

## EFFECTS OF DIFFERENT PREPARATIONS CONTAINING SELENIUM AND VITAMIN E ON SELENIUM STATUS AND REPRODUCTIVE PERFORMANCE OF GOATS

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*Three different preparations containing Se and vitamin E were tested for their effects on Se status and reproductive performance of goats. In the area where nutritional muscular dystrophy (NMD) in lambs had been demonstrated previously 280 does (domestic Balkan goat, were divided into four groups of 70. Experimental groups were treated twice (a month before insemination and three weeks before kidding) with Duphafal (s/c group B), Evitaselen (s/c, group C) or Muvisel (p/o, during 14 days, group D). The control group (group A) was untreated. During winter time does were kept together in a stable and fed bean strow and a daily supplement (500 - 600 g) of ground barley (home grown). During summer the does browsed in the forest and received supplement of barley (200 g daily) twice per week. Blood GSH-Px activities of A, C and D groups were maintained approximately at the same (low) level during pregnancy and lactation. During pregnancy and two weeks after kidding does of group B had significantly higher enzyme activities. At the age of two weeks and three months, kids of all groups had higher enzyme activities than their dams. Kids in groups AA and DD at the age of two weeks had lower enzyme activities than kids in groups BB and CC, but at the age of three months kids of all groups had enzyme activities at the same level. The treated groups had a slightly higher percentage of kidded goats, number of kids born, number of kids born per goat (except group C), percent of goats with twins (except group C), and a lower male/female ratio. Up to the age of three months 6.06% of NMD was registered only in the control group.*

*Key words: Selenium, glutathione peroxidase, vitamin E, goats, selenium status, reproductive performance*

### INTRODUCTION

Selenium has been established as a component of glutathione peroxidase (Rotruck et al. 1973), an enzyme playing an important role in the protection of

cellular components against oxidative damage through the reduction of metabolically generated lipid hydroperoxides and hydrogen peroxide (Flohé et al. 1979). A positive correlation between glutathione peroxidase (GSH-Px) activity in blood erythrocytes and plasma, and selenium concentration in blood has been found for cattle and sheep (Wilson and Judson, 1976), goats (Hussein and Jones, 1982), pigs (Jorgensen et al. 1977; Sankari, 1985), and chicken (Noguchi et al. 1973). Likewise blood or plasma GSH-Px activity and Se concentration have been shown to be positively related to Se intake in several species (Noguchi et al. 1973; Hakkarainen et al. 1978).

A wide variety of Se and vitamin E responsive conditions are known to occur in domestic animals (Combs and Combs, 1986) including low reproductive performance (Mahan et al. 1974; Nielsen et al. 1979; Mihailović et al. 1989, 1991; Mudd and Mackie, 1973; Buchanan-Smith et al. 1969).

The purpose of the present study was to test the effects of several commercial preparations containing Se and vitamin E on the selenium status and reproductive performance of goats.

#### MATERIAL AND METHODS

The experiment was carried out in a mountainous area where nutritional muscular dystrophy (NMD) in lambs had previously been diagnosed. A month before insemination 280 does (domestic Balkan goat) were marked with ear marks and divided into four groups of 70. The goats were treated twice (a month before insemination and three weeks before kidding) as follows: group B with Duphafal<sup>1</sup> (5 ml subcutaneously), group C with Evitaselen<sup>2</sup> (5 ml s/c), group D with Muvisel<sup>3</sup> (5 g per goat daily during two weeks, in the feed), while group A was not treated and served as a control. From October to the end of May the goats were kept together in the barn and fed bean straw supplemented with ground barley (500-600 g per goat, daily). From the end of May to October the goats were kept at a higher altitude and in the forest they browsed hornbeam, oak, undergrowth, and ate acorns. A supplement of home grown ground barley (200 g per goat) was given twice a week.

Heparinised blood samples were taken from 7 - 10 goats in each group at the beginning of the experiment (I) and subsequently at the time of insemination (II), in mid pregnancy (III), three weeks before kidding (IV), two weeks (V) and three months after kidding (VI) and from kids at the ages of 8 - 10 days and three months. Blood GSH-Px activity was determined using t-butyl hydroperoxide (TBH) as a substrate (Günzler et al. 1974). Selenium content in the barley and blood plasma were determined by a fluorometric method (Lindberg, 1968) using <sup>75</sup>Se to estimate the recovery percentage in each sample. The number of kidded goats, number of kids born, and percentage of goats with twins were recorded.

