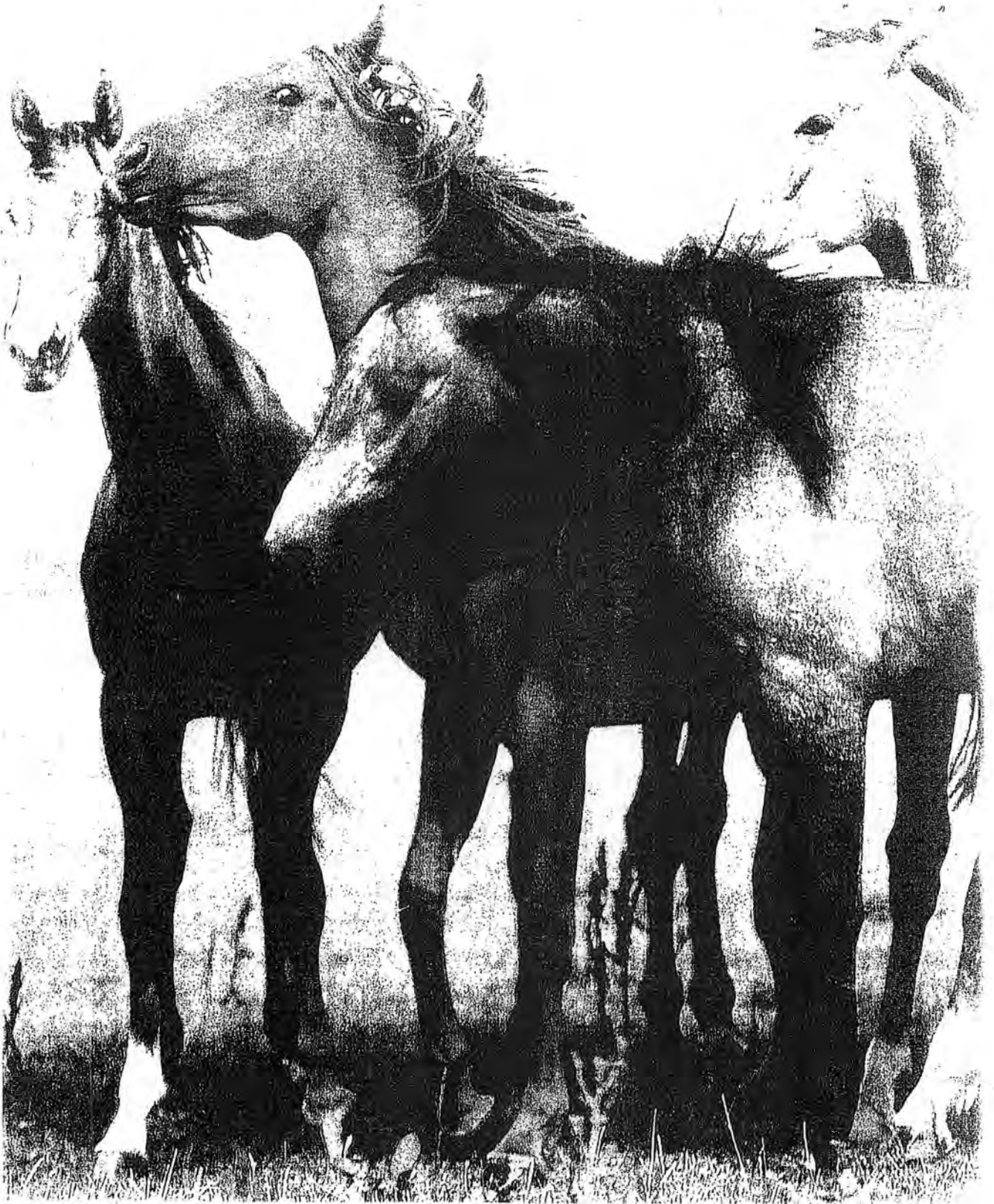


CPCSEA

- 2001



CARE AND MANAGEMENT OF EQUINES
USED IN THE PRODUCTION OF
BIOLOGICALS

**CARE
AND
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OF
EQUINES USED IN
THE PRODUCTION
OF
BIOLOGICALS**

Committee for the Purpose of Control and Supervision of Experiments on Animals
(CPCSEA),

Animal Welfare Division, Ministry of Environment & Forest, Government of India

2001

FOREWORD

The last ten years have seen a significant change in our thinking on the way animals are to be used in experiments and in the production of various immuno biologicals. It is encouraging to see the growing awareness for the ethical use of animals in various experiments. The emphasis on providing better facilities to laboratory animals and in following standard procedures while using them in experiments can never be overstressed. There is an urgent need to adopt more humane approaches to the way we utilize animals in experiments and to ensure that the current scientific procedures in use are in tune with the rapid advancement being made in other spheres of scientific knowledge.

Sensing the need for a standard document on the subject, the CPCSEA has prepared this scientific protocol for animal care and use in the production of biologicals from equines and this need has been further reinforced by the Supreme court of India which led to the Honorable Court's direction that the protocol formulated by the CPCSEA must be followed.

Every aspect of equine care is based on authoritative published literature that has to be followed by all those using equines in the production of biologicals. This will ensure an acceptable level of quality in the final products and also ensure a minimum level of trauma and stress on the animals concerned.

Maneka Gandhi

MANEKA GANDHI
Chairperson, CPCSEA

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INTRODUCTION

This document details the protocol to be adopted with reference to animal care and good management practices in the production of biologicals from equines. It has been prepared after a detailed deliberation at the meeting of the CPCSEA Subcommittee for Alternatives to Animal Testing held on 17-7-2001 at Chennai. Members present at the meeting were:

1. Dr.Kiran Singh, DDG Animal Science, ICAR – Chairperson
2. Dr.S. Chinny Krishna, Member, CPCSEA
3. Dr.J. Ramkrishna, Senior Prof., Department of Preventive Medicine, Madras, Veterinary College.
4. Dr. Jayanth Kumbhkar, Scientific Officer, VCI
5. Dr.P.Y. Guru, Head, Division of Lab of Animals, CDRI
6. Dr.Jayaraman, Assistant Director, ICMR
7. Dr. Shiranee Pereira, Expert Consultant, CPCSEA
8. Dr. S.S. Jadhav, Executive Director, Serum Institute, Pune
9. Dr. Usha Soren Singh, Director, CRI, Kasauli
- 10.Mr. Ramesh Chander, Dy.Director, CRI, Kasauli
- 11.Dr.V.N.Appaji Rao, Prof. Preventive Medicine (Retd.) Madras Veterinary College
- 12.Dr.S. Thirumalai, Prof. & Head, Department of Animal Nutrition (Retd.), Madras Veterinary College
- 13.Dr.P. Balakrishna Murthy, Director, FIPPAT, Padappai
- 14.Dr.S.S.Murugan, Head, Toxicology Division, SGS India Ltd
- 15.Dr.Bhuvana Kumar, Director, Chettinad Stud and Agricultural Farm, Chennai
- 16.Dr.C.B. Tharani, Prof. Of Pharmacology, Stanley Medical College, Chennai
17. Dr.V.D. Padmanabhan, Registrar (Retd.) TANUVAS, Chennai
18. Smt Prema Veeraraghavan, Expert Consultant, CPCSEA.
19. Dr.S.S. Quadri, Expert Consultant, CPCSEA

The protocol was presented and ratified at the National Committee of the CPCSEA on 09-08-2001 at New Delhi. The protocol has been further refined with necessary technical details added to make a document on the subject.

