INFLUENCE OF DIETS ENRICHED WITH SELENIUM ON MUTAGENESIS PROCESSES *IN VIVO*

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Introduction

Prevention of many diseases is impossible without constant replenishment of human organism with biologically active components. Micronutrients are among the factors being of special importance for supporting health, capacity for work and long life expectancy of human beings. A deficiency of supply of micronutrients with food products to human's organism is a common problem in all the civilized countries.

The most suitable method on a state scale for improving supplies of micronutrients to humans' organisms is the enrichment with them of the products of mass consumption, and, first of all - meat products. Three ways of enrichment are available: (1) introduction of a micronutrient through pills and biologically active supplements; (2) introduction of a micronutrient directly into the product during its production; (3) introduction of a micronutrient into feeds, thus enriching meat and final products. The incorporation of supplements with high content of selenium into feeds is the safest way for obtaining the products, enriched with micronutrients.

Selenium is one of the essential micronutrients. It is an important microelement, necessary for supporting the immune system of a human being.

There are many plants, containing selenium in their leaves or fruits. These are, for example, spinach, garlic, Brazilian nut, etc. The use of chick pea (Cicer arietinum L.) seems to be the most suitable method. Chick pea contains according to the data of the authors up to 700 μg/kg of selenium. In previous studies comparisons were carried out on the addition into the feeds of rabbits and fowl of selenium from different sources: sodium selenite, cobalt selenite, selenium methionine, selevite and the yeast enriched with selenium – "Sel-Plex", DAFS-25 (diacetophenonylselenide), chick pea.

As a result of feeding, the data indicating a positive influence of feeds, enriched with selenium, on the accumulation of selenium in organs and tissues of animals and fowl were obtained.

It should be noted, that selenium from chick pea and DAFS-25 were assimilated equally and to the highest degree, as compared to the other selenium-containing supplements. The results of feeding have shown a positive influence of all selenium-containing supplements on the preservation of the stock, gain of muscle tissue, increase in the water-holding capacity of meat and increase in color stability during storage.

The purpose of this work was to compare the influence of feeding the experimental animals with the diets enriched with a selenium-containing supplement DAFS-25 and the diets, containing chick pea, on the processes of spontaneous and induced mutagenesis.

Objects and methods of investigations. The investigation was fulfilled on males of inbred mice of the line C_{57}BL/6 with the weight 18-20g at the age of 8-12 weeks.

Groups: (control) – standard pelletized feed; (1) – chick pea diets; (2) – diets enriched with DAFS-25 (diacetophenonylselenid) at 1.6 mg per 1 kg of feeds; (3) – diets, consisting of the mix of chick pea with standard feeds (1:1). The investigations were carried out 2 or 4 weeks after starting the experiment.

Each group contained 10 animals. After termination of the period of respective feeding, to induce DNA – damage, 6 hours prior to slaughter, a genotoxicant of pro-oxidant action – dioxidine at the dose of 100 mg/kg was injected enterally to 5 animals from each group. The rest of the animals from each group were slaughtered immediately prior to conducting an assay for assessment of a spontaneous level of DNA-damage.

The investigations were carried out by the method of gel-electrophoresis of individual cells (the method "DNA-comet") in an alkaline version by the method of (Singh N.P et al.(1998) according to the guidelines of Hartmann A. et al. (2003).

The images of DNA-comet obtained from micropreparations were analyzed with the use of the software CometStore ("TriTek Corporation", USA). The percentage of DNA in the tail of DNA-comet (%DNA in the tail) was used as an indicator of DNA-damage. The obtained results were processed with the use of the ANOVA post-hoc test in a program medium Statistica 6.0.

Results and discussion

Table 1 shows the results of the investigation of the influence of consumption during 2 and 4 weeks of chick pea and selenium-containing supplement (SS) on spontaneous level of DNA damage in the cells of bone marrow

and liver of the experimental animals.

Statistically significant differences of the assessed index in the cells of the bone marrow in relation to the control in the animals receiving chick pea and DAFS-25 were recorded after 4 weeks of feeding. The analysis of spontaneous DNA-damage after 4 weeks of feeding has revealed a confident decrease of the index in the cells of liver of the animals, consuming chick pea (% of DNA in the tail – 7.20±0.36), while there were no differences in other groups.

Fig 1 shows the results of the of the influence of consumption of chick pea and SS during 2 and 4 weeks on the level of DNA-damage, as induced by dioxidine in the cells of bone marrow and liver of the experimental animals. A statistically significant decrease in the level of DNA-damage of the cells of both the liver and bone marrow of the animals, obtaining experimental diets was shown.

Table 1.Effect of chick pea and selenium-containing supplement on spontaneous level of DNA-damage

Group	Bone marrow		Liver	
	Cells	% DNA in tail	Cells	% DNA in tail
2 weeks of consumption				
Control	600	8.44	650	8.23
Chick pea	510	7.84*	500	7.93
Chick pea + feed (1:1)	520	8.84	520	7.92
Selenium-containing supplement + feed	510	8.25	510	6.81*
4 weeks of consumption				
Control	600	8.44	650	8.23
Chick pea	520	6.45*	500	7.20*
Chick pea + feed (1:1)	500	8.24	510	7.98
Selenium-containing supplement + feed	520	6.62*	520	7.91

* Statistically significant differences in comparison with the control

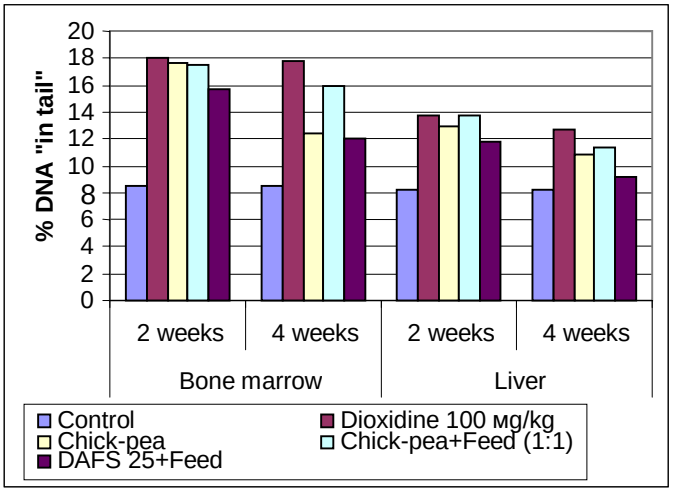

Fig. 1. Influence of chick pea and selenium-containing supplement (DAFS-25) on the level of DNA-damage (spontaneous and dioxidine-induced (100 mg|kg) in cells of bone marrow and liver of mice

Conclusions

1. Feeding the experimental animals with the diets, containing chick pea or selenium-containing supplement DAFS-25 increases stability of bone marrow and liver cells against genotoxic effect.
2. Increase in stability is observed both in the evaluation of DNA-damage, induced by mutagen, and in the evaluation of spontaneous level of DNA- damage – the result of endogenous genotoxic effect.
3. The use of chick pea needs more time for achieving reliable positive effect.
4. Use of natural sources of selenium (for example, chick pea) is more preferable, than synthetic selenium-containing supplements.

References

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