Statistical evaluation of the results was performed using Student's t-test.

<sup>1</sup>Each ml contained: 50 000 IU vitamin A, 25 000 IU vitamin D3, 20 IU vitamin E, 0,8 mg Se (as sodium selenite)

<sup>2</sup>Each ml contained: 20 IU vitamin E, 0,5 mg sodium selenite

<sup>3</sup>Each g contained: 20 000 IU vitamin A, 1000 IU vitamin D3 1.5 mg vitamin B1, 2.5 mg vitamin B2, 6 mg vitamin B3, 18 mg vitamin B5, 2 mg vitamin B6, 7.5 mg vitamin B12, 20 mg vitamin C, 5.25 mg vitamin E 1.75 mg vitamin K3, 0,4 mg folic acid and 33 µg Se



## RESULTS AND DISCUSSION

**GSH-Px activity.** Selenium content in barley (the only nutrient in which Se content was determined) was very low (8.64 ng/g) (Table 1). The low Se content in the blood plasma of untreated goats ( $8.8 \pm 2.82$  ng/ml) implies that the feedstuffs they were fed on were poor in Se. Thus, low initial blood GSH-Px activities ( $94 - 104 \mu\text{kat/l}$ ) as a reflection of low Se intake indicates low Se status of the goats. The control animals had a slight but not significant decrease in the enzyme activity during pregnancy (Figure 1). Two weeks and three months after kidding the enzyme activities were at the initial level. The amounts of Se administered to goats from groups C and D (2.5 mg and 2.14 mg per goat at each treatment, respectively) were insufficient to increase the enzyme activity. During pregnancy and two weeks after kidding the goats from group B had a significantly higher enzyme activity than the controls. A month after the first treatment activity had increased to  $123.5 \mu\text{kat/l}$  and was maintained at that level throughout pregnancy. A second increase was observed two weeks after kidding (5 weeks after the second treatment). Goats from group B received about twice the dose of Se as those from groups C and D. However, three months after kidding GSH-Px activity fell to the initial level. Hussein and Jones (1982) found the first significant increase of blood GSH-Px activity in goats two weeks after intramuscular injection of Se. At the age of two weeks and three months kids from all groups had higher enzyme activities than their dams. At the age of three months kids from groups AA and DD had higher, and kids from groups BB and CC lower activities than they had at the age of two weeks. However, at the age of three months kids from all groups had the enzyme activities approximately at the same level. These results indicate that whole blood GSH-Px activity might be a good indicator of long term Se status of goats and are in agreement to those of Hussein and Jones (1982).

Table 1. Se content in barley and blood plasma

Barley (ng/g DM)	Blood plasma (ng/ml)
8.6 (1)	$8.8 \pm 2.82$ (3)

In brackets: number of samples

Table 2. Reproductive performance of goats

Groups	A	B	C	D
Number of inseminated goats	70	70	70	70
Number of kidded goats	51	54	54	56
% of kidded goats	72.85	77.14	77.14	80.00
Number of kids born	66	70	68	76
- male	42	39	38	41
- female	24	31	30	35
- male/female ratio	1.75	1.26	1.27	1.17
Number of kids born per goat	1.29	1.30	1.26	1.36
% of goats with twins	29.41	31.37	27.45	39.22

