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CAUSE AND TREATMENT OF TRYPANOSOMIASIS IN CATTLE

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Introduction:

The protozoon parasites trypanosomes cause diseases in animals, man and birds. They occur as parasites in the blood and tissues of Vertebrates. Transmission of Trypanosomes occur by blood-sucking flies of the group Tabanus, Stomoxys, Tsetse and Glossina. Some trypanosomes undergo cyclic development in these invertebrate vector and some are transmitted mechanically. During the sexual act also some trypanosomes are transmitted from one animal to another.

There are many pathogenic trypanosomes viz. *T. evansi*, *T. equiperdum*, *T. brucei*, *T. equinum*, *T. dimorphum*, *T. vivax*, *T. hippicum*, *T. cruzi* and *T. gambiense* and diseases caused by them are surra, dourine, nagana or tsetse fly disease, maldecaderas, gambian horse sickness, waisting disease in cattle, waisting disease in cattle, panamanian surra, Chaga's disease in children and sleeping sickness in man respectively.

In this study cattle was found infected by trypanosomes and so the measure for specific treatment against this disease became very necessary to be undertaken for study.

This disease has not been recorded yet by any one in this area of Morang and Sunsari district. It might be possible that the disease was existing since many years. It was found that there were great losses of livestock in this area by this disease. So this investigation for prevention and curative measures against this disease was undertaken.

Materials & Method:

In 1974 september, a buffalocalf aged three years was brought in veterinary hospital, Biratnagar for treatment. The buffalocalf was showing 104°F fever, walking in circles with excitement and fell down. It remained stretched on the ground grinding its teeth, groaning and breathing hard. Clinically the animal was suspected to be infected by Trypanosomes. Blood smears from its ear vein was collected for investigation. Similarly blood smears of animals showing symptoms like above were collected from ear veins of animals of different age and sex. The statement of which are given below in Table 1.

Table - 1

S. No.	Species of animals Bovine	Approximate age of anim. in year	Sex of animal	place where animals were found infected	Stage of disease when blood smears were collected	REMARKS
1.	Buffalo	3	Male	Sitaganj	Fever 104°F	
2.	Cattle	6	Male	Biratnagar	Fever 105°F	
3.	Buffalo	5	Female	Sitaganj	Fever 104°F	
4.	Buffalo	5	Female	Sitaganj	Fever 103°F	
5.	Cattle	3	Male	Kharji	Fever 102°F	
6.	Buffalo	4	Male	Sitaganj	Fever 102°F	
7.	Cattle	5	Female	Biratnagar	Fever 102°F	Pregnant
8.	Buffalo	6	Female	Biratnagar	Fever 104°F	Pregnant
9.	Buffalo	6	Female	Biratnagar	Fever 102°F	
10.	Cattle	5	Female	Biratnagar	Fever 102°F	
11.	Cattle	4	Male	Kasaini	Fever 103°F	
12.	Cattle	4	Female	Kasaini	Fever 102°F	

Blood smears were collected from different areas in the period September October 1974 and May to October 1975.

Blood smears from different animals were taken antiseptically in sterilized clean slides separately and stained by Leishman's stain. These stained films were seen under microscope separately for identification of the organism.

All animals taken in this study, after collection of blood smears, were given Berinil (Hoechst Pharmaceutical Pvt. Ltd.) solution injection deep intra muscularly.

The dosage given according to the severity of the disease was 0.8 gms to 1.6 gm Berinil granules per 100 kg body weight of the animal. The solution for injection was made by adding 5 ml water for every 0.8 gms of Berinil granules.

Results:

Out of twelve blood smears collected from different animals only three smears were positive for trypanosoma vivax and T. congolense.

The trypanosoma showing cytoplasm posterior to nucleus and so swollen and broad posterior end with a terminal kinetoplast and free flagellum was considered as T. Vivax.

And the trypanosoma showing usually blunt posterior extremity with a kinetoplast a little away from the extremity and commonly lying on the margin of the body without a free flagellum was considered T. congolense. The results of blood smears examination and the response of treatment by Berinil granules by different animals are given below in Table II.

Table II

S. N.	Blood smear positive for T. Vivax and T. congolense	Response of treatment by Berinil		REMARKS
		First injection	Second injection	
1.	—	NR	R	
2.	+	R	NG	
3.	—	R	NG	
4.	—	R	NG	
5.	—	NR	NR	Died
6.	—	R	NG	
7.	—	NR	R	
8.	+	R	NG	
9.	+	R	NG	
10.	—	R	NG	
11.	—	R	NG	
12.	—	R	NG	

— = positive

— = negative

R = response.

NR = no response.

NG = not given.

Out of twelve cases only three cases were positive for trypanosome infection. Three case positive for Trypanosomes and six cases although negative for Trypanosomes responded well by Berinil in one injection. About the rest three cases, two cases responded well by second shot of Berinil injection and one did not respond on second injection also died.

Discussion:

Berinil (4-4'-diamidino-diazoamino benzene) has proved very useful in sterilizing infections in this study. But in one case it became unsuccessful to cure the disease and in two cases second inoculation became necessary to sterilize the infection. It seems that trypanosomes show pathogenicity of differing degree. Even among different strain of the same species there may be remarkable differences in virulence (Fiennes 1950). There may be some resistance shown by the organism against Berinil following treatment. Ormerod (1952) has reported the resistance shown by *T. equiperdum* against stilbamidine, following treatment with antrycide.

Here in this study trypanosoma vivax and *T. congolense* were isolated from three diseased cases only. In cattle, the trypanosoma evansi is usually rare in the peripheral blood circulation (Richard and Kendall 1963).

Fiennes (1952) showed that the presence of both *T. congolense* and *T. vivax* in the hearts of cattle accounts sufficient magnitude for the majority of symptoms and the pathological change associated with the disease.

In other infected cases Trypanosomes could not be isolated. Berinil, a Hoechst Pharmaceutical Ltd. product leads complete sterilization and recovery against *T. vivax* and *T. congolense*. It is not recommended against *T. evansi* infection.

In cattle and buffalo occasional outbreaks of acute disease due to *T. evansi* are often associated with the introduction of parasite into a new area (Richard and Kendall 1963). One case which died here in this study might have been infected by *T. evansi*. Because repeated inoculation of Berinil did not lead to recovery in that animal.

In other cases where Trypanosomes could not be isolated may be probably due to the disappearance of febrile period when accumulation of parasites in the blood is noticed.

So, further study and investigation is necessary to cure this disease and for control and prevention, eradication and control of insectvector should be practised widely in the infected area.

Summary:

Twelve clinical cases of Trypanosomes infected cattle and buffaloes blood smears were taking for isolation of organism.

Beriniil (Hoechst pharmaceuticals), was given to all infected animals after blood smear collection. Three cases were positive for *T. vivax* and *T. congolense*. Nine cases were cured by injection of Beriniil, while for two cases repeated inoculation of Beriniil cured the disease. One case did not respond by second injection of Beriniil and also died.

Acknowledgement:

I am obliged to the Director Rameshwor Bahadur Singh, Regional Agricultural Directorate office, Biratnagar for his encouragement during the course of this study and thankful to the staffs of Veterinary Hospital, Biratnagar, for their help and cooperation.

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Preliminary observations on the prevalence of Johne's disease in polworth sheep of karnali sheep farm, gothichaur.

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Introduction :

Karnali Sheep Farm, Gothichaur is situated in the temperate zone of the higher mountain region and is 12 miles north-east of the existing Jumla airport and Jumla Khalanga bazar. At present this farm has a total of 576 sheep of which 134 polworth, 92 cross bred between polworth sheep and Jumla sheep and 350 Jumli sheep.

