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## **Session 4: Reproduction and Breeding** ( 9-Apr-2000 )

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### **1. Monitoring of Traits for Yak and Yak Cattle Crosses** (4-9 Sep 2000)

M.R. Goe and G. Stranzinger

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This paper briefly reviews breeding systems used for domestic yaks and for yak and cattle crosses. Traits for production and performance commonly selected by herders for breeding are highlighted. A simple recording system is then proposed that would allow breeding activities to be jointly monitored by herders and extension workers to reduce the presence of less desirable traits in herds. The system would also permit basic information to be gathered on herd structures which can assist researchers and livestock advisors to determine the extent of inbreeding within regions or areas of a country and better plan for appropriate interventions.

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### **2. Analysis of Main Component About Several Breeding Traits of Maiwa Yaks** (4-9 Sep 2000)

J. Zhong, Z. Chen, X. Zi and Y. Wen

Department of Animal Science, Southwest Nationalities College, Chengdu 610041, China.

The article analyzes the 9 quantitative traits of Maiwa yaks for principal component and cluster analysis. The result shows that the 9 traits can be divided into 3 groups as body size, milk, hair and horn, while the first two groups are more important for growth and development of yaks. So, the first two groups will be the keynote for Maiwa yak selection and breeding to get better effects.

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### **3. Efficient Production of Transgenic Bovine/Cat by Microinjection and Cloning Technology of Early Embryos** (4-9 Sep 2000)

T. Suzuki

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Transgenic livestock have been developed for a variety of purposes, including improvement of food products or disease resistance, production of valuable therapeutic in milk, and as models of human diseases. However, the cost of transferring

microinjected embryos to recipients that do not generate transgenic offspring is a major constraint to this approach. Therefore, for the production of large transgenic animals such as cattle, detection of the transgene at the pre-implantation stage would be desirable, considering the long gestation period and limited number of offspring. In bovine studies, although several non-invasive methods using firefly luciferase as a marker or neomycin resistance gene have been reported for selection of the transgenic embryos, the former method requires a step for loading the substrate (luciferin) inside the cells, and the substrate is known to be toxic, whereas the latter requires the presence of neomycin in the culture medium. In the last few years, green fluorescent protein (GFP), a protein of 238 amino acids found in jellyfish *Aequorea Victoria*, has been applied for various objectives as a useful marker for the monitoring of gene expression in situ. GFP absorbs blue light and emits green fluorescence without any need for exogenous substrates or cofactors, and this characteristic is a great advantage of GFP as a marker. Since no preliminary steps are required for the detection of GFP, cells or organs can be observed at any time in their viable and intact form by simple use of a fluorescence microscope. Therefore, the present study was conducted as a preliminary experiment aimed at evaluating the applicability of this convenient marker for in vitro selection of transgenic bovine/cat embryos. The expression of fluorescence by preimplantation expression by bovine/cat embryos was observed after pronuclear microinjection or cloning with an enhanced GFP (EGFP; S65T; +F64L) gene construct (18).

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#### **4. Effects of Selection and Breeding on Yaks Within Breeds in Linzhou Yak Breeding Farm** (4-9 Sep 2000)

D. Yun Bureau of Science and Technology, Linzhou County, Tibetan Autonomous Region, Linzhou, China.

Linzhou County is the second largest county, belonging to the Lhasa city, with a main income from animal husbandry taking 25.07% of the total agronomy capital. The population in the county is 50,000 and the total area for the county is 450200 hectares and of which there are 326473 hectares used as natural pastureland. There are 316000 heads of livestock and of which the number of yaks are 75300. In 1999, the beef and milk from yaks are 3384 T and 2549 T which take 72% and 66% of the total yield in the county respectively. To improve the productive performances of yaks, a nucleus herd with 550 breeding yaks established through selection within breeds of Yadong and Sibu yaks and raised on 3000 hectares natural pasture and 120 hectares artificial grassland has supported 515 top qualified breeding yaks to Lhasa and other regions by 1999 and 42.8% of total yaks in the county have been improved with the breeding animals from this herd. The average bodyweight of both males and females at 1 and 2 years old have been increased from 54.6 kg and 118 kg to 79.2 kg and 156 kg respectively and the milk yield from July to October was increased from 105 kg to 157.2 kg.

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#### **5. Efficient Ways for the Increases of Yak Numbers and Their Production** (4-9 Sep 2000)

B. Chertkov<sup>1</sup> and M. Kasmaliev<sup>2</sup>

<sup>1</sup>Kyrgyzstan Institute of Cattle Breeding, Kyrgyz Republic. E-mail: land@iuk.kg

<sup>2</sup>Selection and Yak Breeding Lab, Livestock Institute, Kyrgyz Agricultural Academy, 12, Institutskaya str., Flat 12, Frunze Village, Sokuluk District, Chui Region, 722125, Kyrgyz Republic.

