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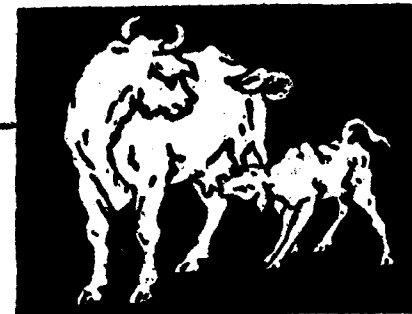
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Published Bi-monthly

(THE JOURNAL OF THE ALL-INDIA VETERINARY ASSOCIATION)

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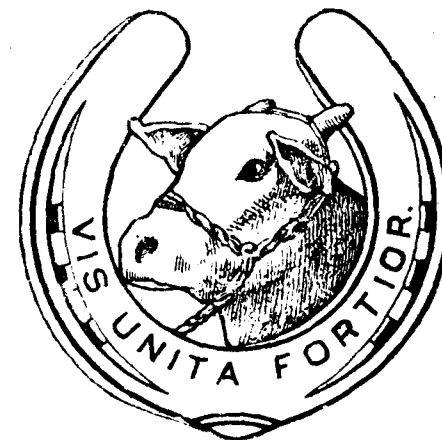
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(The Journal of the All-India Veterinary Association)



Editor:

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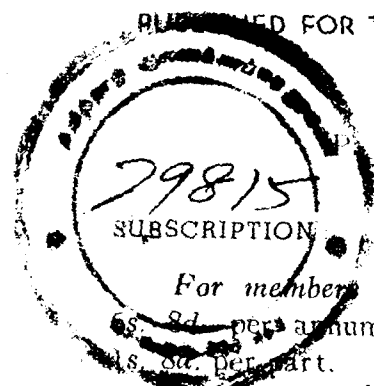
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Devoted to the Cause of Veterinary Profession.

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EDITOR:

S. SRINIVASA RAO, G.M.V.C.



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(The Journal of The All-India Veterinary Association)

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General Articles

PAST, PRESENT AND FUTURE OF VETERINARY EDUCATION IN INDIA

By

The Director, Veterinary Services, Bihar, Patna.

The history of Veterinary Education in India dates from 1874 when as a result of Col. J.H.B.H. Hallen's recommendation for the formation of an Indian Civil Veterinary Department with schools for the training of students, the first veterinary school was opened at the Remount Depot Babugarh. About the same time a similar school was established at Rangoon. The Babugarh Remount Depot was however abolished and in 1882 the veterinary school was transferred to Lahore and in 1900 the name of the institute was changed to "The Punjab Veterinary College". In 1905 the veterinary school which had been established at Ajmir was abolished and its teaching staff was absorbed by the Punjab Veterinary College. In 1886 the Bombay Veterinary College was started. In 1894 the Bengal Veterinary school was opened and in 1898 it was raised to the status of a College. Veterinary courses appear to have been given in Madras as early as 1882 at the school of Agriculture at Saidapet but it was in 1904 that the present Madras Veterinary College was opened. In 1930 the fifth Veterinary College was opened at Patna.

The course of instruction at the Punjab Veterinary College was originally of two years duration and the instruction was given in Vernacular. In 1900 the period of course was raised to 3 years. At this time the course of instruction at the Bombay Veterinary College remained the same as at its start viz., 3 years duration and the instruction was in English. Likewise the course at the Bengal Veterinary College remained the same viz. 3 years course in English.

In 1900 a conference of Principals of the 3 Indian Veterinary Colleges was held at Ambala and as a result of this conference the written examinations of the Bombay Veterinary College were discontinued and the

course was simplified and made uniform with the course given at that time at the Bengal and Lahore Veterinary Colleges. An oral test was thus the only test applied. A simplified curriculum thus became the basis of Veterinary Education in all the Colleges in India. At first non-matriculate students were admitted but later the educational standard was raised to matriculation at all the Veterinary Colleges.

This 3 years course in English was adopted both by the Madras and Patna Veterinary Colleges when they were opened.

Although the length of courses has up to sometime remained the same in all Colleges and the medium of instruction has been English the standard of teaching and the distribution of subjects among the different years has varied at the different Colleges and the question of Veterinary Education in India, has been under discussion for a number of years. The first serious attempt was made by a Committee of the Board of Agriculture which sat at Poona in 1917. It was then discussed at the meetings of Veterinary Officers in Lahore in 1919; at a meeting of Principals of Colleges which sat in Bombay in 1922 and by a meeting of Veterinary Officers in Calcutta in 1923 and by the Royal Commission on Agriculture in 1926-28. In spite of all these attempts no final curriculum could be drafted. The Linlithgow Commission recommended that one of the existing Veterinary Colleges should be converted into an institution for teaching Veterinary Science upto the highest standard for the higher grade Veterinary posts, while the other Colleges should train Officers for the subordinate executive staff and lower provincial services. This proposal of the Royal Commission on Agriculture was, however, abandoned. With the advent of the Animal Husbandry Expert, interest in the improvement of Education was renewed and has since been sustained.

In 1932, the Advisory Board Meeting of the Imperial Council of Agricultural Research, resolved that a curriculum be drafted for adoption at the College. This was taken up by the Sub-Committee on Veterinary Education of the Animal Husbandry Meeting in 1933. This Sub-Committee decided that the curriculum at the existing Veterinary Colleges should remain at 3 years and that the entrance qualification should be raised to Intermediate Science (Medical group) or their equivalent. A new model curriculum was drafted for adoption at all the Veterinary Colleges. In this curriculum new subjects were added to bring it up-to-date. Drastic changes were made in the then existing curricula as it was realised that to teach in three years all the subjects which go to make up Veterinary Science, even if the basic Sciences of Biology and Chemistry be omitted, could not be done without such changes.

Great stress was laid on the proper teaching of Veterinary Physiology and of Preventive Medicine. It was realised that in the past the Veterinary Colleges had drawn up their courses of studies according to the then immediate requirements of the country and that the Veterinarian had confined his activities only to the practice of Medicine and Surgery and had neglected Animal Husbandry—an equally important branch of his profession. No doubt this neglect was partly due to the fact that improvement of Livestock had not received the attention at the hands of Government but since the constitution of the Imperial Council of Agricultural Research and the appointment of the Animal Husbandry Commissioner and the realisation that salvation of the rural areas lay in the improvement of the Livestock, Veterinary Colleges could no longer neglect the true sphere of the activities of the Veterinary profession viz. Improvement of Livestock. To meet this, greater stress was laid in the draft curriculum on Animal Husbandry subjects and the teaching of this subject was spread over all the three years. It was decided that if this curriculum was adopted, the Principals of the Colleges could, by correspondence with each other draw up a detailed uniform Syllabus, giving due consideration to poultry under Husbandry subjects and taking ox as the type animal in Anatomy in accordance with the recommendation of the Royal Commission on Agriculture. This Sub-Committee also recommended a certain minimum staff to ensure that the subjects included in the curriculum were properly taught.

