demand of protein and energy of our livestock for different production purposes

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Anti-Methane

Salient features

- Feed additive, prepared by mixing dry powder of fruit pulp, bulb and seed from various plants
- Safe for feeding as the chemical constituents of the four plants used are not toxic for the animals and human beings.
- The end product is a powder, which can be stored easily for long duration without any adverse effect on its quality.

Performance

- Feeding of “Anti-methane” @ 1 % of dry matter intake results in 32% inhibition of methane emission and 6.6% better feed conversion efficiency, with no adverse effect on the feed utilization and rumen fermentation parameters in buffaloes.

Cost

- ₹ 15 lakh + 5% royalty for 15 years
- Cost of Anti-methane is ₹ 1.98 per day per head of growing buffalo calf

Impact and benefits

- Feed additive developed reduces methane emission by enteric fermentation in livestock thus will be helpful in earning carbon credits.

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Probiotic for Calf

Salient features

- Probiotic for calf is wheat bran fermented with microbial culture
- Safe for feeding since wheat bran is a common feed ingredient for livestock and the bacterial culture is of Generally Recognized as safe (GRAS) grade
- Since the product contains live cells of bacteria, it can be used for feeding up to 15 days by following the instructions provided with the product

Performance

- Feeding of probiotic results in significant reduction in diarrhea of young calves

Cost

- Technology cost : ₹ 3 lakh + 5 % royalty for 15 years and ₹ 5.0 every fortnight.

Impact and benefits

- Feeding of probiotic will reduce the morbidity and mortality there by maintaining young calves in good health which will lead to more profitable livestock production.

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Probiotic for Cows

Salient features

- Probiotic for cows is wheat bran fermented with microbial culture
- Safe for feeding since wheat bran is a common feed ingredient for livestock and the microbial culture is of Generally Recognized as safe (GRAS) grade
- Since the product contains live cells of microbes, it can be used for feeding up to 15 days by following the instructions provided with the product.

Performance

- Feeding of probiotic results in significant increased feed intake, fibre digestibility and body weight gain with improved feed conversion efficiency.

Cost

- Technology cost : ₹ 3 lakh + 5 % royalty for 15 years and ₹ 5.0 every fortnight

Impact and benefits

- Superior than other probiotic products available in the market since it contains live microbial cells hence more effective ensuring positive impact on animal performance
- No sophisticated process is required and farmer can prepare himself

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581 2303258

E-mail: dirivri@ivri.res.in

Mineral Based Technology for Estrus Induction and Synchronization in Bovines

Salient features

- Supports the ovary as well as corpus luteum formation and corrects mineral imbalances. Conception rate is expected to be very high
- Highly economical and increases the milk production in the cows by at least 10%, besides assuring pregnancy
- Self life of the formulation is very long
- Equally effective in buffaloes for which there is no such technology available at present
- Infertility can be overcome by applying this technology

Performance

Development of palpable CL	: 92.27%
Induction of estrous in cows	: 84.25%
Induction of estrous in buffaloes	: 72.36%

Cost

- ₹ 10 lakh + 5 % royalty for 15 years

Impact and benefits

- Present technology is superior than existing reproductive technologies
- Increases milk production, without increasing input costs significantly, benefit the farmers in terms of subsidiary income as well as self-employment ventures

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Epoxy-Pin External Skeletal Fixation For Management of Compound Fractures in Small Animals and Birds



Salient features

- A novel fracture fixation technique in small animals, small ruminants and birds. The technique includes development of external components of linear and circular external skeletal fixators using the bent fixation pins and an epoxy resin
- This technique of epoxy-pin fixation can be used to treat a variety of fractures in different long bones like tibia, metatarsals, radius/ulna and metacarpals.

Performance

- Sufficiently strong against different loads like compression, bending and torsion.

Cost

- ₹ 5 lakhs + 5 % royalty for 15 years

Impact and benefits

- Epoxy-pin fixation technique is very effective, simple and easy
- Fracture of long bone is a common surgical problem encountered by veterinary surgeons in day-to-day clinical practice

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Bilateral External Skeletal Fixation



Salient features

- A novel bilateral external skeletal fixation device for long bone fracture management in large animals

Performance

- Fixators developed have been tested for their *in-vitro* biomechanical properties and also used clinically for treatment of long bone fractures in large ruminants

Cost

- ₹ 5 lakh + 5 % royalty for 15 years

Impact and benefits

- Impact on the income of the entrepreneurs; as such no implant is available in the market
- Long bone fractures of large animals in resource poor farmers can be treated easily, thus improving their economy

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Area-specific Mineral Mixture



Salient features

- Based on deficient nutrients an area specific mineral mixture has been formulated

Performance

- Enhancement of growth and reproductive performance in mithun

Cost

- ₹ 52 per kg of mineral mixture including the labour and packing charges

Impact and benefits

- Balance the mineral requirement for better productive and reproductive capability in mithuns thereby, enhancing the income of the farmers
- Product was socially accepted as good mineral supplement for mithuns in the North East Hill Region

Contact

Director

NRC on Mithun (ICAR)

Jharnapani, Nagaland

Phone: 08362-247327, Fax: 03826-247341

Email: nrcmithun@mailcity.com

Low Cost High Nutrition Feed Block for Mithun



Salient features

- Feed blocks were made from locally available non-conventional feed ingredients
- Tree leaves, straw and concentrate feeds were mixed together and pressed by using feed block making machine
- Feed blocks were also made from paddy straw and spent grains (a breweries industry by product) with high moisture content (75-80%)

Performance

- Average daily growth of 500 g in tree leaves based feed blocks was observed in mithun

Cost

- Under process (Major capital cost is the feed block machine)

Impact and benefits

- Balances the nutrient requirement for better productive and reproductive capability in mithuns thereby enhancing the income of farmers
- Socially accepted as feed supplement/replacement for mithuns in the North East Hill Region

Contact

Director

NRC on Mithun (ICAR)

Jharnapani, Nagaland

Phone: 08362-247327, Fax: 03826-247341

Email: nrcmithun@mailcity.com

Estrus Synchronization of Mithun Females and Fixed Time Insemination

Salient features

- Application of estrus synchronization of mithun females using controlled intravaginal drug release (CIDR) and fixed time insemination technology advances postpartum estrus around 50 days

Performance

- Highly efficient for mithun cows

Cost

- CIDR = ₹ 300 (approx)
- PGF_α = ₹ 100 (approx)
- Total = ₹ 400 (approx)

Impact and benefits

- If a mithun cow gives 10 births in her total lifespan, the technology increases $10 \times 50 = 500$ days more production life span
- Highly economical

Contact Director

NRC on Mithun (ICAR)
Jharnapani, Nagaland
Phone: 08362-247327, Fax: 03826-247341
Email: nrcmithun@mailcity.com

Indigenous Progesterone Impregnated Vaginal Sponges for Estrus Synchronization in Sheep



Salient features

- Synchronizes oestrus in donor and recipient in embryo transfer programme
- Reduces inter-lambing period and compact lambing in conducive environment
- Helps Performing large scale AI programme

Performance

- Excellent

Cost

- Sponge: ₹ 8 per piece
- Speculum: ₹ 25 each
- Plunger: ₹ 35 each

Impact and benefits

- Infertility problems of ewes can be rectified
- Ensure regular cyclic animals in a flock which will intern help in programmed breeding programmes to produce more lambs per ewe
- Cost effective method to improve reproductive efficiency of female sheep flocks

Contact

Director

Central Sheep and Wool Research Institute

Avikanagar 304501

Phone: 01437-220162, Fax: 01437-220163

E-mail: cswriavikanagar@yahoo.com

Area Specific Mineral-mixture for Augmenting Reproduction and Production in Sheep



Salient features

- Supplementation of area specific mineral mixture in animals meets the exact requirement of minerals and avoids excess or deficiency of minerals

Performance

- Bio-availability of deficient minerals

Cost

- ₹ 55 per kg

Impact and benefits

- Supplementation of mineral mixture developed for the region based on deficient minerals
- Improves wool yield by 8-9 %
- Increase milk yield by 10-15%
- Supplementation of mineral mixture in anoestrus sheep brought 60% of sheep into estrus within 15-21 days and remaining 40 % after 42 days of supplementation
- Easily adoptable by even the poor farmers due to very low cost

Contact

Director

Central Sheep and Wool Research Institute

Avikanagar 304501 (Rajasthan)

Phone: 01437-220162, Fax: 01437-220163

E-mail: cswriavikanagar@yahoo.com

Cure Conjunctivitis: A Herbal Eye Drop



Salient features

- Infectious keratoconjunctivitis (pink eye) is a common problem encountered in yaks of India and abroad
- Ophthalmic preparation (eye drop) of herbal origin was found very effective against keratoconjunctivitis in yaks
- Contains extract of *Allium sativum*, *Saussure acostus* and *Azadirachta indica*

Performance

- Product is very effective in curing keratoconjunctivitis in yaks

Cost

- Under Process

Impact and benefits

- This will provide an excellent cost-effective and alternative therapy in the hands of the yak farmers
- Herbal preparation with no side effect

Contact

Director, NRC on Yak, Dirang
National Research Centre on Yak Campus, Dirang
Dirang, West Kameng 790 101 (Arunachal Pradesh)
Phone: 03780-242220/03780 200075, Fascimile number: 03780-242273
E-mail: yakdirector@gmail.com

Healing Touch: A Poly-herbal Wound Healer and Fly Repellant



Salient features

- A poly-herbal preparation was prepared using extracts of different medicinal plants like *Rubusidaeus*, *Allium sativum*, *Saussure acostus* and *Azadirachta indica*, *Geranium* oil, *Calendula* and *Creosote*
- Preparation was first tested in experimental mice model and later its clinical efficacy was tested in the farm animals like yak, hill cattle and mithun. Its clinically efficacy was also proven in surgical wounds External application only
- Effective to provide much needed relief for the hot painful swelling of the udder in mastitis of the farm animals like yak, hill cattle and mithun

Performance

- Effective in healing wounds as well acts as a fly repellent

Cost

- Under Process

Impact and benefits

- An excellent cost-effective and alternative therapy for yak farmers
- Herbal preparation

Contact

Director, NRC on Yak, Dirang
National Research Centre on Yak Campus, Dirang
Dirang, West Kameng 790 101 (Arunachal Pradesh)
Phone: 03780-242220/03780 200075, Fascimile number: 03780-242273
E-mail: yakdirector@gmail.com

Complete Feed Block for Sheep



Salient features

- Significance of feeding complete feed block includes scope for incorporation of unconventional feeds and reduction in wastage of fodder, reduction in storage spaces and transportation cost of complete feed, improvement in keeping quality, a good vehicle for micro-nutrients and feed additives

Performance

- Performing well in institute as well as farmer's flocks of sheep

Cost

- ₹ 600 per 100 kg

Impact and benefits

- Feeding of feed block is convenient; has potency for efficient utilization of existing feed resources especially crop; residues and agro industrial byproducts for economical animal production
- Low cost of storage and transportation of low density roughages
- Reduces the use of concentrate feeds, thus reduces feeding cost and increases farmer's income

Contact

Director

Central Sheep and Wool Research Institute

Avikanagar 304501

Phone: 01437-220162, Fax: 01437-220163

E-mail: cswriavikanagar@yahoo.com

Artificial Insemination in Pig



Salient features

- Artificial insemination (AI) provides unique opportunity for the genetic improvement of pig industry
- Offers the most economically sound method of maintaining genetic variability in a positive direction

Performance

- Standardized for training of boars, semen collection, extension in GEPS extender and preservation at 13-15°C for successful AI in the field level with more than 80% conception rate

Cost

- Approximate cost for developing this technology – ₹ 7.00 lakh
- For one insemination, cost of consumables comes to approximately ₹ 50 including the cost of 60 ml GEPS extender

Impact and benefits

- In the field, a large numbers of fattener farmers were converted to breeder farmers for production of piglets
- Price of piglets has now gone up from the range of ₹ 800 to 1,200 for non-descript piglets and ₹ 1,800 to 2,000 in crossbred piglets in the field due to increased growth performance
- Vivid social change through increased revenue earning

Contact

The Director
NRC on Pig, ICAR
Rani, Guwahati 781 131 (Assam)
Phone: 0361-2847195
Email: nrconpig@rediffmail.com

Mineral Mixture for Small Ruminants



Salient features

- Deficiency and/or imbalance of micro and macro-nutrients, one of the most important factors responsible for low productivity

Performance

- Improving growth and overall health

Cost

- Under Process

Impact and benefits

- Improving the productive efficiency and general health in small ruminants
- Cost-effective, sustainable, adoptable and environment friendly



Contact

Director

National Institute Animal Nutrition Physiology

Audugodi, Bangaluru

Phone: 080-25711304, Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Xylo-Oligosaccharides from Finger Millet Straw

Salient features

- Finger millet straws are lignocellulosic biomass with meager economic significance
- Optimized the process for xylan extraction from finger millet straw
- Conversion of xylan into xylo-oligosaccharides (XOS) by chemical hydrolysis
- High value products i.e. nutraceuticals (XOS) can be produced from the xylan of finger millet straw