The number of yaks in Kyrgyz has decreased from 79300 in 1978 to 20000 at the beginning of 2000. The productivities like bodyweights of yaks have also lowered. However, the natural resources of Kyrgyz could support as much as 200000 to 250000 yaks without competition with other wild and domestic animals. So, it is necessary to seek an approach for increasing the yak numbers and to improve their productivities through effective selection and breeding methodologies including individual and grouping selections and improving the grazing and nutritional conditions.

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## **6. Preliminary Report of Selective Breeding of Yaks In Sangri County, Tibet, PR China (4-9 Sep 2000)**

B. Hu

Supervision Service of Animal and Plant Quarantine of Shannan Prefecture, Tibetan Autonomous Region, Shannan 850000, China.

Yak is a special Bovid species native to harsh ecological environments with an elevation of more than 3,000 meters high above sea level. The sustainable development suitable for yaks production in highland pastures should be established according to yak's appearance, productive performances, reproductive performances and yak's selective breeding together with its scientific management and feeding, products processing and marketing as well as disease controls.

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## **7. Some Genetic Parameters of Body Mass in the Yak of the Buryat Ecotype (4-9 Sep 2000)**

E. Katzina

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The effect of dams on body mass of descendants in mother-daughter and mother-son combinations is determined. It was found that the heritability of body mass at birth for both combinations equaled to 0.27, and at 3-, 4-, 8-, 12-, 18-, and 24-months old fluctuated from 0.25 to 0.38. It looks that the values of heritability increased together with the age going up. An effect of sex on acceptance of inherited information from dams by descendants was not found. Phenotypical correlations between body mass at birth, 3-, 6-, 8-, 12-, 16-, and 18- months old (the last is an age of economic maturity when birth in the March-April interval) in males and females fluctuated from 0.38 to 0.87. High recurrence of the feature in favorable periods of life made an early evaluation of the animal phenotype possible, and also accelerated differentiation of the yak females on their pedigree value. The suggestions to selection for increasing of body mass are given.

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## **8. Review of the Development of Bayingolin Yak (4-9 Sep 2000)**

A. Turshen<sup>1</sup>, H. Liang<sup>2</sup>, C. Zhao<sup>3</sup> and J. Chen<sup>4</sup>

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The present paper introduced the origin, distribution, production performance, reproductive performance and the natural environment of Bayingolin Yak, one of Chinese yak breeds in Bayingolin Mongolian Autonomous Prefecture, Xinjiang of P.R. China. The Bayingolin Yak's improvement and scientific research works have been reviewed briefly, such as genetic selection, introducing new genetics for crossbreeding, researches on the embryo transfer between ordinary cattle and yak, yak underwool, fastening, diseases, physiological and biochemical constants' measurements. The paper also identified the problems in the yak production and made suggestions for the yak industry development in the next five years in the region.

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## **9. Present Situation and Resource of Yak Production and Reasons for Degeneration of Tibetan Yak Productive Performances** (4-9 Sep 2000)

Q. Ji, C. Bhu, Y. Dawa, D. Tsering, C. Dawa, Y. Zhang and S. Lob

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The paper reviewed the information of herd structure, growth and development, productive performances of beef, milk, wool & undercoat yields and reproduction of Tibetan yaks based on systematic investigations, measurements and analysis. The breed characteristics and resources, product qualities, and reasons leading to the degeneration of productive performances of Tibetan yaks were identified. Suggestions to prevent the yaks from further degeneration were proposed as following: (1) to balance and adjust the numbers of yak and rangeland pressure and utilization, (2) to concern the potential of natural resources from the high and cold pastures, (3) to restore the ecological environments and maintain its balance, and (4) to support the sustainable yak and rangeland development ecosystem.

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## **10. Experimental Results of Estrus Synchronization in Yak Cows** (4-9 Sep 2000)

M. Davaa<sup>1</sup>, D. Badamdorj<sup>2</sup>, B. Erdenebaatar<sup>2</sup>, A. Magash<sup>1</sup>, Y. Zagdsuren<sup>2</sup> and N. Altankhuag<sup>2</sup>

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The estrus synchronization of in the female yaks were 52.8% of 53 yak cows treated with hormones, 18.8% of them showed incomplete estrus cycle and no estrus was detected for 28.3%. Above indicators of 26 heifers involved in hormonal treatment were 30.8, 30.8 and 38.4% respectively. The calving period, fattening level and types of hormonal preparations influenced on estrus synchronization.