This attempt to place Veterinary Education in India on a better footing also failed mainly on account of the fact that in view of the low scales of pay, it was impossible to demand the I. Sc. standard of Education for admission to the revised three years courses. In no College was the course organised into 5 groups as recommended by the Sub Committee.

In 1936, the question of Veterinary Education in India was re-examined by the Sub-Committee on Veterinary Education of the second Animal Husbandry Meeting. The terms of reference of this Sub-Committee were "To consider a scheme implementing the recommendations of the Royal Commission on Agriculture to make provision for the training of Indians in India upto the highest standard of Veterinary Education." This Sub-Committee found that (1) The provinces were quite unable to pay their subordinate Veterinary services at rates calculated to attract well educated Indian young men of the I.Sc. standard and that there was little likelihood of any material change in the curricula of the existing Indian Veterinary Colleges which would bring their courses upto the M.R.C.V.S. standard and that the Royal College of Veterinary Surgeons would refuse recognition to them until:—

- (a) at least equal standard of education and courses of professional training of equal duration are insisted on;

- (b) the qualifications of the students at the College or Colleges which train upto the standard is the M.R.C.V.S. or higher.
- (c) provision is made for the examinations to be conducted by a competent Board of Examiners approved by them or over whose examinations they are able to exercise satisfactory control.

Proportion of the highly qualified Veterinary Surgeons of the M.R.C.V.S. standard and that of the supply of young Indians with M.R.C.V.S. diploma was decreasing and would likely cease altogether as no Indians had joined Veterinary Colleges in England during the past 2 years. It accordingly recommended that :—

- (i) the five existing Veterinary Colleges should continue to train Veterinary Assistant Surgeons for the provincial Veterinary departments.
- (ii) that a fully equipped and properly staffed Central Veterinary College be started at Izatnagar and that the course of instruction at this college should be of 5 years duration and the syllabus of courses should practically be the same with minor alterations and additions to suit the Indian conditions as for the 5 years M.R.C.V.S., Diploma Course in the United Kingdom.

In order to give the opportunity to provincial Colleges of taking advantage of the facilities for higher training offered by the Central College by sending selected students (of not below I.Sc. standard) to that College at the end of the first two years at the provincial college, they recommended a model curriculum to be adopted by the Provincial Colleges and required the provincial colleges desiring this recognition to raise the standard of the teaching staff and examinations to those of the Central College in the first two years of the course. This proposal of the Sub-Committee met with strong opposition of the Veterinarians in India and it was argued that this one Central Veterinary College in India could never achieve the ends in view, that centralising Veterinary Education at such cost to produce about 10 men in a year was unjustifiable and that it would be better to raise the standards of the existing Veterinary Colleges in India to the highest uniform standard conceivable at less than half the cost. As a result of this opposition the recommendations of the Committee remained unimplemented.

By this time the provincial Colleges seem to have become alive to the importance of having themselves affiliated to the Universities and effecting improvements. As a result of their attempts the Madras Veterinary College was the first to be affiliated to the Madras University to adopt a course of instruction for the B.Sc. degree in Veterinary Science.

The question of Veterinary Education was again re-examined by the Veterinary Education Sub-Committee of the Animal Husbandry Wing meeting in 1942. In reviewing the existing situation this Sub-Committee found that each of the Colleges had been busy effecting improvements and there was a great diversity of courses of instruction imparted at the different Veterinary Colleges. Thus at Madras : there were two courses :—(a) Diploma course of 4 years based on Matriculation and (b) Degree course of 5 years based on Matriculation.

Lahore :—Degree course of 5 years based on Matriculation.

Bombay :—Diploma course of 3 years based on I.Sc. (Medical group).

Bengal :—Diploma course of 3 years based on Matriculation.

Bihar :—Diploma course of 3 years based on Matriculation.

This Sub-Committee recommended that the higher five years degree course should continue at Madras and Lahore, that early affiliation to the University should be achieved at Lahore and that until such time as the Provincial Governments consider it practicable to raise the initial salary level, education at the other three colleges may proceed on existing lines but it was desirable that these provinces also should institute as soon as possible the higher degree course in place of present 3 years course. The Sub-Committee recommended provisional curricula for the shorter 3 years course and the longer degree course of 5 years based on Matriculation and 4 years based on I.Sc.

This Sub-Committee urged the great importance of giving special attention to Animal Husbandry and Animal Health in Veterinary course at the Colleges and recommended that a farm should be attached to each College to be utilised for teaching. It laid special stress on extra-mural courses in Animal Husbandry, Meat Inspection, Milk Hygiene, and Clinical Practice. It suggested courses of post-graduate training for both the Diploma and Degree course students. The Committee made recommendations for the proper conduct of examination to secure their requisite standard. It drew attention to the complexities of the problems of Veterinary Education and suggested a full and comprehensive enquiry into the whole subject of Veterinary Education. As a step towards this they recommended that the Principals of all the Veterinary Colleges should meet to review the question of Veterinary Education periodically.

In pursuance of the recommendations of this Sub-Committee the Imperial Council of Agricultural Research appointed smaller Education Sub-Committee to consider and recommend the final curricula which would be suitable for :—

(a) three years course based on Matriculation.

(b) 5 years degree course based on Matriculation.

(c) 4 years degree course based on I.Sc.

(d) the 2 years post graduate course for the three years diplomates.

The final recommendations of this Sub-Committee are due to be considered at the Animal Husbandry Wing Meeting in 1945. It is hoped that some final decisions will be taken and implemented as soon as possible by the different provinces so that uniformity of syllabus and course is achieved at the different colleges.

It will thus be seen that several efforts have been made from time to time to improve Veterinary Education in India, but upto the time of the Royal Commission on Agriculture the results of all these efforts have been poor. It is true that with the appointment of the Animal Husbandry Commissioner in pursuance of the recommendations of the Royal Commission on Agriculture there has been evidence of sustained interest in improving Veterinary Education. Notwithstanding the fact that certain Colleges like Madras and Lahore have been affiliated and that all Veterinary Colleges have realised their importance of special sphere of activities of Veterinary Surgeons as regards Animal Husbandry and Animal Health and have oriented their curricula accordingly, there is still a great lack of uniformity at the different Colleges as regards curricula, syllabuses, so that the object of finding a suitable and uniform training so often envisaged by the different Committees remains still the "Consummation to be devoutly wished for".

WHAT A VETERINARIAN CAN LEARN FROM A STUDY OF THE ANCIENT INDIAN VETERINARY LORE *

Part I

By

A. KRISHNASWAMY, G.M.V.C.

Veterinary Research Officer, Medical College, Madras.

Introduction

I would first of all like to define what I mean by a professional Veterinarian. According to my conception, a real professional Veterinarian is one who:—

Visualises the usefulness of his Veterinary art and views it as one of vital importance in village life.