The CPCSEA undertook to prepare this scientific document, in the absence of an uniform code of scientific animal care and use, and package of practices in the production of biologicals from equines, in institutes in India and in the absence of an international reference document for the same.

In the context of rapid advances in science of alternatives to animal experimentation it is imperative to minimize pain and distress to animals if their use is unavoidable in the procedures. Practice of humane techniques is mandatory in biological sciences where animals are used for research or production of biologicals. This document details the package of bioethical procedures to be followed while using equines for production of biologicals.

1. REQUIREMENTS OF EQUINES IN THE PRODUCTION OF BIOLOGICALS

Equines are employed in large numbers in India to produce hyperimmune sera and other biologicals. The choice of the species (equines) for the purpose is apparently due to the ease in management and handling, tolerance to huge doses of antigen and high volume of hyperimmune serum that can be harvested at periodic intervals to mention a few.

Nevertheless unscientific and unscrupulous methods, the most agonizing ways of housing and management, unethical procedures of immunization and bleeding adopted in harvesting hyperimmune sera irrespective of the physiological competence and health status of the animal was observed in several large institutes in India. The equines of course had only two options- endure the torture or succumb to it.

This also results in poor quality of sera, affecting the recipient humans. The equines to be efficient donors of hyper immune sera should be physiological very fit. They should be housed as per standards and should be fed with easily digestible good food. The equines must be provided, in the least, with minimum exercise in order to have efficient digestion and general well being. Care must be given to hoof and daily grooming must be ensured.

Presently most horses used by the institutes are sourced from army, police, racing stables, riding stables etc. They are given to the institutes after they out live their productive functions in the army or other stables, though the basic pre requisite in using equines for the production of biologicals is good health.

Equines, especially horses are very sensitive in nature and will react to micro or macro environmental alterations in feed and handling. They must be treated with care and dignity, which are also basics of animal welfare.

The responsibility of horse care includes the understanding of a horses needs and knowledge of how horses live in the wild. It includes knowledge of the horses structure and how the systems in its body work, learning to recognize signs of ill health, know how to deal with injury and disease and the know-how to use horse equipment and tack.

The horse's anatomy, body systems and natural behavior are all adapted for a life as a herd animal and dictate how it should be cared for. The horse is a herd animal and needs to be able to communicate with other herd members and they need companionship. Of course horses do not have philosophical discussions but they need to convey basic emotions such as fear etc. Wild horses have considerable tactile and social contact with other horses.

Individually stabled horses are denied these social interactions and this may contribute to the development of abnormal behavioral habits such as box walking, weaving, wind sucking and crib biting. Domesticated horses need contact with people instead and this is given through activities such as grooming and exercising. Horses enjoy rolling, especially in the mud and dust. Horses roll for pleasure and they also roll when they have colic or abdominal pain. Rolling involves almost all the muscles of the body and when they roll for pleasure they seem to enjoy it the same way as humans would enjoy a good stretch. Stabled horses will frequently roll in their beds. Bedding is essential for stabled horses. Daily grooming by stable attendants may help to compensate their reduced social interaction with their own species.

While horses do eat a lot, in their natural state they eat small amounts of food continually over extended periods of time. Put simply, horses are grazing animals. Horses have a small stomach for their size and their one way digestive system works best when it is continually supplied with small amounts of food, as in grazing. Equine stomachs can't handle an overload; nor can they expel it by vomiting. A strong muscle that admits food and fluids but prevents anything from going back out, encircles the entrance to a horse's stomach. Thus a horse can't even burp up excess stomach acid, let alone regurgitate disagreeable fodder.

So when a horse eats the wrong thing or even too much of the right things, the food is trapped in his stomach. It stacks up in soggy layers that his digestive system is unable to break down or expel, making him susceptible to several digestive problems. This vulnerability is heightened by any stressful situation. Forage is the foundation of a horse's diet, and nutritionists caution that protein rich grain should be fed only when hay and pasture don't meet caloric requirements. Shortchanging fiber with too much grain and supplements will disrupts the ability of a horse's sensitive digestive system to absorb nutrients, leading to problems.

Teeth of course, are the primary food processors, and digestive efficiency depends on their condition. Horses grasp food with the upper lip, aided by the tongue or front teeth, depending on the type of fodder. Before they chew hay or grain, they mix it with large quantities of saliva, which is secreted by three large salivary glands. These glands also produce a protein that helps break down starches. The water the horse drinks before eating usually stimulates the salivary glands.

The food then moves back in the mouth, where it is ground up, down, and finally sideways by the teeth. This lateral movement gradually wears down tooth enamel, creating sharp edges on the inside of the lower teeth and the outside of the uppers, often causing painful injuries to the tongue and cheeks unless filed regularly.

Horses eat slowly as a rule, in keeping with natural grazing habits suited to the configuration of their jaws. The upper mandible is larger than the lower, allowing them to chew on only one side at a time. What and how much a horse should be fed is determined by his age, breed, and weight, as well as by the type and amount of work he is doing. Young horses have different dietary needs from older individuals and those in their prime. Thoroughbreds have the highest metabolic rate, burning nutrients the most quickly.

Equine intestines teem with diverse colonies of ravenous parasites waiting to cadge a meal. Botfly larvae and the eggs of large and small strongyles, roundworms, and tapeworms, to name just a few, will be first to feast on the nutrients of any fodder a horse eats, depriving the bloodstream of energy-producing elements that the horse needs for peak performance. These parasitic pests invade the mouth as eggs and larvae, swimming on a salivary sea into the hundred-foot alimentary canal, attaching themselves at various points along it, and burrowing in until they reach maturity and are expelled in the feces. If left unchecked, these minuscule gourmands will permanently damage the horse's blood vessels and intestines, causing chronic digestive problems and general debilitation. Wormy horses have a lethargic attitude that translates into poor performance. Their coats are dull and resist shedding, potbellies swell under their visible ribs, and episodes of colic and diarrhea are frequent. To prevent these conditions, all horses must be regularly dewormed.

A healthy hoof should be full, round, open at the heel and proportionate to the horse's size. A horse should stand evenly on all four feet, with the front hooves squarely on the ground. Although they often shift their back legs, healthy horses never lift the front feet in like manner. The attention of a farrier will be regularly required to maintain the health of hoof, especially in stabled horses.

Majority of equids used in research are brought in from outside sources. Ex-race horses – sourced for physiological research, will adjust to stable routine and they are usually amenable to most minimally invasive procedures, such as collection of blood samples. Ponies obtained directly from breeders/dealers, may have had minimal exposure to humans and will need regular and patient handling and training.

2.BASICS OF SELECTION AND QUARANTINE

The equines selected for production of biologicals must be young, strong and must be able to endure the stress of hyperimmunisation and the bleeding schedule. It is not important if it is a thorough bred or native breed or pony or mule .

Age

Young equines in the age group of 5-14 years alone can be used. The minimum age of the equines used in these programme must be not less than 5 years.

No animal should be in the programme for a period exceeding 3 years and plasmapheresis must be an integral part of the bleeding. The equines must be tested for liver function test (LFT) and serum profile at the end of every year after introduction into the programme. These animals can continue in the programme only if these tests indicate that the animal is normal.