According to the informations gathered from farm manager and from other staff of the farm that the sheep died during last year and also this year revealed symptoms like weakness, emaciation, diarrhoea and loss of appetite. It is also gathered from them that sheep were infested from parasitic infestations but after fecal examination all of them were drenched against liverfluke and other nematodes (Joshi, 1975).

The object of the present study was to conduct epizootiological study on prevalence of Johne's disease (Para-tuberculosis) in sheep (polworth breed) of Karnali sheep farm, Gothichaur. So far no study had been done on the prevalence of this disease in this farm. This study was done in April, 1975.

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Materials and Methods:

One hundred and two sheep (Polworth) were subjected to double intradermal (DID) Johnin test on the left side of the neck. Johnin was supplied from Indian Veterinary Research Institute (IVRI) Izatnagar, U. P. India. Out of one hundred and two sheep 18 sheep were clinical cases of the disease and they were emaciated, having diarrhoea poor appetite and weak.

Results:

Details of the results of the Johnin test are given in the following Table. Out of 102 sheep tested four sheep had oedema with severe reaction to Johnin and 10 sheep had reaction with nodule. The thickness of the skin was many-folds more than normal, redness at the site and oedematous reaction of gravitating in nature. All 14 sheep who had oedematous as well as nodular reaction were declared positive for the disease and the prevalence rate of this infection is 13.7% in the polworth herd (Flock) of this farm.

SHEEP SHOWING REACTIONS TO JOHNIN TEST

Sheep & their no.	Original thickness of skin before DID test	Final skin thickness after DID test	Remarks
Englewood-pn/3	2.2 mm	4.6 mm	Nodule
66 Barrech/68-69	2.0 mm	5.0 mm	"
55 Barrech/68-57	3.0 mm	10.0 mm	+++ oedema
Copper/104	2.2 mm	4.6 mm	Nodule
No number sheep	2.3 mm	4.0 mm	Nodule
Deputy/159	2.5 mm	9.4 mm	+++ oedema
Merrong/67-46	3.0 mm	4.8 mm	Nodule
2+1 whole in ear sheep	2.0 mm	5.4 mm	"
Wirmin-68 L-70	3.4 mm	6.0 mm	Nodule
No number sheep	2.3 mm	4.8 mm	"
Polworth	3.0 mm	7.0 mm	+ oed.
Engle wood pn 4	3.1 mm	6.0 mm	Nodule
Larrigan	2.6 mm	5.0 mm	Nodule
67-Larrigan N-2-4-29	2.0 mm	6.8 mm	+ oed.

Discussion and conclusions:

Paratuberculosis (Johne's disease) is a chronic infectious disease of the intestinal tract of cattle, sheep and goats characterized by thickening of the intestinal wall persists causing a gradual loss of body weight. It is caused by Mycobacterium paratuberculosis (Johne's bacillus).

During the present study attempt were made to conduct systematic studies on the prevalence of paratuberculosis in exotic sheep breed. All one hundred and two polworth sheep were subjected to DID test with Johnin. Criteria of declaring an animal reactor to Johnin was based on local reaction. Sheep which were exhibiting service oedematous, gravitating redness and painful reactions were declared positive while those which had minor reaction with nodule were declared considered as doubtful.

Joshi et al (1974) did first time a systematic study on prevalence of paratuberculosis, tuberculosis and brucellosis at livestock farm, Pokhara and they found that incidence of Johne's disease in sheep and goats was 9.0% (224 tested) which was quite alarming. Dhanda and Lall (1959) did survey in different livestock farms of India to know the prevalence rate of Johne's disease and tuberculosis in cattle, buffaloes, sheep and goats and they found that the incidence was very high in good breed of animals compare to the animals who were not of good breed. Johnin tests, intradermal allergic tests and complement fixation test are of value in detecting infected herds but they are insufficiently reliable for individual diagnosis. In early subclinical cases of paratuberculosis it is most difficult to detect the actual case regular culturing of faeces is the method of choice for detecting subclinical cases though positive cases are only after 6 to 8 weeks of disease infection (The Merck Vet. Manual, 1973). Prasad and Shukla (1967) did comparative studies on allergic tests and indirect bacterial haemagglutination test in diagnosis of Johne's disease. They suggested that the use of both the tests for the diagnosis of large number of infected herds.

In this present study incidence of paratuberculosis in polworth sheep was found to 13.7% which appears to be high and alarming.

Acknowledgement:

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A Search for Animal Reservoirs of Influenza in Nepal*

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For unknown reasons the last three variants of influenza virus which caused epidemics throughout the world were first isolated in South-East Asia. Chronologically these variants were A/Singapore/1/57 (H_2N_2), A/Hong Kong/1/68 (H_2N_2) and A/England/42/72 (H_2N_2). Either animals or man or both could have been the host for these epidemic variant viruses. It is known that experimentally an equine virus called A/Equine Miami/1/63 (Heq_2 Neq_2) (Miami/63) can infect humans and Hong Kong/68 can infect horses (Kasol and Couch, 1969.) Under natural conditions, Hong Kong/68 has been isolated from a pig (Mundin, 1970) and a sick chicken (Zhuzmer, 1973). The close antigenic relationship between Hong Kong/68 and Miami/63, is well established (Tumova and Easterday, 1969). Clearly, the species which was the actual host for these new viriant viruses has not been determined.

Tests were conducted to examine whether England/72 and Hong Kong/68 have infected animals and whether Miami/63 and another equine virus called A/Equine ! Prague/1/56 (Heq_1 Neq_1) (Prague/56) and the avian viruses A/Turkey/Mass/65 (Hav_2 N_2) (Turkey/65), A/Quail/Italy/1117/65 (Hav_2 Neq_2) (Quail/65) and A/Duck/England/56 (Hav_2 Nav_2) (Duck/56) have infected humans in Nepal. Of 134 human sera tested with avian influenza antigens, 3 children had low levels (1/40, 1/80, 1/160) of antibody against Quail/65 virus. All three children were in the 0-2 year age group and were hospitalized in the Kanti hospital. The other tests with avian antigens were negative. All of 540

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human sera were negative for Prague/56 antibodies. Experimentally it has been shown that Miami/63 antigen will cross react with 50% of antibody stimulated by Hong Kong/68 (Tumova and Easterday, 1969). As expected, Miami/63 antigen detected low levels of antibodies in 12% (37/318) of the human sera tested. The prevalence of Miami/63 in people of Langtang Village and Kathmandu was similar. In all probability these data indicate cross reactions of Miami/63 antigen with Hong Kong/68 antibody rather than primary infections of people with this equine virus. Equines could be a host for new variant viruses, therefore the sera of 36 horses and 20 mules were tested for H-I antibodies using the following equine and human antigens. Prague/56, Miami/63, England/72 and Hong Kong/68. Antibody for Prague/56 was found in one 13years-old horse which was stabled in Calcutta during the epidemic of equine influenza which occurred in Bombay and Calcutta in 1964 (McQueen et al., 1968). Also three 9 years old Tibetan horses which were born in Nepal and presently residing in Lumle had low levels (1/40) of Prague/56 antibody (Table 1). No Miami/63 antibody was found in any of horses or mules tested.