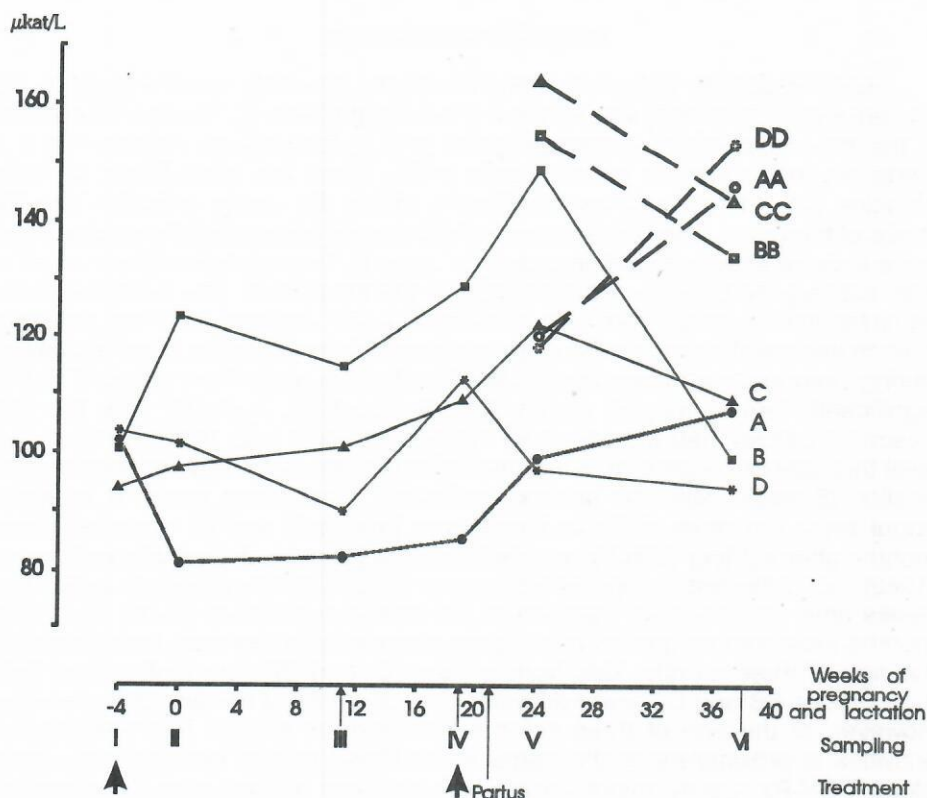


Figure 1. Blood GSH-Px activity of goats and their kids

**Reproductive performance.** In comparison to the control group, treated groups had slightly higher percentages of kidded goats, number of kids born per goat (except group C), percentage of goats with twins (except group C) and a lower male/female ratio (Table 2). The somewhat better performance in goats from group D might be a result of the complex composition of Muvisel. Better reproductive performance in ewes treated with Se and vitamin E were found by Mihailović et al. (1991), Mudd and Mackie (1973) and Scales (1974).

**Incidence of NMD.** Up to the age of three months 4 cases (6.06%) of NMD were registered only in the control group of kids (AA). Symptoms of NMD were similar to those described by Ogryzkov et al. (1966) and Tontis (1984) in goat kids, and by Muth (1970) and Jenkins and Hidirolou (1972) in lambs.

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**EFEKAT RAZLIČITIH PREPARATA KOJI SADRŽE SELEN I VITAMIN E NA STATUS SELENA I REPRODUKTIVNE SPOSOBNOSTI KOZA**

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## SADRŽAJ

Ispitivan je uticaj tri različita preparata koja sadrže Se i vitamin E na status Se i reproduktivne sposobnosti koza. U reonu gde je ranije dijagnostikovana NMD jaganjaca, 280 domaćih balkanskih koza podeljeno je u četiri grupe po 70. Eksperimentalne grupe su tretirane dva puta (mesec dana pre osemenjavanja i tri nedelje pre jarenja) Dufafralom (s/c, grupa B), Evitaselenom (s/c, grupa C) ili Muviselom (p/o, tokom 14 dana, grupa D). Kontrolna grupa (grupa A) nije tretirana. Tokom zimskog perioda koze su držane zajedno u oboru i hranjene grahorinom sa dnevnim dodatkom (500 - 600 g) mlevenog ječma (lokalno uzgajanog). Tokom leta koze su brstile u šumi i dobijale dodatak ječma (200 g dnevno) dva puta nedeljno. Aktivnosti GSH-Px u krvi grupa A, C i D zadržale su se na približno istom (niskom) nivou tokom graviditeta i laktacije. Tokom graviditeta i dve nedelje nakon jarenja koze iz grupe B imale su značajno više aktivnosti enzima. U starosti od dve nedelje i tri meseca jarići iz svih grupa imali su više aktivnosti enzima od svojih majki. Jarići iz grupe AA i DD su u starosti od dve nedelje imali niže aktivnosti od jarića iz grupa BB i CC, ali u starosti od tri meseca jarići iz svih grupa su imali aktivnost enzima na istom nivou. Tretirane grupe su imale nešto veći procenat ojarenih koza, broj rodene jaradi, broj jarića po kozi (izuzev grupe C), procenat koza koje su imale blizance (izuzev grupe C) i niži odnos muške/ženske jaradi. Do starosti od tri meseca 6.06% jaradi je obolelo od NMD, samo u kontrolnoj grupi.