The animal may be permitted to continue in the programme in the fourth year only after a complete health check up and it is observed that the animal is in a state of perfect good health.

Prepurchase Screening Procedures

A set of screening procedures must be in place to ensure the selection of fit animals than accepting any animal given free of cost or lesser cost. Indiscriminate admission of animals will result in poor standards of immunization and the ultimate biological product, which will be undesirable.

Soundness examination

The animal is critically examined by a qualified and registered veterinarian to detect any apparent or hidden defects in the musculo - skeletal system and for other vices. Examination of mouth and dentition will reveal if it can handle feed properly. Examination of eyes, ears will inform the fitness of these systems. Assessment of clinical parameters such as temperature, pulse, respiratory system and general tests for agility will indicate the general health and fitness of the animal. Examination of feet will reveal hoof health.

Diagnostic tests and laboratory investigations

The animals before purchase should be subjected to the following diagnostic tests by a qualified veterinarian to identify any occult disease

- Mallein test (Glanders)
- Examination of blood smears (Haemo- protozoan parasites)
- Coggins test (Equine infectious anaemia)
- Dung examination (Endoparasites)

- Hematology
- Liver function tests
- Renal function tests

The examining veterinarians must enter all the reports of investigation in the forms appended in enclosure-“Soundness examination form” which includes:

1. History sheet
2. Soundness certificate
3. Diagnostic tests and vaccination details
4. Haematology, liver function and renal function tests

Veterinarian

It is mandatory that a qualified and registered veterinarian with adequate experience in equine practice, be available in all the institutes that possess equines for production of biologicals. This is very important as a bioethical measure just as it is a mandatory pre requisite to have microbiologists for vaccine production or pharmacologists for drug production or pathologists in diagnostic laboratories.

The veterinarians should inspect the equines every day for health and fitness and are directly responsible for all interventions such as immunization or bleeding etc. His/her opinion based on laboratory records of hematology, renal and hepatic profile is a must before harvesting blood from equines. He/she should also ensure the use of steriware and safeguard the health of horses.

Diagnostic laboratory

A fully equipped diagnostic laboratory to study hematology, serum protein and lipid profile, renal and liver function tests, examination of materials for endo- and haemoprotozoan parasites etc. with qualified technicians and headed by a veterinary pathologist should be in place in all the institutes producing biologicals from equines. This laboratory will ensure periodic screening and maintenance of records from which the health profile of equines can be assessed. Scientifically this will be the basis for immunization and bleeding schedules than the dates on the calendar. Accordingly the veterinarians must draw the technical programme.

QUARANTINE AND MANAGEMENT OF NEW COMERS

All the purchased/acquired equines should be isolated for a quarantine period of a minimum 21 days to a maximum of 40 days to be screened, observed and prepared before entry into main stables.

During the quarantine period, the following are to be attended to:

1. Weight of the animal to be recorded.
2. All non specific infections, wounds etc. to be attended to .
3. Hoof care to be provided.
4. Immunisations / vaccinations to be administered
5. Deworming to be done
6. Detailed hematology and liver and kidney function tests to be conducted. (if below normal levels are encountered animal to be segregated – special feeding and veterinary supplements to be given.)
7. The collection of naso-pharyngeal swabs for *Streptococcus equi* isolation,
8. Dentition should be checked and teeth rasped if necessary.
9. Animals to be named/numbered/tagged. Ear tags are the ideal form of identification. However if branding is resorted to only cold branding permitted, with a minimum figure size of two inches. Hot branding is not permitted.

SUGGESTED IMMUNIZATION SCHEDULE FOR EQUINES

Disease / vaccine	Frequency	Comments
Tetanus Toxoid	Annual	Booster at the time of penetrating injury / surgery- if the last dose is not administered within 6 months.
Equine Encephalitis (EEE, WEE) (Optional)	Annual	In endemic areas booster every 6 months
Equine Rhinopneumonitis (EHV 1 & 4)	Every 3 months/Annual	-
Anti - Rabies	Annual	Compulsory

SOUNDNESS EXAMINATION FORM

A. DESCRIPTION OF THE ANIMAL

Name of the horse:
 Breed Tattoo
 Sex* Colour ***
 Age ** Markings

Seller's statement before examination:
 Seller's Name: Address: Phone No.
 CPCSEA Regd.No:

Duration for which the animal has been in his possession (years/months)

Seller's knowledge of the animal's health (past or present conditions)

Diseases _____
 Lameness _____
 Treatments/Medications _____
 Vices _____
 Disabilities _____

Signature of seller
 Date:
 Address: Phone No.:

To what use do you intend to put this horse (define whether ARS/ASVS/ ATS etc.)

Name of the buyer:
 Address of the buyer:
 Signature of the buyer
 Date:

* Colt- upto 3 years
 Stallion - infant male of 4 yrs / older
 Gelding - castrated male
 Filly - female upto to 3 yrs
 Mare - female over 4 yrs
 ** Age should be based on:
 1. Age proof supplied by seller- brand, tattoo etc.
 2. Inspection of dentition
 The first, second and third permanent incisors erupt at 2.5, 3.5 and 4.5 yrs respectively. All permanent teeth (incisors, pre molars & molars) are present by 4.5 years.
 *** Coat colour-Bay, Black, Chestnut etc.

B. SOUNDNESS CERTIFICATE

Place _____ Date _____ Time _____

General Health and appearance _____

Approximate height (at withers- cms) _____

Approximate weight (kgs) _____

Temperature (Rectal) _____

(N- Normal; AB - Abnormal)

A. Bilateral symmetry

- 1. Head & neck N. AB.
- 2. Body
- 3. Legs

B. Eyes

- 1. Symmetry N. AB.
- 2. Reflexes
- 3. Lids
- 4. M. Membrane
- 5. Cornea
- 6. Ophthalmoscope examination

C. Mouth

- 1. Lips N. AB.
- 2. Tongue
- 3. Teeth
- 4. Gums
- 5. M. Membrane
- 6. Odour
- 7. Bite

D. Nasal

- 1. Symmetry N. AB.
- 2. Airflow
- 3. Odour
- 4. M. Membranes
- 5. Exudates

E. Pharynx, larynx, trachea

- 1. Palpation N. AB.
- 2. Cough induction
- 3. Auscultation- at rest
- after exercise

F. Cardio-vascular

N.AB.

- 1. Palpation
(heart and pulse)
- 2. Auscultation- at rest
- after exercise

G. Pulmonary

- 1. Percussion N. AB.
- 2. Auscultation - at rest
- after exercise
- 3. Respiratory rate (at rest)

H. Digestive

N. AB.

- 1. Percussion
- 2. Auscultation
- 3. Inspection of dung

I. Genital-urinary

- 1. External N. AB.
- 2. Inspection & Palpation

J. Integument

N. AB.

Note especially for "used" marks
(Interference with saddle, girth sores, firing or other treatment dermatoses etc.)

K. Musculo- Skeletal

- a) Vertebral Column N. AB.
 - 1.Symmetry
 - 2.Palpation
 - 3.Manipulation

- b) Limbs N. AB.
 - 1. Symmetry
 - 2. Palpation
 - 3. Manipulation

- c) Gait N.AB
 - 1.Symmetry
 - 2.Freedom of movement on hard surface
 - 3.On soft surface
 - 4.On a straight way
 - 5.Turning both ways.

