

# The effect of *Echinacea purpurea* on the immunological function of the mammary gland of cows during the perinatal period

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## ABSTRACT

The experiment was conducted on two groups of Black-and-White cows (10 animals per group) during the perinatal period. Cows in the experimental group received a ration with 300 g/d/animal of whole-plant *Echinacea purpurea* meal for 3 weeks from the 10<sup>th</sup> day before the expected calving. Whole *Echinacea* meal contained 1.26% of a biologically active substance - caffeic acid. Milk samples were collected three times a day to determine somatic cell count, and colostrum for determination of the lactoimmunoglobulin ( $\alpha$ ,  $\beta$ ) level. Blood samples from calves and cows were collected to determine the immunoglobulin ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) content.

Statistically significant differences ( $P \leq 0.01$ ) were found only in the content of  $\gamma$ -immunoglobulins in cows from the experimental group after three weeks of *Echinacea* administration. Differences in somatic cell count between the groups in successive samplings of milk were not significant ( $P > 0.05$ ).

**KEY WORDS:** *Echinacea purpurea*, cows, perinatal period, SCC, immunoglobulins

## INTRODUCTION

*Echinacea purpurea* is used in human medicine for treatment of infections and inflammatory states of different origin and, in recent years, it has also been used

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as an immuno-stimulating agent. This plant contains biologically active factors such as polyphenols (especially caffeic acid and its derivatives), polysaccharides and alkaloids. The mentioned compounds stimulate, each of them separately as well as synergistically, reactions within the immunological system (Wustenberg et al., 1999), revealing immuno-stimulating and antiphlogistic activity (Facino et al., 1995; Bauer, 1996).

The aim of the experiment was to check if supplementing the diet for cows with *Echinacea* as a natural phyto-immunostimulator, had an antiphlogistic effect, increased the immunity of cows and new-born calves, and decreased the frequency mammary gland inflammation.

## MATERIAL AND METHODS

The studies were conducted on 20 Black-and-White cows with an average 75% HF share that were in the perinatal period ( $\pm 3$  weeks before calving). The cows were divided into two groups of 10 animals each, according to analogues concerning calving, somatic cell count, lactation and milk yield. The cows of both groups were fed a grass silage, maize silage and concentrate diet, but the experimental group additionally received 300 g of dry whole-plant *Echinacea* meal containing 1.26% active substance - caffeic acid, determined spectro-photometrically. The amount of *Echinacea* meal was based on the content of active substances so as its quantity corresponded to the mean dose used in human medicine to boost immunity. Dry *Echinacea* meal was given for 3 weeks, beginning from the 10<sup>th</sup> day before the expected calving. Samples of colostrum and three samples of milk were collected from each cow: one week (I), 3 weeks (II) and 6 weeks after calving (III). At the same time, blood samples were taken from cows and their calves after colostrum feeding on the 5<sup>th</sup>-7<sup>th</sup> day after birth. The level of immunoglobulins ( $\alpha$ ,  $\beta$ ,  $\gamma$ ) in blood and lactoimmunoglobulins ( $\alpha$ ,  $\beta$ ) in colostrum were determined according to Angielski (1980). The somatic cell count in milk was determined using a Fossomatic device.

The results were subjected to statistical analysis, using the Statgraphics 6.0 program (2001) for single-factor variance analysis.

## RESULTS AND DISCUSSION

In the serum of cows, statistically significant differences were found only in the level of immunoglobulins in the samples collected 3 weeks after calving (II). The cows from the experimental group were characterized by a significantly higher immunoglobulin content. No statistically significant differences in

immunoglobulin contents were found in the serum of calves from the groups in respect to immunoglobulin content. In the colostrum, differences concerning lactoimmunoglobulin ( $\alpha$ ,  $\beta$ ) levels were also not observed (Table 1).

TABLE 1

Immunoglobulins content in calf and cow serum and in colostrum, g/L

Immuno- globulins	Blood sampling						Serum of calves		Colostrum (lactoimmuno- globulins)	
	I		II		III		E	C	E	C
	E	C	E	C	E	C				
$\alpha$	8.6	8.0	9.9	9.1	9.1	8.4	1.0	0.8	11.6	11.1
$\beta$	9.9	7.5	8.8	7.7	8.2	7.9	1.7	1.4	8.3	7.5
$\gamma$	17.9	16.9	23.7 <sup>A</sup>	18.6 <sup>B</sup>	17.6	17.5	7.9	7.8	-	-

<sup>AB</sup> means with different letter are significantly different at  $P \leq 0.01$

E - experimental group, C - control group

In the experiment of Reninger et al. (2000), preparations of *Echinacea* revealed antiphlogistic activity but they were not active as immuno-stimulators. Sokolnicka et al. (2001) reported that the degree of immuno-stimulating activity depended on the type of preparation, dose rate, and period of application. In case of cows, a dose has not been established and therefore, unequivocal results in the conducted experiment are lacking.

In respect to the somatic cell count in cow milk, statistically confirmed differences between both groups were not found (Table 2).

TABLE 2

Somatic cell count in milk

Groups	Months after calving					
	I		II		III	
	X	SD	X	SD	X	SD
Experimental	142000	236361	173385	244945	268538	306010
Control	270182	253646	299000	260494	194455	188486

An antiphlogistic effect of *Echinacea* was found by Reklewska et al. (2004) who reported a significantly lower somatic cell count in goat milk after the addition of *Echinacea* to the diet.

## CONCLUSIONS

After 3-week administration of *Echinacea* meal, a higher level of immunoglobulins in serum of cows was found one month after the start of administration. This may indicate that the biologically active substances present

in *Echinacea* stimulate humoral immunity. Further studies on the optimal level of the active substances for immuno-stimulation in cows during the perinatal period are needed.

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#### STRESZCZENIE

##### **Wpływ dodatku suszu z jeżówki purpurowej (*Echinacea purpurea*) na funkcję odpornościową gruczołu mlekowego u krów w okresie okołoporodowym**

Badania prowadzono na dwóch grupach krów rasy ncb (po 10 sztuk w grupie) w okresie okołoporodowym. Krowy w grupie doświadczalnej otrzymywały 300 g/dzień suszu z *Echinacea purpurea* przez 3 tygodnie, zaczynając od 10 dnia przed planowanym wycieleniem. Zawartość substancji czynnych (pochodnych kwasu kawowego) w suszu wynosiła 1,26%. W surowicy krów i cieląt oznaczano poziom immunoglobulin ( $\alpha$ ,  $\beta$ ,  $\gamma$ ), w siałce lactoimmunoglobulin ( $\alpha$ ,  $\beta$ ), a w mleku zawartość komórek somatycznych.

Statystycznie istotne różnice ( $P \leq 0,01$ ) stwierdzono jedynie w przypadku zawartości  $\gamma$ -immunoglobulin: było ich więcej u krów z grupy doświadczalnej po trzytygodniowym podawaniu suszu z jeżówki. Nie stwierdzono istotnych statystycznie różnic w zawartości komórek somatycznych między grupami w trzech kolejnych pobraniach prób mleka.