

Annual Report 2005-2006



राष्ट्रीय अश्व अनुसंधान केन्द्र
National Research Centre on Equines

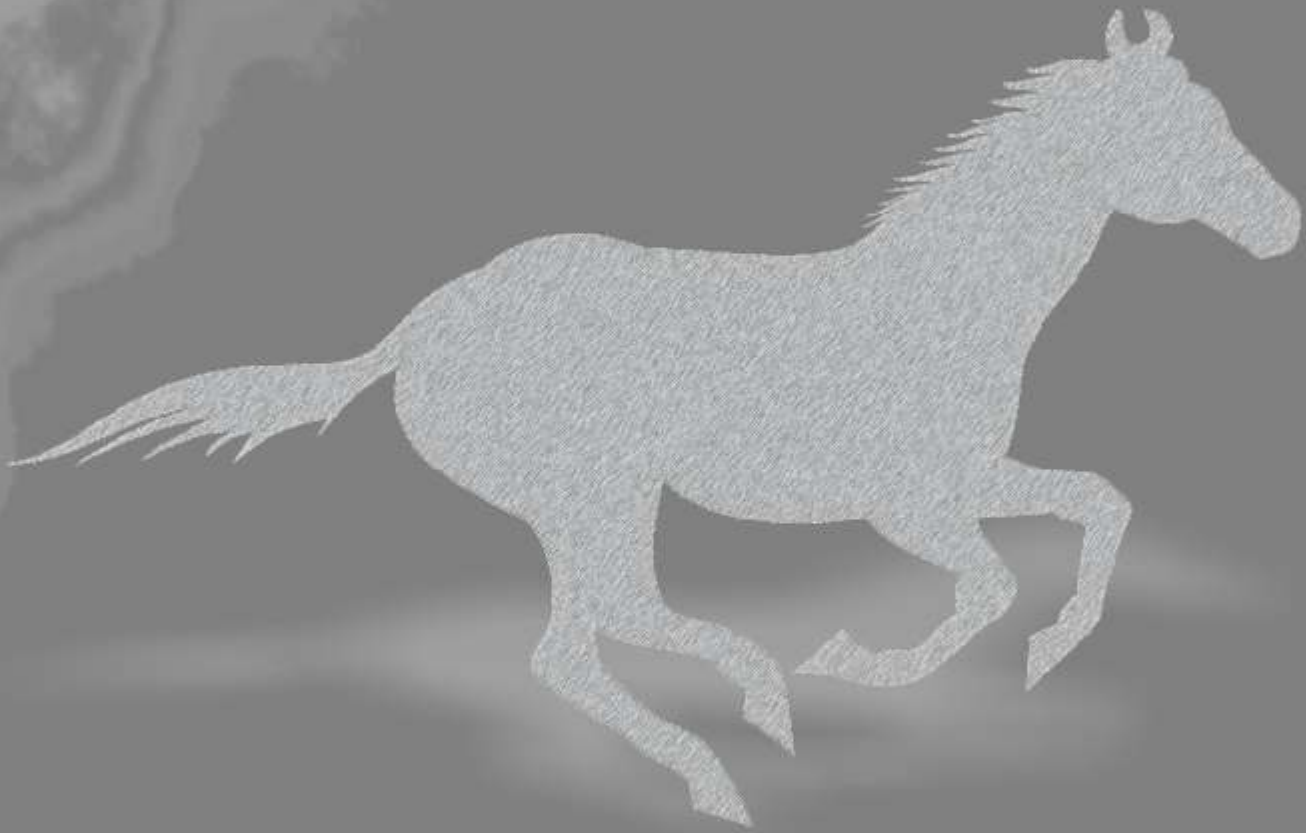




'NRCE should focus towards finding solutions to emerging challenges in animal husbandry'

- Sharad Pawar

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National Research Centre on Equines



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Improving equine health & productivity is the priority of NRCE



Director's Foreword



It is amongst life's greatest ironies that what makes an organization truly enduring, is what lies at its base - the foundation. It is strength of the foundation that determines how far it can grow, and how long it will endure. For National Centre on Equines, this strength emanates from our commitment

to improve health and production of equines. They are the basis of our growth and inspire us along every path. Our efforts have been concerted to understand infectious diseases confronting equines, and from that knowledge to improve the efficiency and sustainability of equine farming. The invaluable research and scientific achievements of the centre since its inception continue to improve health and diminish diseases of equines in India.

It is with much satisfaction that I commend to you the progress we have made towards our commitments to the nation during the year. Continuing the trend, NRCE showed resilience during 2005-06. A patent was filed by the centre for the pregnancy diagnosis kit developed by the centre. The technology for cryopreservation of Marwari stallion semen and artificial insemination has been perfected by the centre and was disseminated in the field to achieve the target of breed conservation. Equine herpes virus type 1 (EHV-1) associated abortions are one of the major concerns in the mares, and the centre has been working on developing indigenous EHV-1 vaccine, which is at efficacy trial stage presently.

In our continued efforts to improve and refine diagnostics for various diseases, we have traversed a distance in developing a recombinant protein based diagnostics for EHV-1 and piroplasmiasis during the year. Similarly, monoclonal antibody based ELISA has been standardized for detection of rotavirus associated diarrhea. The work is underway to evolve a highly sensitive DNA based diagnostic for equine surra, a disease caused by *Trypanosoma evansi*.

The work on active sero-surveillance and disease monitoring to assess the prevalence of equine diseases was further consolidated by covering equine population of 11 different states. Our findings established that equine piroplasmiasis is highly endemic throughout India, with a

sero-prevalence of about 18% during the year.

In our crusade to continually improve the load carrying capacity and propagation of quality mules, cryopreserved semen of true-to-breed Poitou (exotic) jacks was used to artificially inseminate the mares in the field. The attempts were made to use polymorphism in MHC-II genes of equines to characterize Marwari horses. Efforts are under way to identify the equine seminal plasma proteins that influence the fertilizing ability of spermatozoa.

The centre was instrumental in organizing equine welfare activities in different parts of the country. A number of equine health camps and farmer meets were organized during the year to educate farmers about good equine management practices. A round table conference on mule breeding prospects in India and a horse show marked this year's celebration of our Foundation Day on 26th November.

On infrastructure development front, we synergized our efforts to achieve hallmark infrastructural capacity during the year. Due to persistent efforts of the centre, the plans for construction of BSL-3 laboratory and veterinary type cultures facility at the centre could finally cross the drawing-board stage. These facilities are certain to bring NRCE on international map in respect of safe handling of deadly pathogens and for establishing repository of veterinary pathogens. In addition, the construction work of laboratory-cum-office building at Bikaner campus has been completed. The centre is also establishing Agricultural Technology Information Centre at Hisar campus, which will help in dissemination of scientific information to the farmers (end-users) and horse lovers.

On this occasion, I would like to record my sincere thanks to Indian Council of Agricultural Research, New Delhi, particularly Dr. Mangala Rai (DG, ICAR and Secretary-DARE), Dr. V.K. Taneja (DDG, Animal Sciences) and Dr. Lal Krishna (ADG, Animal Health) for their continuous support to this centre to improve equine health and production. The assiduous efforts put up by our scientists to successfully shouldering the various additional responsibilities for smooth functioning of this centre deserve appreciations. I heartily compliment the chairman and members of publication committee for bringing out this afresh looking report in record time.

Dr. S. K. Dwivedi



Executive Summary

During 2005-2006, our efforts were focused towards development of biologicals and diagnostics for improvement in health and production potentials of equines, nation-wide monitoring of equine diseases, popularizing artificial insemination using quality cryopreserved semen and providing advisory & consultancy services to the equine farmers and breeders. Building strong capabilities and state-of-the-art infrastructure for research activities has also been the important agenda of the centre during the year. One of the outcomes of these initiatives has been that the centre developed a kit for detection of pregnancy in equines and submitted a patent application in Patent Office, New Delhi.

Considering the significance of EHV-1 associated abortions in mares, an indigenous EHV-1 vaccine is being developed by the centre. To test the efficacy of the vaccine in experimental ponies, a pilot study was undertaken for comparing the relative pathogenesis of EHV-1 strains isolated from India with particular reference to their ability to induce abortion in pregnant ponies of non-descript breed. The objective of the study was to select a virulent strain of EHV-1 and to establish its pathogenesis. The results of this study established that Raj-98 strain is more virulent than Hisar-90-7 strain, inducing abortion or foal mortality in 2 out of 4 pregnant ponies. Thus, Raj-98 strain of EHV-1 could be used as challenge virus in EHV-1 vaccine trial being undertaken at this centre.

The centre is continuously working towards development and refinement of diagnostics for major equine diseases. During the year, efforts were made to develop recombinant protein-based diagnostic for differentiation of EHV-1 and EHV-4 viruses which are very closely related

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in organized farms was determined using a monoclonal antibody-based sandwich ELISA developed by the centre. Stool samples (n=137) were collected during three foaling seasons from diarrhoeic foals in organized farms. Out of 137 samples tested, 46 (33.58%) were positive for rotavirus by ELISA. This indicates that rotavirus-associated diarrhoea is a major problem in foals below 2 months of age.

Seromonitoring of important equine diseases is being undertaken with special emphasis on indigenous equines to study the magnitude of existing and emerging equine diseases in different states of the country. During the year, active sero-surveillance was conducted in 11 States/ UTs of India, namely Gujarat, Rajasthan, Haryana, Himachal Pradesh, Punjab, Chandigarh, Delhi, Uttaranchal, Uttar Pradesh, Madhya Pradesh and Manipur. EHV-1 antibodies were detected in 52 of the 1138 (4.5 %) samples, while *Babesia equi* sero-prevalence was detected in 168 of the 955 (17.7 %) serum samples tested. None of the samples tested for equine infectious anemia, African horse sickness, glanders, brucellosis and *Salmonella Abortus equi* was detected positive.

Two plant extracts, known to improve stamina and vigour in human were evaluated for their potential use to improve the performance of animals. The ethanol extracts were evaluated for their effect on exercise performance in rats. It was observed that one of the plant extract (SKD-2) had revitalizing effect on rats. It increased the swimming score in all three doses tested. During the 6 weeks observation period, none of the experimental rats exhibited any adverse effects indicating that it could be further exploited to be used as an ingredient of nutraceuticals to improve performance in equines.

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Major histocompatibility complex (MHC) genes code primarily for cell surface glycoproteins that play key role in the regulation of immune response in the animals. The MHC provides a major genetic component of resistance/susceptibility to infectious or autoimmune diseases and regulates the basic immune response in higher animals. In horses, MHC is localized to chromosome 20q14-q22. There are three functional and expressed MHC class II loci (DP, DQ, DR) and each locus contains class II A and B genes. The polymorphism in the MHC class II gene in 24 Marwari horses was evaluated by RFLP analysis. ELA-DRB3 locus in Marwari horses was homozygous on digestion with *Hinfl*, showing two fragments of 241 and 68 bp. On digestion with *RsaI*, the ELA-DRB3 fragment was found to be polymorphic, showing fragments of 238 & 71 and 190 & 119 bp. Similarly, *HaeIII* resolved the fragments of 221 & 88 and 170 & 139 bp. The RFLP results revealed that using above restriction enzymes, the animals could be grouped into different classes.

Seminal plasma contains many proteins which may be used as a diagnostic tool/ marker to select stallions of high breeding value. A study was initiated to evaluate the effect of gelatin and heparin binding fertility related proteins of stallion seminal plasma on *in vitro* fertilizing potential of spermatozoa. The heparin and gelatin binding proteins were isolated from the stallion seminal plasma. Five heparin binding proteins (17- 83 kDa) and four gelatin binding proteins (18-83 kDa) were identified. The effect of these proteins on fertilizing potential is being evaluated.

During the period, semen of three Poitou jacks was collected, examined and preserved for doing artificial insemination in the farm as well as in field

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animals. A total of 700 semen doses of Poitou Jacks were preserved. Four mares at equine production campus, Bikaner farm were inseminated with frozen semen of Poitou jacks and all were conceived. Thirty five mares in the field were inseminated with frozen semen of exotic jacks (23 in Haryana and 12 in U.P.) for mule production and on follow up, 12 were confirmed pregnant till date.

The scientists of the centre published 32 original research articles in international and national journals during 2005-06. Scientists also participated in 15 different conferences and symposia and presented 19 research papers. The scientists of the centre delivered 18 expert lectures and organized practical demonstrations for advanced training/refresher courses organized by various universities and national institutes. Two scientists of the centre were deputed to obtain international trainings in their respective areas of specialization from Russia and Japan. In addition, four scientists participated in national training programmes.

A research paper published by NRCE scientists in the Indian Journal of Veterinary Pathology was selected for Dr. G. M. Sharma award by the Indian Association of Veterinary Pathologists. Sh. R.A. Parashar, AFAO of NRCE won gold medal in chess event during the North Zone Sports Meet held at National Dairy Research Institute, Karnal from 7-10 March 2006.

Infrastructure development was given the high priority during 2005-06. NRCE has signed a memorandum of understanding with Hospital Services Consultancy Corporation (an enterprise of Ministry of Health and Family Welfare, Govt. of India) for developing a BSL-III facility at Hisar campus. With the establishment of BSL-III facility, this centre is likely to get international recognition for working on infectious animal diseases as World Organization for Animal Health (OIE)

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Reference Laboratory. The construction work for the laboratory-cum-office building at our Bikaner campus has been completed and work for the second wing of laboratory-cum-administration building at Hisar campus is nearing completion. In addition, the work on development of National Centre for Veterinary Type Cultures and construction of Agricultural Technology Information Centre (ATIC) at its Hisar campus has been initiated.

The centre took equine welfare activities in different parts of the country by organizing equine health camps and farmer meets to enlighten the equine owners on various aspects of disease control and management. In addition to the treatment of major equine ailments in these camps, deworming and tetanus vaccination was done in equines. Feedback from farmers was obtained for further research and development in equine health and production. Foundation Day of the centre was celebrated with great zeal and enthusiasm on 26th November 2005. On this occasion, a horse show was organized in which indigenous horses from various states participated in different equestrian events. A Round Table Conference on "Prospects of wide scale mule breeding in India and precautions thereof" was also organized to mark the Foundation Day. Various experts from Remount Veterinary Corps (RVC) and other Army units, Equestrian Federation of India (EFI) and office bearers of Indigenous Horse Society of India participated in this conference.