Performance

- Improve yield of xylan from finger millet straw = 20 -23%
- Improve yield of XOS from xylan = 3.61%
- Nutraceuticals (XOS) concentration was detected through chemical tests, TLC as well as HPLC

Cost

- Under Process

Impact and benefits

- XOS can be used in animal feeds, value addition of animal products, and nutraceutical uses in animals and human beings
- Finger millet straw is available in enormous quantity after removal of grains and mostly used for livestock feeding

Contact

Director

National Institute Animal Nutrition Physiology

Audugodi, Bangaluru

Phone: 080-25711304, Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Xylo-Oligosaccharides from Corn by Products

Salient features

- Byproducts of the corn processing industries
- Optimized the process for xylan extraction from corn cobs and conversion of xylan into xylo-oligosaccharides (XOS) using xylanase enzymes

Performance

- Improves yield of xylan from corn cobs = 31%
- Improve yield of XOS from xylan = 8%
- Nutraceuticals (XOS) concentration was detected through chemical tests, TLC as well as HPLC

Cost

- Under Process

Impact and benefits

- XOS can be used in animal feeds, value addition of animal products, and nutraceutical uses in animals and human beings
- Corn cobs are byproducts of corn industries and often disposed as wastes and a great concern to the environmentalists
- Utilization of corn byproducts for nutraceuticals production will enable value addition as well as it will solve the residue disposal problems

Contact

Director

National Institute Animal Nutrition Physiology

Audugodi, Bangaluru

Phone: 080-25711304, Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Use of Areca Sheath as an Alternative to Dry Roughage in Total Mixed Ration



Salient features

- Areca sheath, a byproduct of areca tree contains less lignin and silica and is nutritionally superior to paddy straw
- Dried and chaffed areca sheath can completely replace the paddy straw as a roughage source

Performance

- Technology was tested in both sheep and dairy cattle and could replace paddy straw

Cost

- Under process

Impact and benefits

- Use of areca sheath reduces the cost of feeding dry fodder by 50%.
- Marginal increase in milk yield and mitigate the shortage of dry fodder
- Adds value to areca crop.
- Easily adoptable and environmentally safe

Contact

Director

National Institute Animal Nutrition Physiology
Audugodi, Bangaluru

Phone: 080-257 11 304, Fax: 080-257 11 420

E-mail: cadaba_prasad@yahoo.co.in

Complete Feed Block (CFB)



Salient features

- Locally available feed resources i.e. wheat straw, mustard cake, tree leaves and molasses are properly mixed with desired proportion in a mixer for thorough mixing and equal distribution
- Complete feed block – the solid product containing concentrate and roughage in desired proportion-capable to fulfill the nutrient requirement for targeted animal production
- Complete feed in block form also overcomes low bulk density, storage, handling and transportation of roughage materials

Performance

- Feeding of complete feed stabilizes rumen fermentation and enhances utilization of poor quality of roughages

Cost

- Under process

Impact and benefits

- Supplementation of CFBs (@ ₹ 1.0 kg per head per day) had positive effect on milk production (increase by 22-27%) in cows and buffaloes reared on grazing and low quality cereal straws/ stovers
- Saves labor on feeding management and offers scope for incorporation of less/unpalatable forage/feed
- Enhances bulk density of low grade roughages by 3-4 times, Reduces transport and storage cost

Contact

Director

National Institute Animal Nutrition Physiology,

Audugodi, Bangaluru,

Phone: 080-257 11 304 Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Area Specific Mineral Mixture (ASMM) Pellets for Sheep



Salient Features

- Minerals are very important constituent of animal body and little deficiency or excess in body alters the normal physiological functions and ultimately animal production, reproduction and growth
- Dietary deficiency of minerals affects various metabolic processes, which reflects in the form of deficiency disease and metabolic disorders

Performance

- Area specific mineral mixture pellets are developed for sheep of different agro-climatic zones of Rajasthan based on actual deficiencies
- Pellets of 2.5 cm length and 6 mm diameter are developed for supplementation in sheep
- Daily supplementation of 5g area specific mineral mixture pellets in lactating sheep, increased milk yield by 10-15%, wool yield by 4.50-8.00% and bring 60% of anoestrus sheep into estrus within 15-21 days and remaining 40% after 42 days of supplementation

Cost

- The pellet cost only ₹ 0.25 per day and ₹ 7.50 per month for a sheep

Impact and benefits

- Improving the reproduction, production and general health of sheep flocks
- Cost -effective, sustainable, easily adoptable and environment friendly

Contact

Director

Central Sheep & Wool Research Institute

Avikanagar-304501, Rajasthan

Ph. No. 01437-220162, Fax. No. 01437-220163

e-mail cswriavikaangar@yahoo.com

Micronutrient supplement for Pigs Reared on Hotel Waste



Salient Features

- Can play a major role in maintaining food security in the Country
- Rearing pigs on conventional feeds is not economical and most of the pig farmers in Kerala are using the hotel waste as the sole feed for their animals



Performance

- Micro nutrient supplement was prepared and tested in private pig farms
- Supplementation increased growth rate of piglets and reduced mortality, at the same time improved health status of sows
- Incidence of posterior paralysis and sudden death was also reduced as a result of supplementation

Cost

- Cost of supplementation per sow is less than ₹ 500
- The selling price of one weaned piglet is ₹ 2,500

Impact and benefits

- Reduce the mortality of piglets and thus more piglets will be weaned per litter
- Supplementation of the mixture increased economic return to the farmers
- Cost-effective, sustainable, easily adoptable and environment friendly

Contact

Director

National Institute Animal Nutrition Physiology

Audugodi, Bangaluru

Phone: 080-25711304, Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Chelated Copper and Zinc for Livestock Feeding



Salient features

- Due to mineral interactions in gut, the bioavailability of certain trace minerals is low
- Copper and zinc are most limiting minerals for livestock production and hence their bioavailability need to be improved
- One of the approach for this is the preparation of chelated minerals with lysine or methionine

Performance

- Chelated copper and zinc prepared using methionine when supplemented in diets of rats showed superior bioavailability
- Feeding trials in sheep and goat also showed better performance when inorganic copper and zinc were replaced with chelated copper and zinc

Cost

- Under process

Impact and benefits

- Chelated minerals will be biologically more efficient with better bioavailability
- Improvement in health and productive efficiency of livestock supplemented with chelated copper and zinc
- More environment friendly as this reduces the level of inclusion of copper and zinc in diets and there will be less fecal excretion

Contact

Director

National Institute Animal Nutrition Physiology

Audugodi, Bangaluru

Phone: 080-25711304, Fax: 080-25711420

E-mail: cadaba_prasad@yahoo.co.in

Novel Herbal Anti-diarrhoeal Drug for Animals

Salient features

- An extract base herbal anti bacterial anti-diarrhoeal powder for management of diarrhea in animals.
- Herbal powder comprises the extracts of three plants with the additives effect to each other.

Performance

- Reduce the dependence of antibiotic in management of diarrhea and help to overcome the problem drug resistance.

Cost

- 5 lakh

Impact and benefits

- Herbal product will reduce the dependence of antibiotic.

Contact

Director

CIRG, Makhdoom, PO Farah, Mathura 281122

Phone : 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Intravaginal Pessaries for Augmentation of Reproduction in Goats

Salient features

- Intravaginal pessary relate to oestrus induction in an oestrusgoats, shortning the post-partum interval, oestrussynchronization, more frequent kidding,increase in litter size in less prolific breeds, extending mating outside the normal breeding seasons

Performance

- Shorting the post-partum interval
- Increase in litter size in less prolific breeds
- Ostrus induction in anestrus goat

Cost

- 10 Lakh

Impact and benefits

- Oestrus induction in anestrus goats,shortning the post-partum interval, oestrussynchronization,more frequent kidding,increase in litter size in less prolific breeds, extending mating outside the normal breeding seasons
- No environmental issues are involved

Contact

Director

CIRG, Makhdoom, PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Areamix: An Area Specific Mineral Mixture for Livestock

Salient features

- Formulated area specific mineral mixture for goats for different agro climatic zones of UP on the basis of deficiency of critical minerals in soil, water, fodder and in animals

Performance

- Feeding of formulated area specific minerals to the livestock has improved the fertility status as well as productivity effectively, under field conditions

Cost

- 5 Lakh

Impact and benefits

- Cheaper alternate and will cost less to animal keepers.
- No environmental issues are involved

Contact

Director

CIRG, Makhdoom, PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Urea Treated Wheat Straw in Composite Feed Block

Salient features

- Feed blocks containing 0.75 kg. Cottonseed cake + 1 kg. untreated wheat straw + 1 kg. 4 % urea treated wheat straw + 0.25 kg. Prosopisjuliflora pods on dry matter basis

Performance

- 19% higher growth rate in Gir heifers at 23% lower feed coat

Cost

- : ₹ 12 per block

Impact and benefits

- Saving of ₹ 4.40 per animal per day with additional gain of 23 % over routine diet. Early mating and initiation of early milk production with increased profitability during lifetime of animal

Contact

Director of Research, JAU
Near Motibagh, Vanthali Road, Junagadh 362001 (Gujarat)
Phone: 0285-2670131, Fax: 0285-2674064
E-mail: dr@jau.in

Groundnut Gotar in Ration of Growing Gir Calves

Salient feature

- Inclusion of groundnut gotar at 40 % level in routine ration

Performance

- Can be included successfully

Cost

- ₹ 14.31 per day and ₹ 27.71 kg pre kg liveweight gain

Impact and benefits

- Cost effective and saving of valuable feed for feeding during scarcity

Contact

Director of Research, JAU
Near Motibagh, Vanthali Road, Junagadh 362001 (Gujarat)
Phone: 0285-2670131, Fax: 0285-2674064
E-mail: dr@jau.in

Groundnut Gotar and Wheat Straw as the Ration of Milch Gir Cows

Salient feature

- 40 : 60 ratio of groundnut gotar and wheat straw

Performance

- Can be incorporated in ration

Cost

- Total cost of feeding ₹ 70 per day, ₹ 6-8 per kg milk

Impact and benefits

- Cost effective and saving of feed for scarcity period

Contact

Director of Research, JAU
Near Motibagh, Vanthali Road, Junagadh 362001 (Gujarat)
Phone: 0285-2670131, Fax: 0285-2674064
E-mail: dr@jau.in

Milk Replacer for Gir Calves

Salient features

- Milk replacer feeding instead of milk
- Saves milk for human consumption

Performance

- 19 % higher growth rate in Gir heifers at 23 % lower feed cost

Cost

- Under process

Impact and benefits

- Milk replacer feeding reduces the cost of calf feeding
- Milk can be saved for human consumption

Contact

Director of Research, JAU
Near Motibagh, Vanthali Road, Junagadh 362001 (Gujarat)
Phone: 0285-2670131, Fax: 0285-2674064
E-mail: dr@jau.in

Uromin Lick

Salient features

- Brown 3 kg brick shaped, that is licked by the animals and used for improving the health and production of the animals

Performance

- Serves as a supplement for energy, protein and minerals in cattle and buffaloes.
- Can be stored for a year

Cost

- ₹ 70 per kg

Impact & benefits

- Improvement in milk production and reproductive cycle
- Better health, production of animals and profit of farmers

Contact

Director of Research
GADVASU, Ferozepur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2553346, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Mineral Mixture

Salient feature

- Dry powder used as a mineral supplement for the rations of the animals

Performance

- Serves as a supplement minerals in cattle and buffaloes
- Can be stored for a year

Cost

- ₹ 55/kg to be used @ ₹ 2 kg per q of concentrate mixture

Impact & benefits

- Improvement in health, dry matter intake and economical raising of animals
- Better health, production of animals and profit of farmers

Contact

Director of Research
GADVASU, Ferozpur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2553346, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Area Specific Mineral Mixture for Dairy Animals of Punjab

Salient features

- Providing area specific mineral mixture based on the deficiency of minerals in soil-plant-animal continuum in different agro-climatic zones is the most appropriate and cost effective method of mineral supplementation
- Three types of area specific mineral mixture has been formulated for three different agro-climatic zones of Punjab
- Formulated based upon the mineral composition of fodders, water, soil and blood mineral concentrations

Performance

- Improved blood concentration of calcium, copper, manganese and iodine in dairy cattle and buffaloes under field conditions
- Can be easily prepared by users with least additional cost

Cost

- Approximate ₹ 42 per kg

Impact & benefits

- Improves milk production of lactating cattle and buffaloes
- Maintain and support optimal reproductive performance of breeding animals
- Improves economic returns due to better health and optimum reproductive efficiency

Contact

Director of Research, GADVASU
Ferozepur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2413346-47, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Copper Glycinate for Copper Deficiency

Salient features

- Organic copper supplement which possesses good bioavailability after intramuscular and intravenous injection
- Effectively used as a depot for treatment, control and prevention of subacute to chronic copper deficiency syndromes

Performance

- Provides an effective cure of clinical syndrome caused by copper deficiency viz vitiligo, achromotrichia, unthriftiness in cows, lameness in growing animals, steely wool in sheep

Cost

- ₹ 40 per dose per adult animal

Impact & benefits

- Copper supplement offers advantage in treatment, control and prevention of deficiency as a single injection is effective for 2-3 months
- Saves human time and labour
- Prevention of copper deficiency will improve economic returns in terms of better health and improved production

Contact

Director of Research, GADVASU
Ferozepur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2413346-47, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Ethiodized Oil (Iodine Supplement)

Salient feature

- A slow release iodine supplement which prevents iodine deficiency for 70 days

Performance

- Validated in dairy animals of Punjab
- Provides an effective cure of clinical syndrome caused by iodine deficiency viz infertility in buffaloes and dairy cows and hypothermia in buffalo calves. It is feasible to prepare this supplement and preparation is stable for a good period of time
- Provides 780 mg of elemental iodine /ml

Cost

- ₹ 80 per dose per adult animal

Impact & benefits

- Iodine supplement offers advantage in treatment, control and prevention of deficiency as a single injection is effective for more than 2 months
- Saves time and labour and ensures adequate iodine supply
- Prevention of iodine deficiency shall improve economic returns in terms of better health and improved production and reproduction

Contact

Director of Research, GADVASU
Firozpur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2413346-47, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Area Specific Mineral Formulation



Salient features

- Area specific mineral mixture formulation for yak feeding is prepared with zinc (Zn), copper (Cu), cobalt (Co) and manganese (Mn) and has been shown to improve yak health and production.