All mules and all except one horse had high levels of an H-I inhibiting factor (s) for England/72 and for Hong Kong/68 viruses. However, equine sera frequently contains substances which behave like antibody and give false positive H-I tests. Receptor destroying enzyme (RDE) which was routinely used to destroy inhibitors in all sera before testing for H-I antibodies reduced the concentrations of these inhibitors. Frequently trypsin-heat (56°C-30 min) - KIO₄ treatment is more effective than RDE and regarding equine sera, KIO₄ alone will reduce the concentration of these inhibitors. Following KIO₄ treatment H-I inhibitors for England/72 and Hong Kong/68 were found in 70% (39/56) and 66% (37/56) of the equine sera tested. The geometric mean titer (GMT) for England/72 was 205 and for Hong Kong/68 the GMT was 133 (Table). In ovo, 5 of 6 equine sera at dilutions of 1/40 neutralized 200 egg infectious units of England/72 virus. Immuno-diffusion tests for Hong Kong/68 and England/72 antibody in equine sera showed rings of opalescence after placing the sera in gels containing the antigens. However, the opalescence disappeared within 7 to 10 days. Precipitates containing hyperimmune sera and antigens did not disappear. Additional tests demonstrating lines of identity between equine sera and hyperimmune sera containing only England 1/72 or HongKong/68 antibody should prove or disprove whether the equine in Nepal and Calcutta have been infected with either of both of these viruses. If antibody is found in equine sera the question is "did humans infect horses or vice versa."

To identify additional possible reservoirs of influenza, 47 equine sera were tested for avian influenza H-I antibodies. The antigens used were Duck/56, Quail/65, Turkey/65 and A/Chicken/59 (Hav₈ N₁). No antibodies were found.

Sera from crows trapped in Barasat, a city 14 miles from Calcutta, were tested with Newcastle disease (NDV) as well as with all of the previously mentioned antigens. The overall prevalence and GMT of NDV antibody was 42% and 34 respectively. The GMT included all titers 1/20 and above. There was a seasonal variation in NDV antibody. The 177 crow sera were divided into 4 groups and plotted in accordance with the months when the sera was drawn. The highest prevalence (60%) occurred during June through September 1970 while the lowest prevalence was from March through April (Fig 1.)

Hong Kong/68 H-I inhibiting factors were found in crow sera. The overall prevalence for sera having a 1/20 titer or greater was 80% ($\frac{3}{4} \pm \frac{2}{7}$) and the GMT was 75. The seasonal variation was similar to NDV in that the greatest prevalence (95% $\pm \frac{2}{3}$) occurred during June through September, 1970 (Fig 2).

The search for antibodies which react with all of the human, swine, avian and equine strains of influenza previously listed as well as NDV included a study of 77 goats, 18 cattle, 41 chickens and 6 dogs. Of 59 goat sera collected at the Khumaltar livestock farm 8.5% (5/59) were positive for England/72 antibody (GMT-80) and 3.4% had Hong Kong/68 antibody (GMT-57). All of the 18 goat sera from Singur and Ichag village (West Bengal) were negative. One chicken from the Jawaharlal farm had a low level (1/40) of England/72 antibody whereas 10% (4/41) had antibody for Hong Kong/68 virus. Chickens are routinely vaccinated for NDV and 64% (27/44) had antibody with a GMT of 373. A low level (1/40) of England/72 antibody was found in the sera of one cow (1/13) from Ichag village whereas no antibody was found in the cattle from Singur (0/7). Antibody for Hong Kong/68 was found in 31% (4/13) of the Ichag cattle but none of the Singur cattle were positive. The GMT for Hong Kong/68 was 40 (Table 1).

The new epidemic virus England/72 was first detected in Coonoor, India in July, 1971. In May and June 1972 the virus was also isolated during influenza epidemics in Malaysia, Singapore and Australia (Schild et al., 1972). Monkeys are common to all 4 geographic areas. Therefore the sera of 43 free-living long-tailed macaques (*Macaca fascicularis*) and 2 leaf monkeys (*Presbytis cristatus*) which were trapped in a mangrove swamp forest on Carey Island, Malaysia during 1969 and 1970 were tested for H-I antibodies. Serial serum samples from 5 of the monkeys which were captured more than once over a 13 month period provided an opportunity to measure decreases and increases in antibody levels. All of the antigens previously listed were used in the tests.

The prevalence of England/72 antibodies or H-I inhibiting factors in the monkeys

was 100% (34/34) and the GMT was 72. Hong Kong/68 had a prevalence of 82.8% (29/35) and the GMT was 31. Evidence was also obtained for an infection with the equine virus Prague/56 or some relative of this strain of influenza which has not been as yet, isolated and characterized. The prevalence and GMT for Prague/56 was 50% (16/32) and 446 respectively (Table 1). Transient areas of opalescence lasting 24-48 hours were produced with 5 of 50 sera in immuno-diffusion plates containing England/72 antigen but none were observed with Hong Kong/68 antigen.

The sera drawn repeatedly from 5 of the monkeys over a 13 month period showed decreases as well as increases in the H-I titers for England/72 and Prague/56 viruses. The increases in antibody concentrations indicate that the viral infection was recent whereas the decreasing titers give evidence of an older infection. If the H-I tests are detecting specific antibody then the monkeys on Carey island were experiencing infections with England/72 and Prague/56 viruses 25 months before England/72 was isolated from humans. Monkeys may be a host for new epidemic strains of influenza and a jungle cycle of influenza may exist in nature.

If antibody for these antigens proves to be specific then goats, cattle, chickens and monkeys may be viewed as reservoirs of human influenza. However, tests for serum inhibitors which mimic antibody were positive in all species examined (Table 2). If H-I tests are positive after the sera have been treated with heat-trypsin-KO14 or receptor destroying enzyme it is assumed that antibody rather than non-specific inhibitors are present. All non-specific inhibitors may not be destroyed during treatment and H-I tests for antibody are suggestive, not diagnostic. Confirmatory immuno-diffusion tests will be conducted.

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Table 1. Hemagglutinating inhibiting titer of animal sera against various strains of influenza and Newcastle (Ranikhet) disease viruses.

Animal	England / 72		Hongkong / 68		Prague / 56		Newcastle disease Virus	
	English strain	GMT	No. of positives	GMT	No. of positives	GMT	No. of positives	GMT
	No. of positives		total		total		total	
	tested		tested		tested		tested	
Horses & mules	39 / 56	205*	37 / 56	133	4 / 55	40	ND	-
Chickens	1 / 41	40	4 / 41	40	0 / 41	-	27 / 41	373
Goats	5 / 77	80	2 / 77	57	0 / 77	-	0 / 77	-
Cattle	1 / 20	40	4 / 20	40	0 / 20	-	0 / 20	-
Dogs	0 / 6	-	0 / 6	-	0 / 6	-	0 / 6	-
Monkeys	34 / 34	72	29 / 35	31	16 / 32	446	ND	ND
Crows	0 / 54	-	142 / 177	75	-	-	75 / 177	34

Numbers are the reciprocal of the geometric mean hemagglutinating - inhibiting titer - less than 20; ND = not done.

Table 2. Effects of various treatments on hemagglutinating inhibiting factors in animal sera.

Animal	No treatment		Heat		Hemagglutinating - inhibiting titer	
	England	Hongkong	England	Hongkong	Heat-trypsin-KIO ₄	Receptor-destroying enzyme
	/72	/68	/72	/68	England /72	Hongkong /68
Cattle 1	160	40	80	-	-	-
2	640	-	80	-	-	-
3	320	40	40	-	-	-
4	160	-	-	-	-	-
5	160	-	40	-	-	80
Goat 1	40	80	40	40	-	-
2	40	80	-	-	-	-
3	3-	80	-	-	-	-
Crow 1	40	160	-	-	-	-
2	80	320	80	80	20	40
3	40	320	80	80	40	40
4	40	160	160	160	40	-
5	80	160	80	80	20	80
Horse 1	ND*	ND	640	640	40	40
2	ND	ND	80	80	ND	ND
3	ND	ND	320	320	640	40
4	ND	ND	320	320	1280	640
Chicken 1	>2560	>2560	ND	ND	-	-
2	64	64	ND	ND	-	-
3	128	128	ND	ND	-	-
4	64	128	ND	ND	-	-
5	64	128	ND	ND	-	-

ND - less than 20; numbers are the reciprocal of the serum dilution.
* - not done.