The centre also offers consultancy and diagnostic services for important infectious diseases of equines. Under this programme, 4757 equine serum samples were tested for equine infectious anemia in addition to other diseases. The centre generated revenue of Rs. 29.92 lac from its internal sources, mainly through the contractual diagnostic services.

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Introduction

Since the dawn of human civilization, equines have fascinated the mankind for their sheer charm, grace, sensitivity and endurance. Horses since domestication have been used in wars, agriculture, transportation of man and material. Indian history is full of heroic deeds of the likes of the famous horses as Chetak of Maharana Pratap, Suryavanshi of Ashwamegha Yagya and horse of Luxmi Bai, the Rani of Jhansi and many more. India has 1.77 million equines comprising 0.70 million horses and ponies, 0.29 million mules and 0.78 million donkeys. Even with mechanization of civilization, equines still have great relevance, especially for poor farmers and for hilly and difficult terrains, where other means of transport are inaccessible. These animals provide livelihood to the landless, small and marginal farmers and other section of our rural and semi-urban society through draught and transport. Only 2% population of equines is kept in organized sectors and provides services to the army, police, border security force, racing industry and sports. In order to improve the

Mandate of NRCE

- To undertake research on health and production management in equines;
- To develop diagnostics/biologicals for major equine diseases;
- To act as national referral facilities for diagnosis, surveillance and monitoring of equine diseases;
- To provide diagnostic, advisory and consultancy services.

health, performance and production potential of equines in India, the Indian Council of Agricultural Research established National Research Centre on Equines (NRCE) on 26th November 1985 at Hisar (Haryana).

The main campus of NRCE is located at Hisar (Haryana) and has state-of-the art laboratories for undertaking research in areas of equine virology, bacteriology, parasitology, immunology, pathology,

medicine, biochemistry, biotechnology. In addition, NRCE has a sub-campus at Bikaner (Rajasthan) where new building has come up this year with research laboratories for genetics and breeding, reproduction, physiology and nutrition to undertake research on equine production. National Centre for Veterinary type Cultures has also been established in the year 2005 at NRCE for collection and typing of microbes of veterinary importance. Research activities are carried out by a team of 21 dedicated scientists under the dynamic leadership of Dr. S.K. Dwivedi, Director NRCE. The research activities are supported by centralized services like animal and agriculture farms, experimental animal facility, library and internet facility. The centre has well-maintained herd of Marwari & Kathiwari horses and exotic donkeys at Bikaner. Efforts are being made to create facilities for various equestrian events for the benefit of equine lovers and those interested in equine sports. In addition, the centre is in the process of development of Biosafety Level-III laboratory.

Major achievements of the centre

The centre has made the following salient achievements in a short span since its inception:

- Vaccines for the control of equine diseases: The centre has developed equine influenza vaccine using indigenous isolate (A/Equi-2/Ludhiana/87). Improved bacterin and outer membrane protein-based vaccines have been developed for *Salmonella Abortus equi*. Equine herpesvirus-1 vaccine is under experimental trial in equines.
- Disease diagnosis: The centre has been recognized as national referral centre for diagnosis of important equine infectious diseases by Department of Animal Husbandry, Dairying & Fishery, Ministry of Agriculture (Government of India). The centre has developed diagnostic kits for equine herpes virus-1 (HERP kit) and *Babesia equi* (COFEB kit) infections. In addition, the





centre has developed various tests for diagnosis of equine diseases including equine influenza, EHV-1 & EHV-4, equine rotavirus diarrhoea, equine infectious anaemia, equine piroplasmosis, trypanosomosis, equine viral arteritis, Japanese encephalitis, leptospirosis, mycoplasmosis, streptococci, etc.

- ❑ Equine disease surveillance: NRCE is involved in nation-wide disease monitoring and surveillance of important equine diseases particularly those that are included in list "A" and "B" of *Office International des Epizooties* (OIE). The database generated on prevalence of equine diseases from different geographical locations is helping in their effective management. For instance, the Centre contributed significantly in the control of equine influenza outbreak of 1987 involving 83000 equines. Effective influenza vaccine was developed subsequent to this outbreak. The equine babesiosis and equine herpes virus infection is currently endemic in our country and reported by sero-surveillance in 16 different states of the country. Therefore, development of control strategies against these diseases is the main priority of the centre. Control of EIA in India was done by timely diagnosis and adopting package of practices formulated by NRCE. The disease is not reported from India since 1997.
- ❑ Immunobiologicals: Monoclonal antibodies have been developed for diagnosis and characterization of equine herpes, equine influenza and equine rotaviruses. Monoclonals have also been developed against equine chorionic gonadotropin hormone.
- ❑ Molecular characterization of pathogens: DNA finger-printing of EHV-1 virus and sequencing of antigenically important genes of equine influenza virus was done to identify different strains

prevalent in equines of India.

- ❑ Artificial insemination: The technique of artificial insemination using frozen semen for production of superior quality Marwari horses, mules and donkeys has been perfected. The pure germplasm of endangered indigenous breeds of horses is being conserved using this technology.
- ❑ Indigenous breed characterization: Phenotypic and molecular characterization of indigenous breeds of horses has indicated the existence of genetic variability within Marwari breeds and molecular markers for breed identification have been established.
- ❑ Baseline data has been generated on some of the important haematological, physiological and biochemical indices of Kathiawari horses as well as local donkeys.
- ❑ Early pregnancy diagnosis: Pregnancy diagnosis between days 14 and 18 post-insemination has been achieved using ultrasonography in donkey and horse mares. An ELISA for pregnancy diagnosis in mares using serum samples has been developed.
- ❑ Donkey fibre has been used to produce carpets by mixing with sheep fibres in the ratio of 40:60.

Patents

- ❑ Patent has been granted by Government of India entitled "A method for preparation of a diagnostic kit useful for forecasting Equine Herpes Virus-1 disease".
- ❑ A patent has been filed for "Complement fixation test (CFT) based diagnostic COFEB-Kit developed for the detection of *Babesia equi* antibodies".
- ❑ The centre has filed a patent for "A kit for detection of pregnancy in equines and assay thereof".

Services

NRCE provides following services to the farmers and equine breeders:

- ❑ Disease diagnostic services for various



infectious and non-infectious equine diseases to equine owners, breeders, state animal husbandry departments, police and army horses.

- ❑ Artificial insemination to augment the production of superior quality Marwari horses, mules and donkeys.
- ❑ Quality jacks and jennies are supplied to various states, breeding societies and farmers, for production of superior quality mules and donkeys.
- ❑ Health certification for movement of equines within and outside the country. This facility has helped in promotion of export of horses.
- ❑ Assessment and transfer of technology using the latest know-how of information technology is also given due importance to extend the technologies to the end-users. The scientific and technical staff provides clinical and diagnostic (including pregnancy diagnosis) services and consultancy to the farmers on demand in the areas of equine health and production. Farmers are imparted trainings and supplied education materials for equine management, production and health.

Thrust Areas

- ❑ Surveillance and monitoring of important equine diseases including emerging and

existing diseases with special emphasis on foal mortality and production losses.

- ❑ Development of effective and preferably field-based diagnostics and potent immunoprophylactics against major equine diseases threatening equine population in India.
- ❑ Development of comparatively effective plant-based products for management of important equine diseases and to enhance performance in equines.
- ❑ To provide diagnostic and consultancy services for beneficiaries particularly equine farmers and breeders.
- ❑ Application of artificial insemination techniques in horse production using frozen semen of true to breed indigenous stallions for the conservation of threatening species in India.
- ❑ Breed characterization and *in situ* conservation of various indigenous breeds of horses.
- ❑ Exploiting importance of equine draught power for economically weaker section of the society.
- ❑ Achieving the status of 'OIE International referral laboratory' for diagnosis of equine rhinopneumonitis and piroplasmosis.

Staff Position

Name of the post	Number of posts		
	Sanctioned	Filled	Vacant
Director	1	1	-
Scientific for NRCE	25	20	5
Scientific for VTC	10	1	9
Technical	23	22	1
Administrative	11	11	-
Supporting	22	21	1
Total	92	76	16





Summary of Expenditure

Expenditure	2004-05	2005-06
NON-PLAN		
1. Establishment charges including LSP/PF, wages, OTA	131.63	166.78
2. Traveling allowances	2.40	2.91
3. Other charges including equipments	85.21	69.87
4. Works	6.27	21.05
<i>Non-Plan Total</i>	<i>225.51</i>	<i>260.61</i>
PLAN		
1. Establishment charges including LSP/PF, wages, OTA	0.63	0.62
2. Traveling allowances & HRD	0.67	3.00
3. Other charges including equipments	47.81	76.28
4. Works	150.84	192.19
<i>Total Plan Expenditure for NRCE</i>	<i>199.95</i>	<i>271.92</i>
<i>Total Plan Expenditure for VTC</i>	<i>-</i>	<i>68.79</i>
Total Expenditure (Plan and Non-Plan)	425.46	601.32

Summary of Revenue Generation

Revenue Source	2004-05	2005-06
1. Sale of Farm Produce & auction of dry trees	4400	-
2. Sale of Livestock	200202	-
3. Sale of Publication and advertisements	2600	1560
4. License Fee	60745	58059
5. Interest on loans and advances	77142	156829
6. Interest on short term deposits	94289	216914
7. Leave salary & pension contribution	136155	-
8. Income from internal resource generation	1490150	1601350
9. Receipt from services	6600	3300
10. Other misc. receipts	272202	953847
Total Revenue	2344485	2991859



Research Achievements

Assessment of abortigenic potential of equine herpes virus-1 strains in indigenous mares

A pilot study was undertaken for comparing the relative pathogenesis of EHV-1 strains isolated from India with particular reference to their ability to induce abortion in pregnant ponies of non-descript breed. The objective of the study was to select a virulent strain of EHV-1 and to establish its pathogenesis with particular reference to inducing abortion. The virulent strain so selected would be used as experimental challenge virus in EHV-1 vaccine trial to assess the efficacy of indigenous vaccine developed by the centre in reducing EHV-1 associated abortions.

Eight EHV-1 negative pregnant ponies (between 5 and 7 months of gestation) were procured and divided into three groups. Group I ponies (n=3) were used for infection with Hisar-90-7 EHV-1 strain. Group II ponies (n=4) were infected with Raj-98 strain grown in EEL cells. One pony served as un-infected control. The challenge virus was inoculated by intranasal instillation. After virus challenge, these ponies were monitored closely for development of clinical infection, virus shedding, cell-associated viremia, pre-challenge and post-challenge virus neutralizing antibody response

and pathological lesions.

No clinical manifestations were detectable in group I ponies after inoculation of Hisar-90-7 strain, except slight nasal discharge up to day 3 post-infection. In group II ponies inoculated with Raj-98 EHV-1 strain, severe nasal discharge up to 5 days was seen (Table 1). Profuse vaginal discharge was also seen on day 30 post-infection in one pony (No 8) that gave birth to a weak foal that was unable to suckle milk of dam and had respiratory distress that died within 24 h of its birth. Pony no 7 aborted at 9 month of gestation, with placenta expelled along with the foetus (Fig).



An aborted foetus (wrapped in membranes) consequent to EHV-1 Raj-98 strain infection

Clinical manifestations on infection with EHV-1 strains in pregnant ponies

EHV-1 strain	Pony No	Rise in Temp	Nasal discharge (on days)	Vaginal discharge	Status of pregnancy (foal health)
Hisar-90-7 (Group I)	2	-	+ (2-3)	+	Normal foaling (healthy, live)
	3	-	+ (2-3)	-	Normal foaling (healthy, live)
	4	-	+ (3)	-	Normal foaling (healthy, live)
Raj-98 (Group II)	1	+	+ (2-5)	+	Normal foaling (healthy, live)
	6	+	+ (2-5)	+	Normal foaling (healthy, live)
	7	+	+ (2-5)	+	Abortion at 9 month gestation
	8	+	+ (2-5)	+	Weak foal born (died within 24 h)



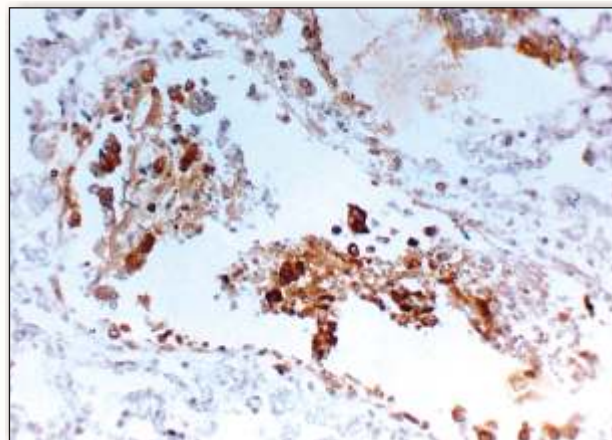


Following infection, nasal swabs were collected from all ponies daily for 10 days for virus isolation in RK13 cells. EHV-1 could be isolated till day 3-4 post-infection from nasal swabs of ponies infected with Hisar-90-7 strain while virus shedding in ponies infected with Raj-98 was observed up to 6 days post-infection.

All the ponies of group 1 and 2 that were negative for antibodies to EHV-1 before infection, seroconverted and virus neutralizing EHV-1 antibody titers were more than $1.2 \log_{10}$ at day 21 post-infection and antibody titers persisted above this level till the end of experiment. Serum antibody titre in the aborted dam and the dam whose foal died was higher ($1.8 \log_{10}$ at day 21 post-infection) than in dams who did not abort.

Virus could also be isolated/ demonstrated from the foetal/ dead foal tissues (i.e. lung, liver, spleen) of group 2 ponies infected with Raj-98 strain. Tissues of aborted foetus and dead foal were subjected gross examination, histopathology and immunostaining (IPT). IPT stained section of liver tissue of aborted foetus showed EHV-1 antigen around focal area of necrosis and scattered spots

of EHV-1 antigen were seen in section of lung tissue of dead foal in desquamated bronchial epithelium of lung tissue (Fig). Both virological and pathological findings confirmed that Raj-98 strains caused abortion/ foal mortality.