Performance

- Efficient technology based on locally available agro-residues

Cost

- Total cost (feed+electricity): ₹ 1282.00 per q

Impact & benefits

- Feeding of animals with area specific minerals supplemented complete feed

blocks especially during winter scarcity period will improve the yak health and production

- Technology utilizes agro-waste residue as animal feed

Contact

Director, NRC on Yak, Dirang
National Research Centre on Yak Campus, Dirang
Dirang, West Kameng 790 101 (Arunachal Pradesh)
Phone: 03780-242220/03780-200075, Fascimile number: 03780-242273
E-mail: yakdirector@gmail.com

Emulsion Based Chicken Products



Salient features

- Value added convenience and ready-to eat processed chicken products like sausages, patties, nuggets, meat balls etc. for human consumption
- Better utilization of tough meat and edible byproducts available from aged/spent hens of poultry industry
- Delicious, safe and nutritious meat products



Performance

- Technologies standardized for preparation of variety of emulsion based products can be easily adopted and integrated into processing chain
- Products have indigenous flavour profile along with refrigerated ($4\pm 1^{\circ}\text{C}$) shelf life of about 3 weeks and frozen ($-18\pm 1^{\circ}\text{C}$) shelf life of about 3 months

Cost

- ₹ 20,000 lump sum to an entrepreneur on non-exclusive basis

Impact and benefits

- Technologies shall improve yield of product, nutritive value and shelf life
Utilization of byproducts and non-meat ingredients will help in reducing cost of production of meat products
- Technologies shall ensure nutritious meat products at affordable price to consumers

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Emulsion Based Mutton and Chevon Products



Salient features

- Value added convenience and ready to eat processed mutton products like nuggets, sausages, patties, meat ball etc. for human consumption
- Better utilization of tough meat and edible byproducts available from aged sheep and goat
- Products are delicious, safe and nutritious



Performance

- Technologies standardized for preparation of variety of emulsion based products can be easily adopted and integrated into processing chain
- Products have indigenous flavour profile along with refrigerated ($4\pm 1^{\circ}\text{C}$) shelf

life of about 3 weeks and frozen ($-18\pm 1^{\circ}\text{C}$) shelf life of about 3 months

Cost

- ₹ 20,000 lump sum to an entrepreneur on non-exclusive basis

Impact and benefits

- Technologies shall improve yield of product, nutritive value and shelf life Utilization of byproducts and non meat ingredients shall help in reducing cost of production of meat products
- Technologies shall ensure nutritious meat products at affordable price to consumers

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Chicken Meat Chips



Salient features

- Crisp, convenience and tasty product, contains nearly 29% protein in comparison to protein empty potato chips

Performance

- The product has a storage life of 4 months at ambient temperature under nitrogen packaging

Cost

- ₹ 20,000 to an entrepreneur on non-exclusive basis

Impact and benefits

- Technology provides avenues for utilization of cheaper spent hen meat
- It requires low capital investment
- Easily adoptable by small and medium entrepreneurs

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax : 0581-2303258
E-mail: dirivri@ivri.res.in

Incorporation of Vegetables in Meat Products



Salient features

- Emulsion based meat blocks, nuggets and patties are processed from mutton/ goat meat /chicken / pork and buffalo meat along with seasonal vegetables
- Better utilization of tough meat and edible byproducts available from aged/ spent animals
- Delicious, safe and highly acceptable nutritious
- Products have indigenous flavour profile along with refrigerated ($4\pm 1^{\circ}\text{C}$) shelf life of about 3 weeks and frozen ($-18\pm 1^{\circ}\text{C}$) shelf life of about 3 months

Performance

- Improved colour, flavour, texture, high crude fiber and improved shelf life
-
- Technologies for preparation of products at commercial level can be easily integrated into existing production chain

Cost

- Under process

Impact and benefits

- Technologies shall improve yield of product, nutritive value and shelf life
- Partial substitution of costly meat with seasonal vegetables shall help in reducing cost of production of meat products
- Ensures effective utilization of tough and low quality meat from different species

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Meat Pickle



Salient features

- Tasty and nutritious food adjunct which has lower salt, higher moisture and pH compared to traditional pickle

Performance

- Shelf stable at room temperature for more than four months

Cost

- ₹ 20,000 lump sum per entrepreneur

Impact and benefits

- Product possesses better functionality features compared to traditional products. It contains less salt and high moisture. Hence, it is juicier with less sour taste
- Suitable for those consumers, who avoid use of excess salt and acidic products

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly -243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Functional Mutton Nuggets with Low Salt, Low Fat and High Dietary Fibre



Salient features

- Emulsion based meat blocks, nuggets and patties are processed from mutton or goat meat and edible chicken byproducts along with dietary fibres
- Highly acceptable, tasty and nutritious

Performance

- Product has indigenous flavour profile along with refrigerated ($4\pm 1^{\circ}\text{C}$) shelf life of about 3 weeks and frozen ($-18\pm 1^{\circ}\text{C}$) shelf life of about 3 months

Cost

- ₹ 20,000 lump sum per entrepreneur on non-exclusive basis

Impact and benefits

- Better utilization of tough meat and edible byproducts available from aged sheep/goat for processing into value added convenient functional mutton/chevon products like blocks, nuggets and patties for human food
- Low value meat cuts and edible meat products can be effectively utilized
- Meat proteins can be provided to consumers at affordable price

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Functional Paneer from Yak Milk



Salient features

- Yak milk paneer is prepared with full fat milk having as high as 8.5% fat resulting in 25-30% fat in paneer. Interestingly, low fat paneer prepared from yak milk having 1% fat has very hard texture
- Among the dietary fibres evaluated, inulin @2% was found to be the best

choice for incorporation in low fat paneer resulting in significant improvement in the product quality and dietary fibre content of low fat paneer

Performance

- Good milk product for health conscious consumers

Cost

- ₹ 190 per kg including raw material and production cost
- Plant set up cost: ₹ 2,00,000 plus cost for equipment

Impact & benefits

- Increased demand of yak milk
- Yak milk value added products shall help to improve the economic viability of yak rearing

Contact

Director, NRC on Yak, Dirang
National Research Centre on Yak Campus, Dirang
Dirang, West Kameng 790101 (Arunachal Pradesh)
Phone: 03780-242220/03780-200075, Fax: 03780-242273
E-mail: yakdirector@gmail.com

Value Added Mutton Products for Increasing Profit, Shelf life and Convenience



Meat nuggets



Meat loaves



Meat sausage

Salient features

- Processing of meat into value added, convenient and ready-to-eat meat products has multiple benefits like increasing profit, shelf life and convenience

Performance

- Good consumer acceptability

Cost

- Meat nuggets, Meat balls, Meat loaves, Meat sausages, Meat salami : ₹ 156/ kg
- Kabab, Mutton patties : ₹ 175/ kg
- Enrobed eggs : ₹ 15/ piece
- Mutton soup : ₹ 8/100 ml

Impact and benefits

- Meat production and consumption has increased remarkably in recent years
- Meat eating habits of the consumers are slowly changing from fresh to frozen and to processed meat and meat products
- Demand for quality meat and meat products are increasing

Contact

Director

Central Sheep and Wool Research Institute
Avikanagar 304501

Phone: 01437-220162, Fax: 01437-220163

E-mail: cswriavikanagar@yahoo.com

Processing Value Added Pork Products (Choice Pork)

Salient features

- 'Farm to Fork' quality pork and pork products for providing wholesome and clean meat to the consumers
- Development and condification of procedures for value addition/packaging/transportation and marketing of pork and pork products, consumption chain research for domestic and export market tapping
- Refined and standardized the technologies for processing an array of emulsion based value added pork products
- 10 different value added pork products (viz. frankfurter, cocktail, ham, nuggets, salami of different flavor and taste) are being marketed in 6 different states in NEH region under the brand name 'Choice Pork'

Performance

- Value added pork products processed and marketed out of the standardized/refined technologies were well accepted by the consumers of NE Region

Cost

- Approximate cost for developing/refining a technology for processing meat products : ₹ 2.0 lakh

Impact & Benefits

- Choice Pork has already established a strong base in the North Eastern retail market
- Products have very good acceptance among the consumers and they are ready to pay more for good quality pork and pork products

Contact

Director

NRC on Pig, ICAR

Rani, Guwahati 781 131 (Assam)

Phone: 0361-2847195

E-mail: nrconpig@rediffmail.com

Bio-functional Probiotic Fermented Strawberry Whey Drink

Salient features

- Only 50% of the total whey produced in India is utilized and the rest is discarded which causes tremendous pollution problem. Utilization of whey for preparation of fermented drinks with probiotic bacteria and prebiotics could be an innovative alternative by dairy industries with a small investment
- Protection against gastro-intestinal disorders
- Bioavailability of vitamins and minerals
- It has health promoting properties like antioxidant, antihypertensive and antimicrobial properties
- Shelf life: 2 weeks under refrigeration condition

Performance

- Good consumer acceptability

Cost

- One time investment on equipment for production of the whey drink may be approximately ₹ 10 lakh
- Cost of production of 1,000 litre of whey drink may be ₹ 75,000
- Sale price of 1000 litre of whey drink may be ₹ 1,50,000

Impact and benefits

- Low cost compared to the other known and available beverages or carbonated drinks
- Prepared product has health benefits to all age groups
- Refreshing taste and is a thirst quencher
- Useful in treatment of diarrhoea and also has antioxidative properties

Contact

Director

National Dairy Research Institute

Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail dir.ndri@gmail.com

Buffalo Casein Hydrolysates Rich in Caseinophosphopeptides

Salient features

- Relate to the production of phosphopeptides enriched ingredient from buffalo casein
- The method can be scaled up to the industrial level for the production of casein hydrolysates rich in caseinophosphopeptides

Performance

- The phosphopeptides enriched ingredient is prepared by the method having calcium binding and solubilising ability. These ingredients contain two peptides i.e. β (2-27) 4P, α s2 (2-21) 3P having main domain (SpSpSpEE) responsible for mineral binding property

Cost

- Under process

Impact and benefits

- Use of membrane technology in the preparation of these ingredients is the major improvement over the old existing selective precipitation method using alcohol
- This preparation can be added to functional foods in an effective amount for enhancing mineral absorption

Contact

National Dairy Research Institute
Karnal 132001 (Haryana)
Phone: 0184-2252800, Fax: 0184-2250042
E-mail: dir.ndri@gmail.com

Technology for Specialty Meat Products with Health and Nutritional Benefits



Salient features

- Functional foods and natural health products encompass a wide range of food ingredients, with a variety of bioactive compounds responsible for health promotion and disease prevention
- These ingredients have been incorporated in the production of value added convenience meat products
- Meat products will also be enriched with fibre and possess health promoting health benefits like low fat and low cholesterol

Performance

- Performing well for meat processors

Cost

- Initial investment: ₹ 5.0 lakh
- Operating cost: ₹ 200 per kg of product

Impact & benefits

- Food supply could be improved by producing functional foods having nutritional profiles that are healthier than conventional products

Contact

Director

NRC on Meat, Chengicherla
BodaUppal P.O., Hyderabad 500 092 (Andhra Pradesh)
Phone: 040-27204541, Fax: 040-27201672
E-mail: nrcmeat_director@yahoo.co.in

Retort Pouch for the Development of Shelf-stable Ready to Eat (RTE) Products



Salient features

- Prepared using the principles of thermal processing and are filled in flexible retort pouches hygienically using a retort sterilizer

Performance

- Performing well for a medium scale retort processing units



Cost

- Initial investment: around ₹ 20 lakh
- Operating cost : around ₹ 2,000 per processing of a batch of around 250 pouches

Impact and benefits

- Ready to eat meat products in flexible retort pouches
- Retort products are without any addition of preservatives or chemicals
- Stable at room temperature thus saves lots of energy and reduces the storage cost
- Requires very less processing time

Contact

Director

NRC on Meat, Chengicherla

BodaUppal P.O., Hyderabad 500092 (Andhra Pradesh)