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## **11. Experiments on Estrus Synchronization and Artificial Insemination With Frozen Semen in Yaks** (4-9 Sep 2000)

Y. Zhang

Dangxun Yak Research Center, Tibetan Autonomous Region, Lhasa 850000, China

Irregular estrus, received estrus, silent estrus and anoestrus in female yaks in highland pastures are very common and cause the lower conception and gestation rates, longer service period, disperser service and calving, poorer production and economic benefit with higher costs of labor and logistics. To solve the problems above, triplet hormones, PG and FSH N° 2 were used to induce the estrus synchronization of 80 yak cows being dividing into 5 groups respectively. The results showed that the estrus rate was 77.50% within 7 days after hormone treatments, the final insemination rate 95% and the conception rate 71.05% which shortened the service period by half. Multiple hormones treatment was the best but with a higher cost. The triplet hormones should be the choice for its economy and effectiveness. In 1992, 780 yak cows were inseminated by AI with frozen yak semen after treatment of the triplet hormones and 68.08% conception rate, increased by one time compared with the natural service, achieved even it was a dry year for the climate. Therefore, it is suggested that the estrus synchronization of yak cows should be a effective and practical action to improve the yak reproduction and subsequently the animal husbandry with better benefit.

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## **12. The Preliminary Experiment to Induce Superovulation in Female Yaks** (4-9 Sep 2000)

M. Davaa<sup>1</sup>, N. Altankhuag<sup>2</sup>, Y. Zagdsuren<sup>2</sup>, D. Badamdorj<sup>2</sup>, A. Magash<sup>1</sup> and B. Erdenebaatar<sup>2</sup>

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The varieties of hormonal treatments including FSH or PMSG were tested to induce superovulation in yak cows. During superovulation the average number of follicles developed in the ovaries was  $5.36 \pm 0.65$  and  $4.46 \pm 0.43$  of them were ovulated. The numbers of ovulated eggs in the right and left ovaries were  $2.55 \pm 0.30$  and  $1.94 \pm 0.2$  respectively. Onset of donor's estrus detected at  $34.1 \pm 0.52$  hour after the prostaglandin injection.

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## **13. Light Microscopic Investigations on Frozen-thawed Yak Semen - A Pilot Study** (4-9 Sep 2000)

S. Nagy<sup>1</sup>, X. Qi<sup>2</sup>, J. Han<sup>2</sup> and A. Kovács<sup>3</sup>

<sup>1</sup>University of West Hungary, Faculty of Agricultural Sciences, Institute of Animal Breeding H-9200 Mosonmagyaróvár, Vár 4., Hungary. E-mail: szabio@mtk.nyme.hu

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<sup>3</sup>Department of Cell Biology, Institute for Animal Breeding and Nutrition, H-2053 Herceghalom, Gesztenyés út 1-3., Hungary.

A simple, light microscopic sperm staining method was used for simultaneous evaluation of acrosome integrity, viability and morphology of sperm cells of wild and wild x domestic F1 yak bulls.

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## **14. A Study on the Improvement of Yak Reproductive Performance by Introducing Wild Yak Blood** (4-9 Sep 2000)

S. Yan

Qinghai General Station of Veterinary and Animal Husbandry, Xining 810001, China.

Wild yak semen was used in an experiment to increase the reproduction performance of yaks, by both artificial insemination and controlled natural mating to improve yak production by crossbreeding. Reproduction and surviving rates were raised to 68.04% (artificial insemination) and 64.37% (natural mating) respectively. Significant benefits were achieved in the study.

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## **15. Artificial Insemination Trial in Yak in Bhutan** (4-9 Sep 2000)

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Yaks have played and still play a very significant role in the economy and social practices of the people of Bhutan. The Department of Agriculture and the Livestock Support Services supported the yak herders by distributing yak bulls procured

from places within Bhutan to mitigate the level and effects of inbreeding. Due to the sealing of the international border, no new breeding males could reach the country, risking a degeneration of the yak population due to inbreeding. To overcome this specific problem, Chinese yak semen were obtained under Helvetas funding through FAO. Artificial insemination was carried out from 1990 to 1997 on trial basis. Out of 80 inseminations, 43 progenies were born. The phenotypic characters of the AI progenies were indicated apart from the discussion on breeding habits of yaks in their natural habitat. The trial also highlights the practical difficulties faced by the field veterinarians and para-veterinarians to undertake such task that affect the success rate and AI coverage. From the experience, the implementation of yak AI on a full scale is not recommended till concrete and authentic results are obtained.