IPT stained section of lung tissue of aborted foetus showing EHV-1 antigen in desquamated bronchial epithelium

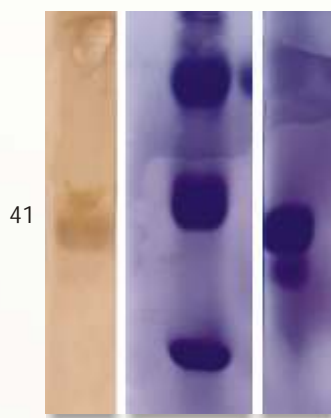
The results of this study established that Raj-98 strain is more virulent than Hisar-90-7 strain, inducing abortion or foal mortality in 2 out of 4 pregnant ponies. Thus, Raj-98 strain of EHV-1 could be used as challenge virus in EHV-1 vaccine trial being undertaken at this centre.

(B. K. Singh, Nitin Virmani and B.R. Gulati)

Cloning and expression of glycoprotein G for diagnosis of EHV-1 and EHV-4 infection

A study was taken up with the objective to develop serological assay which could help in distinguishing between the EHV-1 and EHV-4 viruses, which are very closely related antigenically. For this, recombinant protein were to be developed by cloning glycoprotein G gene from variable regions of EHV-1 and EHV-4. A fragment of glycoprotein G qualifying to our requirements was selected for this and primers were designed with suitable restriction sites to get the correct ligation and orientation. For cloning the desired fragments, EHV-1 (Strain Hisar-90-7)

and EHV-4 (strain Th-20p) were used as template for amplification of the fragment to be inserted into the expression vector pGEX4T-1. The recombinant plasmids pGEX4T-1gG1 and pGEX4T-1gG4 thus constructed were transformed into competent DH5 α *E.coli* cells. The cells containing the recombinant plasmid constructs were screened by X-gal method and PCR was done on the selected clones to verify the presence of desired insert. *E.coli* cells containing correct recombinant plasmid were identified and glutathione S-transferase fusion protein was



Recombinantly expressed
41kDa EHV-1 gG protein

expressed. Briefly, culture of identified clones was grown in LB broth and protein expression was induced by IPTG. Bacteria were lysed and GST fusion protein was purified using Glutathione Sepharose 4B beads. SDS - PAGE analysis of the expressed protein pGEX4T-1gG1 protein was run on 15% SDS PAGE and stained with

Coomassie brilliant blue. It showed an approximate size of 41kDa. Immunoblotting using known positive EHV-1 serum confirmed that this protein was EHV-1 specific (Fig).

Fifty four samples from two organized farms, four samples from the field cases and two samples from abortion were collected and analyzed by multiplex PCR designed for detection of EHV-1 and EHV-4. Three samples which came positive for EHV-1 are being processed for virus isolation.

(Nitin Virmani, A.S. Panisup, B. K. Singh and B.R. Gulati)

Prevalence and characterization of equine rotavirus from diarrhoeic foals

Rotavirus associated diarrhoea is one of the leading causes of mortality and morbidity in foals below two months of age world over. Most of the foals have at least one episode of diarrhoea before they are 6 months old, which may cause loss of condition or even be fatal. A sandwich

ELISA was developed for detection of rotavirus directly from stool samples, employing monoclonal antibody raised against group-specific antigen of equine rotavirus. The prevalence of equine rotavirus in diarrhoeic foals in organized farms was determined using this ELISA.

Stool samples (n=137) were collected during three foaling seasons from diarrhoeic foals below 2 months of age from organized farms.

Out of 137 samples tested, 46 (33.58%) were positive for rotavirus by ELISA (Table).

The samples positive for rotavirus by sandwich

Prevalence of equine rotavirus in an organized farm			
Year	Number of foal stool samples		
	Tested	Positive	% Positive
2005	38	14	36.84
2004	72	28	38.88
2003	27	4	14.81
Total	137	46	33.58

ELISA were passaged in MA104 cell lines for isolation of equine rotaviruses. A total of 26 isolates were made during this study. RNA profiles

of the equine rotaviruses were compared by RNA-PAGE and at least 6-7 different electropherotypes were observed indicating the prevalence of different rotavirus strains in outbreaks of diarrhoea in foals. Initial sequencing results of representative electropherotypes indicated the predominance of G3 type among diarrhoeic foals.

(Baldev R. Gulati and B.K. Singh)





Isolation of *Rhodococcus equi* from foals with respiratory infection

Rhodococcus equi is one of the major causes of foal pneumonia worldwide. In order to understand the extent of problem in indigenous foals, 47 samples (nasal and faecal swabs, lung tissue from autopsy) collected from different parts of Haryana and Rajasthan were tested for presence of *Rhodococcus equi*. In all, 4 isolates of *Rhodococcus equi* were obtained from foals with

respiratory problems. The *in vitro* antibiotic sensitivity testing of the isolates indicated that *R. equi* isolates were sensitive to chloramphenicol, erythromycin, ciprofloxacin, neomycin and rifampicin.

(S. K. Khurana, Praveen Malik, B.R. Singh and Nitin Virmani)

Seromonitoring of important equine diseases

During the year 2005-2006, equine disease sero-surveillance was conducted in equines of various States/UTs of India, namely Maharashtra, Rajasthan, Chandigarh, Delhi, Gujarat, Haryana, Himachal Pradesh, Punjab, Tamil Nadu, Uttar Pradesh, Karnataka, Andhra Pradesh, Uttaranchal, Manipur, Madhya Pradesh and West Bengal. A total of 1142 serum samples were collected from the indigenous equines of these states for detection of antibodies against various infectious diseases. None of the samples tested was positive for antibodies to African horse sickness (n=1142), equine influenza (n=1140), equine viral arteritis (n=120), glanders (n=1142), brucellosis (n=669) and *Salmonella Abortusequi* (n=1142).

Out of 1138 sera tested for antibodies against EHV-1, 52 (4.5 %) were positive for EHV-1 while 168 out of 955 equine serum samples (17.7%) were positive for *Babesia equi* on testing by COFEB kit.

During the year, 4757 serum samples from thoroughbred as well as indigenous equines were examined for equine infectious anemia by Coggins test and none of these

samples was found positive for EIA. In our continuous surveillance and monitoring of EIA, not

Seroprevalence of equine diseases in various states during 2005-06

State	Number tested (+)	
	EHV-1	<i>B. equi</i>
Rajasthan	180 (5)	180 (42)
Haryana	60 (3)	62 (8)
Delhi	72 (6)	44 (20)
Manipur	40 (2)	40 (6)
U.P	119 (6)	67 (12)
M.P	206 (2)	206 (40)
Gujarat	70	70 (11)
Uttaranchal	232 (23)	232 (28)
Himachal	54 (2)	54 (1)
Chandigarh	41 (1)	-
Punjab	64 (2)	-
Total	1138 (52)	955 (168)

a single equine has been detected positive for EIA since 1998-99.

(S.K. Dwivedi and all scientists of equine health unit)

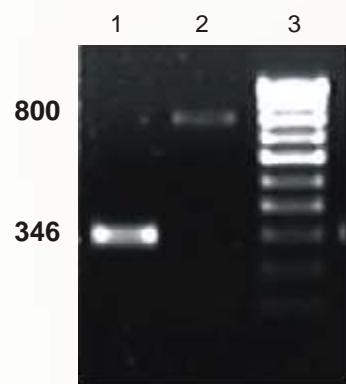


Development of sensitive and specific diagnostics for equine piroplasmosis

Equine babesiosis is recognized as a serious problem of major economic importance as the affected animals manifest decreased working capacity, loss of appetite, etc. This parasite is distributed worldwide including Asian continent; Europe, Africa, South America. Equine piroplasmosis caused by *Babesia equi* is more pathogenic and widespread in distribution than that by *Babesia caballi*. In *B. equi*, two kinds of merozoite surface proteins, EMA-1 (34 kDa) and EMA-2 (30 kDa), have been identified as most immunodominant antigens and mutually expressed on the surface of the merozoites. In the present study, we expressed a truncated EMA-2 gene in the *EcoR1* cloning site of the pGEX-4T-1 expression vector. The purified recombinant proteins were harvested and ELISA was standardized for detection of *B. equi* specific antibodies in the equine serum samples. The assay was found specific and no cross-reaction was observed with *B. caballi*,

Trypanosoma evansi antibodies.

PCR is more efficient in detecting the latent infection as it determines the presence/absence of the parasitic DNA material. We designed the primers, which amplified 346 bp and 800 bp fragments specific to EMA-1 and EMA-2 genes, respectively (Fig).



EMA-1 (lane 2) and EMA-2 (lane 1) gene fragments of *Babesia equi* amplified by PCR

The work on determining the sensitivity and specificity of these assays and their validation is under progress.

(Sanjay Kumar, Rajender Kumar, S. Dey, A. K. Gupta, S.C. Yadav and S. K. Dwivedi)

Sequencing of Ro Tat 1.2 gene of Indian strain of *Trypanosoma evansi*

Diagnosis of surra in equines is difficult when there is low level of parasitemia due to low sensitivity of routinely used parasitological tests. Therefore, a PCR was standardized for sensitive detection of surra, using primers designed to amplify the gene of surface glycoprotein Ro Tat 1.2. A gene fragments (761 bp) of Ro Tat 1.2 gene from the Indian strain of *Trypanosoma*

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ACGGAATTTGGCCTAATCGAAGGCAAGTTGACGACCAGCCAGAACGAGCAGAATTTTCAATAAT
TTGGACAAGGA AAAGCACACCACACTGATTATTAGGCCGAACACACGCAGCACTAATCAATCTG
AAGAGGTTGGAAATGGGACAAGTACGGAGCTTACACAGCAAGAAACCTTACACTTTAGCAGAGG
ACGGCCCGCAACGGCAACCTTAAAGCTTGAGCAATGGCCAGCAACAAAGCAACAAAGAAAGATAAC
AACAACACAACCAACCAACCGCCATAACCGAAATAATTTTGGCAAGGACAAGCTTAATAATCA
AGGAGTTCTGGAACAATTTAAAAAAGAGGACATAGAAGCAACAGAAAGATGACACAACCAAGA
AACTAGCCCTACAACCGTCAACTCTGACAAAGTGCACACAGGCATGGAGTTTACACAGGCC
CAGCCGTTACACAATAGAAAAGTTAAAAAAGAAGTAGATAAGTTGGAAGCAGAATCAGATGG
AAAACAACAAGCAAGCACAAGTTACTGAACAAACGAAACTTCCGAAAGAAAGAGGTAG
ATAAATCGGAGAAAGCCATCGAAGTTGTCGAAGCAATGCTGCTAAAAGTGGACATTTGGACAA
GGATAGGCCAAAAAATTAGAGAAAAGCAGATGTTAAACAAACACCACAGGAAGCAATTC
TCTTCTCAICAAAGCTTCCCTCTTTTCTTGGGTTTGTCTGAATTCGTA
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Sequence of fragment of Ro Tat 1.2 gene of *T evansi*

evansi was amplified in the PCR. The amplified DNA fragment was purified, cloned





and sequenced (Fig). The sequence analysis and comparison by BLAST search showed a very high similarity (> 90%) with the sequences of Ro Tat 1.2 gene of other known strain of the

Trypanosomes. The work on expression of this gene product is under progress.

(Rajender Kumar, Sanjay Kumar, S. Dey, S.C. Yadav and S. K. Dwivedi)

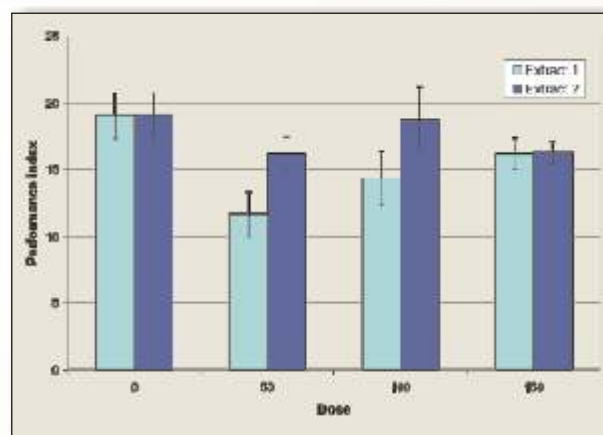
Studies on revitalizing effects of some plant extracts on exercise performance

The performance in equine depends on some basic intrinsic mechanisms like normal cardiovascular, respiratory and liver functions; adrenocortical homeostasis, thermoregulatory mechanism and adaptogenic activity during energy demand. It is adversely affected by defects in detoxifying mechanism of the body, immune functions and ageing process. These processes are not satisfactorily addressed in the modern allopathic system of medicine but there is a scope to explore the use of medicinal plants to reduce stress, restoration of organ function, stamina and endurance.

In this endeavour, two plants, known to improve stamina and vigour in human were evaluated for their potential utility as revitalizers. The aerial part of these plants was washed thoroughly with distilled water and air dried in shed. The dried plant material were grinded to powder and subjected to serial extraction using solvent of different polarity i.e. ethanol, ethanol:water (1:1), water. The extracts were evaluated for their revitalizing potential in rats. These extracts were given orally @ 50, 100 and 150 µg/kg body weight and their effects were evaluated

on exercise performance. The revitalizing effect was calculated on the basis of concentration of malondialdehyde (nmol/ml), glutathione (mg/dl) and packed cell volume (%) of blood.

The details of the results are being presented in



Effect of plant extracts on performance in rat

Fig. It was observed that one of the plant extracts (SKD-2) had revitalizing effect on rats. It increased the swimming score in all three doses tested. During the 6 weeks observation period, none of the experimental rats exhibited any adverse effects, indicating that it could be further exploited to be used as an ingredient of nutraceuticals to improve performance in equines.

(S. Dey and S.K. Dwivedi)



Parentage testing in horses of Indian origin

Parentage verification in horses is important to confirm their ancestry records. Most of the horse breed registries have adopted parentage testing programs worldwide to assure horse pedigree integrity. Therefore, a study was initiated to verify horse parentage using microsatellite based DNA typing. This technique appears to be more effective and efficient for parentage verification than the traditional blood and protein typing.