Phone: 040-27204541, Fax: 040-27201672

E-mail: nrcmeat_director@yahoo.co.in

Curing and Smoking of Value Added Meat Products



Salient features

- Cured and smoked are specialty pork products
- Delicious cured and smoked chicken and mutton products are developed using imported and locally developed machineries for processing upto 20-100 kg per day



Performance

- Acceptability of product is gradually increasing

Cost

- Initial Investment: ₹ 2.0- 5.0 lakh
- Operating cost: ₹ 250 per kg product



Impact and benefits

- Provides new variety of products to the consumers
- Besides satisfying the need of novel products, it also fulfils the nutritional requirement of population
- Provides employment to unemployed youths who with less capital can start meat business
- Farmers also get good remuneration for their animals

Contact

Director

NRC on Meat, Chengicherla,
BodaUppal P.O., Hyderabad 500 092 (Andhra Pradesh)
Phone: 040-27204541, Fax: 040-27201672
E-mail: nrcmeat_director@yahoo.co.in

Enrobed Chicken Meat Products



Salient features

- Improved palatability and appearance of meat products

Performance

- Performing well for small scale meat processors preparing 20-100 kg per day

Cost

- Initial investment of product : ₹ 50,000
- Operating cost : ₹ 300 per kg of product



Impact and benefits

- Enrobing increases marketability of meat products by improving the palatability, appearance and also increases the products yield
- Provides convenience and variety for the consumer while increasing profits to the farmers/processors
- Improved meat consumption

Contact

Director

NRC on Meat, Chengicherla

BodaUppal P.O., Hyderabad 500 092 (Andhra Pradesh)

Phone: 040-27204541, Fax: 040-27201672

E-mail: nrcmeat_director@yahoo.co.in

Emulsion Technology for Value Added Meat Products



Salient features

- Meat emulsion technology is a relevant technology for producing quality and value added meat products
- The tough meat, non-meat ingredients can be utilized through this technology
- Nuggets, patties, meat balls, sausages etc. could be produced utilizing this emulsion technology



Performance

- Well suitable to the small and medium type entrepreneurs

Cost

- Initial investment: ₹ 5.0 to 10.0 lakh
- Operating cost: ₹ 200 per kg of product



Impact and benefits

- Important avenue for efficient utilization of livestock resources with increased demand and higher returns
- Assures the farmers a regular off take of their products at reasonable prices and provides variety to the consumers
- Improved socioeconomic condition of farmers' small entrepreneurs and their livelihood



Contact

Director

NRC on Meat, Chengicherla
BodaUppal P.O., Hyderabad 500 092 (Andhra Pradesh)
Phone: 040-27204541, Fax: 040-27201672
E-mail: nrcmeat_director@yahoo.co.in

Chicken-Gongura Pickle and Chicken Soup



Salient features

- Provides an economical and effective process for the preparation of the chicken pickle and soup using chicken frames
- Provides an effective process for extraction of meat and broth from deboned chicken frames/ bones, treating chicken frames with poly-

phosphate and process for preparation of chicken pickle using *gongura* leaves powder as a natural acidifier in place of vinegar

Performance

- Validated at laboratory level

Cost

- Initial investment: ₹ 1.0 lakh
- Operating cost: ₹ 200 per kg

Impact and benefits

- Shall greatly benefit the micro and small scale meat and poultry processors through the use of deboned frames
- Provide good income to *gongura* growing farmers
- Provides value addition and employment opportunities

Contact

The Director
NRC on Meat, Chengicherla,
BodaUppal P.O., Hyderabad 500 092 (Andhra Pradesh)
Phone: 040-27204541, Fax: 040-27201672
E-mail: nrcmeat_director@yahoo.co.in

Quarg Type Fresh Cheese with Enhanced Health Attributes and Shelf Life



Salient features

- Low-fat product containing beneficial microorganisms and rich in protein and calcium
- Soft, smooth texture, mildly acidic and clean in flavour
-

Performance

- Dietary fibers (soy, oat and inulin) promote beneficial physiological effects including reduction in plasma and LDL cholesterol and phytosterol incorporation to lower cholesterol levels
- Enhancement of shelf life of Quarg cheese using bio-preservatives- MicroGARD & Nisin over 6 weeks
- Excellent product for lowering cholesterol levels
- Low fat fibre enriched product has been developed

Cost

- ₹ 120 per kg of product

Impact & benefits

- Value added product can be sold at premium price thus fetching better remuneration to manufacturers and farmers
- Health enriched product as compared to the conventional Quarg cheese

Contact

National Dairy Research Institute
Karnal 132001 (Haryana)
Phone: 0184-2252800, Fax: 0184-2250042
E-mail: dir.ndri@gmail.com

Feta Cheese from Buffalo Milk using Microbial Rennet

Salient features

- Standardized for feta cheese from cow milk which is bleached to give typical white colour and contains very high amount of salt
- The technology was developed from buffalo milk using microbial rennet
- Cheese is white in colour and contain optimum level of salt
- Adjunct cultures used for flavour enhancement in cheese

Performance

- Soft, smooth texture, mild acidic and sliceable product
- Rich in protein and calcium
- Excellent product for vegetarians
- Can be adopted by cheese manufacturers without additional capital investment

Cost

- ₹ 250 per kg of product

Impact and benefits

- Farmers will get better remuneration for their produce
- Excellent product for export
- Rich source of nutrients

Contact

National Dairy Research Institute
Karnal 132001 (Haryana)
Phone: 0184-2252800, Fax: 0184-2250042
E-mail: dir.ndri@gmail.com

Mozzarella Type Cheese using Skim Milk and Vegetable Oils /Commercial Fat Replacers



Salient features

- Cholesterol free mozzarella cheese variants developed for health and wellness
- Excellent stretch and melt properties, highly suitable for pizza
- Versatile uses and nutritionally sound for people of different groups

- Milk fat was successfully replaced by vegetable oils for manufacture of mozzarella cheese

Performance

- Product has excellent melt and stretch properties which can be suitably used for pizza making

Cost

- ₹ 200 per kg of product

Impact & benefits

- Farmers producing oilseeds can get better remuneration of their produce
- Product is prepared replacing milk fat by vegetable oils and thus the final product is of low cost with equivalent properties as compared to the conventional one
- Product is cholesterol free and thus promotes health and wellness in society

Contact

National Dairy Research Institute
Karnal 132001 (Haryana)
Phone: 0184-2252800, Fax: 0184-2250042
E-mail: dir.ndri@gmail.com

Technology of Fruit Lassi



Salient features

- Fruit lassi utilizing milk solids and fruits, viz. mango, banana and pineapple
- Developed by replacing sugar with low calorie sweeteners, viz. aspartame and acesulfame-K
- Extended shelf-life up to 30 and 50 days by using Nisin and MicroGARD

Performance

- Excellent therapeutic and nutritional value
- In-line with consumer demand for foods without artificial additives
- Excellent avenue for fruit utilization

Cost

- Under process

Impact and benefits

- Enhanced profitability of milk and fruit producers and processors
- Fruits can be better utilized thereby reducing post-harvest losses
- Enhanced nutritive value of product offers consumers a healthy and safe product

Contact

National Dairy Research Institute
Karnal 132001 (Haryana)
Phone: 0184-2252800, Fax: 0184-2250042
E-mail: dir.ndri@gmail.com

Goat Meat Murukku: A Crispy Food Product

Salient features

- Value addition to meat and for the preparation of goat meat Murukku: a crispy food product for the fast food restaurants

Performance

- An alternative to junk foods available in the market which are only the source of carbohydrate and fats

Cost

- ₹ 2 lakh

Impact and benefits

- More animal protein for consumers

Contact

Director

CIRG, Makhdoom

PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Goat Milk Soap “AJAS”

Salient features

- A beauty soap formulation based on goat milk
- Goat milk soap sloughs off dead skin because of the alpha-hydroxy acids in milk. Has pH similar to human skin thus, protects from daily bacterial and chemical invasions
- Does not contain additives like alcohol, petroleum and preservatives

Performance

- Evaluated on various parameters such as lather, moisturizing ability, fragrance and texture

Cost

- Initial investment : ₹ 2.0 lakh

Impact and benefits

- Helps people with acne-prone skin
- Reduces the risk of skin irritation and allergic reactions

Contact

Director

CIRG, Makhdoom

PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Value added Products of Mithun Meat



(Meat Nugget)



(Meat Block)



(Meat Patties)

Salient feature

- Mithun is mainly used as a meat animal by the tribal population
- Organoleptic evaluation of mithun meat (meef) showed overall palatability of 6.92 ± 0.20 in comparison to beef 6.33 ± 0.17 , on a scale of 10

Performance

- Have potential to be used as quality value added products for livelihood security for the tribal mithun rears in North Eastern Hill Region

Cost

Under process

Impact and benefits

- Meat products of this animal are of very good quality
- Products shall help the farmers earn extra income

Contact

Director

NRC on Mithun (ICAR)

Jharnapani, Nagaland

Phone: 08362-247327, Fax: 03826-247341

E-mail: nrcmithun@mailcity.com

Value added Products of Mithun Milk



Salient feature

- Mithun milk is very rich in fat and protein

Performance

- Have potential as quality value added products for livelihood security of the tribal mithun rearers in North Eastern Hill Region

Cost

Under process

Impact and benefits

- Products are of very good quality
- Products shall help farmers earn extra income

Contact

NRC on Mithun (ICAR)
Jharnapani, Nagaland
Phone: 08362-247327, Fax: 03826-247341
E-mail: nrcmithun@mailcity.com

Value-added Products of Mithun Leather



Salient features

- Finished leather products like bag leather, shoe upper leather, as well as garment leather are soft and have good body and roundness
- Can be a good material for the leather industry

Performance

- Have potential to be used as quality value added products for livelihood security for the tribal mithun rearers in NEH region

Cost

Under process

Impact and benefits

- Leather products are of very good quality
- Products shall help the farmers earn extra income

Contact

Director

NRC on Mithun (ICAR)

Jharnapani, Nagaland

Phone: 08362-247327, Fax: 03826-247341

E-mail: nrcmithun@mailcity.com

Camel Milk Kulfi



Salient feature

- Kesarkulfi is prepared from boiled and concentrated camel milk with the addition of 9-10 % sugar and 2 % custard powder

Performance

- Overall acceptability of all the product is above 70%

Cost

- ₹ 8 per piece

Impact and benefits

- Can be easily prepared in house manually and no specific equipments are required
- Extra source income to farmers/camel rearers

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Flavoured Milk



Salient feature

- Prepared by adding 0.1% sodium alginate with continuous shaking of camel milk to avoid clumping of sodium alginate preheated (45°C to 60°C) the milk followed by addition of 6% sugar and added of lemon color to give color

Performance

- Overall acceptability of all the products is above 70%

Cost

- ₹ 8 for 200 ml pack

Impact and benefits

- Can be prepared in house manually and no specific equipments are required
- Extra income source to farmers/camel rearers

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Camel Milk Peda



Salient feature

- Prepared by mixing *mawa* made up of camel milk with well powdered sugar in 3:1 ratio

Performance

- Overall acceptability of the product was above 70%

Cost

- ₹ 105 per kg

Impact and benefits

- Can be prepared in house manually and no specific equipments are required
- Extra income source for farmers/camel rearers

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Camel Milk Chocolate Barfi



Salient feature

- Prepared from camel milk *mawa* and sugar by mixing them in 4:1:5 ratio along with 10-15% chocolate powder

Performance

- Overall acceptability of product is above 70%

Cost

- ₹ 227 per kg

Impact and benefits

- Extra income source for farmers/camel rearers
- Can be prepared in house manually and no specific equipments are required

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Camel Milk Rasogolla



Salient feature

- Chhana made from camel plus cow milk (1:1 ratio) and camel milk plus buffalo milk (1:1, 1.5:1 ratios) are used

Performance

- Overall acceptability of the product is above 70%

Cost

- ₹ 65 per kg

Impact and benefits

- Extra income source for farmers/camel rearers
- Can be prepared in house manually and no specific equipments are required

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Camel Milk Cheese



Salient feature

- Prepared by coagulation of camel milk using different concentrations of rennet / pepsin

Performance

- Overall acceptability of all the product is above 70%

Cost

- Under process

Impact and benefits

- Extra income source for farmers/camel rearers
- Can be prepared in house manually and no specific equipments are required

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

Camel Milk Gulabjamun



Salient feature

- Prepared from camel milk *khoa/mawa*

Performance

- Overall acceptability of all the product is above 70%

Cost

- ₹ 172 per kg

Impact and benefits

- Extra income source for farmers/camel rearers
- Can be prepared in house manually and no specific equipments are required

Contact

Director

National Research Centre on Camel

Post Box - 07, Jorbeer, Bikaner (Rajasthan) 334 001

Phone: 0151-2230183, Fax: 0151-2231213

TANUVAS ICAR Pet Treat

Salient features

- Dried pulverised offals from pigs including ear lobe, tongue, oesophagus, trachea, diaphragm, lungs, liver, kidney, heart, spleen, stomach, intestine; fruit waste including orange peel, pomace of apple, orange, sweet lime, over ripened bananas, guavas; and vegetable waste including carrot pomace, leaves of cabbage, radish, stem of cauliflower, are mixed thoroughly along with vegetable binders and stuffed into uterine tubes of pigs and further dried