Study on Hay and Water Consumption by Yak of Solukhumbu Yak Breeding Farm

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Dillibazar, Kathmandu, Nepal.

Introduction:

In this study we have taken 10 animals (one Yak and nine Naks) from HMG, Yak Breeding Farm, Solukhumbu, Syangboche in the month of October, 1975. The purpose of this study was to find out the general information on hay (dry fodder) and water consumption on the local farm management system. During the process of these studies their morning and evening body temperature, cowdung & urine passed every day by every animals were also recorded. Their body weight and body measurements were also taken. This type of study was done first time in Nepal.

Methods and Materials:

1. One Yak and nine Naks were kept in stall feeding for a week comletly on hay (localy made dry fodder). Each animal was tied and fed seperately. Total consumed

hay and water by individual animal was measured every time of feeding of every day or a week.

2. Body measurements of an individual animals were taken and the approximate life weight was measured by the following formula;

$$\frac{\text{Length}'' \times (\text{Girth})''^2}{300} = \text{body weight in pounds.}$$

Possibility of error is thought to be 6-7% keeping inview the feeding, watering, micturation etc. of the animal is to be measured.

Length = from the point of buttock to the point of shoulder in inches.

Heart girth - Circumpherencial measurement taken behind the shoulder in inch g.

3. Cowdung and urine passed everytime of its process by individual animals was collected and measured for a complete week. The weight of wet fresh cowdung and complete dried cowdung was also calculated seperately. Urine was collected in a polythene bags which were fitted in the organ of individual animals.

4. Morning and evening body temperature of every animals was recoded in O°F by rectal method.

5. One of the Nak, of private farmer in Khumjung village, died due to accident and did postmortem examination and studied all the internal organs of the carcass. The total gross weight of every organs and body parts were recorded.

Results and Discussion:

1. Total hay (in Kg.) and water (in litre) consumed by yak and naks were measured every time of feeding of every day for a week which is shown in Table-1. In the first day of trial every animal took on an average 1.50 Kg. hay for 24 hours but 3.75 Kg. in preceeding days. Because of usual grazing habit of these animals they did not consume more hay and water in the first day and from second day the consumption rate of hay and water was increased.

2. Body measurements in inches and body weight in Kg. of individual yak and naks with their age and tag numbers are given in Table II. Body weight was calculated in pounds and then conversed into Kg. It was kept in mind that the possibility of error might be 6-7% by using the above meationed formula because the feeding watering micturation etc. of the animals to be measured to get the exact body weight of the animal.

3. Total cowdung (in kg.) and urine (in litre) passed by individual animal during one week time is recorded in Table III. The weight of wet fresh cowdung is given in this table. Cowdung was dried completely in sunlight and then measured it. The difference between weight of wet fresh cow dung and complete dried cowdung was 500 gms. which we could say the total water content in that cowdung. First day 5% animals passed their dung which was below 3 kg. in wt. Generally yak and naks used to pass their stool and urine 4-6 times in 24 hours. The normal colour of urine was yellowish and very bad in smell.

4. Recorded morning and evening temperature of individual animals is shown in Table IV. There is on an average 1°F difference in morning and evening temperature of each animal. The normal temperature of yak and nak is 101 and 100°F respectively ($\pm 0.5^\circ\text{F}$).

5. The total gross weight of every organs and body parts of a dead nak is given in Table V. The Total weight of a dead body was 231.0 kg. The weight of vital organs like spleen 0.5 kg., liver 1.6 kg, lungs 4.5 kg, Heart 0.5 kg and kidneys 0.45 kg were recorded.

Conclusions:

1. On an average total hay and water consumed by one animal during 24 hours time was 3.75 kg and 11.68 liters respectively.

2. From the age of the animals the body weight of yak (236.2 kg) is more than nak (221.5 kg average wt.).

3. The total average weight of fresh cowdung & urine passed by an individual within 24 hours time was 3.67 kg. and 1.80 liters respectively.

4. The normal temperature of yak and nak is 101 and 100°F respectively ($\pm 0.5^\circ\text{F}$).

5. The normal total gross weight of different organs and body parts of a dead nak was recorded.

Acknowledgement:

Authors are grateful to Mr. P. J. Rana, Deputy Director General, Department of Agriculture for his keen interest and encouragement.

Table I

Total Hay and Water Consumed by Yak and Naks in one week

S. No.	Animal No.	Days	Consumption in one week													
			Hay (in kg.)							Water (in litre)						
			1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	Nak	1777	1.65	4.25	3.50	3.00	3.65	3.75	3.73	13.45	11.00	12.00	11.00	11.50	11.90	12.00
2	"	1689	1.75	3.45	3.95	3.50	3.85	3.85	3.82	10.60	10.50	11.00	10.50	11.00	11.50	11.50
3	"	1779	1.50	4.20	4.00	3.90	3.35	3.45	3.45	10.00	12.60	12.00	12.50	11.00	11.65	11.00
4	"	1767	1.35	3.95	3.14	3.50	3.96	3.80	3.80	9.30	12.80	11.50	11.50	12.00	11.90	12.00
5	"	1768	1.25	2.70	3.94	4.00	3.86	3.81	3.85	10.00	11.00	11.50	12.00	11.50	11.85	11.50
6	"	1784	1.50	3.13	4.28	4.00	3.50	3.51	3.54	15.00	10.00	11.30	10.50	10.00	11.20	11.30
7	"	1761	1.10	2.80	3.85	3.50	3.40	3.43	3.40	11.20	14.00	10.60	12.00	10.50	11.00	11.00
8	"	1766	1.25	2.32	3.95	3.45	3.45	3.50	3.55	9.80	14.00	12.50	11.50	10.50	11.80	11.80
9	"	1769	1.10	3.95	3.00	3.50	3.80	3.75	3.65	10.00	13.00	12.45	12.00	12.00	11.50	11.13
10	Yak	1781	1.65	3.45	2.95	3.45	3.85	3.88	3.84	10.00	13.00	12.00	11.50	12.00	11.30	11.50

Table II

Body measurements of individual Yak and Naks with their age & No.

S. No.	Animal No.	Age in years	Body measurements in inches						Total Body weight in kg	
			Heart	Girth	Length		Hight			
1	Nak	1777	5	60	"	44	"	40	"	240.0
2	"	1789	5	60	"	46	"	45	"	250.9
3	"	1779	6	59	"	46	"	42	"	242.5
4	"	1767	4	58	"	46	"	38	"	234.4
5	"	1768	4	55	"	44	"	36.5	"	201.6
6	"	1784	4	54	"	47	"	43	"	207.6
7	"	1761	6	59	"	45	"	41	"	237.2
8	"	1766	4	60	"	46	"	42	"	242.5
9	"	1769	3	54	"	39	"	39	"	172.2
10	Yak	1781	4	57	"	48	"	42.5	"	236.2

3. Total cowdung (in kg.) and urine (in litre) passed by individual animal during one week time is recorded in Table III. The weight of wet fresh cowdung is given in this table. Cowdung was dried completely in sunlight and then measured it. The difference between weight of wet fresh cow dung and complete dried cowdung was 500 gms. which we could say the total water content in that cowdung. First day 5% animals passed their dung which was below 3 kg. in wt. Generally yak and naks used to pass their stool and urine 4-6 times in 24 hours. The normal colour of urine was yellowish and very bad in smell.