Eradicates cattle diseases and eliminates their infection by earnest and efficient endeavours.

* Paper read at the A.I.V.A. (Madras Branch) Provincial Veterinary Conference held in April 1945.

Takes a true pride in the treatment of Cattle ailments and tending to their comforts.

Evinces earnestness in his work and enlists the effective encouragement of his clients by his endearing efforts.

Regards his profession with real reverence and respect and renders relief irrespective of remuneration.

Infuses and inspires an innate interest in his clients for the improvement of Cattle wealth.

Neglects not his duties to the needy public.

Always aspires ardently to the acquirement of all-round knowledge on animal matters.

Reveals himself as a real reliever of the sick and suffering and regulates his own requirements with due regard to his professional role.

Identifies his own interests with those of his patients.

Always remains an adept in the art of affording advice on all animal matters and

Never hesitates to use his Veterinary knowledge in national welfare.

In pursuance of my conception above, I may say with confidence that not only the Veterinary Science but every Science for its all-round improvement must always be receptive and not repulsive. In the words of Mr. H. F. Knight, Adviser to His Excellency the Governor of Bombay, who, while declaring open on the 17th July 1941, the Rambilas Anadilal Podor Ayurvedic College, the first Government recognised institution for the study of Indigenous system of medicine in Bombay, said: "In these days, every science has to welcome strangers within its gates, to test and prove them whether they be true or false, and if true to embody them in its own system—if necessary, rejecting them from that system such parts as will no longer stand the test. If a science fails to do so and adopts a policy of isolation and withdrawal from the stream of human progress, then its power of helping humanity inevitably decreases etc." This then appears to be a sound advice applicable to Veterinary Science.

ANCIENT INDIAN LORE IN GENERAL

A study of the history of the ancient Indian Veterinary medicine necessarily involves a passing study of the other ancient Indian sciences as well and takes us into a knowledge of the Ancient Indian Civilization. There is a notion generally prevalent among many western scholars and also among many of the western minded eastern scholars as well, that the ancient Indians were a race devoted only to metaphysics and religion, with no other knowledge or any practical interest in the life of the world around them. This is erroneous. Though metaphysics and religion formed the

major contribution of the ancient Hindus to world thought, yet every other branch of science was also developed with equal precision and interest. In the field of Astronomy, Messrs. Cassini, Bailly and Plafair opine that the observations and conclusions of the Hindu astronomers of the Prehistoric India are still holding the day. In the field of Chemistry, Sir P. C. Ray's contribution on the history of Hindu chemistry throws a flood of light in the advanced state of the knowledge of chemistry in ancient days. In the field of medicine an acknowledged scholar like Captain P. Johnston Saint, has opined that "even the most irreverent layman would see (in ancient Indian medical literature) the distinct fore-runner of all the scientific and surgical marvels of to-day." The fact that in every branch of science the literature written some thousands of years before Christ, still furnish sufficient materials for research work of the most up-to-date scholars of to-day, is sufficient evidence to establish the fact that the truths propounded in these literature have been very valuable. In the case of all other sciences, much pioneer work has been done and almost all the ancient works therein have been translated and printed by eminent scholars. It is the Veterinary field alone that remains an unexplored region, and the much valuable information therein is lying uncared for and unheeded. As a result of my study of the Indigenous Veterinary Lore for the past several years, I have been contributing a series of articles on the Indian Veterinary Science and it may not be out of place for me to point out that, while the Veterinary profession all over the country have been slumbering over it, a few fragments here and there of what have already appeared in my articles of the years between 1937 and 1940 have recently formed the subject of a paper entitled "Veterinary Science in Mourian times" read by Dr. D.V.S. Reddy, M.B.B.S. of the Andhra Medical College, Vizagapatam, before the Medical and Veterinary section of the Indian Science Congress in its last session held at Nagpur in January 1945, copy of which has appeared in the March 1945 issue of the *Indian Veterinary Journal*.

In December 1937 on the action of Sri Biswanath Das, the then premier of Orissa, a scheme was inaugurated by the I.C.A.R. sanctioning an investigation into the efficacy or otherwise, of the indigenous system of treatment of cattle in India, and authorising the collection and collation of all useful information on Indigenous Veterinary medicine from manuscripts and other sources. In 1939, I was appointed to make the enquiry and this gave me a good opportunity to visit all the oriental libraries, Sanskrit and Ayurvedic colleges, and carry on an extensive search for the available veterinary literature therein. On account of the limited time sanctioned in the scheme, only a portion of India could be visited. The tour no doubt yielded very good results, and my report to the I.C.A.R. on this subject at the end of my tour gives information on the indigenous Veterinary lore, which will be found surprising to real seekers of all-round information on veterinary matters.

It is not out of place for me to mention here that of all the places visited, the Saraswathi Mahal library, Tanjore, furnished me most valuable information. About this library, Dr. Burnwell who has compiled an exhaustive catalogue of all the manuscripts in this library, in the course of his valuable letter to the chief secretary to the Government of Madras dated 6th August 1878 has remarked that as far as he could judge, it would not be possible to form a collection like that at Tanjore at a cost less than £ 50,000 and that many manuscripts in this library are unquestionably unique. The last portion of the above remarks proved true in my case. To give an idea of the value of the manuscripts in this library, I would like to give this one instance which came to my notice. It was ascertained by me in the course of my investigation that, during the course of an expedition to Mewar in the reign of Shahjahan, a big original Sanskrit work on horses by name Salihotra was secured from Chittur, and under the orders of Emperor Shahjahan, this work was translated into Arabic by Saiyad Abdulla Khan Bahadur Feroze Jung. This translated Arabic book is called "Kitab-ul-Vitart". The original Sanskrit work was considered lost. Subsequently during the early days of the East India Company, this Arabic work "Kitab-ul-Vitart" appears to have been translated into English. Only 2 copies of this English translation are now reported to be available, one in the London museum and the other in the Berlin library. While trying to find out if the original Sanskrit work will be available anywhere, it was found that a portion of that work was available in the Saraswathi Mahal library, Tanjore, in the name of Aswayurveda Sidhayoga-samgraha. It is considered probable that the remaining portion also may be available either in Kashmir or in Nepal. It is also worthy of note that this Sanskrit work was translated in the Tibetan tongue and it exists in its Tibetan garb in the celebrated encyclopædia, the Tangyur and is mentioned in Cordier's list of Tibetan manuscripts. The Tanjore library has therefore given us information on Veterinary Science not available anywhere else in India so far.