L. Vices

- 1.Cribbing – Weaving – Digging – Savaging-Others N.AB
- 2.Stables Manners
- 3.Field manners

M. Nervous system

- 1. Is the horse nervous Yes/No
- 2. If so when and where?

N. Hoof Health

Whether overgrown/wounded/normal

Conditions other than normal found in the animal. Give particulars

Signature of the Veterinarian _____

Qualification_____

Registration Number_____

Date_____ Place_____

C. DIAGNOSTIC TESTS AND VACCINATION DETAILS

Diagnostic Tests Results

1. Glanders – Mallein test

Results _____

2. Trypanosomiasis (surra) – Screening blood smears

Results _____

3. Babesiosis – Screening blood smears

Results _____

4. Equine infectious anemia – Coggins test

Results _____

5. Screening for Endoparasites

Results _____

6. Skin scrapings test (if necessary)

Results _____

Vaccination Details

- 1. Against tetanus - date -
- 2. Against rabies - date -
- 3. Others - Specify - date -

Name of Laboratory _____

Signature of the Veterinarian _____

Qualification _____

Registration Number _____

Date _____ Place _____

D. HAEMATOLOGY, LIVER FUNCTION AND RENAL FUNCTION TESTS

Results of Haematology tests

Results of liver function and renal function tests

Name of Laboratory _____
Signature of the Veterinarian _____
Qualification _____
Registration Number _____
Date _____ Place _____

3. HOUSING AND HYGIENE

HOUSING

Horses may be housed in individual stables, with provision for daily and regular exercise and socializing, or in "open barns" which includes a sheltered area with an open paddock for exercise, grazing, socializing etc.

The Stabled Horse

Living in a stable is not natural for a horse. The horse will feel confined and isolated against its natural instincts of feeding and socializing. If you have to stable a horse you must provide good food, water and bedding and the psychological needs of the horse should also be attended to.

The minimum size of horse stables should be a minimum of 12' (length) x 10 (breadth) x 9 (height). The floor must be hard wearing, impervious to moisture, have a non-slip surface and should slope gently for drainage. The stable should be well ventilated from all sides.

They may be loose boxes or stalls. Loose boxes are individual 'rooms' for horses and may open to the outside or are enclosed in a larger barn. Stalls have solid partitions and a single bar across in the front.

In the American Barn type of stabling, loose boxes face each other across a central aisle with the whole area covered over. This is recommended next to the open barn type of housing as it provides stimuli for the animals, which can see each other and communicate with each other. The only disadvantage being the common air space they share.

Whether the animals are housed in individual loose boxes, stalls or in the American Barn type of housing, these animals should be provided daily exercising, grooming and socializing in an open field. Hence a large open grazing field with provision for sand baths should be an essential part of the housing unit. Clean warm bedding is a must for stabled horses. Bedding provides comfort and it insulates and prevents horse feet from being jarred by standing for too long a time on hard surface and encourages a horse to pass urine and droppings. Although horses sleep standing they like to lie down from time to time.

Straw, wood shavings, shredded newspaper may be used as bedding material. Care should be taken to ensure that straw is not mildewed or infected with fungal spores, which in equines can trigger respiratory problems. Wet bedding, droppings and urine in stables should be removed in the least twice a day. Stables should be well ventilated with an air vent near or in the roof of the stables to enable air circulation. Roofing should not be noisy when hit by rain, etc. and must not become too hot in direct sunlight. There should be an overhang on the roof to protect the horse and its bedding from the rain. The roof should have excellent guttering so that the captured rainwater runs into a drain.

The door of stables should be atleast 3 1/2 ft wide and 7 ft in height. Horses that are stabled should be exercised/rolled 2-3 times day compulsorily.

The Open Barn

The better alternative to stables is the 'Open Barn' system, which includes a sheltered area with as open paddock. A large barn in a field has the advantage that a number of horses can be sheltered together and have continuous social interaction. The sheltered area (barn) should have sufficient and enough area to provide cover for all the animals in summer / winter / monsoon seasons. The covered areas should have total area equivalent to individual(12 ft x 10 ft x 9ft) stables into the number of horses being housed. The common barn should be provided with adequate feeding and water troughs.

The paddocks should be provided for with grazing area and sand baths.

Fencing of paddocks and the open field area for stabled horses should be of safe metal / wood material. Barbed wire / wire mesh cannot be used. Timber or metal fencing and gates are to be used.

HYGIENE

Sanitation and disinfection of stables, barns and exercising yards

- All manure, litter & combustible materials should be removed and transported away from stables and disposed.
- At least 4 inches of top soil should be removed from any contaminated dirt surfaces.
- The flooring in animal stables should be graded to eliminate any areas of water stagnation.
- All the stables and surfaces should be thoroughly cleaned with water and an effective animal friendly detergent and disinfectant.
- All equipment used for the removal of manure and for cleaning should be thoroughly cleaned.
- All building surfaces and equipments should be kept clean and disinfected.
- If buildings or other facilities are not adequately disinfected by spraying, they should be sealed and fumigated. Allow facilities to dry and remain vacant for a day or two before restocking.
- Fly control measures to be undertaken using safe eco friendly fly repellants.

NOTE:

- 1) Bleaching powder – a good disinfectant may be employed in the routine cleaning of stables. However it should be applied only after the animals are removed from the stables.

All the dung and litter should be removed by scraping dung and litter material from the floor and walls and disposed off by burning.

The walls up to 6 feet high should be thoroughly scrubbed with water and so also the floor.

The entire area should be coated with animal friendly disinfectant, by means of a spray with as much pressure as possible.

The disinfectant (bleaching powder) should be left to act for 24 hours.

After 24 hours, the building or the stable should be washed out thoroughly with cold water and then allowed to dry thoroughly. The animal may be brought in only after the stable is dry and has no odor of the bleaching powder.

- 2) Phenolic compounds not permitted in disinfecting animal housing facilities.

4. STANDARDS OF NUTRITION AND FEEDING

The horse is a non-ruminant herbivore with microbial fermentation occurring in the cecum and colon. The stomach is only about 8% of the capacity of the total digestive tract, relatively small in relation to body size. Hindgut comprises 62% of the capacity of the total digestive tract. Unlike cattle, horses cannot digest & utilize crude fibre efficiently. As an herbivore, the horse is and behaviorally accustomed to continuous feeding, they spend most of time grazing or browsing.

In stabled horses, their movements are restricted and socialization is reduced. There is an increased possibility of both gastro-intestinal colic problems arising from individual housing and intermittent feeding

The equines used for production of biologicals must have an ensured input of nutrition in order to maintain the health of the animal and yield quality products. They are invariably stall fed and therefore standards of nutrition can be maintained with the feed ingredients and computation of ration.

Principles of feeding

- The animals should be fed with concentrates three times a day.
- The freshly computed concentrate should be fed as per the needs of individual animals.
- The concentrate feed is filled in mangers, which are fixed at chest level, for comfortable intake and to avoid contamination, wastage or spillage.
- The manger provided should be of optimum size so that the ration will occupy only ¾ of the height to avoid spillage.
- The manger should be emptied every time and cleaned well before refilling for the next feed.
- Roughages (green and dry) are also allotted on the body weight basis.
- Roughages are provided in the stable in separate hay racks / hay nets and should be fixed at chest height.
- Fresh and good quality hay must be ensured and fed at specified timings in appropriate quantities to avoid spillage and wastage.
- The hay racks / nets must be cleaned well before refilling.