Biological samples from ninety one horses of known parentage belonging to Marwari,

Kathiawari, Spiti and Thoroughbred were collected and DNA was isolated. Amplifications of AHT4, HMS6, HMS7, HTG4, HTG10 and ASB2 microsatellite loci were carried out by PCR. The amplicons were analyzed by agarose and denaturing polyacrylamide gel electrophoresis. Further amplification at 5 more microsatellite loci is being done before statistical analysis of the data to confirm the parentage. This study will help in generating valuable information for determining the parentage of indigenous horses.

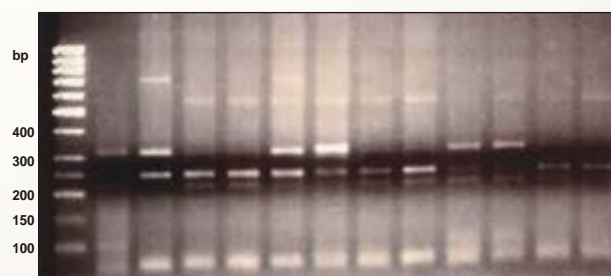
(Mamta Chauhan and A.K. Gupta)

RFLP-based genotyping of MHC class II genes in Marwari horses

Major histocompatibility complex (MHC) genes that code primarily for cell surface glycoprotein play a key role in the regulation of immune response in the animals. The MHC provides a major genetic component of resistance/susceptibility to infectious or autoimmune diseases and regulates the basic immune response in higher animals. In horses, MHC is localized to chromosome 20q14-q22. There are three functional and expressed MHC class II loci (DP, DQ, DR) and each locus contains class II A and B genes.

In this study, the DNA from the blood samples of 24 Marwari horses was isolated and the MHC class II DR B gene was amplified using specific set of primers (LA31, LA32). Gene fragment of

desired size (309 bp) was successfully amplified. The RFLP analysis of ELA-DRB3 PCR-amplified locus was carried out by digestion with restriction enzyme *HinfI*, *RsaI*, *HaeIII*. Digestion



MHC-DRB3 gene of Marwari horses on digestion with *HinfI*

with *HinfI* resolved homozygous status in 10 out of 24 Marwari horses showing two fragments of 241 and 68 bp (Fig.). In remaining 14 heterozygous Marwari horses, three bands, viz, 309, 241 and 68 bp were resolved. On





digestion with *RsaI*, the ELA-DRB3 fragment was found to be polymorphic, showing fragments of 238 & 71 and 190 & 119 bp. Similarly, *HaeIII* resolved the fragments of 221 & 88 and 170 & 139

bp. The RFLP results revealed that using above restriction enzymes, the animals could be grouped into different classes.

(R.C. Sharma and S.C. Mehta)

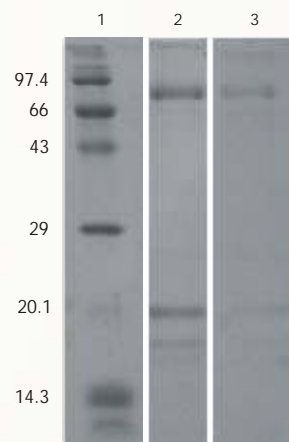
Isolation of stallion seminal plasma proteins

Seminal plasma, which is a complex mixture of secretions originating from the testes, epididymis and accessory sex glands, contains factors that modulate the fertilizing ability of sperm. Seminal plasma factors may also have an influence on semen storage, prevent premature capacitation of sperm and protect sperm from lipid peroxidation damages. Identification of fertility related proteins may be used as a diagnostic tool/ marker to select stallion of high breeding value. Therefore, a study was initiated to evaluate the effect of gelatin and heparin binding fertility related proteins of stallion seminal plasma on *in vitro* fertilizing potential of spermatozoa.

During the year, seminal plasma proteins were resolved by SDS-polyacrylamide gel electrophoresis (SDS-PAGE). Thirteen total protein bands were observed in the range of 17-95 kDa (i.e 17, 18, 19, 21, 22, 24,

27, 28, 31, 50, 58 72 and 95 kDa). The heparin and gelatin binding proteins were isolated from the stallion seminal plasma by using heparin-agarose and gelatin-agarose affinity column chromatography, respectively. The molecular weights of the 5 heparin binding proteins were in the range of 17- 83 kDa (17, 18, 21, 64 and 83 kDa). Four gelatin binding proteins were observed in the molecular weight range of 18-83 kDa (18, 21, 64 and 83 kDa) (Fig). The effect of these proteins on fertilizing potential is being evaluated.

(A. Arangasamy and S.K. Bhure)



Profile of seminal plasma proteins of a Marwari stallion



Superior mule production in the field through frozen semen of exotic Jacks

Mules are used extensively for transportation by the military forces and civilians in the hills and inaccessible terrain. Superior mules in terms of greater strength and size will be helpful in improving the socio-economic status of marginal farmers and landless laborers possessing small ponies, donkeys and mules of low productivity. The paucity of good quality jacks is the major hindrance in producing quality mules in the field. A study was undertaken by the centre to preserve the germplasm of exotic jack and production of genetically superior mules and to popularize artificial insemination with frozen semen of exotic Jack among equine farmers.

During the period under report, the semen of three exotic jacks was collected, examined and preserved for doing artificial insemination in the

farm as well as in field animals. A total of 700 semen doses of exotic Jacks were preserved. Four mares at equine production campus, Bikaner farm were inseminated with frozen semen of exotic jacks and all were conceived. Thirty five mares in the field were inseminated with frozen semen of exotic jacks (23 in Haryana and 12 in U.P.) for mule production and on follow up, 12 were confirmed pregnant till date. The villages covered for mule production were Tamsa, Israna, Asan, Osari, Osar and Balhera villages of Haryana and Ram Raj, Naya Gaon and Deval villages of Mujaffar Nagar district of UP. The work on mule production by AI in field is further being extended in the states of Haryana, Punjab and Rajasthan.

(R. A. Legha, R. C. Sharma and
A. Arangasamy)





Technologies Assessed

Cryopreservation of Marwari stallion semen and perfection of artificial insemination

Marwari horse is one of the elegant breeds of Indian origin. Horses of this breed are dwindling due to ignorance of the farmers as well as intermixing of this breed with other breeds. Cryopreservation of stallion semen is very important so that equine owners can get quality semen for production of true-to-breed Marwari horses. Therefore, the semen characteristics of Marwari breed were evaluated and freezing protocol were standardized. Using the

cryopreserved Marwari stallion semen; artificial insemination was done in mares under experimental and field conditions. The salient findings of the study are:

Microscopic, physical and biochemical properties of Marwari semen: The average total volume of semen and gel free semen was 90.0 ± 5.75 and 44.6 ± 90.15 ml in breeding season and 66.43 ± 8.62 and 41.90 ± 4.50 ml in non-breeding season, respectively. Consistency of



Semen being collected from a stallion for cryopreservation



the semen was thin to thick and colour was milky white to creamy. The pH varied from 7.0 to 7.5 in both the seasons. Average initial and progressive motility recorded was 75.08 ± 1.28 and $68.44 \pm 1.20\%$ in breeding season and 76.67 ± 3.26 and $71.90 \pm 3.42\%$ in non-breeding season, respectively. Average sperm concentration was $195.0 \pm 9.5 \times 10^6$ and 158.9×10^6 per ml during breeding and non-breeding season in Marwari stallions. Live dead ratio of spermatozoa in frozen semen was 68:32.

Activity of enzymes and levels of metabolites were studied in seminal plasma. Mean activity of GOT and GPT was 1.54 ± 6.3 and 52.5 ± 11.0 IU/l in seminal plasma. Mean glucose and total protein content was 13.4 ± 2.4 mg/dl and 9.2 ± 0.6 g/dl. Average cholesterol concentration was 7.0 ± 0.8 mg/dl.

Standardization of semen freezing protocol: Six primary extenders viz., BSA Primary extender, Citrate EDTA extender, Glucose EDTA extender, Skimmed milk and sugar extender, Sucrose solution (11%) and HF-20 extender were used for washing the spermatozoa and secondary extenders viz., Skim milk egg yolk extender, Lactose-glucose-egg-yolk extender, Glycine egg yolk extender, Skim milk and sugar extender, Sugar based extender and HF-20 extender were used as freezing media. Lactose-glucose-egg-yolk extender gave better (25-40%) post thaw motility followed by sugar based extender (20-30%) and HF-20 extender (20-30%). However, pre-freezing

motility was observed comparatively high with sucrose solution.

Concentration of glycerol and equilibration time affects the post-thaw motility of frozen semen. The post-thaw motility was 40.00 ± 2.04 and 33.75 ± 2.39 per cent for freezing media containing 3% and 5% glycerol with 3 hr equilibration time, respectively. Hence, freezing media containing 3% glycerol was observed to be superior than containing 5% glycerol on the basis of post-thaw motility, whereas equilibration time had no effect on stallion semen freezability.

Thawing protocol for frozen stallion spermatozoa plays a major role in the post-thaw motility of spermatozoa. Investigations were carried to study the effect of various thawing temperatures and time on post-thaw motility of spermatozoa. Post-thaw motility was observed as 40.00 ± 1.86 , 34.44 ± 1.54 and $46.67 \pm 2.35\%$ on thawing at 37°C for 30 seconds, 37°C for one minute and at 45°C for 15 seconds, respectively. It was observed that thawing at 45°C for 15 seconds was superior for obtaining better post-thaw motility in frozen stallion spermatozoa.

The quality of post-thaw Marwari stallion semen was evaluated using computer-assisted semen analyzer (CASA). Mean path velocity ($\mu\text{m}/\text{sec}$), progressive velocity ($\mu\text{m}/\text{sec}$), track velocity ($\mu\text{m}/\text{sec}$) and lateral head displacement ($\mu\text{m}/\text{sec}$) were 73.82 ± 1.13 , 60.38 ± 1.22 , 139.4 ± 2.37 and 7.8 ± 0.18 , respectively. Average beat cross





frequency of thawed semen was 38.69 ± 0.21 Hz. Straightness, linearity and elongation of the spermatozoa after thawing was 75.33 ± 0.84 , 42.0 ± 0.81 and $54.33 \pm 0.88\%$, respectively. Mean size of spermatozoa was 6.4 ± 0.13 pixels. Mean motility, progressive, rapid and slow percent in thawed stallion semen was observed as 32.6 ± 2.06 , 6.0 ± 0.55 , 9.83 ± 0.55 and 9.0 ± 0.89 , respectively. Viability of semen was $64.11 \pm 1.44\%$.

Cryopreservation of semen and AI: Based on these observations, the technique of cryopreservation of semen of Marwari breed was perfected and 200 semen doses of Marwari

stallions maintained at EPC, Bikaner were cryopreserved and stored. In addition, the technique was tested in the Marwari stallion in the field and about 80 semen doses of superior quality Marwari stallions were also cryopreserved at Sikarbadi (Udaipur).

A total of 10 mares were artificially inseminated at our farm and two mares were inseminated in the field. The fertility trials of cryopreserved semen on farm and under field conditions are further under progress.

(Yash Pal, R A. Legha, A. Arangasamy and S. N. Tandon)

Internal validation of kit for pregnancy diagnosis

The primary target of any equine breeder is to get maximum number of healthy foals from any mare in its life-time which can be achieved conveniently, if foaling takes place in breeding mares at regular intervals during the breeding life of that mare. This can only be made feasible if pregnancy status of mares is known at an early hour after their covering. A simple and reliable method of pregnancy diagnosis can help and improve the reproductive efficiency of mares. This centre has developed an eCG based ELISA for pregnancy diagnosis which is quite economical, sensitive, specific, reliable, easy and animal friendly as compared to conventional rectal palpation technique. The ELISA is based on the

detection of eCG content in the serum of pregnant mares. This test is effective in diagnosing the pregnancy between day 35 and 120 of gestation. Equine owners who can not afford to pay the examination charges as well as transport charges may be benefited economically as they can simply send 1-2 ml of serum for pregnancy diagnosis to this centre. However, this eCG based test is specific only for those mares which have been covered by horse stallion only and not for mares covered by donkey stallion for mule production. Internal validation of this test as well as feed back received from equine owners has indicated 100% sensitivity of this assay.

(A.K. Gupta, Yash Pal, Sanjay Kumar)



Education & Training

Participation in international trainings

Two scientists of the centre were deputed for obtaining international trainings during 2005-2006. In addition, a number of students from state universities acquired trainings from this centre.

- Dr. Nitin Virmani (Scientist) was deputed to Russia for a training under an agreement between ICAR and Russian Academy of Agricultural Sciences (RAAS). He acquired training in the area of *Epizootiology, Diagnostics and Vaccine for Exotic Diseases of Animals* from All Russia Research Institute of Veterinary Virology and Microbiology at Pokrov (Russia) from April 25-May 1, 2005. During this training programme, Dr. Virmani also visited the OIE Referral Laboratory for Equine Viral Diseases and Dourine at Moscow to learn skills on exotic equine diseases.
- Dr. Rajender Kumar, Senior Scientist participated in the training programme on "Molecular Diagnosis of Protozoan Diseases" held under JSPS AA Science Platform Program at National Research Centre for Protozoan Diseases, Obihiro University of Agriculture & Veterinary Medicine, Obihiro, Hokkaido, Japan from January 10-February 24, 2006. During this training programme, Dr. Rajender acquired skills in various techniques including molecular diagnosis of protozoan diseases particularly Loop-Mediated Isothermal Amplification (LAMP) for detection of *T. evansi* infection, *in vitro* cultivation of *T. evansi* and methodologies for diagnosis and

control of protozoan infections.

Participation in national trainings

1. Dr. A. Arangasamy (Scientist) attended a training course on "Recent concepts in physio-pathology of animal reproduction" organized by Department of Animal Reproduction, Gynaecology and Obstetrics, College of Veterinary Sciences, Punjab Agricultural University, Ludhiana from September 23 to October 13, 2005.
2. Dr. Sanjay Kumar (Scientist) attended a training course on "DNA-based diagnostics" organized by Department of Animal Biotechnology, CCS Haryana Agricultural University, Hisar from November 7-28, 2005.
3. Dr. S. Dey (Senior Scientist) attended a training course on "Strategies for stress management" organized by National Academy of Agricultural Research Management, Hyderabad from November 17-23, 2005.
4. Dr. Praveen Malik (Senior Scientist) attended a practical training course on "DNA based diagnostics" organized by Department of Animal Biotechnology, College of Veterinary Sciences, CCS HAU, Hisar from February 7-28, 2006.