AUTHORS OF VETERINARY SCIENCE AND THEIR WORK

Among the original and authentic authors on veterinary science so far known, may be mentioned the names of Salihotra, Palakapya, Rajaputra Vaisampayana, Vyasa, Narada, Mrigasarma, Brihaspathi, Sukra, Veerasena, Nakula, Jayadatta, Gana, Maldeva Panditha, Garag, Simhadatta, and Nala etc; and among the authors of later origin come Vatsya, Jayadeva, King Indusena, Bhoja, Saranghadhara, Someswara, Vahada, Basavamantri, Geervana, Yuddha Vikrama, Vishanath Vaypeyi, Sivamara Bhupathi, Dipankara and poet Rudradeva etc. Each one of the above authors is reported to have contributed a valuable book on veterinary science, but many of them are lost either partially or completely; and the few fragments of literature now reported to be available here and there in some

libraries and oriental institutions are also in an already decaying and crumbling condition. Of all the authors mentioned above, the names of Salihotra as the author on horses, and Palakapya as the author on elephants, stand pre-eminent. No doubt other eminent authors have contributed much valuable information. Every disease to which the animals are prone to, and the remedies therefor, have been dealt with in great detail.

VALUE OF THE INFORMATION IN ANCIENT INDIAN LITERATURE

The first noticeable feature that I wish particularly to point out is, that profuse information on elephants and horses and their diseases and control is available, and they all remain a sealed book to the lay public and to the profession at large. I may say with no fear of contradiction that the information on elephants and their diseases is practically nil at present. The only modern treatise on elephants and their diseases now in use is that of Lt. Col. G.H. Evans (1910), whose publication contains only the individual observations and experiences of the author and the treatment suggested by him on the lines adopted to other domestic animals, together with the common empirical treatment adopted by local Mahoots, collected and compiled by the author during his distinguished service in India, Burma and other places. In fact the author of the book Lt. Col. G.H. Evans himself, in his preface to the book writes. "The scantiness of the literature on the subject is a source of embarrassment to those in charge of these valuable animals, and the need for some guidance has been widely felt..... The subject of the elephant diseases apart from its high scientific interest, has become a matter of immense economic importance". He also further regrets in his preface that his appeal for information on notes concerning elephants and their diseases met with little response. I venture to imagine that Lt. Col. G.H. Evans would not have been obliged to make this appeal for information, had he known of the existence of Palakapya's Elephantology dealing exhaustively and exclusively on a subject, on which he felt the scantiness of literature as a source, of embarrassment, and for which he made his unresponsive appeal.

Again I may point out another instance, to show how this ancient Indian Veterinary Science contains information, little known to modern veterinarians. Tuberculosis is one of the major diseases commanding world wide attention affecting both men and animals alike. As already pointed out by me in Lt. Col. G.H. Evans's book on "Elephant and their diseases" we find the following;—

"Tubercular disease as far as I am aware is extremely rare in elephants probably owing to their mode of life; however, that it may occur is proved by an interesting case which was reported by Dammann and

Stedefer, of one of the two elephants which were sent to the surgical clynic of the Hanover Veterinary School in July 1908. The result of bacterial examination seemed to show that the disease was one of human origin. In any case, the disease is not likely to be diagnosed in the jungle". I have now to point out that notwithstanding the claim made by Professor J. T. Edwards to have discovered first Tuberculosis among elephants, and notwithstanding the above remarks made by Lt. Col. G.H. Evans, about the variety of tuberculosis amongst elephants, there are overwhelming evidences in ancient Indian Literature, to show that this disease was common among elephants. In the book of Hastayurveda or elephantology which dates back to the period of the Ramayana epic, this disease has been dealt with in great detail in two different places viz., one under the heading of fevers in chapter 9 of Part I and again under the heading of wasting diseases in chapter 40 of Part II. It is my desire to give you the varied remedies given in the treatment of diseases. Lack of time forbids me to do so. I may say with confidence that the information available in them is really well classified, varied and interesting.

ANIMAL HUSBANDRY.

Apart from the question of animal diseases and their treatment, much information on animal husbandry and general breeding operations are available. As the first and foremost measure under this head, we find that cow killing is drastically forbidden. According to Matsya Purana, Manu, Apasthamba, and Parasara Samhitas, Kautilya's Arthasastra, drastic and severe punishments have been ordained for cow-killing, either wilful or otherwise. Great authors like Atri, Parasara, Gautama, etc., have laid down definite rules for the use of cattle in ploughs, showing details as to how many are to be used, how and when they are to be used etc. In Agni Purana we find the King being enjoined to preserve the breed of cattle in the country. The Arthasastra mentions a government officer called the Superintendent of Cattle and another called the Superintendent of horses whose exclusive duties were to supervise live-stock in the country, keep a census of them and see that they were properly bred and reared. The Superintendent of cattle was expected to maintain cattle census registers under the following classification:—Male calves, steers, tameable cows draught oxen, bulls that were to be trained for the yoke, bulls kept for breeding purposes, cattle fit for slaughter, buffaloes, female calves, heifers, pregnant cows, milch kine, barren cattle either cows or buffaloes etc. Under fear of cattle-lifting enemies, owners sometimes kept their animals under the care of the Superintendent, giving the state 1/10th of the dairy produce.

Castration of scrub animals was permitted and was allowed to be done only on certain days and months of the year. According to the edicts of the Emperor Asoka, a bull, a goat or a ram could be castrated on all days

except on the 8th, 10th, 13th and 15th day of each fortnight, on the punarvasu or any other festival day and also except during the 4th month of the year.

DEDICATION OF BULLS

Brahmanical bulls were inviolable and were objects of special attention on certain festival occasions. Dedication of bulls for breeding purposes was a great ceremony and had to be performed under certain well-laid out rules and regulations. Selection and necessary qualifications of a bull for such dedication are interesting. In the Vishnu purana it is said that the bull should be the offspring of a milch cow with young ones living. It should not be deficient in any limb, and it should be capable of protecting the herd. Matsya purana ordains that the bull should have elevated shoulders and hump, a soft and straight tail, tender cheeks, broad back, shining eyes, sharp horns and big tuft of hair in the tail. It must be well built with a roar like thunder, high in stature, and walking like an infuriated elephant. In the Mahabharatha, cattle census and pedigree registers are described. All these show that the ancient Indians were very particular about the general confirmation and physical fitness of the breeding bulls. The Arthashastra mentions that every herd of 10 heads of cows or buffaloes should include 4 bulls. Particulars of the time of service are also well described.

In the field of Genetics, the science of conception, the parental disposition, the possible potentialities of progenital inheritance from the father and mother, the antenatal, and postnatal care of animals are all well explained.

LIVESTOCK FEEDING

The manner in which the stock were fed was most important; because the breeds depended primarily upon the feed. Elaborate prescriptions regarding the nature and the amount of ration that a bull or a cow or a buffalo should receive are given as hereunder:—

For bulls equal to horses in speed and loading capacity, half a Bhara (maund) of meadow grass, twice the above of ordinary grass, one tola (100 palas) of oil-cake, 10 adhakas of bran, 5 palas of salt, one kudumba of oil, for rubbing over the nose, one drona of barley or cooked blackgram one drona of milk, half an adhaka of sura (liquor) one prastha of oil or ghee, ten palas of sugar and one pala of the fruit stringibera, are recommended. Three-fourths of all the items above will form the food for mules, cows, and asses; and twice the quantity for buffaloes and camels.

