

## GENETIC RESISTANCE TO BLV

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### INTRODUCTION

Bovine leukosis virus (BLV) is cattle retrovirus infection. It causes malignant lymphoma from 1 to 5 % of infected cattle. BLV is widespread in many countries of the world. It is registered in all Russian regions. BLV infection reaches 70 % and higher in many cattle herds. In 1980 40 percent of dairy herds and 11 percent of beef herds were BLV infected in Canada (Samagh and Kellar, 1980). In US 89 % of all dairy operations and 43.5 % of all dairy cattle were BLV seropositive (Leukassay *et al.*, 1999). In 75 % of seropositive herds 25 % of individual dairy cows were seropositive for BLV. In dairy cattle seroprevalence (a measurement of BLV magnitude) was higher, than it was in beef cattle. In operations with low BLV infection culling may be the most effective method. It is necessary to study the resistance of hereditary determination to BLV infection and ways to decrease animals' infection with the help of selection methods.

### MATERIAL AND METHODS

The cattle seropositive for BLV were investigated, using the agar gel immunodiffusion (AGID) test, in area and region veterinary laboratories of West Siberia. Such investigations have been done in the laboratory of Institute of Experimental Veterinary of Siberia and Far-East under Siberian Division of Russian Academy of Agricultural Sciences. BLV infection and cows leucosis incidence among different breeds (Black and White, Simmental, Red, Hereford and Yakut) were analysed. 998 000 animals were examined for BLV infection and 476 000 animals were investigated for leukosis incidence. The causes of culling 587 000 Black and White, Simmental and Red cows have been determined for the last 5 years. The evaluation of bull genotypes for their daughters resistance to BLV infection was carried out. The correlation between the resistance of over 9 000 pairs of mothers and daughters to BLV infection and leukosis was studied.

**Statistical analyses.** Statistical analyses of quality variation traits were used. The coefficients of correlation were estimated in mother-daughter pairs for BLV infection, leukosis and heritability ( $\pm$  s.e.) values.

### RESULTS AND DISCUSSION

The frequency of BLV infection and leukosis morbidity are shown in table 1. BLV infection in West Siberia operations varies from 12.2 % to 30 %. In some herds the frequency of individual animal seroprevalence was 80 % and more. Leukosis morbidity in the regions changes in, wide range (from 1.3 to 4.5 %). The correlation between leukosis morbidity and the level of BLV infection was not revealed. The causes of culling 587 000 cows showed

that  $5.0 \pm 0.03$  % was discarded for leukosis. It is necessary to note, that the frequency of leukosis morbidity in Black and White cows was 2 times higher than in Simmental and Red ones. The assessment of BLV infection shows the highest prevalence in Black and White cows ( $16.8 \pm 0.08$  %) and the lowest in Red ( $6.4 \pm 0.1$  %) and Holstein breed ( $4.4 \pm 0.15$  %). In Yakutian cattle  $12.3 \pm 2.8$  % cows were BLV infected. BLV infection animals were not revealed among beef cattle (Hereford). It was established, that in Canada in dairy cattle BLV infection was 9.3 % versus 0.5 % in beef cattle. These data to a certain extent are evidence of hereditary determination resistance to BLV infection.

**Table 1. Prevalence of BLV in West Siberian herds**

Region	Cows number, thousand	BLV+ %	Cows number, thousand	Leukosis %
Altai	397.9	$12.2 \pm 0.05$	121.7	$4.5 \pm 0.06$
Kemerovo	27.8	$17.2 \pm 0.23$	26.1	$1.4 \pm 0.07$
Novosibirsk	278	$20.0 \pm 0.07$	113.2	$3.5 \pm 0.05$
Omsk	52.1	$10.0 \pm 0.13$	36.7	$3.6 \pm 0.10$
Tomsk	120.7	$18.2 \pm 0.11$	47.6	$3.3 \pm 0.08$
Tumen	121.6	$30.0 \pm 0.13$	130.6	$1.3 \pm 0.03$
Total	998.0	$17.4 \pm 0.04$	475.9	$3.0 \pm 0.02$

The frequency of BLV infection was studied in families of bulls' daughters. Significant differences were established in infected animals from different families and bulls' daughters (table 2).

**Table 2. BLV infection frequency in bull progenies and families**

Bulls number	Total number	BLV+%	Family number	Total number	BLV+ %
116030	69	$46.0 \pm 6.0$	496	24	$44.4 \pm 11.7$
964	75	$42.6 \pm 5.7$	15	35	$34.3 \pm 8.0$
757	129	$31.0 \pm 4.1$	641	32	$28.1 \pm 7.9$
106	302	$17.5 \pm 2.3$	5	36	$18.5 \pm 7.5$
342	96	$7.3 \pm 2.66$	131	17	$11.7 \pm 7.5$
837	343	$5.5 \pm 1.24$	2347	19	$15.7 \pm 8.3$
246	110	$3.6 \pm 1.8$	1474	15	$6.7 \pm 6.5$
966	49	$2.0 \pm 2.0$	381	13	$7.7 \pm 7.4$
Total	1502	$15.5 \pm 0.37$	Total	422	$22.0 \pm 2.1$

The frequency of seropositive daughters of bulls varies from 2 to 46 % and between families – from 6.7 to 44 %. There were no sires and families with their numerous offspring who could be completely BLV free. It testifies to the relative hereditary resistance of cattle to BLV infection. Different variants were revealed in combination frequency of BLV infection and leukosis morbidity among daughters from the same bulls. 1.5 times ( $P < 0.001$ ) more daughters were derived from BLV infection mothers than from seronegative ones (table 3).

**Table 3. Frequency of BLV infection daughters derived from seropositive and seronegative mothers**

Mother	Number of mother-daughter pairs	Daughter			
		BLV+		BLV-	
		n	%	n	%
BLV+	604	255	42.2 ± 2.01	349	57.8 ± 2.01
BLV-	2416	685	28.3 ± 0.92	1731	71.7 ± 0.92
In all	3020	940	31.1 ± 0.84	2080	68.9 ± 0.84

The same correlation between mothers and daughters infections was established in many breed herds. There is a positive correlation between the frequency of mothers and daughters leukosis morbidity (table 4). The coefficient of heritability resistance to BLV is 0.24. The coefficient of heritability to leukosis was higher ( $h^2 = 0.39$ ). There was not found the correlation between frequency of BLV infection and leukosis morbidity of mothers, daughters as well as members of the same families and bulls progeny. It testifies to the about existence of two genetic determination separate systems : resistance to infection and resistance to leukosis.

**Table 4. The correlation frequency between mothers and daughters BLV infection and leukosis**

Traits correlation	n	r ± S <sub>r</sub>	Traits correlation	n	r ± S <sub>r</sub>
BLV(+) – BLV(+)	3020	0.12 ± 0.018	Leukosis –BLV(+)	1011	- 0.018 ± 0.031
Leukosis - leukosis	4401	0.195 ± 0.015	BLV(+) - leukosis	1430	0.12 ± 0.026

### CONCLUSION

These results clearly show that resistance to BLV infection is the trait of genetics determination. It is confirmed by the differences between breeds, families, bulls daughters by the frequency of BLV infection and positive correlation between mothers and daughters BLV infection. Heritability coefficient ( $h^2$ ) of this character is 0.24. The resistance to BLV infection and leukosis breeding for resistance may be increased by the way of using selection methods. It is necessary to estimate families and bulls by progeny resistance to BLV infection and leukosis morbidity. The efficiency of breeding for diseases resistance in farm animals was shown by many authors (Owen and Axford, 1991).

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