- The equines should have constant access to clean and potable water whether at pasture or in stable.
- The source should have large surface area for animals to have easy intake on an average 25 to 30 liters of water may be required daily.
- It is again preferable if the water source is at chest height for comfortable access and to prevent contamination and pollution.
- In winter, rainy, chilly days or in cases of higher altitudes where the ambient temperatures will be low, the horses must be fed with warm water that will encourage more in take.

Equine feed components

Rodent and moisture free facilities for storage of feed and fodder should be ensured in every institute.

Concentrates

Under our conditions maize is one of the most energy dense grains and it should be fed on a basis of weight and not volume. Oats and maize can be fed as a whole, crimped, rolled or ground. Supplementation with vitamins and salt are also recommended. Vitamins at the rate of 5 mg / kg feed and salt at about 50 g (daily) is the most useful supplement for all horses.

Roughages

Hay requirements of equines may range between 1.5 and 2.0 kg per 100 kg live weight. Hay occupies the horse's attention, an important consideration in stabled horses, if behavioral problems are to be avoided. Hay provides most of the dietary intake, of providing both fiber and nutrients.

Straws are deficient in energy, protein and minerals when compared to good quality hay. Wheat and rye straw are not suitable for feeding to horses because of their high lignin content.

Water

Whether stabled or at pasture, equines should have constant access to clean water. The water supply should be sufficiently large to allow several horses to drink at one time in pasture / paddock. Potability of the water to be checked periodically.

When on a excessive concentrates and hay diet, stabled horses require 5 litres of water per 100 kg live weight per day.

During winter, the water in take is reduced, and it is important that horses should be provided with highly digestible feeds in order to minimize the risk of intestinal impaction.

Energy Requirements

The energy requirements of horses vary according to size, activity level, ambient temperature and individual metabolic activity.

The digestible energy (DE) requirements for the maintenance of horses weighing up to 600 kg live weight can be calculated using the following formulae:

$$DE \text{ (Mcal/day)} = 1.4 + (0.03 \times LW)$$

Where LW is the live weight in kgs.

The DE requirements increase by 25 – 100 % for mature horses in light to intensive physical /physiological work as in equines used in production of biologicals..

Feed ration for equines used in the production of biologicals

Concentrate feed (for 100 animals)

S.No.	Items	Morning Kg	Noon Kg	Evening Kg	Total Kg
1	Oats	16	20	20	56
2	Barely	10	14	10	34
3	Soyabean (crushed)	16	20	20	56
4	Maize (crushed)	20	29	25	74
5	Horsegram crushed	5	5	5	15
6	Wheat bran	5	5	5	15
7	Rice bran	2	1	2	5
8	Lin seed (crushed)	10	12	10	32
		84	106	97	287

Feed supplements (for 100 animals)

S.No.	Items	Morning Kg	Noon Kg	Evening Kg	Total Kg
1	Common salt	2	3	3	8
2	Mag. Sulphate	1	1	1	3
3	Dical. Phosphate	400 g	200 g	400 g	1
4	Liv.52 powder	400 g	200 g	400 g	1
5	Agrimmin powder	1	1	1	3
6	Jaggery	3	4	3	10
		7.8	9.4	8.8	26

Green grasses

S.No.	Items				
1	Lucerne		10-15 kg	Animal /day	
2	Green maize		5 – 10 kg	Animal /day	
3.	Carrots		1 kg	Animal /day	

Dry grasses

Hay 1.5 – 2.0 kg Animal / day

5. ENDOPARASITE CONTROL

Stall-fed animals have far lesser chance than those in paddocks or field grazing to acquire endoparasitic infections. In order that the equines maintained for production of biologicals be maintained free from endoparasites, it will be appropriate to examine the dung samples once in three months and the animal dewormed as and when the need arises. The ill effects of endoparasites will include loss in general condition, loss of body weight, anaemia, digestive disturbances and debility.

The drugs/dosage available for treating endoparasites is appended herewith. Anthelmintic drugs are administered to treat control and prevent parasitic infections. They are administered therapeutically or prophylactically to minimise morbidity or mortality associated with parasitic infections.

The decision to administer anthelmintic treatments must be made in the light of the level of parasitic challenge present in the environment of the animal and the health of the animal. The frequency of treatment depends solely on the rate at which the animal acquires parasitic infections.

Equines are generally infected with internal parasites, round worms, tape worms and bots (larvae of bot fly). Large and small strongyles are found in horses of all ages and are potentially very pathogenic. Small strongyles (particularly the larvae) undergo a prolonged period of development in the large intestinal mucosa, and are associated with several clinical syndromes such as diarrhea and weight loss and which demonstrates seasonal pattern. Tapeworms are common and occasionally associated with ileo - caecal colic.

Use of an appropriate dewormer at the correct time of the year for the particular target parasite, together with good pasture management is an important part of equine management. All horses grazing the same pasture should be treated with the same anthelmintic at the same time.

Specific treatments for bots, tape worms, small strongyles and migrating larvae should be given at the appropriate time of the year of the climatic region as per the decision of the veterinarian.

All new comers should be treated with a larvicidal dose of fenbendazole followed by a double dose of pyrantel and kept housed for 48 hours after last treatment, before allowing them to graze with the resident population.

Anthelmintics used routinely should be rotated on an annual basis to reduce the possibility of development of resistance. However it should not be changed every time the horse is dosed as this makes it easier for the worms to become resistant to the dewormer.

COMMONLY USED ANTHELMINTICS IN EQUINES

Drug	Dosage	Target organism
Ivermectin	200 mg / kg body wt.	Nematodes / bots
Thiabendazole	44 mg / kg. body wt.	-do-
Mebendazole	8.8 mg / kg body wt.	-do-
Oxyfendazole	10.0 mg / kg body wt.	-do-
Fenbendazole	10 mg/kg body wt.	Nematodes
Pyrantel	6.6 mg/kg body wt.	Strongyles /
Ascarids		

Note:

MORAMECTIN

Horse worming paste (30g)
one

(Avermectin 4 mg/ml Morantel
tartarate 167 mg / ml)

Available in a syringe.

The contents of this syringe will treat

horse of 600 kg. body wt.

For ponies 5 ml / 100 kg body wt.

PANCUR PASTE

(1 dose applicator containing
24 g paste)

For nematodes (large and small)
Ascarids, Oxiurids

EQVALAN PASTE
(MSD)
(Ivermectin)

A complete horse dewormer

- Nematodes and bots

One syringe contains sufficient paste to
treat one 600 kg horse – (at 200 mg / kg
body wt.)

6. IMMUNIZATION & BLEEDING

The recipient animal should be screened for physical fitness and good health, liver and kidney health profile and haemogram prior to being inducted into the program. The fitness of the animal should be certified by the veterinarian before every immunization and bleeding. Post-immunization the veterinarian should observe the animal for a period of 3 days for any possible immediate /delayed, local or systemic reactions. Only sterile ware should be used for immunization.