Training organized for post-graduate students :

- A four-month training on 'Development of RT-PCR based diagnostics for equine rotavirus in diarrhoeic foals' was conducted for post-graduate students of Guru Jhambeshwar University from January - April 2005.





Lectures and practicals conducted for advanced training/refresher courses:

- Dr. B.R. Gulati (Senior Scientist) delivered a lecture on 'Infectious Diseases of Equine Respiratory System' in Training Course on Equine Practice organized by Student Counseling & Placement Centre, Directorate of Students Welfare, CCS Haryana Agricultural University Hisar. August 22-September 1, 2005.
- Dr. A.K. Gupta (Principal Scientist) delivered a lecture on 'Serum based techniques for pregnancy diagnosis in equines' in Training on "Advances in Large Animal Practices" organized by Deptt. Of Veterinary Clinical Medicine, CCS HAU Hisar, from September 7-27, 2005.
- Dr. S. Dey (Senior Scientist) delivered a lecture on 'Equine colic-diagnosis and therapeutic management' in Training on "Advances in Large Animal Practices" organized by Deptt. Of Veterinary Clinical Medicine, CCS HAU Hisar, from September 7-27, 2005.
- Dr. Sanjay Kumar (Scientist) delivered a lecture on 'Common vaccines and vaccination schedule in equines' in Training on "Advances in Large Animal Practices" organized by Deptt. Of Veterinary Clinical Medicine, CCS HAU Hisar, from September 7-27, 2005.
- Dr. A.K. Gupta (Principal Scientist) delivered a lecture on 'Serum based techniques for pregnancy diagnosis in equines' in Training on "Advances in Large Animal Practices" organized by Deptt. Of Veterinary Clinical Medicine, CCS HAU Hisar, from November 9-29, 2005.
- Dr. Praveen Malik (Senior Scientist) delivered a lecture on 'Bacteriological and mycological diagnosis in equines including antibiotic sensitivity test' in Training on "Advances in Large Animal Practices" organized by Deptt. Of Veterinary Clinical Medicine, CCS HAU Hisar, from November 9-29, 2005.
- Dr. A.K. Gupta (Principal Scientist) delivered a lecture on 'Molecular diagnostic tools for Animal disease diagnosis' in "Winter School on Application of Genomic, Molecular markers and Transformation tools for crop improvement" organized by Deptt. Biotechnology and Molecular Biology, CCS HAU, Hisar from December 1-21, 2005.
- Dr. B.K. Singh (Principal Scientist) conducted a practical on 'Enzyme-linked immunosorbent assay for diagnosis of equine herpesvirus-1 infections' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. B.K. Singh (Principal Scientist) delivered a lecture on 'Current methods in diagnosis of equine herpes virus-1 infections' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. B.R. Gulati (Senior Scientist) delivered a lecture on 'An overview of viruses associated with diarrhoea in man and animals' in a training course on 'Currents Methods in Veterinary Microbiology'



organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.

- Dr. B.R. Gulati (Senior Scientist) conducted a practical on 'Detection and characterization of equine rotaviruses from diarrhoeic foals by ELISA and RNA-PAGE'. in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. S.K. Khurana (Senior Scientist) delivered a lecture on 'Current trends in diagnosis of *Rhodococcus equi* infection among equines' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. S.K. Khurana (Senior Scientist) conducted a practical on 'Serodiagnosis of African horse sickness in equines' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. Praveen Malik (Senior Scientist) conducted a practical on 'Serodiagnosis of Glanders in equines' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. Praveen Malik (Senior Scientist) delivered a lecture on 'Recent aspects of *Streptococcus equi* infection in equines and their diagnosis' in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. Praveen Malik (Senior Scientist) delivered a lecture on 'ICT in veterinary sciences: Role of teachers and researchers'. in a training course on 'Currents Methods in Veterinary Microbiology' organized by Centre of Advanced Studies, Department of Veterinary Microbiology, CCS Haryana Agricultural University Hisar from January 17-February 6, 2006.
- Dr. Sanjay Kumar (Scientist) conducted a practical on 'Detection of *Trypanosoma evansi* parasite by PCR amplification' for the participants of training programme on 'DNA based diagnostics' organized by the Department of Animal Biotechnology, CCS HAU, Hisar from February 7-28, 2006.
- Dr. Sanjay Kumar (Scientist) delivered a lecture on 'Latest diagnostic trends in Protozoan diseases' in "Recent advances and trends in the field of animal disease control" organized by the Department of Animal Husbandry, Govt. of Rajasthan, Jaipur from February 23-24, 2006.





Awards & Recognitions

NRCE establishing BSL-3 Laboratory for safe handling of animal pathogens

With the recent emergence and global spread of certain infectious diseases like bird flu, it has become imperative to handle the pathogens in safe laboratory environment. NRCE Hisar took timely initiative in this regard and decided to establish highly sophisticated biosafety level 3 (BSL-3) laboratories for safe handling of veterinary pathogens. Recognizing the expertise and dedication of this centre in the area of animal health, particularly equine infectious diseases, Indian Council of Agricultural Research (ICAR) sanctioned a grant of Rupees three crore to this centre for the purpose.

According to Dr. S.K. Dwivedi, Director NRCE, the BSL-3 laboratory at the centre will be the only facility in northern India that will cater to the need of working on highly infectious animal diseases that can spread rapidly from animals to animals and also on diseases that can be transmitted from animals to humans. ICAR has earlier established a BSL-4 facility for working on exotic animal diseases at Bhopal. The BSL-3 laboratory at NRCE will be equipped with the state-of-art health and safety features in accordance with the WHO guidelines for handling of pathogenic microorganisms, so that deadly diseases do not become risk for the community and the environment. BSL-3 facility

will also help in developing a repository (bank) of dangerous veterinary pathogens, under the ICAR funded National Centre for Veterinary Type Cultures, being established at NRCE. Both these facilities will help preserving important indigenous veterinary pathogens without their leakage in the environment for their later use in the development of diagnostics and vaccines.

NRCE has signed a memorandum of understanding with Hospital Services Consultancy Corporation (an enterprise of Ministry of Health and Family Welfare, Govt. of India) for developing this facility at Hisar. With the establishment of BSL-3 facility, this centre is likely to get international recognition for working on infectious animal diseases as World Organization for Animal Health (OIE) Reference Laboratory.



MOU signed between HSCC & NRCE for construction of BSL-3 laboratory



Patent application for pregnancy diagnosis kit submitted

A patent application entitled "A kit for detection of pregnancy in equines and assay thereof" has been submitted to the Patent Office, New Delhi.

Best Research Paper Award to NRCE Scientists

A research paper entitled "Immunohistochemical diagnosis of equine herpes virus-1 infection employing microwave irradiation for reducing the processing time" published in the Indian Journal of Veterinary Pathology was selected for Dr. G.M. Sharma award for the year 2004. Drs. Nitin Virmani, A.S. Panisup and B.K. Singh were conferred this award by the Indian Association of Veterinary Pathologists in the XXII

Annual Conference at Pune from November, 25-27, 2005.

NRCE official wins zonal chess competition

Sh. R.A. Parashar, AFAO of NRCE won gold medal in chess event during the North Zone Sports Meet held at National Dairy Research Institute, Karnal from 7-10



March 2006. Dr. S.K. Dwivedi, Director NRCE felicitated the winning participant and encouraged the employees of the centre to actively participate in various sports activities to keep body and mind healthy.





List of Publications

Research articles

1. Arangasamy A., Singh L.P., Ahmed N., Ansari M.R. and Ram G.C. 2005. Isolation and Characterization of Heparin and Gelatin Binding Buffalo seminal plasma proteins and their effect on *in vitro* fertilizing ability (BCMPT and HOST) with cauda epididymal spermatozoa. *Animal Reproduction Sciences* 90: 243-254.
2. Arangasamy A., Singh R. and Singh L.P. 2005. Bilateral aplastic testes in adult buffalo bull (*Bubalus bubalis*). *The Indian Journal of Animal Reproduction* 26:174-175.
3. Agarwal M., Chandra M. and Singh B.R. 2005. Applicability of subserovar level typing of *Salmonella Paratyphi B* isolates of Indian origin. *Indian Journal of Animal Sciences* 75:151-163.
4. Agarwal M., Chandra M., Sharma G. and Singh B.R. 2005. A Study on Virulence Markers of Indian Strains of *Salmonella enterica* subspecies *enterica* serovar Paratyphi B from Foods of Animal Origin. *Journal of Food science and Technology* 42: 66-79.
5. Agrawal R., Singh B.R., Babu N. & Chandra M. 2005. Novel haemolysin(s) of *Salmonella enterica* subspecies *enterica* serovar Gallinarum. *Indian Journal of Experimental Biology* 43:626-630.
6. Azhahia Nambi P., Yadav S.C., Raina O.K., Sriveny D. and Saini M. 2005. Vaccination of buffaloes with *Fasciola gigantica* recombinant fatty acid binding protein. *Parasitol Res.* 97: 129-135.
7. Bork S., Okamura M., Matsuo T., Kumar S., Yokoyama N., Igarashi I. 2005. Host serum modifies the drug susceptibility of *Babesia bovis in vitro*. *Parasitology* 130:489-92.
8. Chandra M, Singh B.R., Harishankar, Agarwal M., Agarwal R., Sharma G. and Babu N. 2005. Seroprevalence of brucellosis in chevon goats from Bareilly slaughterhouse. *Indian Journal of Animal Sciences* 75: 220-221.
9. Dey S., Dwivedi S.K., Malik P., Panisup A.S., Tandon S.N. and Singh B. K. 2006. Heat stress associated with mortality in donkeys in India. *Veterinary Record: In Press*.
10. Gulati B.R., Malik P. and Kumar R. 2005. Isolation and electropherotyping of equine rotaviruses from diarrhoeic foals in India. *Indian Journal of Animal Sciences* 75:745-748.
11. Gulati B.R. and Singh B.K. 2006. An overview of infectious respiratory diseases of equines. *Centaur* 22:32-43.
12. Gulati B.R., Pandey R. and Singh B.K. 2006. Development of monoclonal antibodies against group A animal rotaviruses. *Indian Journal of Biotechnology* 5:37-41.



13. Gupta A.K., Kaur D., Rattan B. and Yadav M.P. 2005. Molecular variability in different Indian isolates of equine herpesvirus-1. *Veterinary Research Communications* 29:721-734.
14. Gupta A.K., Pal Y., Tandon S.N. and Dwivedi S. K. 2005. Haematological and blood biochemical profiles in healthy Indian Spiti horses. *Indian Veterinary Journal* 82: 604-608.
15. Gupta A.K., Sharma S. K. and Dwivedi S. K. 2005. Biochemical profiles in exotic horse and donkey stallions. *Indian Veterinary Journal* 82: 834-837.
16. Gupta A.K., Chauhan M., Tandon S.N. and Sonia. 2005. Genetic characterization and bottleneck studies in Marwari horse breed. *Journal of Genetics* 84: 295-301.
17. Pal Y., and Gupta A.K. 2005. Oestrous cyclicity, follicle development and progesterone profile in indigenous donkeys and ponies. *Indian Journal of Animal Sciences* 75:1398-1400.
18. Pawaiya R.V.S. 2005. Pathology of chemically induced neoplasms and evaluation of molecular markers in diagnosis of animal tumors (Thesis abstract). *Indian Journal of Veterinary Pathology* 29:63.
19. Raina O.K., Yadav S.C., Sriveny D. and Gupta S.C. 2006. Immunodiagnosis of bubaline fasciolosis with *F. gigantica* Cathepsin-L protease. *Acta Tropica*: In Press.
20. Sarvanan B.C., Yadav S.C., Borkataki S. and Pourouchottamane R. 2006. Lice infestation in Yak. *Indian Veterinary Journal*: In Press.
21. Senapati S.K., Dey S. and Dwivedi S.K. 2005. Effect of Arjuna (*Terminalia arjuna*) extract on tissue lead levels in rats. *Pharmaceutical Biology* 43:696-700.
22. Singh B.K., Tandon S.N. and Virmani N. 2006. Immune response to inactivated oil adjuvanted equine herpes virus-1 using different emulsifiers in horses. *Indian Journal of Biotechnology* 5: 42-46.
23. Singh B.R., Chandra M. and Agarwal R. 2005. A Study on Interaction of *Salmonella enterica* subspecies *enterica* Serovar Typhimurium and Mung Bean (*Phaseolus aureus*) Plants. *Journal of Food protection* 68: 476-481.
24. Singh B.R., Alam J. and Hansda D. 2005. Alopecia induced by salmonellosis in guinea pigs. *Veterinary Record* 156:516-518.
25. Singh B.R., Chandra M., Agarwal R. and Babu N. 2005. Curing of *Salmonella enterica* serovar Typhimurium-contaminated cowpea seeds and sprouts with vinegar and chlorinated water. *Journal of Food Processing and Preservation* 29: 268-277.
26. Singh B.R., Singh M., Preetam, Babu N., Chandra M. and Agarwal R. 2006. Prevalence of multiple drug resistant (MDR) *Salmonella* on betel leaves (Paan) and in water used for soaking wet betel leaves (Paan) in North Indian cities. *Journal of Food Protection*. 69:288-292.