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#### **16. Fertility of Mongolian Female Yaks Inseminated With Frozen Semen of Wild Yak Bull** (4-9 Sep 2000)

D. Badamdorj<sup>1</sup>, M. Davaa<sup>2</sup>, B. Erdenebaatar<sup>1</sup>, B. Dagviikhorol<sup>3</sup>, L. Batsuuri<sup>2</sup>, J. Gombojaw<sup>3</sup> and B. Amarsanaa<sup>2</sup>

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<sup>2</sup>National Yak Research Center, State University of Agriculture, Zaisan, Ulaanbaatar-210153, Mongolia. E-mail: haaint@magicnet.mn

<sup>3</sup>High mountain Department, RIAH, Zaisan, Ulaanbaatar-210153, Mongolia.

Wild yak bull frozen semen, imported from P.R. China, was used for an experiment on AI technique in Mongolian female yaks, aimed at evaluation of the conception rate and obtaining 1/2 hybrid progenies. Female yaks shown natural (n=20) and synchronized (n=20) estrus were inseminated twice at 12 hours interval. The conception rate of cows calculated against the numbers of calves born was 35.0% and 40.0%, respectively.

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#### **17. Experiments on Sexing Yak Spermatozoa by Fluorescent in Situ Hybridization Using Bovine Y-chromosome Specific Dna Probe** (4-9 Sep 2000)

T. Révay<sup>1</sup>, X. Qi<sup>2</sup>, E.P. Tardy<sup>3</sup>, S. Nagy<sup>4</sup>, J. Han<sup>2</sup>, A. Kovács<sup>5</sup>, A. Tóth<sup>3</sup>, and A. Salgó<sup>1</sup>

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Y-bearing bovine spermatozoa may be distinguished by fluorescent in situ hybridization (FISH) using specific DNA probe, offering an in vitro control of experiments for producing sex-oriented or sex-specific semen. Bovine Y-specific probe gave evaluable signal also in yak spermatozoa. Specific binding of the probe to the corresponding sex chromosome was confirmed on yak chromosome preparations.

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## **18. Use of Herbal Medicine for Anoestrus Management in Yak (*Poephagus Grunniens L.*) (4-9 Sep 2000)**

T.K. Mohanty, R.N. Pal, K.V.H. Sastry and B.P. Singh

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Reproductive rate in yak is low in the natural habitat of high altitude due to several factors i.e. winter stress and nutritional deficiency. Age at first service and post-partum anoestrus are major problems which results in delayed less calf crop per yak and long calving interval. Generally yak breed in alternative year due to short breeding season. Since hormonal management of anoestrus is costly and require examination of the animal by expert for therapy, which is not possible due to inaccessible yak tract. In this experiment a herbal drug and mineral supplementation was tried in true anoestrus yak in randomly selected animals. Group I: Control animal with normal concentrate ration plus dry grass and green fodder. Group II: Normal ration plus Cyclomin 7 (Mineral supplementation Bolus) one bolus for seven days. Group III: Normal ration plus Cyclomin 7 followed by Prajana (Herbal estrus induction preparation) two boluses for three days.

Only 20 percent of the animals in Group I came to heat in the same breeding season and 40.60 percent animal came to heat in Group II on first treatment on subsequent treatment with the same medicine after fifteen days to the non-responders total estrus percentage increased to 55.84. However, in Group III, 78.68 percent animal shown estrus symptoms after first treatment and after repeating the treatment to non-responders total estrus percentage increased to 86.42. Anoestrus condition in yak can be managed efficiently by a small amount of concentrate, extra mineral supplementation and use of Prajana treatment.

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## **19. Parturition of Yak Cow (4-9 Sep 2000)**

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Investigation on parturition and clinical symptoms of postpartum period was conducted on yak cows with normal parturition. As a result of our research the dilatation of uterine cervix in calving cow continued for  $228.0 \pm 22.2$  min, the actual period of fetus's expelling was  $25.2 \pm 2.6$  min, the length of placenta expulsion lasted for  $136.0 \pm 0.5$  min and totally whole process of calving continued for 339.2 min. Such symptoms as chance of the animal behavior, the udder enlargement, milk secretion were observed before parturition.

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## **20. Yak Breeding and its Economic Efficiency in High Mountainous Regions of Kyrgyzstan (4-9 Sep 2000)**

J. Tynaev and M. Asylbekov

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## **21. Changes of Progesterone Concentration in Blood and Skim Milk During Estrous Cycle in Female Yaks (4-9 Sep 2000)**

B. Erdenebaatar<sup>1</sup>D. Badamdorj<sup>1</sup> and M. Davaa<sup>2</sup>

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**22. Report on the Breeding by Milking Ability of Maiwa Yak** (4-9 Sep 2000)

J. Lang, D. Zou, X. Wu

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