Performance

- Product well accepted by pets

Cost

- ₹ 75 per kg

Impacts and benefits

- Value addition to fruit and vegetable waste and also by-products obtained from slaughter of pigs
- Reduction in post-harvest losses
- Product serves as a solution to the environmental problem of solid waste management arising due to accumulation of waste

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail: dr@tanuvas.org.in

Extruded Chicken Products

Salient features

- Extruded chicken meat products are food products containing up to 25% chicken meat
- Products are extruded with the meat and various cereal flours in a single screw extruder
- Ready to cook product

Performance

- Well received by the sensory panelists

Cost

- ₹ 100 per kg

Impacts and benefits

- Value addition
- Provides variety to the consumer
- Ready to cook product; very suitable for today's fast paced lifestyle

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail: dr@tanuvas.org.in

Extruded Beef Products

Salient features

- Food products containing up to 15% buffalo meat
- Products are extruded with the meat and various cereal flours in a single screw extruder
- It is a ready to cook product

Performance

- Well received by the sensory panelists

Cost

- Product cost: ₹ 100 per kg

Impacts and benefits

- Value addition
- Provides variety to the consumer
- Ready to cook product; very suitable for today's fast paced lifestyle

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail: dr@tanuvas.org.in

Restructured Buffalo Meat

Salient features

- Prepared from cheek muscles of buffaloes, free of visible fat and connective tissue
- Sliced into slices of convenient thickness post-tempering

Performance

- Well received by the sensory panelists

Cost

- ₹ 100 per kg

Impacts and benefits

- Value addition
- Enhance the demand for meat
- Provide an excellent source of protein to the poor

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583, E-mail: dr@tanuvas.org.in

Bruccheck

Salient features

- A dot ELISA kit for diagnosis of brucellosis in goats and sheep.
- Brucellosis in goats and sheep is exclusively caused by *Brucella melitensis* and presently there is no diagnostic kit available in India which can exclusively detect brucellosis in goats and sheep

Performance

- Best available diagnostic kit with better outcome than other methods
- Great demand for dot-ELISA kits in almost all the veterinary hospitals, dispensaries and mobile clinics

Cost

- ₹ 10 lakh (Initial investment)

Impact and benefits

- Dot-ELISA kit detects antibodies to *Brucella melitensis*
- Environmental friendly

Contact

Director

CIRG, Makhdoom

PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Low-volume Saponified Haemorrhagic Septicaemia (HS) Vaccine



Salient features

- Seed culture *Pasteurella multocida* serotype B:2 (P52)
- Adjuvant : Saponin
- Dry weight of the mass : 2.5mg/dose
- Dose : 2ml
- Route of inoculation : Intramuscular
- Safety : Safe in cattle and buffalo
- Vaccine induces a longer duration of immunity (12 months) than the currently used one
- Keeping quality of the vaccine is very good and can be stored for six months without losing its potency

Performance

- Better growth with large volume of seed culture
- Time saving and easy to grow the organisms
- Better syringibility
- Easy to mix in the vaccine as compared to the oil and other adjuvants
- Easy to prepare and inoculate because of its low viscosity, low dose with no side effects

Cost

- Lump sum premium ₹ 10 lakh + royalty 3.5% + service tax 10.3 %

Impact and benefits

- The vaccine provides a solid protection in cattle and buffaloes up to one year
- Vaccine is cost effective
- Enhanced livestock production and productivity

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Vero Cell Based Live Attenuated Vaccine for Control of Sheep Pox

Salient features

- Virus strain : R F strain
- Passage level for vaccine: LT-32/Vero-9
- Titer : $10^{5.0}$ to $10^{6.5}$ TCID₅₀/ml
- Passaging method : Co-cultivation/ adsorption
- Potency : Protective antibodies for at least one year
- Immunizing dose : 10^3 TCID₅₀ subcutaneously

Performance

- No shedding of infective virus
- Safe in pregnant and young ones
- Simple to produce with no clinical reaction

Cost

- Lump sum premium ₹ 10 lakh (excluding service tax 10.3 %) + royalty 5% for 15 years

Impact and benefits

- Vaccine production is commercially viable
- Vaccine supplied in lyophilized condition is highly thermostable, can tolerate temperate conditions without loss of titre
- Easily transportable
- Vaccine can be used in other Asian countries also, where sheep pox is currently endemic
- Can boost sheep husbandary practices

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Swine Fever Cell Culture Vaccine (CFSV)



Salient features

- The vaccine is safe and potent and can be used in pregnant animals
- Provides immunity for a year and no untoward reaction in animals
- Each dose contains at least 100 PD₅₀ (as per Pharmacopeia)

Performance

- The vaccine provides immunity for 13 months

Cost

- Lump sum premium ₹ 20 lakh + (service tax 10.3 %) + royalty 3.5% for 15 years

Impact and benefits

- Great demand of swine fever vaccine throughout the country, especially North Eastern States
- The cell culture vaccine can be a suitable alternative to limit the use of animals for vaccine production
- Scaling up and large scale production can be taken up with private partners after proper training

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Anti-Hyalomma Tick Vaccine



Salient features

- A recombinant glycoprotein having immunization potential against *Hyalomma anatolicum* and *Boophilus microplus* ticks
 - The technology is a part of integrated tick management programme in which other components of tick control shall be used strategically to achieve sustainable control
- Three doses of 2 ml each, containing adjuvant is required to inject animals intramuscularly
 - The ideal time of immunization is when tick activity season is at optimum level
 - Safe in animal trial
 - Harmless, sustainable and eco-friendly

Performance

- The developed herbal acaricide showed 52-75% mortality of acaricides resistant ticks
- The developed herbal acaricide also possesses anti-dog tick and anti-lice properties giving 60-80% efficacy
- In clinical field validation, the herbal formulation showed 75-90% protection from natural tick infestation on animals
- The shelf life efficacy of prepared solution is consistent up to 3-4 months
- At 5x concentration the formulation has not shown any unwanted reaction in animal model

Cost

- Under process

Impact and benefits

- Improves the quality of tick control measures in sustainable manner
- Vaccine available against *Boophilus microplus* of latin American strain is highly acceptable by the farmers
- Eco-friendly, having no adverse effects on animals

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Monoclonal Antibody based Sandwich-ELISA kit for *Peste des petits ruminants Virus* Antigen Detection



Salient features

- Sandwich-ELISA kit uses a monoclonal antibody (4G6) directed against an epitope of nucleoprotein (N) of PPR virus. Extremely useful for detection of PPR antigen in clinical specimens.

Performance

- Sensitivity: 89% compared to immunocapture- ELISA kit
- Specificity: 93 % compared to immunocapture- ELISA kit

Cost

- ₹ 5 lakh + 5% royalty for 15 years duration

Impact and benefits

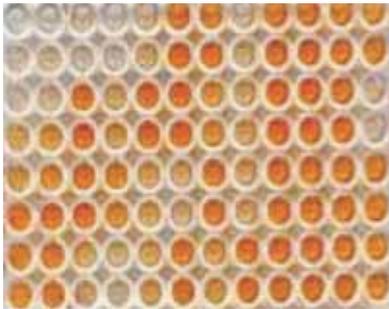
- Effective in PPR control programme launched by Government of India
- Improves efficiency
- Reduces labour, input usage, material loss and resource usage
- Does not require cell culture facility for use

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Monoclonal Antibody based Competitive-ELISA Kit for *Peste des petits Ruminants Virus* Antibody Detection



Salient features

- Competitive-ELISA kit developed at IVRI, Mukteswar uses a monoclonal antibody (4B11) directed against a virus neutralising epitope in haemagglutinin protein (H) of PPR virus. It is suitable for sero- surveillance and sero-monitoring of antibodies to PPR virus in small ruminants

Performance

- Sensitivity is 92.2% compared to VNT
- Specificity is 98.84 % as compared to VNT
- High speed of diagnosis (results within 4 hours)

Cost

- ₹ 10 lakh as lump sum amount and 3.5% as royalty on sales for 15 years

Impact and benefits

- The technology detects PPR, an OIE A listed disease in small ruminants
- Even poor quality samples can provide diagnosis
- Stability of reagents is one year

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Recombinant Antigen Based Leptospirosis Detection kit



Salient features

- Detects a re-emerging zoonotic disease leptospirosis

Performance

- Test is rapid and reliable (2-5 *minutes*)

Cost

- ₹ 2 lakh + 5 % royalty for 15 years

Impact and benefits

- Detects only pathogenic leptospiral infection
- Easy to scale up production
- Cost effective and simple test suitable for field use
- Requires no skill and specialized equipments

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Recombinant Antigen Based Rapid Immunoassay for Sero Diagnosis of Infectious Bursal Disease (IBD)



Salient features

- A rapid immunoassay kit for the semi-quantification of infectious bursal disease antibody from serum samples for assessment of revaccination status of breeding and laying flocks of poultry
- The test is extremely simple, novel and has commercial potential, and does not require the need for expert and trained personnel

- Recombinant antigen is specific for all the strains of IBDV

Performance

- The recombinant antigen sensitized beads could be stored at 4^o C for more than 4 months and at ambient temperature for a month without the loss of activity for both weak and strong positive samples
- The test is also useful to assess the immune status of vaccinated birds in management of large flocks.

Cost

- ₹ 2 lakh + 5% royalty for 15 years

Impact and benefits

- Assay is more sensitive and specific
- No risk involved for both the producer and the user as live organisms are not handled
- The recombinant antigen is non-infectious and free from risk of biohazard

Contact

Director

Indian Veterinary Research Institute (IVRI)
Izatnagar, Bareilly 243122 (Uttar Pradesh)
Phone: 0581-2300096, Fax: 0581-2303258
E-mail: dirivri@ivri.res.in

Caprine Pleuropneumonia Diagnostic Kit



Salient features

- The technology is based on slide agglutination test using colored antigen which was prepared using the Indian strain of *Mycoplasma mycoides* subsp. *capri* and colouring agents as Rose Bengal dye. A 25 μ l antigen is sufficient to carry out one test

Performance

- An effective diagnostic kit for mass screening in commercial reared goats' flock

Cost

- ₹ 2 lakh + 5% royalty for 15 years

Impact and benefits

- Cost effective diagnostic kit for mass screening in commercially reared goat flocks
- Easy and simple to perform within 2 minutes at field level
- Spot diagnosis of caprine pleuropneumonia, in field and at farmers door step

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly -243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Bluetongue Indirect-ELISA Kit

Salient features

- A BTV antibody detection kit was developed under the All India Network Programme on Bluetongue Disease (AINP-BT). The VP7 gene is expressed in bacteria and the protein is affinity-purified. The indirect ELISA was developed with the purified recombinant VP7 (rVP7)

Performance

- Sensitivity : 96.47%
- Specificity : 91.13%
- Stability of reagents : 1 year
- Speed of diagnosis : 5 hours

Cost

- ₹ 3 lakh + 5% royalty for 15 years

Impact and benefits

- Target users : Disease investigation laboratories and research organizations
- Cost: One-third of the imported kit
- Uses recombinant antigen and not infectious virus
- Quick and reliable results

Contact

Director

Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Recombinant Protein based Serodiagnostic for Surra caused by *Trypanosoma evansi*

Salient features

- The diagnostic reagent comprises ~57KDa surface glycoprotein of *T. evansi* expressed as a 6x His- tagged recombinant protein in a heterologous host system
- Detects very low grade infections in carrier animal population with increased sensitivity and specificity for application in epidemiological surveys

Performance

- The protein @ 3 µg/ml concentration is suitable for detection of *T. evansi* specific antibodies in infected bovine calves, equines and camels; diluted 1:100

Cost

- Lump sum ₹ 3 lakh + nil royalty for 15 years (₹ 4 per unit)

Impact and benefits

- A highly sensitive and specific recombinant protein based ELISA which helps in early detection of the infection not only in the acute stage but also in the chronic stage of infection
- An early detection will help in initiating specific chemotherapeutic measures to save the life of the animals

Contact

Director

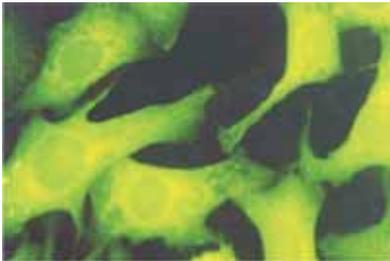
Indian Veterinary Research Institute (IVRI)

Izatnagar, Bareilly 243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

A Novel Peptide as Transfection Reagent for Protein and Nucleic Acids



Salient feature

- The technology relates to an artificially synthesized peptide useful as transfection reagent for delivering proteins/ peptides and DNA/nucleotides into mammalian cells

Performance

- Technology overcomes barriers during cellular transfection by making non – covalent complex of nano meter dimensions with cargo molecules.
- Easy to use transfection reagents with simple mixing of cargo molecule and is devoid of toxicity at the concentration used for maximum transfection (above 70%)

Cost

- ₹ 20 lakh + 5% royalty for 15 years

Impact and benefits

- Technology is five times less costly than the available commercial reagents like lipofectamine
- Available transfection reagents such as lipofectamine and polymeric nano particles suffer with disadvantage of toxicity and quantitative limitations