27. Singh L.P., Arangasamy A. and Samuel A. 2006. Characterization of epididymal fluid proteins in buffalo bulls. *Indian Journal of Animal Sciences* 76:139-140.
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29. Virmani N., Verma P.C., Panisup A.S., Singh B.K. and Batra M. 2005. Studies on neurotropic properties of indigenous strains on EHV-1 in murine model. *Indian Journal of Animal Sciences* 75: 393-396.
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32. Yadav S.C., Sarvanan B.C., Borkataki S., Baruah K. 2006. A new record of *Parafilaria bovicola* from Yak *Poephagus grunniens* in India. *Journal of Veterinary Parasitology*: In press.
- Abstract in Conferences, Symposium, etc.
1. Arangasamy A., Bhure S. K. and Dwivedi S. K. 2005. Characterization of seminal plasma proteins of marwari stallion and exotic jacks by SDS-Polyacrlamide gel electrophoresis. In: XXI Annual Convention of ISSAR and National Symposium, November 23-25.
 2. Arangasamy A., Singh L. P. and Ahmed N. 2006. Isolation and characterization of gelatin binding proteins in crossbred bull (HF X Haryana) seminal plasma In: Proceedings of National Symposium on Technological Interventions for Livestock Improvement and Production, Thrust area: Disaster Management held at NAAS, New Delhi, February 17-19.
 3. Arangasamy A. and Bhure S. K. 2006. Isolation and characterization of heparin binding proteins in Marwari stallion seminal plasma. In: Proceedings of National Symposium on Applications of Recent Biotechnological Advances in Equine Reproduction held at Equine Breeding Stud, Babugarh, U. P., March 2-3.
 4. Gulati BR and Singh BK. 2005. Incidence of equine rotavirus infection in diarrhoeic foals of organized farms in India. In: 32nd Annual Conference of Indian Immunology Society, PGIMER, Chandigarh, November 24-27.
 5. Lal N. 2005. Knowledge awareness about donkey husbandry. In: National Seminar on



- "Entrepreneurship Development for Livelihood Security- Experiences, Prospects & Strategies for Rural India" organized by Society for Community Mobilization for Sustainable Development at Indian Veterinary Research Institute, Izatnagar, November 29 to December 1.
6. Lal N. 2005. Population trend of Equine for Industrial Marketing. In: National Seminar on "Green to Evergreen- Challenges to Extension Education" being organized by Indian Society of Extension Education & Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi, December 15-17.
 7. Legha R.A. and Sharma R.C. 2006. Comparative studies of three different primary and secondary semen extenders for freezing of exotic Jacks semen in arid conditions of Rajasthan. In: Proceedings of National Symposium on Technological Interventions for Livestock Improvement and Production, Thrust area: Disaster Management held at NAAS, New Delhi, February 17-19.
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 9. Legha R.A., Sharma R.C., Pal Y. and Arangasamy A. 2006. Cryopreservation of equine semen and its applications at farmers' door. In: Proceedings of National Symposium on Applications of Recent Biotechnological Advances in Equine Reproduction held at Equine Breeding Stud, Babugarh, U.P., March 2-3.
 10. Malik P. 2005. Zoonotic Influenza: A global problem. In: National symposium on 'Influenza: Epidemiology and Control' at VP Chest Institute, University of Delhi, Delhi. April 5.
 11. Pawaiya R.V.S., Kumar R. and Paliwal O.P. 2005. Molecular differentiation of canine cutaneous histiocytoma and transmissible venereal tumour. In: XXII National Symposium on 'Newer concepts in animal and avian disease diagnosis a farmer, industry and institutional dialogue' organized by Indian Association of Veterinary Pathologists, Pune, November 25-27.
 12. Pawaiya R.V.S. and Kumar R.. 2005. Systemic phycomycosis in sheep- a pathological study. In: Proceedings of National Symposium on Technological Interventions for Livestock Improvement and Production, Thrust area: Disaster Management held at NAAS, New Delhi, February 17-19.





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16. Sharma R.C., Mehta S.C., Bansal R.S. and Dwivedi S. K. 2006. RFLP profile of MHC-DRB3 genes in Marwari horses of Rajasthan. In: Proceedings of National Symposium on Technological Interventions for Livestock Improvement and Production, Thrust area: Disaster Management held at NAAS, New Delhi, February 17-19.
17. Singh B. R., Chandra M., Agarwal R. and Babu N. 2005. Effect of *Salmonella* contamination on soil fertility. In: International Conference on 'Microbial Diversity-2005, Current perspectives and potential applications", organized by Association of Microbiologists of India, New Delhi, April 16-18.
18. Singh B.R., Singh M., Preetam, Babu N., Chandra M., Agarwal R., Verma A., Siddiqui M.Z. and Saud Hasan. 2005. Assessment of the microbial quality of water used for soaking betel leaves (Paan) in North Indian cities. In: International Conference on 'Microbial Diversity-2005, Current perspectives and potential applications", organized by Association of Microbiologists of India, New Delhi, April 16-18.
19. Virmani N., Gulati B.R., Panisup A.S. and Singh B.K. 2005. Development of diagnostic tool for differentiation of rhinopneumonitis caused by equine herpes virus-1 and 4 infections. In: XXII National Symposium on 'Newer concepts in animal and avian disease diagnosis a farmer, industry and institutional dialogue' organized by Indian Association of Veterinary Pathologists, Pune, November 25-27.



Participation in Conferences & Symposia

1. Dr. Praveen Malik (Senior Scientist) participated and delivered a lecture in National symposium on 'Influenza: Epidemiology and Control' at VP Chest Institute, University of Delhi, Delhi on April 5, 2005.
2. Dr. S.K. Dwivedi (Director) delivered an invited lecture on "Importance of equine piroplasmiasis in race horses and necessity for regular testing of race horses against piroplasmiasis' at Bangalore Turf Club, Bangalore on July 8, 2005.
3. Dr. Nitin Virmani (Scientist) and Dr. A. Arangasamy (Scientist) participated in a workshop-cum-seminar on "Capacity Building program for Indian Agriculture Research, Extension and Development (RED) organization in Globalized Agricultural Economy" organized at Indian Agricultural Research Institute, Pusa, New Delhi from September 15-16, 2005.
4. Dr. S.K. Dwivedi (Director) delivered a Lead paper on "Forages for equines of arid region" in National Symposium on Technological Interventions for Livestock Production and Improvement held under the aegis of IGFRI at Jaipur, Rajasthan from November 19-20, 2005.
5. Dr. Baldev R. Gulati (Senior Scientist) presented a paper in 32nd Annual Conference of Indian Immunology Society held at Post-Graduate Institute of Medical Education & Research, Chandigarh from November 24-27, 2005.
6. Dr. R.V.S. Pawaiya (Scientist) presented a paper in National Symposium on 'Newer concepts in animal and avian disease diagnosis - a farmer, industry and institutional dialogue' organized by Indian Association of Veterinary Pathologists at Krantisinha Nana Patil College of Veterinary Sciences, Shirval, Satara from November 25-27, 2005.
7. Dr. Niranjana Lal (Scientist) presented a paper in National Seminar on "Entrepreneurship Development for Livelihood Security- Experiences, Prospects & Strategies for Rural India" organized by Society for Community Mobilization for Sustainable Development at Indian Veterinary Research Institute, Izatnagar from November 29 to December 1, 2005.
8. Dr. S. Dey (Senior Scientist) participated in a workshop on "High performance thin layer chromatography" organized by ACHROME Company (Switzerland) in





- Delhi on December 12, 2005.
9. Dr. Niranjana Lal (Scientist) presented a paper in National Seminar on "Population Trend of Equines for Industrial Marketing" organized by Indian Society for Extension Education at Indian Agricultural Research Institute, Pusa, New Delhi from December 15-17, 2005.
 10. Dr. R.C. Sharma (Senior Scientist) and Dr. R.A. Legha (Scientist) participated in National Seminar on "Conservation, processing and utilization of monsoon herbage for augmenting animal production" held at CSWRI, ARC Bikaner from December 17-18, 2005.
 11. Dr. S.K. Dwivedi (Director) chaired a session in National Congress on Canine Practice 2006 organized by Indian Society for Advancement of Canine Practice at OUAT, Bhubaneswar from February 10-12, 2006.
 12. Dr. S.K. Dwivedi (Director) delivered a keynote address on 'Post-disaster problems in equines and needs for resettlement' in National Symposium on "Technological intervention for livestock improvement and production" organized by Indian Society for Sheep and Goat Production & Utilization at NAAS, New Delhi from February 17-19, 2006.
 13. Dr. R.C. Sharma, Dr. Praveen Malik (Sr. Scientists), Dr. R.V.S. Pawaiya, Dr. R. A. Legha, Dr. A. Arangasamy (Scientists) and Dr. R. S. Bansal (Farm Manager) participated in National Symposium on "Technological intervention for livestock improvement and production" organized by Indian Society for Sheep and Goat Production & Utilization at NAAS, New Delhi from February 17-19, 2006.
 14. Dr. S.K. Dwivedi (Director), Dr. R.C. Sharma, Dr. B.R. Gulati (Sr. Scientists), Dr. R.A. Legha and Dr. A. Arangasamy (Scientists) participated in National Symposium on Application of Recent Biotechnological Advances in Equine Reproduction, Remount Veterinary Corps, Equine Breeding Stud, Babugarh from March 2-3, 2006.
 15. Dr. B.R. Singh (Principal Scientist) participated and presented paper in International Conference on 'Microbial Diversity-2005, Current perspectives and potential applications', organized by Association of Microbiologists of India, New Delhi from April 16-18, 2005.



Consultancy, patents & commercialization of technology

This centre offers consultancy and diagnostic services for investigation of equine infectious diseases in the country. Under this programme, equine disease investigation is done by collecting samples from different parts of the country and results are conveyed to concerned quarters for remedial measures. A total of 4757 equine serum samples received from animal quarantine stations, thoroughbred and indigenous equines were examined for equine infectious anemia (EIA) by Coggins test. None of the samples tested was positive for EIA. A total of 323 vaginal/prepuccial swabs were tested for contagious equine metritis (CEM) by agent isolation & identification and all samples were found negative for CEM.

Bacteriological examination of 197 samples, including nasal swabs, vaginal swabs, ocular swab, faecal samples, tissues, exudates, pus samples and aborted foetus yielded 36 isolates (Table).

During this period, 10 equine necropsies were conducted and the pathological conditions diagnosed were squamous cell carcinoma (1), strangulation/ intussusception of intestine (2),

acute/ suppurative pneumonia (2), shock (2), haemorrhagic gastritis and hepatopathy (1), anoxic changes in the tissues (2). Amongst the aborted material two cases were confirmed to be positive for EHV-1 abortion on the basis of histopathological lesions/indirect immunoperoxidase technique and PCR.

Patent Application submitted

Submitted a Patent Application entitled "A kit for detection of pregnancy in equines and assay thereof" in Patent Office, New Delhi.

Commercialization of technology

The technologies developed at the centre including diagnostic services offered help in generation of revenue for the centre. During the year, the centre generated revenue to the tune of Rs. 16.01 lacs during the year by testing samples for various diseases including equine infectious anaemia (9.63 lacs), contagious equine metritis (3.23 lacs), glanders (0.45 lacs), African horse sickness (0.40 lacs). In addition, the improved germplasm of equines was also provided to the farmers in different parts of the country.

Isolates recovered and their origin

Revenue Source	2004-05	2005-06
Nature of sample	Isolate	Number of isolates
Nasal swab (2)	<i>Streptococcus equi</i> subsp. <i>zooepidemicus</i>	2
Nasal swab (2), Ocular swab (1)	<i>Klebsiella</i> spp.	3
Nasal swab (2)	<i>Enterobacter</i> sp.	2
Faecal Sample(1), Nasal swab (1)	<i>S.equisimilis</i>	2
Rectal Swab(19)	<i>Klebsiella pneumoniae</i>	19
Aborted foetii(5), Nasal swab(3)	<i>Staphylococcus</i> spp.	8
Total		36





RAC, Management Committee & SRC Meetings

Research Advisory Committee Meeting

The 7th RAC meeting was held under the chairmanship of Dr. S. K. Garg on May 31st 2005 to discuss various scientific, administrative and policy matters of NRCE. The RAC recommended that posts of the technical and supporting staff should be provided to the centre as per the



RAC members reviewing the research activities of the centre

recommended ratio. In view of the achievements made by the centre and its services required at national level, the RAC also strongly recommended that the centre may be upgraded to a National Institute on Equines Research with establishment of more regional stations. The scientists of the centre should be provided opportunities for getting training from reputed international institutes to refresh and upgrade their scientific skills. The chairman reiterated to formulate research projects assigning major emphasis on requirements of the equine farmers.

Staff Research Council Meeting

The Annual SRC meeting was held under the

chairmanship of Dr. S. K. Dwivedi on June 15, 2005 to discuss the progress made in various on-going research projects. Two new research



SRC reviewing the progress made by the scientists in various research projects

project proposals submitted by scientists were approved by the SRC. The chairman emphasized that the centre should conduct trainings at NRCE to upgrade the skills of veterinarians dealing with equines both from India and SAARC countries, in the areas of equine health and production.

25th Institute Management Committee Meeting

Twenty-fifth meeting of the Institute Management Committee was held on July 19, 2005 under the chairmanship of Dr. S.K. Dwivedi, Director. Important decisions regarding purchase of equipments and furniture for the current financial year, write off losses incurred due to fire incidence were taken. In addition, IMC recommended the establishment of Veterinary Type Cultures facility and purchase of equipments and vehicle for the same.



26th Institute Management Committee Meeting

Twenty-sixth meeting of the Institute Management Committee was held on January 30, 2006 under the chairmanship of Dr. S.K. Dwivedi, Director. IMC accorded approval for the construction of Agricultural Technology Information Centre (ATIC) at NRCE. In addition, the committee also approved the proposal for erection of horse statue at Equine Production Campus, Bikaner, out of revenue generated by the centre.

Half-Yearly Staff Research Council Meeting

The half yearly SRC meeting was held under the chairmanship of Dr. S. K. Dwivedi on November 9, 2005 at NRCE, Hisar and on February 1, 2006 at EPC, Bikaner. SRC discussed the progress made in various on-going research projects in equine health and equine production, respectively. The house reviewed the research work done and made specific recommendations for different ongoing projects. The chairman emphasized the need of bottom up approach so that the outcome of the research is disseminated to the end users for improvement in health and production potentials of equines of India.