DAIRY FARMING

Every village had its own pasture lands and forest lands. Common rights in pasture and forestry were important and recognized by the state.

In the Arthashastra, the King has been directed to set apart pasture lands in uncultivated tracts. In the Manu Samhita, it is enjoined that on all sides of a village, a space about 100 dhanus in extent should be reserved for pasture and thrice that space round a town. In all Royal grants of villages, special provisions were always made for them. The cattle were allowed to graze freely in these pasture lands, and forest lands supplied fuel to the people, and thus saved much of the cowdung now-a-days used as fuel, with a consequent loss of the available manure for agricultural purposes.

There were professional herdsmen who took the cattle for grazing early in the morning and brought them back in the evening. The ancient Indian lawgivers have given due attention to these herdsmen. In olden days, as now, tinkling bells were attached to cattle, so that the whereabouts of those straying in the forests could be easily known. In the Arthashastra, it is suggested that the cattle should be grouped in herds of ten of similar colour while grazing. The cowherds were expected to have a full knowledge of all the common ailments of cattle and their remedies. They were considered wholly responsible for the safety of the cattle, while on pasture lands, and any loss due to their negligence should be recouped by them. In cases of death of an animal from natural causes, the cowherd should surrender to the owner, the skin of the dead animal, its fat, bile, marrow, teeth, hoofs, horns and bones. In return for such responsible duties done by these herdsmen, Manu ordains that for tending 100 cows, a heifer shall be given to the herdsman as wages every year; for tending 200 cows, a milch cow; and he shall be allowed to milk all the cows for himself once every eight days.

FODDER FOR CATTLE

Cultivated lands were available for grazing after the crops had been harvested. The weeds on cultivated lands, the plants growing up from the seeds falling both before and during the harvest, the stumps of crops, and grass on the field borders, and along water-channels were made available for the cattle. The cultivation of fodder crops and their conversion into silage was a process known to the earliest Indians, as suggested by the word *sujavas* which occurs in the Rig Veda.

Another interesting point in this connection, is, that the nutritive value of standard milk is also described. One drona of cow's milk was known to yield one prastha of butter, and that of buffalo milk, one seventh prastha more. In the Arthashastra, it is said that the increase in the yield of milk and butter depends upon the nature of the soil, the quality and the quantity of fodder and water allowed. It is advocated that to increase the supply of milk the cow should be given daily a few morsels composed of several sticks of *Asvagandha*, (*Physalis Flexosa*) and sesame.

Some standard works in Sanskrit which are purely of literary value also contain information of veterinary interest. As an example of this I may quote Kalidasa's *Raghuvamsha* where in sloka 73 of canto V he says a piece of rock salt should always be kept in stables for the horses to lick constantly. This is a very healthy rule, and is followed by Veterinarians of to-day in the case of valuable horses such as race horses and polo ponies, and in royal stables. Needless for me to point out that under such well laid out laws and regulations, there must have been very fine breeds of cattle and horses in ancient India. So far regarding livestock breeding operations.

Regarding other points of general veterinary interest, we find the following worthy of mention:—

1. In the case of horses, colour pigmentation, physical conformation and the nature of volition in relation to the temperamental qualities of an animal, i. e. to find out if an animal is good or bad tempered by its colour confirmation and voice is described.

2. In the case of cows, colour pigmentation in relation to the nutritive value of its milk is given. Thus the milk of a black cow is considered most nutritious. The milk of a red cow comes next and that of a white cow is least nutritious. Modern research scholars have recently found this to be true.

3. In a book called *Sivatatva Ratnakara* by Basavamantri, we find all useful information about fowls. Cock-fighting, their colour, form and their various gait, etc. as an index to their fighting capacity, are well described. In the same book, much information is found about the keeping of sheep, goats, dogs, serpents etc.

4. In the famous book called *Sukraniti* much interesting information on what is called the standard conformation of an animal, the detailed measurements of all the limbs of a standard animal, the proportion of the various limbs, of the body in relation to each other and to the whole body in general etc, are well explained. In view of the usefulness of this information to the veterinarians and in view of the paucity of this information in our present day veterinary knowledge, I propose to reproduce a translation of the whole veterinary portion of this book, in the form of a separate article, which will form Part II of the present one.

There is no time for me to dwell in detail about what all has been dealt with in all the books and manuscripts available so far. I think enough has been said to show that much information on all branches of Veterinary Science is available in the ancient Indian Veterinary literature.

It may perhaps be asked, if the time and labour involved justify the expenditure in carrying on research on a literature, in a language which is generally considered obsolete and more or less extinct. The answer to this can be given that it is so. Now-a-days we come across extensive propaganda work being carried on under the "Grow more Food" and "Drink more Milk" campaigns carried on by the Government. We are also well aware of the gradual depletion of cattle wealth on account of the exigencies of war. It is also worthy of note that the latest milk marketing report published by the Government of India discloses a state of affairs worse than any that was existing before. In the words of the report "the low milk consumption indicates a serious state of affairs, especially among the poorer classes, who consume well below 5.8 oz. a day, while many have to go without milk or milk products altogether." It is also distressing to note that the production of milk in Madras has of late been the lowest of all the provinces, about 3 ounces against the average in India of over 6 ounces. The prosperity of a country like India lies mostly in its cattle wealth. The urgent need for Veterinary and livestock improvement is thus apparent. The Government of India are also well aware of this. The Imperial Council of Agricultural Research have taken up the question of the improvement of livestock and breeding operations seriously and are taking all necessary measures to cope up with the present serious depletion of cattle wealth. For livestock improvement in India to be really successful, the agriculturist and the livestock owner should not be made to depend entirely on foreign medicaments for all their cattle ailments, especially at a time when, on account of war conditions, such foreign medicaments are not available even after great difficulty. One thing is clear. God has not created cattle alone in India, with remedies for all their ailments elsewhere outside India. Where there are such a large number of cattle, there are also local remedial agents available. Past experience, and existence of such elaborate literature on veterinary science together with the glorious accounts of eminent historians about ancient India, show that India in the past was self-sufficient not only in its cattle wealth, but also in all its cattle medicaments and other requisites. In the interest of efficiency and economy, such local and easily available remedies must be made known and available to the livestock owner.

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Finally it may also be observed that in view of the difficulty of the present day allopathic treatment reaching the distant out of the way villages, and of the easy availability of the indigenous herbs and plants at low cost, a further investigation into the efficacy of the indigenous drugs for which some data have now been accumulated, in my report seems to be a matter for serious consideration. The need for assessing their value on a rational basis is self-evident.

Time and labour involved in carrying on research in the ancient Indian veterinary science is therefore well worth the expenditure incurred therein.