Contact

Director

Indian Veterinary Research Institute (IVRI),
Izatnagar, Bareilly -243122 (Uttar Pradesh)

Phone: 0581-2300096, Fax: 0581-2303258

E-mail: dirivri@ivri.res.in

Type-Foot and Mouth Disease (FMD) Kit

Salient features

- Foot and mouth disease virus (FMDV) serotyping, based on a standard sandwich ELISA technique to determine the presence of FMDV antigens in tissue samples
- Contains all reagents and ELISA plates sufficient for testing of minimum 500 FMD suspected clinical samples

Performance

- Excellent

Cost

- ₹ 51.00 per test

Impact & benefits

- In use across the country and covers all virus strains in circulation in the country
- Eliminated necessity of costly imported kits
- FMD virus diagnosis is pre-requisite to monitor and control the disease

Contact

Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

Liquid Phase Blocking ELISA (LPBE)-FMD



Salient features

- Measures post vaccinal antibody response to FMD vaccine
- The test is aimed at the quantification of protective antibody level in the animals following vaccination (seromonitoring)
- The kit contains all reagents and ELISA plates sufficient for testing of minimum 1,000 serum samples

Performance

- Excellent

Cost

- ₹ 103.00 per test

Impact and benefits

- The reagents cover all FMD virus strains in circulation, and is extensively being used in the country for seromonitoring
- Novel and effective kit

Contact

Project Director

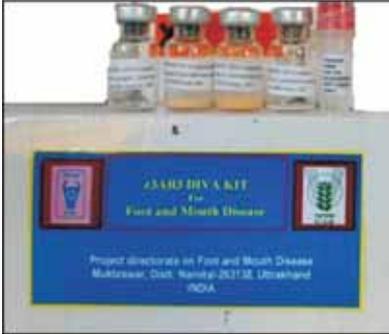
Project Directorate on Foot and Mouth Disease

IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

DIVA FMD Indirect



Salient features

- For differentiation of vaccinated animals from FMDV-infected animals
- Kit contains recombinant antigen, other reagents and ELISA plates for testing 450 serum samples

Performance

- Excellent

Cost

- ₹ 70.00 per test

Impact and benefits

- Indigenous kit, eliminates necessity of import
- Sensitivity as good as those used in other countries

Contact

Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

DIVA FMD Competitive

Salient features

- For NSP sero-surveillance in competitive ELISA for differentiation of FMD infected from vaccinated animals
- The kit contains monoclonal antibodies, recombinant NSP antigen, other reagents and ELISA plates for testing of 100 samples of all the susceptible species on a common platform

Performance

- Excellent, with high sensitivity and specificity

Cost

- Under process

Impact and benefits

- Same test platform for all species susceptible to FMD
- Indigenous kit, eliminates import

Contact

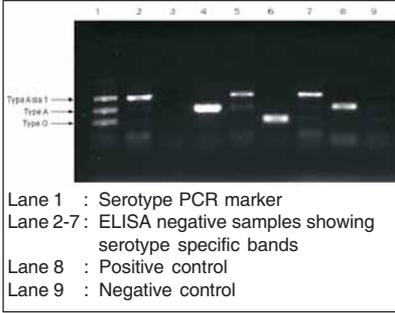
Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

mPCR-FMD Kit



Salient features

- For foot and mouth disease virus serotyping in difficult clinical samples
- The kit contains a set of serotype-specific oligonucleotide primers for serotypes O, A and Asia1, other reagents and plastic wares for testing 50 clinical samples

Performance

- Excellent

Cost

- ₹ 57.00 per test

Impact and benefits

- Indigenous kit at a minimum available cost
- User friendly and requires minimum skill to run the test

Contact

Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

Email: pattnaikb@gmail.com

FMD-Multiple NSP Panel DIVA Indirect

Salient Features

- For NSP sero-surveillance in disease controlled zones and for export purpose
- The kit contains four NSP recombinant antigens i.e. 2C, 3D, 3AB3 and 3ABC, other reagents and ELISA plates for testing of 100 serum samples
- Kit is only available with PD_FMD, Mukteswar

Performance

- Excellent

Cost

- ₹ 595 per test

Impact & benefits

- Indigenous kit at a minimum available cost
- A powerful tool for import/export certification

Contact

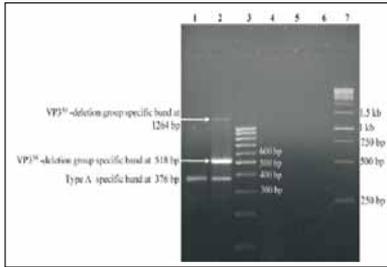
Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

Email: pattnaikb@gmail.com

Genotype/Lineage-FMD



Salient features

- For differentiation of genetic lineages of FMD virus serotypes A and Asia 1.
- The PCR based kit contains a set of lineage-specific oligonucleotide primers, other reagents and plastic wares for testing 50 clinical samples
- Unique kit is only available with PD_FMD, Mukteshwar

Performance

- Excellent

Cost

- Under process

Impact and benefits

- Suitable to cover genetic diversity occurring in nature

Contact

Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

Semen Test Kit for FMD



Salient features

- For rapid, sensitive and reliable detection of FMDV in bull semen
- The kit (multiplex PCR) is suitable for detection of FMD virus serotype in meat and extended semen samples. The kit will help in deciding as to when to resume the semen collection and

processing for artificial insemination (AI) following FMD

- The kit contains a set of serotype-specific oligonucleotide primers, other reagents and plastic wares for testing 10 semen samples

Performance

- Excellent, with high specificity and sensitivity

Cost

- ₹ 63 per test

Impact and benefits

- Can certify FMD virus negative semen
- Can prevent virus transmission through semen

Contact

Project Director

Project Directorate on Foot and Mouth Disease
IVRI Campus, Mukteswar 263138 (Uttarakhand)

Phone: 05942-286004, Fax: 50942-286307

E-mail: pattnaikb@gmail.com

Equiherpabort Vaccine



Salient features

- Vaccine was developed for diagnosis of herpes virus-1 infection in horses
- EHV-1 is responsible for heavy economic losses to the equine industry worldwide by causing storm of abortions

Performance

- Vaccine contains killed EHV-1 (Hisar-90-7) virus and the dose is 2 ml i/m inoculated at 5th, 7th and 9th month of gestation
- Immunization response of the vaccine at experimental level is satisfactory
- Vaccinated animals showed booster response

Cost

- Under process

Impact and benefits

- Decrease in occurrence of abortions, paralysis, perinatal foal mortality and respiratory disease due to EHV-1 in horses
- Increase in equine production, work efficiency and economy of the equine owners

Contact

Director

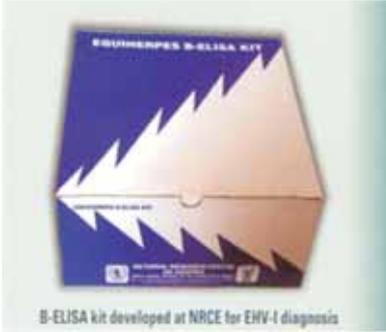
NRC on Equines

Sirsa Road, Hisar 125 001 (Haryana)

Phone: 01662-275787, Fax: 01662-276217

E-mail: nrcequine@nic.in

Equiherpes B-ELISA Kit



Salient features

- This kit was developed for diagnosis of equine herpes virus-1 (EHV-1) infection in horses
- EHV-1 is responsible for heavy economic losses to the equine industry worldwide by causing storm of abortions

Performance

- Validation of equiherpes B-ELISA kit by testing of field serum samples.
- The diagnostic reagents of the kit were stabilized in liquid buffer so that the users can test serum samples on different days as per the availability of test serum samples

Cost

- Under process

Impact and benefits

- It will help in timely diagnosis of EHV-1 infection/immunity in horses, which, in turn, will help in controlling the disease

Contact

Director

NRC on Equines

Sirsa Road, Hisar 125 001 (Haryana)

Phone: 01662-275787, Fax: 01662-276217

E-mail: nrcequine@nic.in

EQUIP ROTA-VIRUS TEST

Salient features

- Monoclonal antibody-based sandwich enzyme immunoassay for diagnosis of rotavirus in different animals and human stool samples
- EQUIP rotavirus test uses a polyclonal anti-rotavirus serum as coating antibody to capture the rotavirus antigen and a monoclonal antibody is used for detection of group-specific antigen present on the captured rotaviruses

Performance

- The assay has 100% sensitivity and a specificity of 96% in comparison to virus isolation
- Highly sensitive and specific assay for detection of rotavirus from equine stool samples

Cost

- Under process

Impact and benefits

- Helps in timely diagnosis of rotavirus associated diarrhoea in animal and human population, that will help in developing control strategies

Contact

Director

NRC on Equines

Sirsa Road, Hisar 125 001 (Haryana)

Phone: 01662-275787, Fax: 01662-276217

E-mail: nrcequine@nic.in

Kit for Detection of Antibodies against *Theileria equi*



Salient features

- A recombinant protein of equine merozoite antigen-2 was expressed and utilized in ELISA for detection of antibodies against *Theileria equi* in equine serum
- The kit has ready-to-use ELISA plate onto which serum samples can be loaded after proper dilution
- The results can be obtained in 1h 30 min after application of serum samples
- Test capacity: One ELISA plate can accommodate 42 test serum samples (in duplicate)

Performance

- Diagnostic sensitivity : 94.0%
- Diagnostic specificity : 96.0%
- Duration : about 1:30 min
- Kit is stable for at least 6 months at 4°C.

Cost

- ₹ 25.00 lakh for unit establishment and ₹ 1,500.00 per plate

Impact and benefits

- Specific and sensitive test
- Less time consuming than commercially available CI ELISA kit
- Cost effective and economical than commercially available CI ELISA kit
- Help in demarcation of endemic zone of *T. equi* infection for formulating strategies for tick-vector control

Contact

Director

NRC on Equines

Sirsa Road, Hisar 125 001 (Haryana)

Phone: 01662-275787, Fax 01662-276217

E-mail: nrcequine@nic.in

Pregmare Kit for Pregnancy Diagnosis in Horse Mares



Salient features

- Early pregnancy kit based on ELISA can be used for pregnancy diagnosis between 35 to 120 days of gestation in mares
 - Based on the detection of PMSG or eCG which is released after conception (after about 30 days of gestation) from the endometrial cups in pregnant mares can be used both as qualitative and quantitative test
- ELISA kit is rapid, sensitive, specific and user friendly
 - Test capacity is 72 serum samples per kit

Performance

- Sensitivity : 100%
- Specificity : 97.84%
- Duration : Results are available in 4-5 h

Cost

- ₹ 25.00 lakh for unit establishment and ₹ 1,500.00 per unit for 72 tests

Impact and benefits

- It is more sensitive than commercial kit (EVL) for early pregnancy diagnosis (35 days of gestation)
- Can be used both for early pregnancy and fetus viability
- Economically, it is very beneficial to all categories of equine owners as cost per test is quite low as compared to ultrasound scanning fee
- Confirmation of pregnancy at an early date i.e., after 35 days of gestation, helps the equine owners in recovering their mares for getting one foal every year from any good quality broodmare

Contact

Director

NRC on Equines

Sirsa Road, Hisar 125 001 (Haryana)

Phone: 01662-275787, Fax: 01662-276217

E-mail: nrcequine@nic.in

Molecular Screening of PSE Pork and PSS condition in pig

Salient feature

- This problem focuses primarily on colour, firmness, water holding capacity and marbling (quality) in pork muscle which is not preferred by consumers and mostly becomes unfit for value addition resulting in considerable economic losses.