Members of Research Advisory Committee

Dr. S.K. Garg, Vice-Chancellor, Veterinary University, Mathura	Chairman
Dr. S.K. Dwivedi, Director NRCE, Hisar	Member
Dr. R.P. Mishra, Ex FAO Expert, Bareilly	Member
Col (Dr.) B. Raut, Consultant Field Research Laboratory, Chandigarh	Member
Dr. M.S. Oberoi, SAARC Regional Coordinator, FAO, New Delhi	Member
Dr. Lal Krishna, ADG (AH), ICAR, New Delhi	Member
Sh. Arvind Yadav, Rewari	Member
Sh. Ram Kripal Bhadoria, Lucknow	Member
Dr. Rajender Kumar, Incharge PME Cell, NRCE, Hisar	Member Secretary

Members of Institute Management Committee

1. Dr. S.K. Dwivedi, Director NRCE, Hisar.	Chairman
2. Dr. Lal Krishna, ADG (AH), ICAR, New Delhi.	Member
3. Director, Animal Husbandry, Govt of Haryana	Member
4. Director, Animal Husbandry, Govt of Punjab	Member
5. Dean, Veterinary College, CCS HAU, Hisar	Member
6. Finance & Accounts Officer, NBPGR, New Delhi	Member
7. Dr. S.N. Tandon, Principal Scientist, NRCE, Bikaner	Member
8. Dr. A.K. Gupta, Principal Scientist, NRCE, Hisar	Member
9. Dr. R.K. Sethi, Principal Scientist, CIRB, Hisar	Member
10. Dr. S. Dey, Senior Scientist, NRCE, Hisar	Member
11. Sh. Arvind Yadav, 208, Sector 3, Rewari (Haryana)	Member
12. Sh. Ram Kripal Bhadoria, C-20 Dilkhusha, Lucknow	Member
13. AAO, NRCE, Hisar	Member Secretary





Workshops, Seminars, Summer Institutes, Farmer' Day, etc.

Conference on mule breeding organized at the centre

A Round Table Conference on "Prospects of wide scale mule breeding in India and precautions thereof" was organized at the centre on November 26, 2005 to mark its Foundation Day. Various experts from Remount Veterinary Corps (RVC) and other Army units, Equestrian Federation of India (EFI) and office bearers of Indigenous Horse Society of India participated in this conference.



Various equine experts discussing prospects of mule breeding in India

It was emphasized that while implementing programmes on production of mules, care should be taken on its repercussions of breeding of 'true to breed' indigenous breeds horses and ponies in the country. The experts emphasized that mule production should be taken up for areas where mules are needed as necessary means of transport and for carrying load. Various equine breeders suggested line breeding of different equine species for the conservation of our indigenous breeds. The need for maintaining nuclear herd of

indigenous breeds at government controlled equine farms, farms under control of indigenous horse/pony breeding societies and army establishments was emphasized.

A clinical camp organized on World Veterinary Day

A clinical health camp was organized at Sirsa (Haryana) on April 28, 2005 to mark the World Veterinary Day. A total of 98 equine owners along with their equines participated in the camp.



NRCE staff explaining equine welfare activities of the centre to farmers

Besides giving treatment to sick equines, seventy five animals were vaccinated against tetanus in this camp. Twenty seven mares were examined for pregnancy using ultrasound and immunoassays. Samples from equines were collected for laboratory testing for various diseases.

NRCE celebrates Independence Day

The centre celebrated Independence Day on 15th August 2005 with the hoisting of the National Flag by Dr. A.S. Panisup, Incharge Director. Addressing employees of the centre on this occasion, he



complimented the efforts of scientists and employees of the centre towards betterment of farmers and equine breeders. Dr. Panisup



Employees celebrating Independence Day at NRCE campus

emphasized on the need to follow the footsteps of those who sacrificed their lives for the nation and advised to dedicate whole-heartedly for the development of this country. On this occasion, employees and their family members presented a cultural programme.

Equine Welfare Camp organized for working equids at Gauri Kund (Uttaranchal)

An equine health camp was organized at Gauri Kund near Kedar Nath (Distt. Ruderpryag) from September 20-23, 2005 to provide healthcare to 1200 working equines of this region. A total of 226 mules and 17 ponies were examined clinically. The major health problems encountered in these animals were respiratory disorders, wound and lameness syndrome. The welfare team of the centre treated these animals for three consecutive days and the farmers were educated for foot care, housing and nutritional management of equines. They were advised on issues related to load

carrying capacity without much distress to mules and ponies in hilly tracts. All the equids were dewormed and vaccinated against tetanus.



NRCE scientist examining the sick equines in a health camp at Gauri Kund

Samples of blood, feed, forage and water were collected for laboratory analysis. The farmers were provided literature and know-how for ideal management and formulation of balance feed for equine from the locally available feeds.

NRCE organizes a horse show and farmers' meet on its Foundation Day National Research Centre on Equines, Hisar



An indigenous equine and its owner participating in equestrian events at the centre

celebrated its Foundation Day on 26th November 2005 with great fanfare. On this occasion, a horse





show was organized in which indigenous horses from various parts of Haryana and Rajasthan participated. Different equestrian events like tent pegging, horse dance, etc were also organized on this day. Addressing to the equine owners, Dr. S.K. Dwivedi, Director NRCE highlighted the salient achievements of the centre

Workshops, Seminars, etc

in recent years for improvement in health and production of equines. A Kisan Goshthi (farmers' meet) was also organized in which equine owners from Haryana and neighbouring states discussed the problems faced by them in equine production and health and were provided sustainable solutions.

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हिन्दी सप्ताह समारोह में निदेशक, डा० द्विवेदी कर्मचारियों को सम्बोधित करते हुए।

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Personnel Milestones

Promotions

- Dr. Rajender Kumar as senior scientist w.e.f. March 22, 2005.
- Dr. Praveen Malik as senior scientist w.e.f. July 5, 2005.
- Sh. R.K. Chaturvedi (T-5) as T-6 (technical officer) w.e.f. January 1, 2005.
- Sh. Kamal Kumar Singh (T-4) as T-5 (technical officer) w.e.f. July 22, 2004.
- Sh. Ajmer Singh (T-3) as T-4 (stock assistant) w.e.f. February 3, 2005.
- Sh. Brij Lal (T-3) as T-4 (stock assistant) w.e.f. February 3, 2005.
- Sh. D.D. Pandey (T-3) as T-4 (laboratory technician) w.e.f. February 3, 2005.
- Sh. Sita Ram (T-3) as T-4 (laboratory technician) w.e.f. February 3, 2005.
- Sh. Sanjeev Kumar (T-3) as T-4 (laboratory technician) w.e.f. February 3, 2005.

New appointments

- Dr. B.R. Singh joined NRCE as Principal Scientist on June 30, 2005. Dr. Singh has acquired his Ph.D (Vety. Microbiology & Public Health) from GB Pant University of Agriculture & Technology, Pantnagar in 1997. Before joining NRCE, he has worked as In-charge Laboratory for Food-borne Infections and In-charge National *Salmonella* Centre (Veterinary) at Indian Veterinary Research Institute, Izatnagar.
 
- Dr. Niranjana Lal joined this centre as Scientist (Extension Education) on October 1, 2005. Dr. Lal has acquired his Ph.D. (Extension Education) from Indian Veterinary
 

Research Institute, Izatnagar (U.P.) in year 2000.

Transfer

- Sh. J. Ramani, AAO relived from this centre on January 28, 2006 to join Central Institute for Research on Buffaloes, Hisar.

Joining

- Dr. S.C. Yadav joined NRCE as Senior Scientist (Parasitology) on July 28, 2005 consequent upon his transfer from NRC on Yak, Dirang (Arunachal Pradesh). Dr. Yadav has acquired his Ph.D (Zoology) from Agra University, Agra in 1985 and advance training in molecular biology from University of Melbourne, Australia in 1999.
 
- Dr Rajveer Singh Pawaiya joined National Centre on Veterinary Type Cultures at NRCE as Scientist, Senior Scale (Veterinary Pathology) on December 20, 2005, on his transfer from Southern Regional Research Centre, Central Sheep and Wool Research Institute, Mannavanur (Kodaikanal, Tamil Nadu). He joined ICAR services in 1996 and completed his Ph.D. in Veterinary Pathology from Indian Veterinary Research Institute, Izatnagar (U.P.) in 2004.
 
- Sh. K.K. Chandna, AAO joined this centre on January 28, 2006 on his transfer from Central Institute for Research on Buffaloes, Hisar.



Staff at NRCE

Director

Dr. S.K. Dwivedi, M.V.Sc., Ph.D.

Administrative Staff

1.	Sh. K.K. Chandna	AAO (from 28.03.06)
2.	Sh. R.A. Parashar	AFAO
3.	Sh. Hawa Singh	Assistant
4.	Sh. Ram Pal	Assistant
5.	Sh. S.P. Kaushik	Assistant
6.	Sh. Ashok Arora	Stenographer Gr III
7.	Sh. Subhash Chander	Sr. Clerk
8.	Sh. Pratap Singh	Jr. Clerk
9.	Sh. D.D. Sharma	Jr. Clerk
10.	Sh. Om Prakash	Jr. Clerk
11.	Sh. Mahender Singh	Jr. Clerk

Scientific Staff

1.	Dr. A.K. Gupta M.Sc., Ph.D.	Principal Scientist
2.	Dr. A.S. Panisup, M.V.Sc., Ph.D.	Principal Scientist
3.	Dr. S.N. Tandon, M.V.Sc., Ph.D.	Principal Scientist
4.	Dr. B.K. Singh, M.V.Sc., Ph.D.	Principal Scientist
5.	Dr. B.R. Singh, M.V.Sc., Ph.D.	Principal Scientist
6.	Dr. S.C. Yadav, M.Sc., Ph.D.	Senior Scientist
7.	Dr. S. Dey, M.V.Sc., Ph.D.	Senior Scientist
8.	Dr. S.K. Khurana, M.V.Sc., Ph.D.	Senior Scientist
9.	Dr. Yash Pal, M.Sc., Ph.D.	Senior Scientist
10.	Dr. R.C. Sharma, M.V.Sc., Ph.D.	Senior Scientist
11.	Dr. B.R. Gulati, M.V.Sc., Ph.D.	Senior Scientist
12.	Dr. Rajender Kumar, M.V.Sc., Ph.D.	Senior Scientist
13.	Dr. Praveen Malik, M.V.Sc., Ph.D.	Senior Scientist
14.	Dr. R.V.S. Pawaiya, M.V.Sc., Ph.D.	Scientist (SS)
15.	Dr. R.A. Legha, M.Sc., Ph.D.	Scientist (SS)
16.	Dr. Nitin Virmani, M.V.Sc., Ph.D.	Scientist (SS)
17.	Dr. Sanjay Kumar, M.V.Sc., Ph.D.	Scientist (SS)
18.	Dr. (Ms.) Mamta, M.Sc., Ph.D.	Scientist (SS)
19.	Dr. Deepinder Kaur, M.Sc., Ph.D.	Scientist
20.	Dr. A. Arangasamy, M.V.Sc., Ph.D.	Scientist
21.	Dr. Niranjana Lal, M.Sc., Ph.D.	Scientist

Technical Staff

1.	Dr. R.S. Bansal, T-9	Farm Manager
2.	Sh. R.K. Chaturvedi, T-6	Technical Officer
3.	Sh. K.K. Singh, T-5	Technical Officer
4.	Sh. K.S. Meena, T-4	Farm Manager
5.	Dr. Jitender Singh, T-4	Veterinary Officer
6.	Sh. P.P. Chaudhary, T-4	Lab. Technician
7.	Sh. Ajmer Singh, T-4	Stock Assistant
8.	Sh. Brij Lal, T-4	Stock Assistant
9.	Sh. D.D. Pandey, T-4	Lab. Assistant
10.	Sh. Sita Ram, T-4	Lab. Assistant
11.	Sh. S.K. Chhabra, T-4	Lab. Assistant
12.	Sh. N.K. Chauhan, T-3	Farm Technician
13.	Sh. Mukesh Chand, T-2	Lab. Assistant
14.	Sh. Sajjan Kumar, T-2	Staff Car Driver
15.	Sh. Arun Chand, T-2	Tractor Driver
16.	Sh. Suresh Kumar, T-2	Vehicle driver
17.	Sh. Joginder Singh, T-2	Laboratory Assistant
18.	Sh. Shankar Lal, T-2	Tractor driver
19.	Sh. S.N. Paswan, T-2	Livestock Assistant
20.	Sh. Om Prakash, T-2	Tractor driver
21.	Sh. Rajendra Singh, T-1	Lab. Technician
22.	Sh. Raghubir Singh T-1	Vehicle driver

Supporting Staff

1.	Sh. Ishwar Singh	SSGr.III
2.	Sh. Guru Dutt	SSGr. III
3.	Sh. Jai Singh	SSGr. III
4.	Sh. Mahabir Prasad	SSGr. III
5.	Sh. Ramesh Chander	SSGr. II
6.	Sh. Mardan	SSGr. II
7.	Sh. Balwan Singh	SSGr. II
8.	Sh. Desh Raj	SSGr. II
9.	Sh. Ishwar Chander	SSGr. II
10.	Sh. Om Prakash	SSGr. II
11.	Sh. Deepak Kumar	SSGr. II
12.	Sh. Gopal Nath	SSGr. II
13.	Sh. Satbir Singh	SSGr. I
14.	Sh. Hanuman Singh	SSGr. I
15.	Sh. Subhash Chander	SSGr. I
16.	Sh. Ishwar Singh	SSGr. I
17.	Sh. Ram Singh	SSGr. I
18.	Sh. Raju Ram	SSGr. I
19.	Sh. Mahabir Prasad	SSGr. I
20.	Smt. Ram Kali	SSGr.I
21.	Smt. Santra	SSGr.I



Distinguished Visitors

Hon'ble Agriculture Minister and President ICAR visits NRCE

Hon'ble Union Agriculture Minister Sh. Sharad Pawar Ji visited the centre on July 23, 2005. On this occasion, a horse show was organized in which equine farmers from Haryana, Punjab and Rajasthan exhibited their Marwari horses. Addressing the scientists, the ICAR President and Union Agriculture Minister praised the research achievements of the centre in the area of conservation of indigenous breeds of equines, cryopreservation of semen and artificial insemination in equines, development of diagnostics and vaccines against major equine



Union Agriculture Minister, Sh. Sharad Pawar Ji in a horse exhibition at the centre

diseases. He advised scientists to patent the technologies developed at the centre and take steps for their commercialization both within and outside the country. He also exhorted the scientists to find solutions to emerging challenges in animal husbandry for use of animals in agriculture and to provide nutritional security for teeming Indian population.