WHAT A VETERINARIAN CAN LEARN FROM A STUDY OF THE ANCIENT INDIAN VETERINARY LORE

Part II

BY

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In part I of this article I have, in general, pointed out the varied useful information that a veterinarian is likely to get from a perusal of the Indigenous Veterinary Lore. In this part, I am reproducing below a copy of the translation of the relevant veterinary portion of a book called SUKRA-NITI. This book Sukra-Niti is a recognised book on polity containing advice on administrative matters to Kings and Nobles. When dealing with armies and their maintenance, the veterinary portion comes in and is dealt with in such a manner worthy of an administrative adviser with all-round knowledge and contains information much amusing and interesting to veterinarians.

SUKRA-NITI—CHAPTER IV—SECTION VII

N.B.—References are to lines and not to slokas in the original text.

* * * *

64-67. Harmful elephants are those that have blue palates, blue tongues, curved tusks, or no tusks, who persist long in their angry moods whose rut gushes out without any systematic order, who shake their backs, who have less than eighteen nails, and whose tails touch and sweep the ground; good elephants have the opposite attributes.

68. There are four classes of elephants—Bhadra, Mandra, Mriga and Misra.

69-70. The Bhadra elephant is known to be that which has tusks coloured like honey (i.e., not pure white but yellowish), which is strong and well-formed, is round and fat in body, has good face and has excellent limbs.

71-72. The Mandra elephant is that which has a fat belly, lion-like eyes, thick skin, thick throat and thick trunk, medium limbs and a long body.

73-74. The 'Mriga' elephant is that which has small or short-throat, tusks, ears and trunk, big eyes and very short lips and genital organ, and is dwarf.

75. The 'Misra' elephant is that which has these characteristics in mixture.

76. The three species have separate measurements.

77-78. In elephant measurements one angula is made by eight yavas (Barley grain) and one kara or cubit is made by twenty-four angulas.

79-80. In the Bhadra class the height or stature is seven cubits, the length is eight cubits, and circumference of the belly is ten cubits.

81. The measurement of the Mandra and Mriga species are successively one cubit less than the preceding.

82. But it is mentioned by sages that the lengths of the Mandra and Bhadra class would be equal.

83-84. The best of all elephants is that which has long cheeks, eyebrows and forehead: has the swiftest speed, and has auspicious marks on the body.

85. The horse measure is separate, as indicated by the ratio that five yavas make one angula.

86-89. The best horse is that whose face is twenty-four angulas. The good is that whose face is thirty-six angulas. The medium is that whose face is twenty-eight angulas.

90. In horses all the limbs are made according to a certain proportion with the face.

91-95. The height is three times the measure of the face. The length of the whole body from the crest (top of the head) to the beginning or origin of the tail is four times the face together with its one-third. The circumference of the belly is three angulas over and above three times the face. These are the general rules of measurement of limbs. Elaborate details are being given below.

96-101. In the horse of the twenty-eight-angula-face, the height of the heel (hoof) is three angulas, the ankle-joint (fetlock) four angulas, the leg is twenty angulas, the knee is three angulas, the thighs to the end of the elbow are twenty-four angulas. The space from the elbow-joint to the neck is thirty-eight angulas. The back thighs are equal to the face, the back legs are less than the face by a quarter.

102. The height has been already mentioned. The length is now being described according to the Sastras.

103-104. The length of the neck is extensive, one-sixth in addition to twice the face. The height of the neck is one-fourth and half of that less than the face.

105-106. From the end of the neck to the origin of the genital organ the measure is equal to that of the neck. From there to the end of the vertebral column the space is one-half and one-sixth of the face.

107-108. The tail is half the face, the genital organ likewise, the testicles are half the tail and organ. The ear is six angulas long, may be four or five angulas also.

109-110. The circumference of the heel or hoof is one angula in addition to half the face. That of the portion just above is half of this, that of the legs is likewise.

111-113. The circumference of good thighs is eleven angulas according to the masters. The circumference of the back thighs is three times one-sixth. The outer aspect of the hind thigh and leg is to look like a curved bow.

114-115. The circumference of the hock or the ankle-joint is nine angulas. The circumference of the hind-legs is equal to that of the fore-legs.

116-117. Space between the things is one angula. Breadth or width of the neck on which the hair grows is one and a half angula.

118-119. The mane should be made to grow beautifully downwards, to the extent of one cubit, from the space between the crown and the end of the neck.

120-122. The hair of the tail is one and a half cubit or two cubits. The length of the ears is seven, eight, nine or ten angulas, their width is three or four angulas.

123-125. The neck is neither fat nor flat but like that of the peacock. The circumference of the foreneck is one mushti or four angulas in addition to the face. The circumference of the origin of the neck (*i.e.*, where it comes out from the body) is twice the face minus ten angulas.

126-127. The good breast is one-third less than the face. The circumference of the forehead over the eyes is eight angulas in addition to the face.

128-129. The circumference of the face at the nose below the eye is equal to the face minus one-third.

130-131. The width of the eye is two angulas, their length is three angulas. Or the width two angulas and a half and the length is four angulas.

132. The space between two thighs is one-third face.

133. The space between the two eyes is one-fifth of the face.

134. The space between two ears is likewise, as well as the space between an eye and an ear.

135. The space between two heels, when the horse is standing erect is equal to the length of the ear.

136-137. The space between two eye-pupils, space between two eyes, as well as the space between the nose and the eye are one-third of the hind thigh.

138-139. The upper lip is one third of the face. The space between two nostrils is one-third of the same.

140. The body (from back to breast) is half of human height, and is equal to the breast at the end of the vertebral column.

141. The breast hangs low at the origin of the arms to the extent of one-fourth of the face.

142-143. The space between the arms at the breast is known to be one-sixth of the face. The lower lip is an angula and a half together with the jaw.

144. That horse is beautiful which has a high neck and low back.

*145-147. If an image is to be made the appropriate pattern or model should be always placed in front. No image can be made without a model. So the artist should frame the limbs after meditating on the horse and finding out the measurements and attributes of horses in the manner indicated above.

* 1. Or hind thigh is 28 angulas. The space therefore is about 9 angulas.

2. The following are the measurements given in II. 96-144. The type taken is that whose face is 28 angulas, *i.e.*, the lowest species.