Performance

- It is a simple, rapid, accurate and repeatable PCR based screening
- Small volume of blood or tissue sample from live animal is sufficient for the test

Cost

- Approximate cost for developing the technology - ₹ 5.00 lakh
- Approximate cost for screening the samples - ₹ 500.0 per sample

Impact and benefits

- Genetic screening of breeding stock may ensure elimination of this condition from the herd and corresponding economic benefit
- Enhanced production by arresting incidences of PSE pork

Contact

The Director
NRC on Pig, ICAR
Rani, Guwahati 781 131 (Assam)
Phone: 0361-2847195
E-mail: nrconpig@rediffmail.com

A New Test for Detection of Detergent in Milk



Salient features

- Can detect presence of detergent in milk at around 0.02% level and the test has the potential to detect presence of so called synthetic milk in milk supplies
 - Based on the presence of detergent in synthetic milk
 - Colour based test
- Results are available in 100 sec
 - Can be performed by households
 - Sensitive to detect 1.5 to 2 liters of synthetic milk in 100 liters of milk
 - Does not require any equipment

Performance

- Can detect presence of around 0.2% level of laboratory grade anionic detergent in milk
- No known adulterant interfered with the test and works in the presence of formalin also
- USP (unique selling proposition) of the developed test can detect all brands of commercial detergents available in the market
- The test is sensitive enough to detect 20 mg laboratory grade detergent in 100 ml milk sample and the results are available in 2 minutes

Cost

- ₹ 3.10 per test cost

Impact and benefits

- Major improvement over the earlier developed method for detection of detergent in milk in terms of rapidity; ease as well interpretation of results
- Help in controlling the menace of adulteration of milk

Contract

Director

National Dairy Research Institute

Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail: dir.ndri@gmail.com

Kit for Detection of Milk Adulteration



Salient features

- Used for detection of different kinds of adulterants in milk and can detect these adulterants in minutes

Performance

- Very efficient, qualitative detection, highly reliable

- Being sold to different dairy industries through consultancy unit NDRI, Karnal

Cost

- ₹ 5,000 for six adulterants detecting reagents. For additional adulterant ₹ 600 plus taxes

Impact and benefits

- Adulteration in milk can be stopped and good quality milk will be made available, which fetches more price compared to substandard milk
- Easy to carry and environmental friendly

Contract

Director

National Dairy Research Institute

Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail: dir.ndri@gmail.com

A Novel Enzyme-Substrate Based Bio-Assay for Real Time Detection of *Listeria Monocytogenes* in Milk



Salient features

- Development of media (LSEB) with novel features of inhibition of contaminants like *Enterococci*, *Bacillus cereus* other than *Listeria* spp. for its application as either detection / or enumeration of *Listeria monocytogenes* in milk and milk products

Performance

- The field level test was analyzed with natural milk samples from cow, buffalo, mixed milk, pasteurized milk (toned/standardized, double toned, full cream milk, and dried powders (SMP, milk powder)

Cost

- Under progress

Impact and benefits

- Decreases the time of detection as it enables detection of *Listeria* spp. in milk per ml / or 25 ml (stage-1) in 18/ or 24 hours respectively with counts less than or equal to 10 as against 5 days protocol following conventional method (IS: 14988 (Part-2): 2002 / ISO: 11290-2: 1998)
- Cost effective in comparison to conventional method
- Effective monitoring of high-risk products and other ready-to-eat foods for prevention of food-borne listeriosis and release of food products within a day to market which help in ensuring food safety of dairy products to consumers

Contact

Director

National Dairy Research Institute
Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail: dir.ndri@gmail.com

A Novel Selective Medium and Micro-technique for Detection of *Enterococci* in Milk



Salient features

- Better sensitivity
- Consistency in color development within 5-12 hours
- Lab validation with conventional method (ISO 7899-2:1984)
- Wide spectrum of application for raw, pasteurized, dried milk

Performance

- Developed media can be utilized in the form of broth as novel micro-technique and solid media for selective isolation/enumeration of *Enterococci* in different food matrix
- These media are widely used in large scale quantity in industry, clinical laboratories and R and D institutions for enumeration purpose and hence have lot of commercial sale value in the market

Cost

- Cost of micro technique : <₹ 1.0 per test
- Cost of the medium (EBSAM) : ₹~ 98.3 per liter
- Non-exclusive license fee cost of technology : ₹~3.5 lakh

Impact and benefits

- Potential to replace the existing medium for *Enterococci* being cost effective
- The developed media has advantage of rapid detection of *Enterococci* and help obtaining results in a single working day

Contact

Director

National Dairy Research Institute

Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail: dir.ndri@gmail.com

Spore Inhibition Based Enzyme Substrate Assay for Monitoring Aflatoxin M1 in Milk



Salient features

- Real time chromogenic assay with results within 45 minutes
- Semi quantitative detection at 0.5 ppb limit set by Codex
- Validated with AOAC approved Charm 6602 and ELISA test with real samples under field condition

- Can detect aflatoxin M1 in raw, heat treated and dried milk products

Performance

- Can be applied at dairy farm, reception dock, manufacturing unit and R and D centre
- The field level test was analyzed with natural milk samples like cow, buffalo, mixed milk, pasteurized milk (toned/standardized, double toned, full cream milk, and dried powders (SMP, milk powder, infant food, procured from Haryana, Delhi, Uttar Pradesh and Rajasthan
- Comparative performance of field level test indicates its working in accordance to AOAC approved Charm 6602 and ELISA assay

Cost

- Spore based assay test cost: ₹ ~ 20 per test
- Non- exclusive license fee cost of technology : ₹ ~7.5 lakh

Impact and benefits

- Developed aflatoxin kit (SIB-ESA) will help in mass screening of milk samples at reception dock in food processing units leading to food safety assurance to consumers

Contact

Director

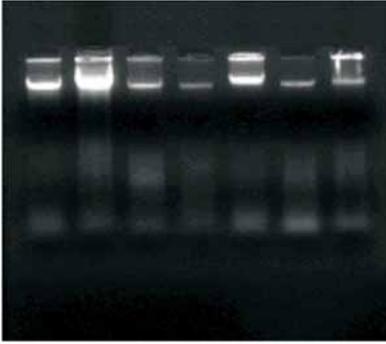
National Dairy Research Institute

Karnal 132001 (Haryana)

Phone: 0184-2252800, Fax: 0184-2250042

E-mail: dir.ndri@gmail.com

Polymerase Chain Reaction Techniques for Speciation of Meat



Salient features

- Species specific PCR, PCR restriction fragment length polymorphism and nucleotide sequencing methods were developed, and PCR standardized for confirmation of species of cattle (*Bos indicus*), buffalo (*Bubalus bubalis*), sheep (*Ovis aries*) and goat (*Capra hircus*).

Performance

- Speciation achieved in both meat and byproducts and in meat processed to any cooking temperature including canning

Cost

- Initial investment: 10.0 lakh for establishing lab
- Operating cost: ₹ 500 per sample analysis

Impact and benefits

- Helps in prevention of adulteration of meat for economic gains and implementation of slaughter rules of different states of the country
- Helps to prevent adulteration of beef in buffalo meat and mutton in chevon

Contact

The Director
NRC on Meat, Chengicherla
BodaUppal P.O., Hyderabad-500 092 A.P.
Phone: 040-27204541, Fax: 04027201672
E-mail: nrcmeat_director@yahoo.co.in

Plate ELISA kit for the Dignosis of Johne's Disease

Salient features

- Johne's disease (JD) or paratuberculosis in ruminants is a chronic, granulomatous enteritis of ruminants caused by an intestinal infection with an environmental bacterial pathogen, *Mycobacterium avium* subspecies *paratuberculosis* (MAP)

Performance

- Indigenous ELISA kit' was developed by using antigen recovered from the native isolate of MAP.

Cost

- ₹ 10 lakh (initial investment)

Impact and benefits

- Can be used for the diagnosis of MAP infection in animals (goats, sheep, cattle and buffaloes) and also human beings

Contact

Director

CIRG, Makhdoom

PO Farah, Mathura 281122

Phone: 0565-2763380, Fax: 0565-2763246

E-mail: dir@cirg.res.in

Kit for Parentage Verification in Zebu Cattle (*Bos indicus*)

Salient features

- For determining the parentage in zebu cattle (*Bos indicus*) using microsatellite markers
- A core set of 15 microsatellite markers from cattle genome database were identified and are amplifiable in a single multiplex PCR reaction

Performance

- Assuming one parent is known, the core set of markers provide exclusion probabilities of 0.99935 averaged across zebu cattle of all geographical regions of India

Cost

- Under process

Impact and benefits

- Present procedure is meant for parentage verification because maintenance of pedigree records etc are subjected to human errors
- New technology provides high degree of accuracy in confirmation of parents using molecular markers
- Markers are highly polymorphic, have high heterozygosity, located on different chromosomes and provide a high exclusion probability.

Contact

Director

National Bureau of Animal Genetic Resources

P.B.No. 129, GT Road Bye Pass

Karnal 132001 (Haryana)

Phone: 0184-2267918, Fax: 0184-2267654

E-mail: directornbagr@gmail.com

Kit for Parentage Verification in Camels (Single and Double Humped)

Salient features

- For determining the parentage in camels (single and double humped) using microsatellite markers
- A core set of 15 microsatellite markers have been identified and are amplifiable in a single multiplex PCR reaction

Performance

- Assuming one parent is known, the core set of markers provide exclusion probabilities of 0.999940 averaged 6 breeds/ populations of camels and also double humped camel from Leh (Nubra Valley)

Cost

- Under Process

Impact and benefits

- Present procedure meant for parentage verification like maintenance of pedigree records etc are subjected to human errors
- New technology provides high degree of accuracy in confirmation of parents using molecular markers
- Markers are highly polymorphic, have high heterozygosity and provide a high exclusion probability

Contact

Director

National Bureau of Animal Genetic Resources

P.B.No. 129, GT Road Bye Pass

Karnal 132001 (Haryana)

Phone: 0184-2267918, Fax: 0184-2267654

Kit for Parentage Verification in Buffaloes (*Bubalus bubalis*)

Salient features

- For determining the parentage in buffaloes (*Bubalus bubalis*) using microsatellite markers
- A core set of 15 microsatellite markers from cattle genome database were identified and are amplifiable in a single multiplex PCR reaction

Performance

- Assuming one parent is known, the core set of markers provide exclusion probabilities of 0.99978 averaged 6 on 13 breeds/ populations of buffaloes from different geographical regions of India

Cost

- Under process

Impact and benefits

- Present procedure is meant for parentage verification because maintenance of pedigree records etc are subjected to human errors
- New technology provides high degree of accuracy in confirmation of parents using molecular markers

Contact

Director

National Bureau of Animal Genetic Resources

P.B. No. 129, GT Road Bye Pass

Karnal-132001 (Haryana)

Phone: 0184-2267918, Fax: 0184-2267654

E-mail: directornbagr@gmail.com

AB-ELISA kit for Detection of Antibodies to IBR in Bovine Sera



Salient features

- Avidin-biotin indirect ELISA for the detection of antibodies to infectious bovine rhinotracheitis in bovines
 - Internationally validated by IAEA, Vienna
 - Validated by many veterinary colleges and diagnostic laboratories
- Can detect antibodies in 400 samples and has 3 months shelf life
 - The kit was developed as per OIE standards

Performance

- The kit is 98% specific and 95% sensitive
- Well appreciated by the end users
- Well adoptable

Cost

- ₹ 16,000 per kit (Vat and Freight charges extra)

Impact and benefits

- IBR is an economically important disease of bovines causing abortions, nervous signs and respiratory ailments. An IBR negative herd increases the productivity of the farm thereby, increasing the economic status of the resource poor farmers

Contact

Project Director

Project Directorate on Animal Disease Monitoring and Surveillance (PD-ADMAS)

Indian Council of Agricultural Research

IVRI Campus, Bellary Road, Hebbal, Bengaluru 560024 (Karnataka)

Phone: 080-23412531/23419576, Fax: 080-23415329

E-mail: hricar@gmail.com, director@pdadmas.ernet.in

Protein -G ELISA Kit for Bovine Brucellosis



Salient features

- Highly sensitive
- Nationally validated test for screening of brucellosis in cattle and buffaloes

Performance

- Excellent

Cost

- ₹ 16,000 per kit (Vat and Freight charges extra)

Impact and benefits

- Brucellosis is an important zoonotic disease
- A herd free of *Brucella* has value addition for all its products and by-products
- Increased profits, thereby elevating the social status of the farmer

Contact

Project Director

Project Directorate on Animal Disease Monitoring and Surveillance (PD-ADMAS)

Indian Council of Agricultural Research

IVRI Campus, Bellary Road, Hebbal, Bengalure 560024 (Karnataka)

Phone: 080-23412531/23419576, Fax: 080-23415329

E-mail: hricar@gmail.com, director@pdadmas.ernet.in

Leptospira Staining Kit



Salient features

- Can be used for demonstration of the morphological features, including fine coils with clear background of stained slides
- The characteristics morphology of the organism is easily discernible against clear background of stained slides
- Clouding of the smear and development of artifacts can be avoided
- Over staining and cracks of staining can be avoided by using this kit

Performance

- Well appreciated by the end users

Cost

- ₹ 1,500 per kit (Vat and Freight charges extra)

Impact and benefits

- Leptospirosis is an important zoonotic disease
- A herd free of *Leptospira* has value addition to its products and by-products
- Increases profit thereby elevating the social status of the farmer

Contact

Project Director

Project Directorate on Animal Disease Monitoring and Surveillance (PD-ADMAS)

Indian Council of Agricultural Research

IVRI Campus, Bellary Road, Hebbal, Bangalore 560024 (Karnataka)

Phone: 080-23412531/23419576, Fax: 080-23415329

E-mail: hricar@gmail.com, director@pdadmas.ernet.in

Indirect Elisa kit for Sheep and Goat Brucellosis



Salient feature

- Screening of Brucellosis in sheep and goats

Performance

- Excellent performance

Cost

- ₹ 16,000 per kit (Vat and Freight charges extra)

Impact and benefits

- The kit is being widely preferred throughout the country and has great economic impact on the small ruminant industry

Contact

Project Director

Project Directorate on Animal Disease Monitoring and Surveillance (PD-ADMAS)

Indian Council of Agricultural Research

IVRI Campus, Bellary Road, Hebbal, Bengalure 560024 (Karnataka)

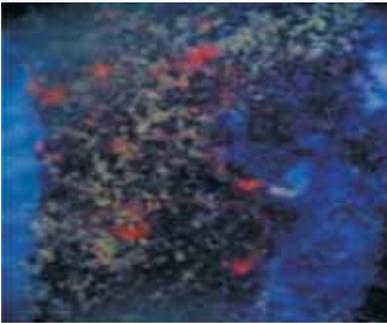
Phone: 080-23412531/23419576, Fax: 080-23415329