IMMUNIZATION

During the immunization period the following parameters /tests should be conducted:

1. Weight of the animal to be recorded at monthly intervals. Any animal, which shows a loss/drop in weight, should be removed from the program and subject to a thorough veterinary examination.
2. Screening for ecto/ endo parasites to be done once every three months.
3. Hematology, liver and kidney function tests to be recorded once in two months.
4. Adequate and proper feeding and nourishment to be given to immunized animals.
5. Veterinarian to be present at the time of every immunization. Health of horse to be monitored continuously and first aid made available in the case of anaphylactic shock etc.
6. **If the required and/or necessary titer values are not obtained from an animal, the same animal is not to be exposed/subject to a different permutations and combinations of antigen and adjuvant. The animal has to be removed from the program.**

BLEEDING

Bleeding should be done only by a veterinarian in the specially designed bleed room. Bleeding is to be done in calm surroundings after gentle and firm restraint of the animal. A veterinarian must do prebleeding examination and his certification must be in record. Adequate precautions must be in place in the bleeding room to tackle contingencies such as hypovolaemic shock. The animals in bleeding programme should undergo routine comprehensive (physical examination, Eye test, LFT, RFT, haemogram) health check every 3 months to ensure good laboratory procedures.

Whenever equines are used for collecting the blood samples, minimizing any pain and distress they suffer should be as important an objective as achieving quality products. The refinement of procedures to make them more humane should be an integral part of all scientific research. **It is in the interests of good science, as well as of animal welfare, that stress should be kept to a minimum.**

Scientists should be aware that the process might well be unnecessarily stressful for an animal simply because of handling or the discomfort associated with a particular technique. The chemical and physiological changes associated with increased stress may affect the quality of the blood drawn. It has been observed that stress affects the levels of prolactin, cortisol, corticosterone, glucose, RBC and WBC counts, platelet count and the packed cell volume. Hence minimizing stress during blood collection is helpful for the animal as well as the operators.

Bleeding / Immunization chambers

Every institution should fabricate special sterile chambers into which the equines can be brought for immunization and bleeding. A post bleed room should be attached to the bleeding room to monitor the animals for atleast 3 hours after bleeding. The chamber must have good facilities to calmly restrain the animals and enough room for interventions. At any time only one animal should be held in the chamber, with cool and clean pollution free atmosphere all of which is required as good laboratory procedures. In short the chamber must have tranquility and sanitary standards of an aspiration theatre with lesser sophistication. Enough number of chambers can be had in an institute as per its needs.

PRE-BLEEDING CONSIDERATIONS

- Blood collection environment/room should be clean, sterile and neat and well lit with temperature control.
- All equipments used for bleeding should be sterilized preferably disposables.
- The animal should be identified and a general physical examination carried out to ascertain the health of the animal.
- .Baseline tests and observations should have been conducted to get a clear picture of the normal hematology especially RBC, Hb, Packed Cell Volume, plasma protein in order to assess the health status of the animal.
- The color of the mucous membrane and capillary refill time, rectal temperature, pulse and nature of respiration should be monitored.

NOTE: BLEEDING SHOULD NOT BE DONE IN ANAEMIC /SICK ANIMALS

RESTRAINING THE ANIMAL

Large animals are normally physically restrained for venepuncture without anaesthesia. The animal should be gently restrained by an experienced handler who, should ideally be known to the animals. The key role played by the person holding the animal and raising the vein cannot be overemphasized. The animal may well show signs of discomfort but it should be reassured by gentle handling and talking.

Special frames (stocks) designed to restrain the animal for veterinary examination may be used for bleeding. The frame should not have any sharp projections or too narrow that it will hurt the abdomen. The entire frame should be wrapped with cushioning material (removable and washable). The horizontal bars

should be well rounded and the floor surface non-slippery. Some means of a quick side release should be available should a horse slip and go down.

Most horses and ponies will accept being restrained for collection of blood if they have been well – handled previously. A head collar should be put on with a long lead, preferably with a quick release catch. For collection of venous blood horses usually do not require additional control.

If more control is needed, then grasping a fold of skin in the neck with one or both the hands and twisting it (neck twitch) is usually sufficient to keep the horse still until the blood is collected. Horses are commonly physically restrained for venepuncture with out anaesthesia. For more fractious animals, a twitch can be applied to the upper lip. **However twitches should only be applied by staff experienced in their use and should only be used for a short period of time.**

Excessive force used in restraint will stress the animal and raise catecholamine and glucocorticoid levels in the blood. This in turn will alter the blood parameters such as packed cell volume and blood glucose level.

EQUIPMENT

- 1.Disposable needle with canula . 14-16 gauge x 25-40mm needle with suitable silicon tubing
- 2.Hair clipper
- 3.Anti-septic
- 4.Percussion hammer
- 5.Cotton
- 6.Towels
- 7.Collection flasks
- 8.Plasmapheresis equipment

PREPARATION OF THE SITE OF BLOOD COLLECTION AND LOCALIZING THE VEIN

Collection of blood samples are usually made from the jugular vein which is readily visible when the vein is raised by manual pressure in the jugular groove.

It is important to locate the vein accurately before taking a sample. Obstruction of the venous return may be required in order to distend the vein and to prevent excessive movement of the vein. This makes location and introduction of a needle much easier. Percussion may help to determine the course of a vein. **It is important that time be spent making an accurate location and blood dilation of the vein before puncturing the vessel.**

Important point to consider is that the thickness of the skin varies between sites on the same animal. Repeated injections may lead to fibrosis of the vein and thickening of the skin.

It is important to maintain asepsis through out the procedure, so hair and superficial skin debris over the vein should first be removed. Hair can be removed using a pair of clippers. Clip the hair over an area approximately 10cm long and 5 cm wide on either the right or left hand side of the animals neck. The clipped area should be cleaned with warm water to which is added a disinfectant such as cetrimide or an antiseptic lotion like Savlon (1:30) dilution. These agents should be subsequently removed with plain water to prevent contaminating the sample.

INSERTION OF NEEDLE AND TAKING THE SAMPLE

- Having located and tracked the course of the vein, dilated and immobilized it, prepared aseptically the next stage is to pierce the skin with a needle (Sometimes with the a syringe attached). The skin should be pierced with one movement by directing the tip of the needle , a little way up the vein, so that the angle of penetration is almost parallel to the vein. (The angle of perforation should not be steep since the steeper the angle of needle entry the more likely it is to pass through the vein)
- **The maximum volume that can be bled from an equine should not exceed 1% of the body weight or 10% of circulating blood volume weight with plasmapheresis. The plasma so depleted should be restored by resuspending the solid suspended material with the equivalent volume of warm (30-35° C) Ringers lactate or normal saline infusion.**

If too much blood is withdrawn too rapidly, or too frequently without replacement an animal may go into short-term hypo-volaemic shock and in the long term suffer from anemia. Again the vein will collapse if the sample is taken too quickly in a large quantity and so care should be taken to ensure that it is taken at an appropriate rate.