4. Recorded morning and evening temperature of individual animals is shown in Table IV. There is on an average 1°F difference in morning and evening temperature of each animal. The normal temperature of yak and nak is 101 and 100°F respectively ($\pm 0.5^\circ\text{F}$).

5. The total gross weight of every organs and body parts of a dead nak is given in Table V. The Total weight of a dead body was 231.0 kg. The weight of vital organs like spleen 0.5 kg., liver 1.6 kg, lungs 4.5 kg, Heart 0.5 kg and kidneys 0.45 kg were recorded.

Conclusions:

1. On an average total hay and water consumed by one animal during 24 hours time was 3.75 kg and 11.68 liters respectively.

2. From the age of the animals the body weight of yak (236.2 kg) is more than nak (221.5 kg average wt.).

3. The total average weight of fresh cowdung & urine passed by an individual within 24 hours time was 3.67 kg. and 1.80 liters respectively.

4. The normal temperature of yak and nak is 101 and 100°F respectively ($\pm 0.5^\circ\text{F}$).

5. The normal total gross weight of different organs and body parts of a dead nak was recorded.

Acknowledgement:

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Table I

Total Hay and Water Consumed by Yak and Naks in one week

S. No.	Animal No.	Days	Consumption in one week													
			Hay (in kg.)							Water (in litre)						
			1	2	3	4	5	6	7	1	2	3	4	5	6	7
1	Nak	1777	1.65	4.25	3.50	3.00	3.65	3.75	3.73	13.45	11.00	12.00	11.00	11.50	11.90	12.00
2	"	1689	1.75	3.45	3.95	3.50	3.85	3.85	3.82	10.60	10.50	11.00	10.50	11.00	11.50	11.50
3	"	1779	1.50	4.20	4.00	3.90	3.35	3.45	3.45	10.00	12.60	12.00	12.50	11.00	11.65	11.00
4	"	1767	1.35	3.95	3.14	3.50	3.96	3.80	3.80	9.30	12.80	11.50	11.50	12.00	11.90	12.00
5	"	1768	1.25	2.70	3.94	4.00	3.86	3.81	3.85	10.00	11.00	11.50	12.00	11.50	11.85	11.50
6	"	1784	1.50	3.13	4.28	4.00	3.50	3.51	3.54	15.00	10.00	11.30	10.50	10.00	11.20	11.30
7	"	1761	1.10	2.80	3.85	3.50	3.40	3.43	3.40	11.20	14.00	10.60	12.00	10.50	11.00	11.00
8	"	1766	1.25	2.32	3.95	3.45	3.45	3.50	3.55	9.80	14.00	12.50	11.50	10.50	11.80	11.80
9	"	1769	1.10	3.95	3.00	3.50	3.80	3.75	3.65	10.00	13.00	12.45	12.00	12.00	11.50	11.13
10	Yak	1781	1.65	3.45	2.95	3.45	3.85	3.88	3.84	10.00	13.00	12.00	11.50	12.00	11.30	11.50

Table II

Body measurements of individual Yak and Naks with their age & No.

S. No.	Animal No.	Age in years	Body measurements in inches						Total Body weight in kg	
			Heart	Girth	Length		Hight			
1	Nak	1777	5	60	"	44	"	40	"	240.0
2	"	1789	5	60	"	46	"	45	"	250.9
3	"	1779	6	59	"	46	"	42	"	242.5
4	"	1767	4	58	"	46	"	38	"	234.4
5	"	1768	4	55	"	44	"	36.5	"	201.6
6	"	1784	4	54	"	47	"	43	"	207.6
7	"	1761	6	59	"	45	"	41	"	237.2
8	"	1766	4	60	"	46	"	42	"	242.5
9	"	1769	3	54	"	39	"	39	"	172.2
10	Yak	1781	4	57	"	48	"	42.5	"	236.2

Table III

Total Dung and Urine passed by individual Yak and Naks during one week time.

Animals			Dung (in Kg.)							Urine (in Litre)						
No.	days		1	2	3	4	5	6	7	1	2	3	4	5	6	7
1.	Nak	1777	3.35	3.60	3.80	3.50	4.00	3.80	4.00	2.35	2.00	1.5	1.65	1.89	1.95	2.00
2.	"	1789	2.67	4.30	4.00	3.85	3.85	3.90	3.90	1.55	2.00	1.90	1.89	1.90	1.88	2.00
3.	"	1779	4.00	3.50	3.85	3.70	3.85	3.76	3.70	3.00	1.90	1.8	1.75	2.00	1.95	1.94
4.	"	1767	2.00	3.90	4.00	3.86	4.90	3.92	3.80	1.80	2.00	1.96	1.90	2.00	2.00	1.95
5.	"	1768	1.80	3.85	3.90	3.66	3.90	3.55	3.85	1.75	2.20	1.80	1.99	2.00	1.86	2.50
6.	"	1784	3.55	3.70	4.00	3.90	4.00	3.80	3.70	2.50	2.00	2.00	1.90	2.00	1.99	2.00
7.	"	1761	1.80	3.07	3.50	3.33	3.00	3.45	3.00	2.00	1.89	1.93	1.83	2.00	2.00	1.95
8.	"	1766	3.60	3.35	3.60	3.77	3.50	3.55	3.40	1.45	2.00	1.65	1.50	1.92	2.00	1.85
9.	"	1767	1.45	1.97	3.00	3.25	3.15	3.80	3.00	3.33	2.50	1.96	1.62	2.00	1.96	1.95
10.	Yak	1781	2.92	4.90	3.90	3.90	3.65	3.66	4.00	1.80	2.00	1.88	1.90	2.00	1.89	1.80

Table IV

Temperature Record of individual Yak and Naks for a week.

Animal		Temperature in °F.													
No.	Days	Morning							Evening						
1.	Nak. 1777	98.5	99	100	99.5	100	99	100	100.8	101.5	101	100.9	101	101	100.9
2.	" 1789	99.0	100	99.5	99.5	100	100	100	100.5	101	101.7	100.6	101.5	100.5	100.5
3.	" 1779	99.6	99	100	100	99.6	100	99.5	100.2	102	101	100.9	100.2	101	100.5
4.	" 1767	99.8	98.5	100	99.5	100	100	99.5	101	102	101	101	101.5	101	101
5.	" 1768	100.4	100	100	100	100	100.2	100.4	101.4	101.5	101	101	101	101.4	101.2
6.	" 1784	100	100	101	99.5	100	100.5	100	101	101	102	102	101	101	101
7.	" 1761	100.5	99.5	100	100	100.5	100	100.5	100.4	101	101.4	101.9	101	101	100.4
8.	" 1766	99	100	99.5	100	99	99.5	99	100.3	101.3	101	100.5	100.5	101	100
9.	" 1769	100.4	100	100	100	100.3	100	100	101.4	101.6	101.4	101.6	101.4	101.5	101.4
10.	Yak 1781	101.2	101	101	100.5	101.8	101	101.2	101.4	101.8	102	101.9	101.4	101.9	102

Table V

Weight of different Parts of body and organs of a dead Nak.