(a) Heights

1. Heel or Hoof	...	...	3 angulas
2. Ankle joint	...	...	4 "
3. Fore leg	...	...	20 "
4. Knee	...	...	3 "
5. Fore thigh	...	...	14 "
6. Thigh to neck	...	...	38 "
7. Hind legs	...	...	28 "
8. Hind thighs	...	...	21 "
9. Neck	...	...	18 "

(b) Lengths

1. Neck	...	60 angulas
2. Body	...	60 "
3. From organ to end of vertebral column	...	18 "
4. Tail	...	14 "
5. Genital organ	...	14 "
6. Testicles	...	7 "
7. Ear	...	9, 4 or 5 angulas
8. Mane or Hair of neck	...	1 cubit
9. Hair of Tail	...	1½ or 2 cubits
10. Eye	...	3 or 4 angulas

(c) Circumferences

1. Heel	...	15 angulas
2. Ankle joint	...	7½ "
3. Fore leg	...	7½ "
4. Fore thigh	...	11 "
5. Hind thigh	...	88 "
6. Hock or the ankle joint	...	9 "
7. Hind leg	...	7½ "
8. Forepart of neck	...	32 "
9. End of neck	...	46 "
10. Forehead	...	36 "
11. Face at the nose below the eye	...	19 "

(d) Distance, Breadth, Width or Space

1. Between two thighs at the back	...	1 angula
2. The neck on which hair grows	...	1½ "
3. Ear	...	3 or 4 angulas
4. Breast	...	19 angulas
5. Eye	...	2 or 2½ angulas
6. Between two thighs	...	9 angulas
7. Between two eyes	...	5 "
8. Between two ears	...	5 "
9. Between eye and ear	...	5 "
10. Between two heels	...	6, 7 and 8 angulas.
11. Between two pupils of eyes	...	9 angulas
12. Between two eye brows	...	9 "
13. Between eye and nose	...	9 "
14. Between two nostrils	...	3 "
15. Between arms at breast	...	4 "
16. Lower lip	...	1½ "
17. Upper lip	...	9 "
18. Between back and breast	...	1½ "

If the hair-rings have a rightward direction in female horses, the result is inauspicious. So if a male horse has hair rings which turn leftwards the result is not satisfactory.

149-153. The horse with divine attributes or excellent horse is that which has a beardless face, beautiful, smart and high nose, long and high neck, short belly, heels and ears, very mild, has good form and colour and beautiful circular rings of feather.

154-155. Circular hair-rings or feather-rings are of two kinds—those turning leftwards or rightwards, full rings or partial rings, small rings or large rings.

156-157. The hair ring that turns leftwards is suspicious in the female horse, and that which turns rightwards in the male horse. Not the contrary.

158. Their results vary with the directions in which they are formed. e.g., downwards, upwards or oblique.

159-161. The auspicious marks made of hair or feather are the conch, wheel, mace, lotus, altar, seat of meditation, palace, gate, pitcher full of water, white mustard seeds, garland, fish, dagger and Srivatsa gem.

162-163. Those horses are the very best which have these feathery shapes on the nose tip, the forehead, throat and head.

164-165. Those are good horses which have these hair marks on the breast, neck, shoulder, waist, navel, belly and the front of the sides.

166-167. The purnaharsha horse is that which has two such marks on the brow and a third on the head.

168-169. The horse that has a mark on the backbone leads to the increase of the master's horses and is known as the suryya horse.

170-171. The horse that has three marks on the forehead is known as trikuta and leads to the increase of horses.

172-173. The horse that has three such feather spots on the neck is the vajeesha or lord of horses in the royal stable.

174-175. If two marks are noticed on the cheeks of a horse they lead to the increase of fame and kingdom.

176-177. The horse that has however only one mark on the cheek is known as the sarvanama and leads to the owner's ruin.

178-179. The horse that has a mark on the right cheek is known as the siva and leads to the happiness of the master.

180. The horse that has a mark on the left cheek is wicked and leads to loss of wealth.

181-183. The horses that have two spots on the ears are known as Indra, those that have marks on the nipples are known as Vijaya.

Both give victory in wars and lead to the increase of territory.

184-185. The horse that has two marks on the side of the neck is known as Padma and that brings several Padmas (Padma—one thousand billions) of wealth as well as unceasing happiness to the master.

186-187. The horse that has one or three marks in the nose is known as Bhupala and Chakravarti.

188-189. The horse that has one large mark on the throat is known as Chintamani and leads to the realization of the desired objects.

190. The horses that have marks on the forehead and the throat are known as Sulka and give increase and game.

191-192. If the horse has marks in the mouth or at the end of the belly, it is sure to get death or cause ruin of the master.

193-195. The marks that are on the knees give the troubles of life abroad. That on the genital organ causes loss of victory and beauty. That on the end of the vertebral column means destruction of trivarga; *i.e.*, every thing.

196-197. The horse that has a mark on the origin of the tail brings ruins and known as Dhumaketu. The horse that has a mark on the rectum; the tail and the end of the vertebral column is known as the Kritanta.

200-202. The marks are always bad if they are on eyes, jaws, cheeks, breast, throat, upper lip, kidney, waist, knee, genital organ, hump of the back, navel, right waist and right foot.

203-205. The marks are good if they are on the throat, the back lower lip, space between ear and eye, left waist, sides, thighs, and fore legs.

206-207. Two marks on the forehead with space between indicate good and are like the sun and the moon. If they overlap they give medium results, but if they are too contiguous they are evil.

208-209. Three marks on the forehead with space between them one being on the top are indicative of good. But two marks very contiguous to each other are inauspicious.

210. Three triangular marks on the forehead are the causes of grief.

211. One mark in the middle of the throat is very auspicious and prevents all harms.

212. On the leg the downward mark is good, on the forehead the upward.

213. A Satapadi which is turned backward is not at all regarded as inauspicious.

214-215. The mark on the back of the genital organ or the nipple is bad. That near the ear also is bad.

216. If the horse has a mark on one of the upper sides of the neck it is called Ekarashmi.

217. The horse that has an upward mark on the leg is disparaged as the uprooter of posts.

218. The horse that has both good and evil marks is known to be medium.

219. The horse that has five white marks on the face and four on legs is known as Panchakalyana. The one that has in addition to these three marks on the breast, neck and tail is known as Ashtamangala.

220. The Shyamakarna horse is that which has one colour throughout the body but has ears coloured shyama *i.e.*, greenish. If that one colour be white the horse is sacred and deserves to be worshipped.

223. The horse is known to be Jayamangala which has eyes like vaiduryya gem.

224. The horse may be worshipped, whether of one colour or of variegated colour, provided it is beautiful.

225. The horse with black legs as well as that with one leg are disparaged.

226-228. The rough, grey coloured as well as ash-coloured horses are also despised. The horses with black roofs of mouth, black tongues, black lips, as well as those which are throughout black but have white tails are deprecated.

229-231. Those horses are good which run with legs thrown from height whose movements are like those of tigers, peacocks, parrots, pigeons, deer, camels, monkeys and bulls.

232-233. If the horse man does not get tired by riding a horse even after over-feeding and over-drinking, the gait of the horse is known to be excellent, and the horse is also very good.

234-235. The horse that has one very white mark on the forehead but is throughout coloured otherwise is known as dala bhanji, the man who has such a horse is looked down upon.

