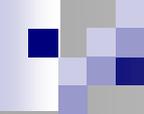




Effect of selenium on the inflammatory response of the cows udder

Zorana Kovačević, Dragica Stojanović, Branislava Belić, Ivana Davidov, Marko Cincovic, Miodrag Radinović, Mihajlo Erdeljan

University of Novi Sad, Faculty of Agriculture, Department of veterinary medicine, Novi Sad, Serbia



Introduction

- Research in both human and veterinary medicine shows a clear relationship among nutrition, inflammation and disease susceptibility
- Trace minerals play an important role in dairy cow immune function, fertility and growth
- Selenium is recognized as an essential trace element for both animals and humans

Introduction

Selenium

- An essential component of the glutathione peroxidase (which is responsible for reduction of H_2O_2 and free O_2 to H_2O) in the antioxidant system
- Plays a vital role in protecting both (intra- and extra-cellular) lipid membranes against oxidative damage

Selenium deficiency

- Impairs the antioxidant and immune system, and consequently disease resistance
- Associated with impaired growth, fertility and health in farm livestock
- Reduced the blood ability and milk neutrophils to kill bacteria in dairy cows (whole blood Se conc. - in positive correlation with neutrophil adhesion)

Introduction

Selenium supplementation

- Potential benefits to periparturient health include:
 - reduced clinical mastitis symptoms,
 - reduced milk somatic cells,
 - decreased rate of new intramammary infections,
 - reduced rates of inflammation of mammary gland

- **NRC (2001)** recommended that the level of Se in dairy diets is **0,3 mg/kg** dry matter

Introduction

Concentrations of Se in serum and whole blood

- Used as an index of selenium status
- Increased conc. of Se
 - reduce milk somatic cell count,
 - reduced mastitis and
 - improved neutrophil function

Somatic cell count

- Measures the amount of leukocytes (such as macrophages, lymphocytes and polymorphonuclear neutrophilic leukocytes)
- Of *500.000/ml* or more indicates *an inflammation of the udder*

Introduction

According to the **NMC** (2011):

- *Clinical mastitis* is characterized by visible abnormalities in the milk or the udder (abnormalities in the milk are flakes, clots, and a watery appearance)
- *Subclinical mastitis* is inflammation of the mammary gland that does not create visible changes in the milk or the udder

The aim of the study

- Find out the effect Se blood conc. on the inflammatory respond of the cows udder because of literature lack data about not visible changes in udder tissue

33 As Arsenic 74.92160 [Ar]3d ¹⁰ 4s ² 4p ³ 9.7886	34 Se Selenium 78.96 [Ar]3d ¹⁰ 4s ² 4p ⁴ 9.7524	35 Br Bromine 79.904 [Ar]3d ¹⁰ 4s ² 4p ⁵ 11.8138
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Material and methods

Animals

- The study was performed on thirty Holstein cows approximate same body weight, ages 3 to 5 years and in first to third lactation, and they giving approximately the same amount of milk
- All cows were stabling with dry straw for bedding and with *ad libitum* access to potable water, and feed by total mixed ration (maize silage, grass silage, cracked wheat, soyabean meal, rapeseed meal, sugar beet and hay)
- Cows recived daily **0,3 mg/kg selenium *per os*** (30 days before conception and trough all lactating month)

Material and methods

Sampling

- ***Samples*** were taken in two productive periods,
(in the first and sixth lactating month)
- The same sampling were used each time

Milk samples

- Milk from all four quarters was taken before morning milking and whole milk samples were taken with milk meter for somatic cell count
- When quarter milk samples were taken the teat ends were disinfected
- Milk samples were taken for somatic cell count and were analyzed by the **fluoro-opto electronic method** (Fossomatic; Foss Electric, Hillerod, Denmark)

Material and methods

Sampling

Blood samples were taken after the morning milking from the caudal vein by applying the principles of asepsis and antisepsis

- Tubes with appropriate needle were used for taking blood
- The blood in tubes was left at room temperature for 24 h to separate the serum
- The level of Se in blood serum was determined by mineralizing 1g of sample in 4 ml of 16 M HNO₃ and 2 ml of 9.8 M H₂O₂ within a closed-vessel heating block system
- The solution was further diluted with water and Se was subsequently determined using inductively coupled plasma **mass spectrometry** (Perkin Elmer Elan 6100 ICPMS, Massachusetts, USA)

Material and methods

- The evaluation was performed using
Microsoft Excel 2007 software
- The findings were evaluated using
test of correlation between
Se blood conc. and milk somatic cell count
(at first and sixth lactating month)