S. No	Different Parts and organs	Total weight (in kg)
1.	Head	8.95
2.	For legs	20.9
3.	Hind legs	54.5
4.	Vertebral Column, ribs and Pelvic	32.7
5.	Hide with Hair	13.6
6.	Stomach with its content	69.0
7.	Spleen	0.500
8.	Liver with Bile	2.10
9.	Bile	0.300
10.	Lungs with Heart	5.10
11.	Heart	0.550
12.	Kidneys	0.450
13.	Loss of Blood and Body fluid during Post-Mortem exam.	22.35 (Estimated)
Total -		231.0 Kgs.

Studies on the conception rate in cattle by insemination with deep Frozen semen

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Tripureswor, Kathmandu.

Introduction

Artificial insemination with liquid semen has long been used for maximum utilization of germ plasma of the improved bulls for live-stock improvement. A new era in this field has started with the introduction of deep frozen semen. Frozen semen has been used for inseminating cattle in different countries but very recently it has been introduced in Nepal in live-stock farm Khumaltar, Artificial Insemination Centre (Tripureswor) Kathmandu, Biratnagar, Pokhara, Bhairahawa. With the commissioning of Liquid Nitrogen Plant at A.I. Laboratory Tripureswor, Frozen semen of proven Jersey bulls has been imported from New Zealand Dairy Board as an assistant for artificial breeding programme in Nepal.

Materials and Methods:

In the present piece of work the date of conception rates by deep frozen semen was obtained from A.I. centre Live-stock farm Khumaltar and Tripureswor. Deep frozen semen of proven Jersey bulls imported from New Zealand was used for insemination of Jersey, Jersey-Nepali cross breeds and local cows of Live-stock farm Khumaltar and local cows from Swichatar area at Tripureswor, were included in the list. The frozen semen was contained in 0.5 ml straws and was preserved at -196°C in liquid nitrogen. The straws were thawed in tap water for 4-8 minutes. The straws were dried in clear cotton wool leaded in inseminating gun, covered with polythene scath and were used by rectovaginal method for insemination.

The conception rate (C.R.) by the following formula was calculated.

$$C.R. = \frac{\text{No of animals conceived}}{\text{No of animals inseminated and examined}} \times 100$$

The average number artificial insemination required per conceptions were calculated by the following formula.

$$\text{No of A.I./conception} = \frac{\text{No of animals inseminated \& examined}}{\text{No of animals conceived.}}$$

Result and Discussion:-

The conception rate at Live-stock farm Khumaltar A.I. center and Tripureswor A.I. center were 61.36% and 50% respectively and difference between the two A.I. centers varies greatly and the main reason of lower conception rate at A.I. center Tripureswor was such less because the farmer did not come back with their cows after return of first inseminations. The average conception rate of two centers was 54.54. The result on the conception rate in cattle due to insemination with deep frozen semen have been presented in Table I.

Table I

Conception rates in cattle due to insemination with deep frozen semen of proven Jersey bulls.

Period of inseminated on	centers where inseminated	No of animals inseminated & examined	No of animals conceived	% conception	Av. conceptions
August-74 to May 1975.	Live-stock farm, Khumaltar	44	27	61.36	
April 74 to March 1975.	artificial insemi- nation center, Tripureswar (swichatar)	46	23	50%	55.68

From Table I, it is clear that conception rate of farm animals is higher than that of farmer's cows brought to A.I center, Tripureswor and that might be due to poor nutritional status, poor fertility and untimely (earlier or late) inseminations of cows brought from villages as reported by kumaran (1965) and Bhosreker (1973). Comparative charts of conception with deep Frozen of Exotic breeds are presented in Table II.

Table I

Comparative charts of conception rate with deep frozen semen
of different breeds in Nepal and India

A. I. Centers	C. R.	A. I. Centers	C. R.
Live-stock Farm Khumaltar & Tripureshwar, Nepal		National dairy Research Institute, Karnal, India	
No of cows Inseminated 88 (Jersey semen)	55.68 %	No of cows inseminated (I) 45 (Brownssiss semen used)	8 %
		(II) 131 (Friesian semen used)	32.82 %
A. I. centers	C. R.	A. I. centers	C. R.
Intensive Cattle Development Project Karnal, India		National Dairy Research Institute, Banglore (India)	
No of cows inseminated, 8514 (Brownssiss semen used)	41.71 %	No of cows inseminated (I) 158 (Jerseysemen used)	50.9 %
		(II) 383 Friesian semen used	46.3 %
C. R. = conception rates			

The conception rate (55.68 %) with imported frozen semen of Jersey bulls is higher than that of Bonglore, (INDIA) reported by G. P. Chinnaiya (1974). Only 90 cow have been verified and presented in this paper, for accurate results more cows inseminated from different A. I. centers are to be included. From Table II, it is also noted that there is great variation of conception rates by the bulls of the same breeds and also between different breeds, probable causes might be due to difference in fertility of the bulls as well as cows and the different hands of the inseminators also play a very important role for conception.

The number of A. I. with deep frozen semen, required per conception is shown in Table III.

Table III

No of A. I. required per conception

Period of insemination	Centers where inseminated	No of animals inseminated	No of animals conceived	No of A. I. per conception	Average conception
Aug; 74 -	I, Live-stock	44	27	1.62	
May 75	Farm Khumaltar				
April 74 -	II, Tripureshwar	46	23	2.00	1.81
- March 75					

The number of A. I. required per conception varies from 1.62 to 2.00. The mean insemination required per conception is 1.8- which is lower than all mean 2.49 reported from Kerala, India in 1975 (B. B. Krishan Nair)

Review of Litratures:-

Stewart (1951) reported a calf born by inseminating frozen semen in England. Graham and Mariden (1953) used 10 percent glycerol in semen before freezing and improved conception rate. Kumaran (1965) reported that deep Frozen semen imported from U.S A and used for insemination of cattle at National Dairy Research Institute, Karnal (India) gave unsatisfactory results. R. Nagarcenkar et al (1972) used deep frozen semen of Brown swiss and Friesion bulls and reported poor conception rate. Bhosrekar (1973) reported from National Dairy Research Institute Karnal more cases of repeat breeding with the use of deep frozen semen of Brown swiss sires which indicated lower conception rate. Chinnaiya, G.P. et al (1974) reported satisfactory conception rate by inseminating deep frozen semen of different exotic breeds. According to Krishnair, B.R. (1974) conception rate by frozen semen of Brown swiss in Karnal (India) was unsatisfactory.

Summary

A study on the conception rate due to inseminations of imported deep frozen semen of Jersey bulls, was made at Live-stock farm, Khumaltar and A. I. center Tri-pureshwor. 44 and 46 cows were inseminated at two centers, with the conception rates 61.36% and 50%. The mean of the conception rates was 55.68%. The number of inseminations required per conception at two centers were 1.62 and 2.00, with the mean of 1.81.

Acknowledgement

The author is grateful to Mr. B. B. Khadka and Mr. P. J. Pana, Director and Deputy Director General of Dept. of Agriculture respectively and also thankful to Dr. S. L. Shresth, Farms manager Live-stock Farm Khumaltar for their co-operation.

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Management Of Yak Herd In Nepal

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Introduction :

The domesticated and wild yak is a large, long haired, excellent pack and riding animal of northern alpine region of Nepal and Tibetan plateau as a whole. It is believed that this wild ancestors are still roaming in the Tibetan mountains and some himalayan regions of Nepal. It is found generally in regions above 2000 meters from sea level. This animal survives on the extremely poor scrubby pastures of high mountain areas and can live without food for 4-7 days during heavy snowing period. In Nepal male & female animals are called yak & nak respectively (Joshi & Pradhan 1974.)