230. All defects due to colour vanish if the horse has a decent aspect.
238. The horse that is strong, has good gait, is well-formed and not very wicked is much appreciated even if defiled by hair marks.
- 239.43. Defects grow in horses through long continued absence of work. But through excessive work the horse grows lean and emaciated by diseases. Without bearing burden the horse becomes unfit for any work. Without food it becomes sickly, but with excessive feeding it contracts disease. It is the good or bad qualifications of the trainer that give the good or bad gait.
- 244.245. The good trainer is he who moves his legs below the knees, keeps his body erect, is fixed in his seat, and holds the bridle uninformedly.
- 246.247. The good trainer should strike the horse at the proper place by whips mildly and not too severely but with medium pressure.
- 248.250. He should strike the horse at the sides if it neighs, also at the sides if it slips, at the ear if it shies, at the neck if it goes astray, at the space between the arms if angry, at the belly if absent minded.
251. The horse is not struck at any other place by experts.
- 252.254. Or one should strike the horse at the breast if it be terrified, at the tail if it be angry, at the knees if it be absent minded.
- 255.257. One should not strike the horse very often or at the wrong place. One adds to the defects of the horse by striking it at the wrong time and place. Those defects exist so long as the horse lives.
258. One should overpower the horse by whips, and should never ride a horse without a whip.
259. The good horse should go one hundred dhanu in sixteen matras.
260. Horses are inferior according as their speed is lower, (than the rate defined above).
- 261.263. The circle that is to be made for training the horse is one of the highest class if one thousand chapas in circumference, is medium if half that size; inferior if half that, small if only one hundred dhanus in size, and very small if half that.
- 264.265. The trainer should daily increase the movement or speed of the horse by exercises within the circular ring in such a way that it can run one hundred yojanas in a day.
- 266.267. One should ride the horse in the morning and evening in October and November, winter and spring, in the evening in summer, in the morning in autumn.

268. One should not use the horse in the rainy season nor on uneven grounds.
269. The appetite, strength, prowess and health of the horse are promoted by well regulated movements.
- 270.271. The horse that has got fatigue through work should be given a slight stroll for sometime, then should be fed upon sugar and powdered grains mixed with water.
- 272.273. The horse should be given peas or grains, masha, mung, both dry and wet, as well as well-cooked meat.
274. One should not use the whip at the places which have been wounded.
- 275.278. In the interest of its strength the horse should be given gur and salt just after work before the saddle and fittings are brought down. Then when the sweat has disappeared and it has stood calm and quiet the horse should be relieved of its fittings and reins.
- 279.280. The horse should be made to stroll in the dust after its limbs have been rubbed, and carefully tended with baths, drinks and foods.
281. Wines and juices of forest or wild animals take away all the defects of horses.
282. The horse should be made to take milk, ghee, water and powdered grains.
- 283.284. If the horse be made to carry burden just after taking food and drink, it soon contracts coughs and gasps and other diseases.
- 285.86. Barley and pea constitute the best food for horses, masha and makushtha are good, masur and mungs are inferior stuff.
- 287.288. The movements of horses are of six kinds—dhara, askandita, rechita, pluta, dhuritaka, valgita,; each has its own characteristics.
289. The dhara gait is known to be that which is very fast, in the midst of which a horse would get puzzled if spurred with the heels.
- 291.292. The askandita movement of horse is known to be that in which the horse contracts its forelegs and runs with rapid leaps.
293. The rechita movement is that with short leaps but continuous.
294. The pluta movement is that in which the horse leaps with all the four legs like the deer.
- 295.296. The dhauritaka movement is rapid movement with uncontracted legs very useful in drawing chariot.
- 297.298. The valgita movement is that in which the horse runs with contracted legs, neck raised like that of the peacock, and half the body trembling.

299-300. In bulls the circumference of the belly is four times that of the face, the height or stature together with the hump is three times the face and the length is three times and a half of the face.

301. The bull that is seven talas in height is appreciated if it possesses all these attributes.

302-303. The bull that is neither idle nor wicked but a good beast for carrying burden, has a well formed body and a good back, is the best of all.

306-307. The age of one hundred years is the maximum for men and elephants.

307. The young age of both men and elephants extends up to the twentieth year.

308-309. The middle age of man extends up to the sixtieth year, that of elephants to the eightieth.

310-311. The maximum age of horse is thirty-four years. That of the bulls and camels is twenty five years.

312-313. The young age of horses, bulls and camels extends up to the fifth year. Their middle age extends up to the sixteenth year, old age since then.

314. The age of both bulls and horses is to be known from the growth and colour of teeth.

315-320. In the first year of horses six white teeth grow. In the second year the lower teeth get black and red. In the third year both the front teeth become black and this goes on till the sixth year. In the fourth year the two teeth by the side of the two front teeth are replaced by new teeth. In the fifth year the last two (molar) teeth are replaced and these blacken from the sixth year.

The following table gives these distinctions between the various period of life, viz., youth, manhood, old age, as pertaining to men, elephants, &c.

		Maximum Age	Youth	Middle Age
Man	...	100 years	20 years	60 years
Elephant	...	100 "	20 "	80 "
Horse	...	34 "	5 "	16 "
Bull	...	25 "	5 "	16 "
Camel	...	25 "	5 "	16 "

Thus in the course of five years the whole dental structure of horses is replaced. With the replacement of the nasal teeth infancy is closed and middle age begins.

321-24. The teeth gradually yellow from the ninth year and whiten from the twelfth year, become transparent like glass from the fifteenth year, have the hue of honey from the eighteenth year and of conch from the twenty-first year. The last continues till the twenty-fourth.

325. Since twenty-fourth year the teeth get loose and separated, and begin to fall down in threes.

326-27. The horse that has attained full age gets three circular rows on the upper lip. The age is to be considered low in proportion as the rows are less.

328-29. The bad horses are those that throw kicks, make sounds with lips, shake their backs, tend to go down into water, suddenly stop in the midst of a movement, lie down on the back, move backwards and leap up.

330. As well as those that have snake-like tongues, the colour of bears, and are timid in character.

331. The horse that has a mark on the forehead disfigured by a minute blot (of another colour) is depreciated, as well as that which tears asunder the ropes.

332-35. All the eight white teeth of bulls grow in their fourth year. Two extreme (molar) teeth fall down and are replaced in the fifth year; in the sixth year the next two, in the seventh the next two, and in the eighth the central two.

336-37. Every two years the teeth get black, yellow white, red and conch-like in order. Then their looseness and fall commence.

338. The age of camels also has to be understood from consideration like these.

339-40. The hook with two mouths, one for movement forward and the other for movement backward has to be used in controlling the elephant. The driver should use this instrument for regulating the movements of the animal.

341-44. (Description of bridle or reins) The horse is to be controlled by such a bridle.

345. The bull and the camel have to be governed by strings with which the nose can be pulled.

346. An instrument with seven sharp teeth is to be used in cleansing or rubbing) these animals.

347-48. Men as well as beasts have to be always governed by adequate punishments. The soldiers have to be controlled by special methods not by fines.