Hence as a rough guide upto 10 % of the circulating blood volume can be taken on one single occasion from a normal hardy animals on an adequate plane of nutrition with minimal adverse effect. **This does not mean the animal does not experience any after effects – merely that it does not show any.**

This volume may be repeated only after 4 weeks. If 5% of the circulating blood volume is removed a 2-week rest period is to be given between 2 bleeds. An annual rest of 3 months from bleeding is mandatory for all animals used in bleeding

WITHDRAWAL OF THE NEEDLE AND POST -BLEED MONITORING

- After the needle has been withdrawn, continuous pressure should be applied immediately to the puncture site for latest 30-60 seconds.
- The puncture site should be observed for further 30 seconds to ensure that bleeding does not recur.
- The animal should be retained in the post- bleed room and checked every 10-15 minutes for the next 3 hours.
- If there is any chance that the bleeding may restart the animal must be isolated at once so that it can be closely monitored.
- Care must be taken in handling the animals after blood withdrawal. Since bad handling can stimulate bleeding due to physical trauma or raised blood pressure.
- If the bleeding persists it may be advisable to apply a haemostatic preparation or tincture benzoin to arrest bleeding. However thermocautery artificial skin sealants should not be used as they cause discomfort.
- Rectal temperature, pulse, heart rate and respiration should be monitored.
- Urine flow should be observed.

CARE OF THE ANIMAL IN HYPO VOLAEMIC SHOCK AND ANEMIA

It is essential to be able to recognize the signs and symptoms of shock and anemia and appropriate action must be taken.

Hypo-volaemic stock manifests as a fast and thready pulse, pale dry mucous membrane, cold skin and extremities, restlessness, hyperventilation and a subnormal today temperature. Central venous pressure should be monitored to avoid overloading and pulmonary oedema. The animal should be kept warm and well ventilated but direct heat should not be applied. In these animals therapeutic intervention consists of substituting the blood volume lost with an equivalent amount of warm isotonic intravenous infusion.

Systemic administration of broad-spectrum antibiotics is indicated in hypovolaemic shock to avoid secondary infection, which can occur due to impaired reticulo -endothelial system. The temperature, pulse and respiration have to be monitored periodically.

Signs of anemia includes pale mucous membrane of the conjunctiva or inside the mouth, pale tongue, gums, intolerance to exercise and at a more extreme level an increased respiratory rate when at rest. Monitoring of the individual animal is very important and the base line data of each animal i.e. PCV, HB, RBC and reticulocytes counts should be monitored throughout the series of bleeds. Any deviation from normal should be taken seriously and the animal attended to.

In case of anemia the animal should be treated with iron and vitamin B12 for the above mentioned blood parameters during therapy until normal values are reached again.

7.MAINTENANCE OF RECORDS / DOCUMENTATION

Records and documentary proof of the equines in possession and production with necessary and important information must be scrupulously maintained in every institute and they must be open to verification and inspection.

The following registers must be maintained:

1. Livestock register with details of age, sex, source, identity etc.
2. Individual animal health card
3. Individual animal production record of immunizations, bleed volume, harvest etc.
4. Feed and stock register
5. Daily diary of veterinarian
6. Sick Bay register and treatment register
7. Roaster of deworming and vaccinations
8. Quarantine and Isolation register
9. Mortality and Postmortem register

8.CARE OF SICK AND INJURED EQUINES

There are disorders of equines consequent to domestication and confinement in stables or paddocks. Commonly they will be of digestive or respiratory or behavioral in nature, that should be watched for and appropriately handled.

The staff at stables must be trained to recognize common ailments and must be aware of first aid and nursing. Basically such animals should be kept in a clean, spacious well-ventilated loose box with adequate bedding and a separate attendant should be on 24-hour duty.

RECOGNITION OF PAIN IN EQUINES

The following signs are indicative of pain in equines:

- 1.Periods of restlessness
- 2.Interrupted feeding with food held in the mouth uneaten
- 3.Anxious appearance with dilated pupils and glassy eyes
- 4.Inreased respiration and pulse rate with flared nostrils
- 5.Profuse sweating
- 6.Rigid stance
- 7.Frequent yawning
- 8.Frequently lying down

In prolonged pain, behavior may change from restlessness to depression with head lowered.

In pain associated with musculo-skeletal damage, limbs may be held in unusual positions and there is reluctance to move, with the head and neck "fixed". There may be a pain-induced tachycardia. In abdominal pain a horse may look at, bite or kick its abdomen; it may get up and lie down frequently; walk in circles; roll and injure itself as a result of these activities with bruising especially round the eyes. This state may progress and last for several hours. When near collapse, the horse may stand quietly rigid and unmoving but with signs of deteriorating circulatory status such as mucosal cyanosis and prolonged capillary filling time. Horses in pain generally show a reluctance to be handled.

NURSING EQUINES

Nursing a sick animal does not necessarily mean that the animal is free from pain, but that everything has been done to make its life as comfortable and pleasant as possible in the given circumstances.

Most importantly never leave a horse in even the slightest pain for more than 24hours without identifying the cause. Call for a vet immediately.

When a horse needs nursing, keep it in a large, well-lit, draught free box. There should be an electricity point and a source for hot water nearby. A sick horse needs constant attention to keep it warm, clean and if the condition permits well fed. An attendant should be on hand 24hours to respond to its needs and any change in its condition.

Bring a horse in from the field if does not appear to be eating normally, if it is lethargic, if it feels colder than you would expect, or if it has diahorrea or it is not passing normal droppings. If required immediate first aid should be administered before calling in the vet. Medicines can be mixed with small amounts of the horse's normal feed. If it refuses this, try adding a strong flavor such as molasses or try hiding the drug in a hollowed apple or carrot.

Give a sick horse a good bed to lie on, but do not make it too thick, especially if it is straw. If a horse stands miserably shifting its feet it may build up a pile of straw between its legs and makes further movement difficult.

You can tell whether the horse is feeling cold by feeling its ears gently. If the horse is cold put on a rug. However the ears will not show you if the horse has a high temperature or not.

A horse's nostrils and airways can become clogged with mucous, a steam inhalation will loosen the mucus and soften any crusting, which might be uncomfortable. Put a few drops of vapor inhalant into a bowl of hot water. Wrap a towel around the bowl and loosely around the horse's muzzle, so that the horse can breathe only the air containing the medicated steam.

Horses like routine, and when they are ill , this is all the more important. Give meals and do other tasks at the normal times. Grooming is vital, even for the sick horses, it really freshens them up unless it evinces any pain in doing so.

First Aid Kit

The first aid kit should contain:

Antiseptic liquid (ideally chlorhexidine)

Antiseptic aerosol spray

Bandages- elastic adhesive bandage, crepe bandage, self-adhesive bandages etc.

Scissors

Gauze

All purpose dressing materials

Gamgee

Freeze pack

Cold pack , etc.

Equine Examination Equipment

- Weigh Bridge
- Records (examination sheet, health record sheets, request forms etc.)
- Head collars, Halters, Rope
- Farrier equipment
- Hoof pick
- Grooming equipment
- Hair clippers
- Thermometer
- Clock with second hand
- Stethoscope
- Twitch
- Rectal Sleeves and tube
- Nasogastric tube
- Hausman's gag
- Teeth rasps
- Mare catheters
- Stallion catheters
- Infra red radiation source
- Diathermy
- Enema can
- Symm's abscess knife
- Hoof knife and testers
- Stretcher trolley

SICK BAY AND RETIREMENT FACILITIES

Every institute is to be provided with an exclusive sick bay where sick animals are to be given 24 hr veterinary attention and care. The institute should have a large animal ambulance with a hydraulic lift.

Institutes must allocate land, funds and staff for rehabilitation of equines after the production period during which they were used for the production of anti-toxins/serum. Retired animals should be given all necessary care and nutrition and should not be reused or disposed for other reasons.