Management of Yak Herd :

Management of yak is quite different from other cattle management although this animal belongs to Bovidae family. This animal has got a nomadic habits of moving and grazing in high and low alpine regions according to seasons. The different aspects of management are briefly mentioned below in separate headings.

Body Characteristics :

The wild domesticated yak is a small type of yak strong and good body confirmation. The average live weight of 15 male breeding yak was 244.5 kg. (538 lbs), 25 female nak (cows) average weight 215 kg. castrated yak averaged 337.1 kg. (739.5 lbs) in Solukhumbu Mustang and Dolpa districts of Nepal. According to Novikov et. al. (1950) yak bulls weight 350 kg. and cows 240 kg. in USSR., In Tibet the mean live weight of adult female yaks was estimated at 225 kg. (Phillips et. al., 1945). In China on the Tsinghai

border of south-eastern Kansu Province, 29 yak cows averaged 212 kg. and 7 oxen 541 kg. (Balezin, 1959).

The body measurements of domestic 15 yak, 25 nak & 10 oxen castrated are shown in the following Table:

Particulars	Yak (cm)	Nak (cm)	Yak castrated (cm)
1. Height at withers	104.9	101.9	116.2
2. Length of body shoulder point to pin bone	109.9	105.3	123.7
3. Heart girth	140.0	130.0	157.0
4. Length of fore-legs	52.0	48	75
5. Length of hind-legs	48.0	47	73

The domesticated yak and nak have a relatively heavy and wide head with long narrow and slightly dished face, short ears and prominent laterally situated orbits. The horns are pointed at the tip, projected outwards, upwards and slightly backwards in a simple curve. The female animal (nak) has got shorter & thinner horns than the male yak and castrated yak. Some of the domesticated yak & naks are polled. This animal has got short neck no dewlap, humpless, wither very high and long owing to the elongated neural spines of the thoracic & cervical vertebral and widest near their highest point. The belly and chest of these animals are deep and wide, hindquarters tend to be high and the rump is short and droops to the low tail root. These animals legs are short, strong, thin (like deer) and generally well placed and straight, their hooves are large hard durable and shining. The body coat consists of winter & summer coats. The winter coat consists of an outer fine, glossy hair and inner soft, fine undercoat. The summer coat consists of relatively shorter outer hair and inner short and fine. The hair around the head, withers and back are very short and on the shoulders, sides and thighs are longer and average length of the hair reaches 20-50 cm. The tail is short, hairy from the base and extends into a long, bushy, full, even switch much finer and softer. The coatcolour of animals are usually dark black, black and white, grey, silvergrey, dark brown, redish brown, white and blue roan.

Housing :

It is practiced that most of the time inside the stone fenced field and during heavy snowing time they are kept inside house. Milking naks are generally left in the pasture with the newly born calves in day time and separte during night time with other calves inside the fenced wall.

Feeding Summer Time :

Mostly animals are kept in open pasture (alpine) for whole summer time. Farmers do not provide concentrate feeds during this time except to the weak and lactating animals which are generally kept near the villages. Once or twice a week they give salt to the animals in the pasture and in the mean time they also count their animals number in the herd. Most of the animals get healthy & fatty during this time.

Winter Times :

During this time animals are kept in lower altitude areas and also nearby villages where they do stall feeding and also provide concentrate feeds & hay along with salt.

Concentrate feed includes: maize flour, soyabean, potatoes, radish, gur, mustard oil and fermented rice, maize, barley, naked barley, millets etc which are residues of local beer (Chhyang). In winter season animals must be provided plenty of water for drinking because they are fed hay & concentrate feeds during that time.

Pasture management :

They have rotational pasture management and movement is nomadic in nature. After rainy season they make hay & store for the winter feeding. So far there is no introduction of any improved grasses in this alpine pasture.

Identification :

Farmers identify and call their animals by the name & colour of the animals. Some time they tie pieces of colourful clothes at tail, withers, horns, neck & poll.

To identify weak and strong animal they have certain guidelines such as in summer season if the animal is healthy & strong they change their body coat soon, their eyes are red and lacrimating and in winter season they have to examine the flesh of inner thigh, bulging of eye ball and can go high in pasture for grazing.

Handling :

Yaks and naks are very sensitive to a new objects and become nervous and run away from the herd. To catch and control the animal there must be a daily care taker cowboy, one must go slowly to approach the animal from side and catch the base of the horn. Once caught the horns carefully & strongly it becomes docile. If the yak is very furious it is practiced to keep the nose rings and then control it. At the milking time they are tied in the neck and two forelegs together.

Castration :

They do castration by open method (locally) take out both the testicles and

stitch the wound with ordinary thread which some time most risky, dangerous and fatal. These castrated yaks are very strong and big in size, they are used for both transportation and ploughing purposes. One animal can carry 60-70 kg load on high altitude and walk for 6-8 miles per day.

Breeding :

In pure yak herd, systems of breeding have been broadly divided into two :

(a) Inbreeding : This means breeding of the related animals.

(b) Out breeding : This means breeding of the unrelated animals.

They also do cross breeding between yak and hilly cow and hilly bull with nak, this way the F₁ cross is called female chauri and male. Jhopkiyos which is always sterile. Jhopkiyos have fully developed secondary sexual characters and testes do not produce spermatozoa although the interstitial tissue is comparatively well developed (Zawadowsky, 1931 and Epstun 1969). Chauries are always fertile and can be mated with parent stock but again their male calves are sterile. Although yak animal belongs to Bovidae family in which all the animals are polyestrus but because of climatic condition this is a seasonal breeder. Its maturity age is range between 2-3 years. Its gestration period depends upon the breeding systems. When yak crossed with nak the gestration period is 255 days while between nak and hilly bull (lang) the gestration period is 285 days. Interval of parturition depends mostly in management and feeding. In healthy herds nak comes on heat after 20-32 days of weaning of calf but usually nak conceives in one year interval. The ratio between yak & nak for mating is 1:15 or 20. Mating time is usual in the months of August & September (Sawan & Bhadra). Nak conceives with yak even after failing 2-3 times with Kirko bull or lang or hilly bull. Qestrus cycle is of 21 days average and duration of oestrus is 16 hours. Nak gives birth of one calf but some time twin are also observed. Weaning of calves is done generally after 2½ to 3 months of calving. Average birth weight of the calf is 10-20 kg.

Total milking days is 5 months out of this 2 months for calf feeding and rest three for milking. In 1st & 2nd calving time nak gives less milk than the proceeding lactation periods. The average milk yield is 4 kg/day. Total fat content is 5.5 to 9.5% (Tewari, 1967). It is recorded in Tibet that the milk yield is produced 1-2 kg/day for 4-5 months with 6.34% butter fat content (Phillips et al 1945). The milk of nak is a rich golden colour and has a high fat content. Milking of animal is done twice a day and morning production is higher than the evening production.

Shearing of wool:

Shearing is practiced once in a year during the month of June & July (Jestha & Asadh). The average total production of wool from one animal is 1 to 1.5 kg of

which 0.75-1 kg hair and 0.25 to 0.5 kg fine fibres per anum. In Tibet adult yak yields approximately 1 kg (0.75-1.35 kg) hair and 0.5 kg. (0.37-0.61 kg.) finer fibers per anum (Denisov, 1935). Shearing is done by both hand pulling and by scissor. They make carpet, rope, bags or sacs for grains, fere, cheera and tent cover. Wool of the undercoat is used for clothing.