Results and discussion

- Table 1. Selenium blood serum concentration at first lactating month

No. Cows	1	2	3	4	5	6	7	8	9	10
Se conc. ($\mu\text{mol/l}$)	0.276	0.350	0.254	0.303	0.394	0.736	0.202	0.514	0.312	0.83
No. Cows	11	12	13	14	15	16	17	18	19	20
Se conc. ($\mu\text{mol/l}$)	0.801	0.612	0.897	0.776	0.679	0.688	0.769	0.815	0.900	0.242
No. Cows	21	22	23	24	25	26	27	28	29	30
Se conc. ($\mu\text{mol/l}$)	0.302	0.514	0.586	0.264	0.347	0.364	0.759	0.495	0.612	0.628

- The mean estimate of Se blood serum conc. = **0.536 $\mu\text{mol/l}$**
- Standard deviation = 0.224789

Results and discussion

- Table 2. Selenium blood serum concentration at sixth lactating month

No. Cows	1	2	3	4	5	6	7	8	9	10
Se conc. ($\mu\text{mol/l}$)	0.296	0.353	0.354	0.400	0.494	0.834	0.222	0.714	0.382	0.783
No. Cows	11	12	13	14	15	16	17	18	19	20
Se conc. ($\mu\text{mol/l}$)	0.842	0.741	0.998	0.896	0.772	0.812	0.869	0.855	0.903	0.242
No. Cows	21	22	23	24	25	26	27	28	29	30
Se conc. ($\mu\text{mol/l}$)	0.307	0.541	0.658	0.284	0.379	0.446	0.799	0.549	0.643	0.662

- The mean estimate of Se blood serum conc. = **0.601 $\mu\text{mol/l}$**
- Standard deviation = 0.236800

Results and discussion

- Table 3. Milk somatic cell count at first lactating month

No. Cows	1	2	3	4	5	6	7	8	9	10
Somatic cell count/ml	570.00 0	510.00 0	530.00 0	490.00 0	480.00 0	390.00 0	540.00 0	410.00 0	520.00 0	320.00 0
No. Cows	11	12	13	14	15	16	17	18	19	20
Somatic cell count/ml	330.00 0	410.00 0	350.00 0	400.00 0	380.00 0	390.00 0	410.00 0	420.00 0	360.00 0	540.00 0
No. Cows	21	22	23	24	25	26	27	28	29	30
Somatic cell count/ml	450.00 0	480.00 0	430.00 0	580.00 0	560.00 0	530.00 0	430.00 0	480.00 0	420.00 0	420.00 0

- Average somatic cell count = **450.000/ml** of milk

Results and discussion

- Table 4. Milk somatic cell count at sixth lactating month

No. Cows	1	2	3	4	5	6	7	8	9	10
Somatic cell count/ml	490.000	420.000	470.000	400.000	390.000	290.000	510.000	330.000	450.000	220.000
No. Cows	11	12	13	14	15	16	17	18	19	20
Somatic cell count/ml	230.000	310.000	170.000	210.000	280.000	330.000	270.000	240.000	160.000	490.000
No. Cows	21	22	23	24	25	26	27	28	29	30
Somatic cell count/ml	460.000	410.000	390.000	490.000	450.000	430.000	280.000	380.000	370.000	330.000

- Average somatic cell count = **355.000/ml** of milk

Results and discussion

- Table 5. Test correlation between selenium blood concentration and milk somatic cell count at first lactating month

Somatic cell count/ml	Selenium conc. ($\mu\text{mol/l}$)	n=30
320.000-380.000	0-0.24	5
390.000-450.000	0.25-0.49	12
460.000-530.000	0.5-0.74	8
540.000-580.000	0.75-1	5
		-0.89935*

*Negative correlation

Results and discussion

- Table 6. Test correlation between selenium blood concentration and milk somatic cell count at sixth lactating month

Somatic cell count/ml	Selenium conc. ($\mu\text{mol/l}$)	n=30
150.000-240.000	0-0.24	6
250.000-340.000	0.25-0.49	8
350.000-440.000	0.5-0.74	8
450.000-540.000	0.75-1	8
		-0.956*

*Negative correlation

Conclusion

- Since there is a negative correlation between blood serum Se conc. and milk somatic cell count
 - > it was noticed that increasing levels of Se in blood serum cause a decline in the number of milk somatic cell count
- Se have an important influence on reducing somatic cell count and low incidence of tissue inflammation

Conclusion

- There is relationship between blood serum conc. of Se and incidence of tissue inflammation of dairy cows mammary gland
- Since there is a lack of available results in literature about not visible changes in udder tissue
 - > it could be concluded that blood Se conc. has effect on the inflammatory respond of the cows udder



Thank you!