On this occasion Dr. Mangala Rai Ji, Director General ICAR lauded the role of the centre in conservation of equines and asked the scientists to ensure that the end users are benefited by the

research done at the centre. NRCE Director, Dr. S.K. Dwivedi said that the various state governments should come forward to take the benefit of superior frozen semen of Marwari horses and exotic donkeys available at this centre for the production of true-to-breed Marwari horses and quality mules.

Major General N. Mohanty desires active collaboration between NRCE and RVC for equine welfare

Major General N. Mohanty, Additional Director General, Remount Veterinary Services, Army HQ, New Delhi visited this centre on 28th November



Maj. Gen. Mohanty being apprised of research activities at the centre

2005. During his visit Maj. Gen. Mohanty took keen interest in the ongoing research activities of the centre and appreciated the outstanding research work being done in the area of epidemiology, diagnosis and control of equine diseases. On this occasion, Director, Dr. S.K. Dwivedi highlighted the salient achievements of the centre in the area of equine health and production and also discussed about the future research priorities of the centre. Addressing to the scientists, Maj. Gen. Mohanty said that there should be more collaborations between Remount





Veterinary Corps and NRCE to share each other's experiences for the welfare of equine population and desired to extend all kind of help to the centre in this endeavour.

DDG (Animal Sciences) visited Bikaner

Dr. V. K. Taneja, DDG (Animal Sciences), ICAR New Delhi visited Equine Production Campus, Bikaner on December 16, 2005. During his visit, Dr. Taneja was apprised of different ongoing research and



Dr. Taneja, DDG (Animal Sciences) during his visit to Bikaner campus development activities of the campus. Dr. Taneja was impressed by the excellent up-keep of the equine herd. He took keen interest in the research programmes being undertaken at the campus and provided valuable inputs for improvement in production of indigenous equines.

Col. (Dr.) B. Raut reviews equine production activities at Bikaner

Col. (Dr.) B. Raut, Hon'ble Member, Research Advisory Committee of the centre visited Equine Production Campus, Bikaner during October 23-24, 2005 to review the ongoing projects at the campus. Col. Raut discussed different priority areas for improvement in management and production of equines with the scientists of the campus. He admired the contribution of the

campus in conservation of indigenous breeds of



Col. Raut reviewing the research activities at Bikaner campus

equines and stressed on maintaining the pure germplasm.

Two Former Directors of ICAR Institutes visit NRCE

Dr. Khub Singh, Former Director, National Institute of Animal Nutrition & Physiology, Bangalore visited this centre on October 22, 2005. During his visit, Dr Singh was apprised of various research activities being undertaken at the centre for the welfare of equines.

Dr. N.K. Bhattacharya, Former Director, Central Institute for Research in Buffaloes/Goat (ICAR) visited this centre on November 9, 2005. Dr. Bhattacharya appreciated the quality of research work and contributions of the scientists in the area of equine health and production.

Sh. Arvind Kaushal applauds equine welfare activities being done at the centre

Sh. Arvind Kaushal, Joint Secretary, Department of Animal Husbandry, Dairying and Fisheries, Government of India visited this centre on January 20, 2006. He applauded NRCE for its efforts for equine welfare in India.



Infrastructure & Support

High security containment (BSL-3) laboratory to be established at NRCE

Recognizing the expertise and dedication of this centre in the area of animal health, Indian Council of Agricultural Research selected this centre for establishing BSL-3 facility for working on highly pathogenic animal microorganisms. BSL-3 facility safeguards the environment and



Director NRCE signing MOU for construction of BSL-3 laboratory at NRCE

laboratory personnel while working on such infectious agents. ICAR sanctioned a grant of Rupees three crore for this purpose to the centre. NRCE has signed a memorandum of understanding with Hospital Services Consultancy Corporation (an enterprise of Ministry of Health and Family Welfare, Govt. of India) for developing this highly specialized and sophisticated facility at Hisar.

Construction of laboratory buildings nearing completion

The work on the construction of laboratory-cum-office building at NRCE, Hisar is nearing completion and the building is likely to be dedicated to the nation in very soon. The building, with an estimated cost of Rupees 2.59 crores includes state-of-the-art research laboratories and a conference hall. The foundation stone for this building was laid by Hon'ble Dr. Mangala Rai, Secretary DARE and Director General ICAR on January 12, 2005.

In addition, the administrative-cum-laboratory building at Bikaner Campus has been completed. This wing has state of the art laboratories for equine nutrition, genetics and breeding, molecular biology and equine physiology.

Agriculture farm production

NRCE has agricultural farm at its Hisar and Bikaner campus for production of fodder for equines. During the period 2005-06, the fodder production at Hisar and Bikaner campus is shown in Table 1. The centre produced 1825.3 quintal of fodder during the year, 1118.6 quintal at Hisar farm and 706.7 quintals at Bikaner farm.

Table 1. Fodder production at Bikaner

Type of fodder	Production in Quintals		Total
	Hisar	Bikaner	
Lucern	41.0	411.5	452.5
Oat	256.6	185.0	441.6
Millet	77.5	30.2	107.7
Sorghum	383.0	80.0	463.0
Cowpea	85.5	-	85.5
Berseem	160.0	-	160.0
Maize	115.0	-	115.0
Total	1118.6	706.7	1825.3



Livestock

The centre has maintained a representative herd of equines at Bikaner campus comprising indigenous horses of Marwari (n=36) and Kathiawari (n=4) breed, exotic donkeys (n=41) and mules (n=2) (Table 2).

The centre is also maintaining some animals at Hisar campus comprising horses of Marwari

breed (n=4), exotic donkey (n=1) and other equines including ponies, mules and indigenous donkeys of different age groups (Table 3). The centre is also maintaining a frozen stock of the semen which is being used for artificial insemination purpose.

Table 2 : Equine herd strength at Bikaner campus

Category	Horses				Poitou (exotic) donkeys		Mules	
	Marwari		Kathiawari		Male	Female	Male	Female
	Male	Female	Male	Female				
Above 3 years	6	13	-	3	9	17	-	-
2-3 years	-	3	1	-	2	1	-	-
1-2 years	3	9	-	-	6	4	-	-
6-12 months	-	1	-	-	1	1	-	1
0-6 months	-	1	-	-	-	-	1	-
Total	9	27	1	3	18	23	1	1

Table 3 : Equine Herd strength at Hisar campus

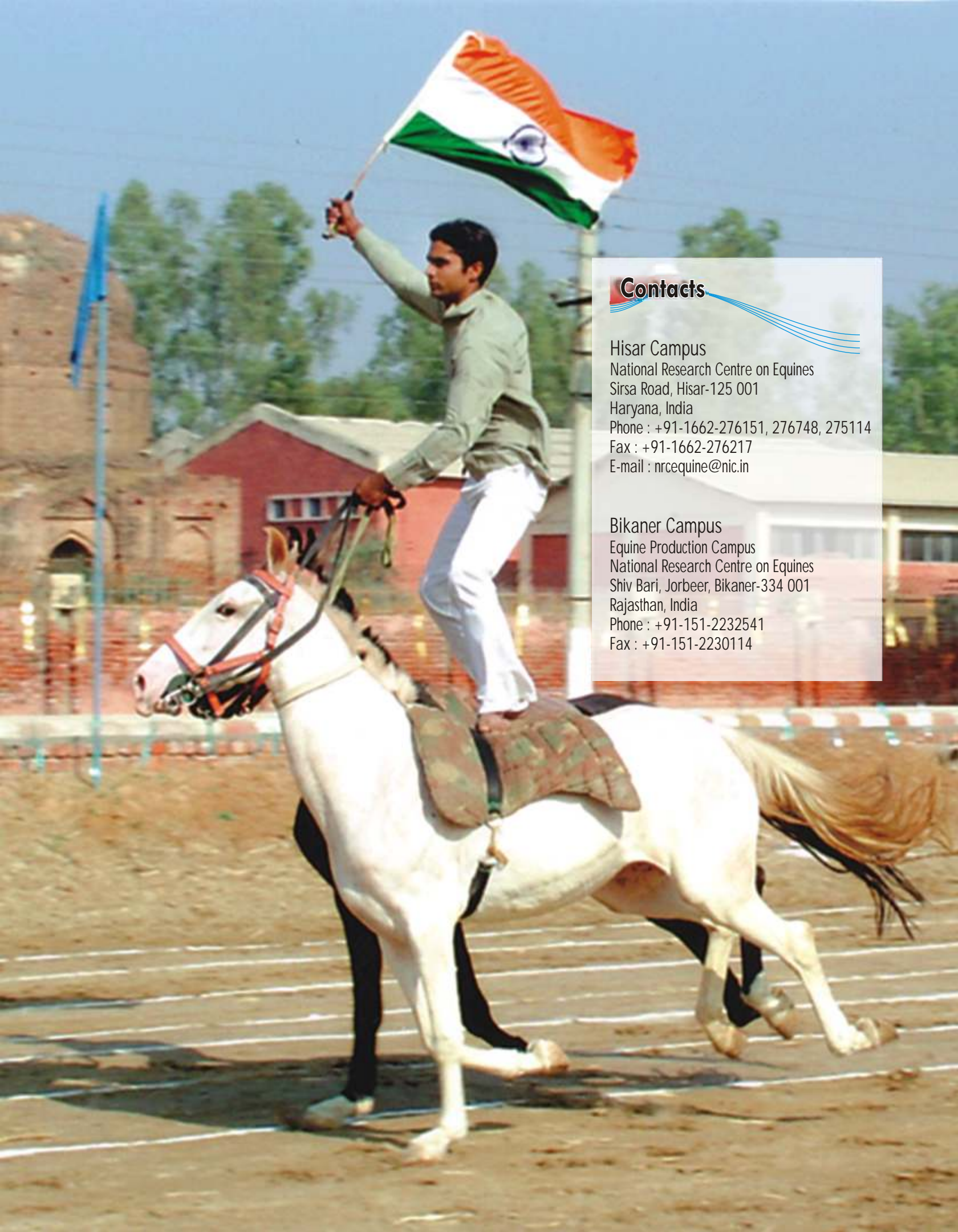
Category	Horses		Ponies	Mules	Donkeys		Grand Total
	Marwari	Others			Poitou	Indian	
Adult Male	01	01	01	01	01	02	07
Adult female	nil	01	10	nil	nil	nil	11
2-3 yrs	03	nil	01	01	nil	nil	05
1-2 yrs	nil	04	01	01	nil	nil	06
0-1 yrs	nil	nil	04	nil	nil	nil	04
Grand Total	04	06	17	03	01	02	33



Ongoing research projects at NRCE

Title of the Scheme	Team	Date of Start	Date of Completion
EQUINE HEALTH			
Development of improved vaccine against equine diseases			
Establishing the pathogenesis of available EHV-1 strains/new isolates selection of a virulent strain in equines for inducing abortion in pregnant mares	B.K. Singh, B.R. Gulati and N. Virmani	June, 2005	May, 2006
Development of improved diagnostics against important viral and bacterial diseases of equines			
Studies on the improvement of the Diagnostics for differentiation between EHV-1 and 4 infections employing molecular techniques	Nitin Virmani, A.S. Panisup, B.K. Singh & B.R. Gulati	May, 2004	March, 2007
Development of sensitive & specific methods for diagnosis of equine rotavirus from diarrhoeic foals	Baldev R. Gulati and B.K. Singh	June, 2003	May, 2007
Development of diagnostic(s) for pathogenic <i>Streptococcus equi</i> in equines	Praveen Malik, B.R. Singh, Nitin Virmani, S.K. Khurana and Mamta Chauhan	June, 2003	March, 2006
Development of diagnostics for <i>Rhodococcus equi</i> infection of equines	S.K. Khurana, B.R. Singh, Praveen Malik and Nitin Virmani	May, 2004	March, 2007
Epidemiological studies on emerging and existing diseases of equines	S.K. Dwivedi, A. S. Panisup, B.K. Singh, S. Dey, S. K. Khurana, B.R. Gulati, Rajender Kumar, P. Malik, S. C. Yadav, Nitin Virmani, Sanjay Kumar and A. Arangasamy	Continuous Service Project	
Chemotherapeutic and diagnostic studies on trypanosomiasis and Babesiosis in equines			
Development of diagnostic tests for equine trypanosomiasis (Surra)	Rajender Kumar, S. Dey, Sanjay Kumar, S.C. Yadav and S.K. Dwivedi	June, 2003	March, 2006
Development of sensitive and specific diagnostic tests for detection of equine piroplasmosis	Sanjay Kumar, Rajender Kumar, S. Dey, A.K. Gupta, S.C. Yadav and S.K. Dwivedi	May, 2004	March, 2006
Development of Nutraceutical from Medicinal plants for improvement of equine performance	S. Dey, S.K. Dwivedi, Scientists from IICT or CDRI	June, 2005	May, 2006
EQUINE PRODUCTION			
Cryopreservation of stallion semen and perfection of AI in Marwar horses.	Yash Pal, R.A. Legha, S.N. Tandon, A. Arangasamy and S.K. Khurana	May, 2002	June, 2006
Development of equine chorionic gonadotropin (ecg) based ELISA test for pregnancy diagnosis in equines.	A.K. Gupta Yash Pal, Sanjay Kumar and S.K. Dwivedi	May, 2002	June, 2006
Molecular marker based parentage testing in horses of Indian origin	Mamta Chauhan & A.K. Gupta	Dec., 2004	Nov., 2006
RFLP - Based genotyping of major histocompatibility complex class II genes in Marwari horses.	R.C. Sharma & S.C. Mehta (from NRC on camels, Bikaner)	Oct, 2004	Sept., 2007
Isolation of stallion seminal plasma proteins and their effect on in vitro fertilizing ability of spermatozoa.	A. Arangasamy & S.K. Bhure (from NRC on Camel, Bikaner)	Oct, 2004	Sept., 2006
Superior mule production in the field through frozen semen of exotic Jacks.	R.A. Legha, R.C. Sharma and A. Arangasamy	Dec., 2004	Nov., 2007





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