Habit:

Mostly yak & nak walk in group in alpine pasture & in snow whereas the castrated yak always follows man made track. They come down upto 10,000 ft and go up to 20,000 ft above sea level. They always follow snow belt and sometime graze after digging out the snow. Very rarely they return back to the dwelling place after grazing. To protect the young and weak animal from the wild animal they make circle by facing outwards putting them inside the circle. these animals are very sensitive and by smelling they can know the presence of crevases on the track and can indicate. They have also bad habits like kicking, licking, suckling & butting to other animal as well as to human. They have grunting voice like pig. When animal gets away from herd it become very nervous and furious, breaths very fast, taking out the tongue, and starts charging to any objectives very fast finally runs away towards on the top of the mountain. To bring back such animal into the herd, itself should go near him.

This animal is used for multipurposes like milk, meat, packing(transportation) riding, ploughing etc. The hide is used for shoe making (Docha).

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A SEROLOGICAL SURVEY OF ANIMAL BRUCELLOSIS IN KATHMANDU

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Introduction:

The occurrence of brucellosis among cattle, water-buffaloes, sheep, goats, pigs, dogs, horses, poultry and human beings is not well known in Nepal. No systematic study has been made on animal brucellosis before.

Brucellosis inflicts heavy economic losses. Brucellosis causes abortions, still-births, retained placenta, sterility and low milk yield. The loss of milk through loss of calves and low milk yield affects human nutrition and it causes morbidity in the attendants and consumers of milk (Mathur, 1970). Thus it is important from the point of view of farm economy. Brucellosis also is one of the most important zoonotic diseases.

In the present study this is the first time a serological survey and milk ring test were undertaken to find out the prevalence of brucellosis in animals. It is now only a beginning to work and continue with this in future.

Materials and Methods:

The sera samples from cattle, goats, yak, pigs, horses, dogs, poultry of both the sexes were collected from Khumaltar Live-stock Farm, Central Veterinary Hospital, Jaulakhel Brooder Farm, Royal Army Cabillary Singhdarwar and Balaju and from various herds in the locality. Yak serum samples were collected from Lantang at about 12000 ft. altitude from sea level (Grave, 1973).

The bulk (pooled) milk samples of water-buffaloes were collected from Bhaktapur Milk Chilling Centre, Lainchaur Dairy Center and from cows of local people which were brought to the Central Veterinary Hospital, Tripureswar, for treatment.

Blood serum for standard Tube Agglutination Test using Brucella plain antigen.

Pooled milk samples of whole milk (Unpasteurized or unboiled) for Milk Ring Test (MRT) and whey plate agglutination test using ARB coloured antigen.

All the sera samples collected were subjected to plate agglutination and tube agglutination tests according to the methods recommended by Indian Veterinary Research Institute, Izatnagar. Carbol-saline solution was used as a diluent.

Milk Ring Test:- To 1 ml of a milk sample in a narrow tube was added one drop of BRT coloured antigen prepared at the Central Veterinary Laboratory, Weybridge. These were gently mixed and incubated at 37° C for one hour (Ebadi, 1972). The test was read and results recorded. From the same milk sample whey was prepared and whey was tested as plate agglutination method using ARB antigen.

Brucella abortus coloured as well as plain antigens were obtained from IVRI Izatnagar, U.P. India. For tube agglutination test the reading was made 24 hrs after incubation at 37° C. Interpretation of results for tube test a titre of 1/40 (80 I.U.) or above was regarded as positive reaction and 1/20 (40 I.U.) above was regarded as doubtful for brucellosis in cattle, equine, and dogs (Cruickshank, 1965). But 1/20 or above regarded as positive reaction and 1/10 or above doubtful for sheep, goats, pigs and poultry.

Fifty percent agglutination at serum dilutions of 1/10, 1/20, 1/40, 1/80, 1/160, 1/320 represent 20, 40, 80, 160, 320, and 640 international units (I.U./ml) respectively (WHO Report, 1958., 1964, and 1971).

Results and Discussion:

Total 274 sera samples of animals were tested for evidence of brucellosis, of which, 79 were goats, 47 horses and mules, 46 cattle, 24 pigs, 20 dogs, 3 yaks and 55 poultry (Table 1).

In cattle showing a titre of 1:40 or above, in goats 1:20 or above, in dogs 1:40 or above, in horses and mules 1:40 or above and in poultry 1:20 or above were recorded as reactors or positive (Table 4).

Variable titres observed in different species may be dependent not only on the extent of exposure of a particular animal to the infective agent but also on the duration for which the infection had persisted in that animal (Sethi et al, 1971).

Results of tube plate and card tests of different species were recorded in Table 3. In this result some sera have shown positive reaction in plate and card tests but negative in tube test.

Only a limited number of yak and pigs were subjected to this study and none was found positive.

Total 45 milk samples, of which, 40 pooled water-buffalo milk, 4 individual cow milk and 1 goat milk were tested by milk ring test (MRT) and whey plate test (WPT) (Table 2). Of which one cow milk has shown positive reaction for both the tests. The same cow serum was tested for tube and plate tests and shown positive reaction.

Summary

A serologic survey of brucellosis in cattle, goats, horses and mules, poultry, pigs and yak has been carried out. Of 35 cattle tested 5 were found to show a titre of 1:40 or above the incidence rate being 14.28 percent. Of the 70 goats tested only 7 reactors were recorded the incidence rate 10.00%. Of the 40 horses and mules tested 5 reactors were recorded the incidence rate 12.50%. Of the 8 dogs tested 3 reactors the incidence rate 37.50%. Of the 25 poultry tested 9 reactors the incidence rate 36.00%. Due to limited number of cases examined no reactors were recorded in pigs and yak (Table 5).

On the basis of limited study it is very difficult to suggest or to say which one of the species has a higher incidence of brucellosis in this valley. Further investigation is awaited to confirm the exact incidence.

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Table 1:**Serum record**

Species	No. of serum samples	No. of serum samples examined		
		Tube	Plate	Card
Cattle	46	35	46	9
Goats	79	70	79	30
Pigs	24	10	24	5
Dogs	20	8	20	—
Horses and mules	47	40	47	25
Poultry	55	25	55	10
Yak	3	3	3	3
Total	274	191	274	82

Table 2:**Results of Milk Ring and Whey Plate Tests**

No. of milk samples	No. examined	No. positive	No. of whey samples	No. examined	No. Positive
Buffalo	40	—	40	40	—
Cow	4	1	4	4	1
Goat	1	—	1	1	—
Total	45	1	45	45	1

Table 3:**Results of Tube, Plate and Card Tests**

Species	No. of serum examined	Positive for different tests		
		Plate	Tube	Card
Cattle	46	14	5	4
Goats	79	9	7	1
Pigs	24	—	—	—
Dogs	20	3	3	—
Horses and mules	47	11	5	2
Yak	3	—	—	—
Poultry	55	8	9	6
Total	274	45	29	13

Table 4:-

Titro wise break up of reactors

Species	1:10	1:20	1:40	1:80	1:160	Total
Cattle	-	-	2	2	1	5
Goats	-	2	2	3	-	7
Pigs	-	-	-	-	-	-
Dogs	-	-	2	1	-	2
Horses and mules	-	-	4	1	-	5
Yak	-	-	-	-	-	-
Poultry	-	4	5	-	-	6
Total	-	6	15	7	1	29

Table 5:-

Incidence of Brucellosis in Animals

Species	Tested for tube test		Incidence rate (percent)
	Total tested	Total positive	
Cattle	35	5	14.28
Goats	70	7	10.00
Pigs	10	-	-
Dogs	8	3	37.50
Horse and mules	40	5	12.50
Yak	3	-	-
Poultry	25	9	36.00
Total	191	29	15.18

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