Sick and dying animals are to be given the best of care and veterinary assistance. Euthanasia is not recommended unless the animal is in absolute distress or trauma and cannot be treated.

Euthanasia if ever done has to be done only with sedatives and barbiturates and with the permission of CPCSEA. If the animal is in sudden and severe pain /distress possibly due to an accident etc. or fatally injured the authorities are requested to contact the CPCSEA telephonically, day or night, to seek permission for euthanasia and not let the animal suffer.

Pentobarbital or a pentobarbital combination is the best choice for equine euthanasia. Because a large volume of solution must be injected, a catheter should be placed in the jugular vein. To facilitate catheterization of an excitable or fractious animal, a tranquilizer such as acepromazine, or an alpha-2-adrenergic agonist can be administered, but these drugs may prolong the time to unconsciousness because of their effect on circulation. Opioid agonists or agonist/antagonists in conjunction with alpha-2 adrenergic agonists may further facilitate restraint.

In certain emergency circumstances, it may be difficult to restrain a dangerous horse or other large animal for intravenous injection, and the animal might cause injury to itself or to bystanders before a sedative could take effect. In such cases, which might include euthanasia of a horse with a serious injury, the animal can be given an immobilizing agent such as succinylcholine, but an anesthetic must be administered as soon as the animal can be controlled. After the animal is anesthetized, an overdose of the anesthetic can be used to accomplish euthanasia. Succinylcholine alone or without sufficient anesthetic must not be used for euthanasia.

NORMAL EQUINE PARAMETERS

Respiration

A horse normally takes 8-16 breaths per minute.(A breath is taken as one out-in movement of the ribs)

Temperature

A healthy horse has a temperature of 100.5-101.5 °F)

Pulse

The normal pulse rate is 32-44 beats per minute.

Blood Parameters

Circulating blood volume (ml/kg)	: 75
Packed Cell Volume (%)	: 32-53
Red Blood Cell (x 10 ⁶ /ul)	: 6.8-12.9
Haemoglobin (g/dl)	: 11-19
White Blood Cell (x 10 ³ /ul)	: 5.4-14.3
Plasma protein (g/dl)	: 5.8-8.7

9.COMMON/POSSIBLE DISORDERS IN EQUINES USED IN THE PRODUCTION OF BIOLOGICALS

1.Adverse effects after venepuncture

There are four main adverse effect that may be observed after venepuncture:

1. **Hemorrhage**
2. **Bruising**
3. **Thrombosis and phlebitis**
4. **Stress caused by inappropriate handling**

The appropriate treatment depends on the site, cause, and individual animal. Advice on treatment should be sought from a veterinary surgeon.

1.Hemorrhage due to poor haemostasis is not a common problem unless the animal has a clotting defect and in most cases gentle continuous pressure applied for several minutes will stop the bleeding.

2.Bruising is due to subcutaneous bleeding at the time of venepuncture or after the animal has been returned to the stable, when the site might be aggravated by the animal itself through licking or rubbing. The animal should be checked after 30 minutes and if necessary appropriate action taken.

3.Thrombosis (clotting) and **phlebitis** (inflammation of the vein) are usually caused by unclean techniques or leaking of an irritant substance (eg.alcohol based chemicals) around the vein, or may result from self-mutilation.

Repeated bleeding can also lead to phlebitis and scarring, which can also occur as a result of repeated attempts at venepuncture. This can be reduced by improving the technique (using disposable cannulas and needles) and by rotating blood collection sites.

One can begin collecting at one end of a length of vein normally starting at the end furthest away from the heart. Haematoma's, which may occur, will gradually be resorbed but may form a temporary focus for infection resulting in inappetance and a rise in body temperature.

There is also possibility of damage of the nerves, which accompany a vein, when a needle is misdirected. Venous occlusion may result from thrombophlebitis and very rarely embolisms due to dislodging a thrombus in a needle as a result of an accidental injection of a small amount of air can occur. (Emboli have the potential to cause death).

4. Stress due to improper handling.

The correct level of restraint is that which allows a satisfactory sample to be taken at the first attempt and does not cause the animal to be unnecessarily distressed. In the event of bleeding an animal in a stressed condition it is observed that blood glucose levels, blood pressure etc. increase leading to both scientific and animal welfare complications.

2. Amyloidosis

Although a rare clinical entity in the general horse population amyloidosis is a frequent post-mortem finding in horses used for hyper immune serum production, the liver and the spleen being the more commonly affected organs.

Since liver rupture is common cause of death in such horses, on welfare and economic grounds, regular monitoring of Gamma Glutamyl Transferase (GGT) activity in serum is advisable.

Studies in hyper immune serum producing horses once in a 5 year period have shown that GGT levels increase with in 6-7 years of first starting the immunization procedure, and that constantly high values correlate with advanced liver Amyloidosis.

3. Equine Recurrent Uveitis (ERU)

There are many causes of uveitis in horses, which include keratitis, associated trauma, lens associated, generalized viral and bacterial diseases.

On many occasions there is no obvious cause and this category encompasses the endogenous type of immune – mediated uveitis, known as Equine Recurrent Uveitis, where the characteristic feature is hypersensitivity to a variety of antigens.

Impaired vision or total blindness (either unilateral of bilateral), corneal oedema, secondary cataract formations are the clinical features characteristic of ERU.

Current evidence suggest that most cases of chronic recurrent uveitis are immune mediated rather than from infections. (Equine Medicine & Surgery -Mair & Love , 1998).

Experimental studies have shown that the uveal system can develop and retain antibodies to a specific antigen. Later exposure to this antigen via systemic or local means initiates immune mediated inflammation, a delayed hypersensitivity reaction. (Equine Medicine & Surgery, Colahen et al., 1999)

In most cases, it is impossible to verify a specific etiology and affected horses are treated symptomatically for immune mediated ocular inflammation. Immune mediated uveitis is a common uveal disease and the recurrence of inflammation cumulatively destroys the vision in one or both the eyes. Repeated stimulation with the original antigen causes rapid recurrence of uveitis. Inflammation of the uvea results in a permanent increase of vascular permeability. Clinical signs include severe blepharospasm, lacrimation, photophobia, congested conjunctiva, corneal oedema, opacity, cataract and blindness. Proper eye inspection and treatment with NSAID antibiotics and atropine eye drops should be used if necessary.

4. Liver Dysfunction

Repeated immunization of the animal with venom/toxins for the production of hyper immune sera causes severe liver damage. If neglected the damage is irreparable.

Supportive therapy has the objective of allowing time for regeneration of hepatocytes. This may initially involve i/v glucose administration followed by oral feeding of glucose.

For horses suffering with severe hepatic dysfunction, dietary management should ensure the following:

- The ration should be divided into atleast 3 daily meals.
- The ration should contain the highest quality protein in adequate amounts, but not in excess.
- An amino acid supplement of glycogenic branched chain amino acids, isoleucine and valine (1g / kg diet of each) may help .
- Soluble fibre sources, like beet pulp, are useful, together with wheat bran and other insoluble fibre sources and a moderate level of several cooked starch sources.
- Vitamin E (1500 I.U./day) and a water-soluble B vitamin supplement, including 1000 mg choline / kg diet are advisable.
- A supplement of 0.5 kg DL - Methionine / ton of feed is recommended

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