E-mail: hricar@gmail.com, director@pdadmas.ernet.in

Early Detection of Amyloid in Biopsy



The microphotograph exhibiting a pink fluorescence in the kidney under fluorescence microscope. FT 40x



The microphotograph exhibiting a pink fluorescence in the spleen under fluorescence microscope. FT 40x

Salient feature

- Biopsy sample sections stained with Congo red and viewed under fluorescent microscope

Performance

- Amyloid produces pink colour auto-fluorescence, without addition of any fluorescein dye

Cost

- Excluding microscope, ₹ 250 per biopsy sample

Impact and benefits

- Early detection of amyloid in animals in laboratory might be helpful for detection in humans also
- Healthy and sound animals may be separated from ill ones at early stage

Contact

Director of Research, WBUAFS
37-68, KB Sarani, Kolkata 700037 (W.B.)
Telefax: 033-25563396

Mastitis Diagnosis and Prophylaxis Kits



Post-milking teat dipping



SLS Paddle test

Salient features

- The department standardized procedures and prepared kits (sodium lauryl sulphate paddle test; SLS paddle test and bromothymol blue card test; BTB card test) for diagnosis of mastitis in dairy animals
- Based on the somatic cell count in milk whereas BTB card test is based on pH of milk

Performance

- These tests are very economical, safe and easy to use, even by the farmer as cow-side tests
 - Validated in dairy animals of Punjab
 - Post-milking teat dipping in iodine-glycerol teat dip could prevent up to 50% of intramammary infections and cured various udder and teat lesions such as chaps, wounds and fissures on teats etc
- Use of dry therapy could eliminate more than 80% of existing intramammary infections, prevented occurrence of emerging mastitis cases and resulted in lowering the somatic cell count of milk post-calving

Cost

- ₹ 1,200 per cow per year

Impact and benefits

- Estimated returns in terms of increased milk production may be 200-300 percent
- Early diagnosis and control of disease enhances the profit of dairy farmers by increased milk production and low culling rate
- Improves the udder health and results in clean milk production, low bacterial and somatic cell count with reduced levels of drug residues, thereby addressing the public health and dairy industry concerns

Contact

Director of Research, GADVASU
Firozpur Road, Ludhiana 141004 (Punjab)
Phone: 0161-2413346-47, Fax: 0161-2553346
E-mail: sarnarinder@gmail.com, sarnarinder11@gmail.com

Cell Culture Attenuated Classical Swine Fever Virus (CSFV) Vaccine

Salient features

- Two prototypes of CSFV vaccine candidates, viz. one from field isolates and the other lapinized strain of CSFV were developed by adaptation and attenuation in cell culture
- Cell culture attenuated vaccine candidates were tested for their safety and efficacy and found to be useful for large scale vaccine production

Performance

- Prototype vaccine virus is having better efficacy, easy to produce and stable for a year in freeze-dried form

Cost

- ₹ 8.00 at commercial level

Impact and benefits

- The vaccine is better than the lapinized vaccine and economically more beneficial because the vaccine can be produced in bulk and the production cost will be less than the existing lapinized vaccine

Contact

Director of Research (Veterinary)
College of Veterinary Science
Assam Agricultural University
Khanapara, Guwahati 781022
Phone: 0361-2364941, Fax: 0361-2310831
E-mail: drapurba2@gmail.com

Indirect ELISA for Detecting Immune Response of Pigs after CSFV Vaccination



50 percent Hampshire sow



50 percent Hampshire boar

Salient features

- An indirect ELISA test developed for screening serum samples of pigs after classical swine fever virus (CSFV) vaccination
- ELISA test is convenient, easy to perform and large number of serum samples can be screened at a time

Performance

- Easy validation

Cost

- ₹ 3.00 at commercial level

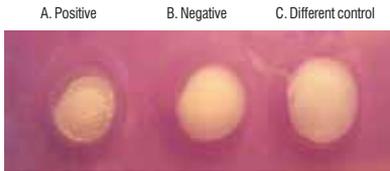
Impact and benefits

- Testing of serum samples of the vaccinated pigs after CSFV vaccination by this test shall be useful to know whether the vaccinated pigs are having the required antibody level or not
- CSFV antigen used in the test is nonpathogenic to pigs and has no adverse effects on human health

Contact

Director of Research (Veterinary)
College of Veterinary Science
Assam Agricultural University
Khanapara, Guwahati 781022
Phone: 0361-2364941, Fax: 0361-2310831
E-mail: drapurba2@gmail.com

Monoclonal Antibody Based Latex Agglutination Test for Field Diagnosis of SURRA



Salient features

- Rapid diagnosis of SURRA (trypanosomiasis) in animals
- Ensures biosafety

Performance

- Results within 30 minutes

Cost

- Under process

Impact and benefits

- Easy to perform and interpret
- Field adaptable
- Better reproducibility
- More sensitive than other tests

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

Synthesis and Applications of Polyacrylamide Gels catalyzed by Silver Nitrate

Salient features

- Polyacrylamide gels widely used for biomolecular analysis
- Silver nitrate can be used as a novel catalyst for polymerization

Performance

- Silver nitrate catalyzed gels are suitable as antigen and drug

Cost

- Under process

Impact and benefits

- Silver nitrate used as a novel catalyst for polymerization
- Gel used as drug delivery device for tropical dressing of infectious wounds

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

Primer Pair to detect Buffalo Tissue

Salient feature

- Novel process for detection of buffalo tissue in raw/ processed and mixed tissue meat samples

Performance

- Detection by highly sensitive PCR assay

Cost

- Under process

Impact and benefits

- Can differentiate between cattle and buffalo tissues as well as other species tissue
- Detection by PCR assay
- Fast detection of buffalo tissue

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

Protein - G based Technology for the Diagnosis of Brucellosis in Buffaloes

Salient feature

- Protein – G from *Staphylococcus* binds IgG of mammals. This property is used in ELISA for diagnosis of brucellosis

Performance

- ELISA is an efficient, reproducible and proven test

Cost

- Under process

Impact and benefits

- Can detect *Brucella* antibodies in serum of buffaloes
- Highly sensitive and specific test

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

Fluorescence Polarization Assay for Diagnosis of Brucellosis in Buffaloes

Salient features

- OIE recommended test for diagnosis of brucellosis
- Can differentiate between infected and vaccinated animal

Performance

- Rapid, cheap and easy to perform

Cost

- Under process

Impact and benefits

- Fluorescence polarization assay is very fast and sensitive
- Based on binding of fluorescent labeled antigen with specific antibody

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

ELISA Kit for Monitoring Hemorrhagic Septicemia (HS) Antibodies in Cattle and Buffalo



Salient features

- Effective monitoring of HS vaccination programme
- Ready to use kit
- Ensures biosafety and chemical safety

Performance

- Capable to test low titred serum samples

Cost

- ₹ 5,000 for 352 samples

Impact and benefits

- Can monitor vaccination programme in field (HS)
- Test both cattle and buffalo serum samples

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
E-mail: research.dr@llruvas.edu.in

Rapid Field Test for Diagnosis of Hemorrhagic Septicemia in Cattle and Buffalo



Salient features

- Field spot test at farmers' door step
- Rapid and cost effective test
- Shelf life more than one year

Performance

- Requires only one drop of blood
- Can be performed by lab staff

Cost

- Under process

Impact and benefits

- Results within 5-10 minutes
- Effective

Name and address of the firm or entrepreneurs to whom the technology has been transferred

- DKS Incorporate Marketing Ltd., Hisar, Haryana
- Vanshikha Milk Agro, Hisar, Haryana

Contact

Director of Research, LLRUVAS
Hisar 125004 (Haryana)
Phone: 01662-284309, Fax: 01662-270164
Email: research.dr@llruvas.edu.in

Rapid Latex Agglutination Test kit for Chicken Anaemia Virus Antibody Detection

Salient features

- Recombinant CAV VP1 protein expressed in prokaryotic system is used to coat the white latex beads and applied in the test kit
- Rapid field based test where the result can be obtained in 2-5 minutes

Performance

- Kit has been validated with the commercial ELISA kit (IDEXX, USA) and has 97.5 % concordance

cost

- ₹ 10 per serum sample but it may be brought down to 5-10 fold lesser at commercial scale

Impact and benefits

- Simple, rapid and field based technology which uses recombinant protein and could be an alternative to the commercial ELISA based test system
- Developed kit is environment friendly and safe to the public

Contact

Director of Research, TANUVAS
Madhavaram Milk Colony, Chennai 600 051
Telefax: 044-25551583
Email: drtanuvas@gmail.com; dr@tanuvas.org.in

An Indirect ELISA Kit for Chicken Anaemia Virus Antibody Detection

Salient features

- Recombinant CAV VP1 protein expressed in prokaryotic system is used to coat the ELISA plates
- Sensitive test where quantification can be done

Performance

- Kit has been validated with the commercial ELISA kit (IDEXX, USA)

cost

- Under process

Impact and benefits

- Highly sensitive technique which uses recombinant protein, is an economical alternative to the commercial ELISA kit which uses whole virus antigen
- Production of recombinant protein is easier at large scale so that the cost of the kit can be brought down heavily
- Developed kit is environmental friendly and safe to public

Contact

Director of Research, TANUVAS
Madhavaram Milk Colony, Chennai 600 051
Telefax: 044-25551583
Email: drtanuv@gmail.com; dr@tanuv.org.in

TANUVAS Haemorrhagic Septicaemia (HS) Bio-film Vaccine for small Ruminants



Salient features

- Homologous inactivated vaccine against HS
- *Pasteurella multocida* serotype A, of sheep origin isolated from the reported HS outbreak in south India
- Formalin inactivated Montanide adjuvanted vaccine

Performance

- Validated at the Institute of Veterinary Preventive Medicine, Ranipet

Cost

- ₹ 2 per dose

Impacts and benefits

- Can be safely given to all small ruminants
- Large doses can be prepared

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044- 25551583
E-mail: dr@tanuvas.org.in

Live Attenuated Infectious Bronchitis Virus Vaccine



Salient features

- Seed virus used to prepare the vaccine is a field virus
- Vaccine prepared by passaging 30 times in 9-11 days old embryonated chicken eggs

Performance

- Vaccine is safe and elicits good immune response to infectious bronchitis

Cost

- ₹ 0.50 per dose

Impacts and benefits

- This is the first IB vaccine prepared by using the field isolate as master seed
- Birds vaccinated with this vaccine would be protected against the homologous field virus which in turn would provide good immune response for better health and production

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583
E-mail: dr@tanuvas.org.in

Inactivated Pentavalent Leptospiral Vaccine

Salient features

- Bovine oil emulsion Vaccine with *australis*, *ballum*, *hardjo*, *hebdomadis* and *pomona*

Performance

- Protective in experimental animals
- Seroconversion detected in target species

Cost

- ₹ 50 lakh (Initial investment)

Impacts and benefits

- Vaccine will prevent abortion, reduce renal carriership and infertility
- Reduces zoonotic and occupational risk of the disease

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583
E-mail: dr@tanuvas.org.in

Novel Vaccine against *Haemonchus contortus*

Salient features

- Vaccine from concealed immunoprotective mid gut proteins from adult worms
- Replaces currently used chemotherapeutic agents (deworming drugs)

Performance

- 70% reduction in worm burden and 80% reduction in egg counts
- Immunoprotective effect lasts for up to six months

Cost

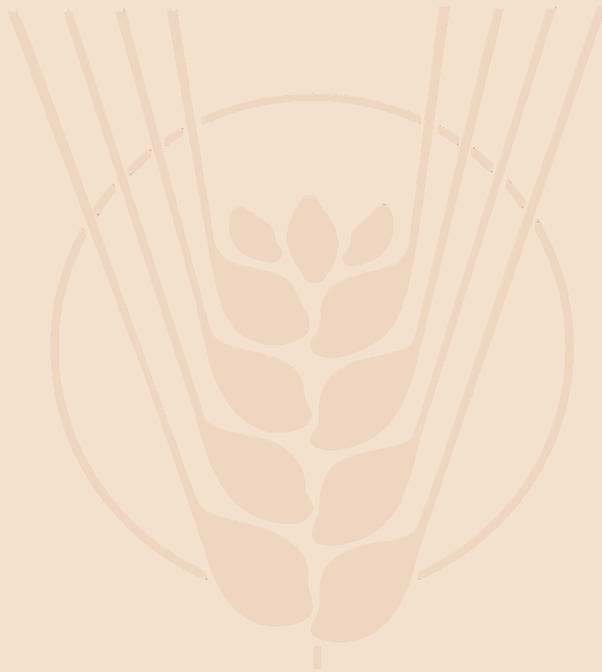
- Generation: ₹ 10 lakh
- Deworming per annum ₹ 100/animal

Impacts and benefits

- Reduces chemical burden in the environment caused due to conventional chemotherapeutic drugs
- Prevents drug residues from accumulating in meat and dairy products and thereby protecting the consumers

Contact

Director of Research
Tamil Nadu Veterinary and Animal Sciences University
Madhavaram Milk Colony Campus
Chennai 600051 (Tamil Nadu)
Telefax: 044-25551583
E-mail: dr@tanuvas.org.in



भारतीय
ICAR

