Effect of vitamin E and selenium and different types of milk on health and growth of organic goat kids

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Abstract

Newborn goat kids are low in blood levels of vitamin E and selenium. Not known is how this affects health and growth of the kids. In a study on an organic farm 40 kids were allotted to 4 groups. Parenteral administration of 0.5 ml vitamin E and selenium solution (treated groups) or 0.5 ml salt solution (placebo) at the day of birth was combined with powdered full goat milk or goat milk replacer during the raising period.

The milk-groups were housed in one group. Housing conditions and additional feed were the same for all groups. Blood samples were taken at days 0, 31 and 102. Kids were weighed at blood sampling days and at day 14. Health and medical treatments were recorded by the farmer.

In goat milk selenium content was 116 µg/kg and vitamin E was 1.5 mg/kg while milk replacer contained 682 µg/kg and 102.7 mg/kg resp. Health did not differ between groups and number of treatments were low. No kids were lost till day 31 indicating a good farm management. Blood GSH-Px and vitamin E values in treated groups and in milk replacer groups were significantly higher than in placebo groups and goat milk groups at day 31 but not at day 102. The average daily gain in the first 14 days, the first 31 days and over the whole period of 102 days was 181, 181 and 165 grams. Treated groups gained on averages 10 grams more a day than the placebo groups, milk groups did not differ in daily weight gain. Although blood levels are different between treated and between milk groups, no relevant differences in health and weight occurred under well managed farm conditions.

Key words: organic goat kid, vitamin E, selenium, blood values, weight gain

Introduction

In newborn goat kids selenium and especially vitamin E can be very low, although Ghany-Hefnawy et al (2007) state that goat keep the selenium status in kids at a high level. Smolders et al, 2010 found low blood levels of vitamin E in kids although the level in pregnant goat were at an acceptable level. This could negatively affect resistance in kids and cause health problems and high mortality rates. Administering selenium and vitamin E could have a positive effect on animal health and on mortality of newborn goat kids. Shi et al (2010) found no difference in the form of selenium supplied. On the other hand supplementing selenium and vitamin E could result in zinc deficiency (Kojouri&Shirazi, 2007). In the Netherlands temporarily overproduction of goat milk occurs. To keep the milk price at a acceptable level, the surplus milk from a cooperation of goat farmers is taken from the market and powdered. It is used to feed goat kids in automatic feeder systems to avoid contact with the mother because of high risk of infection with Johne´s disease. Not known is whether minerals and or vitamins should be added to promote daily gain and health of goat kids.

Material and methodology

On an organic goat farm with 800 dairy goats in the lambing period October – November 2010 40 newborn goat kids were allotted to 4 groups within two day. The design of the experiment is shown in table 1.

Table 1. Design of the experiment with 10 kids per group

Milk	Goat milk (full, powdered)		Milk replacer	
Treatment	0.5 cc Vitesel	0.5 cc placebo	0.5 cc Vitesel	0.5 cc placebo

Within an hour after birth the kids were collected from the barn with the pregnant and lambing mothers. The first 20 kids were placed in a group supplied with powdered full goat milk and the second lot of 20 kids was placed in the group supplied with milkreplacer[8], in the same barn and the same housing system with long straw as bedding material. In both groups 10 kids were treated with Vitesel[9] and 10 kids were treated with salt solution as a placebo. The kids were separated from the mother before they could get colostrum. The kids were weighed, eartaged, injected with either 0.5 ml of Vitesel or 0.5 ml salt solution and supplied with the first colostrum replacer from a bottle with teat within two hours after birth. Weighing was done at a person scale with the caretaker and the kid. The first two days colostrum replacer was fed by automatic feeders and also the powdered milk and milk replacer were supplied by automatic feeders till weaning at 12 kg live weight (about 6 weeks of age). Hay and concentrates were available from 5 weeks after birth. Blood samples were taken before administering the vitamin E + selenium solution at about 2 hours after birth (=day 0), at day 31 and at day 102. Blood samples were stored at 4 degrees Celsius and transported to the laboratory the next day for analysing GSH-Px and vitamin E. The kids were weighed at days 0, 14, 31 and 102. Powdered full goat milk and milk replacer were analyzed for minerals and trace elements. Diseases were recorded by the farmer and treatments were given in accordance with the practicing veterinarian.

Results

Full powdered goat milk contained less selenium (116 vs. 668 µg/kg) than milk replacer and also vitamin E was lower in goat milk (1.5 vs. 102.7 mg/kg respectively). In table 2 the mean and standard deviation of the GSH-Px blood values of the goat kids at day 0, day 31 and day 102 are given per treatment and milk group. At day 31 the treated kids have significantly higher GSH-Px values than the placebo kids and the kids fed with milk replacer have higher values than the kids fed with powdered full goat milk. At day 102 the differences between groups decreased but all groups had high GSH-Px blood levels.

In table 3 the mean and standard deviation of the vitamin E blood values at day 0, day 31 and day 102 are given per treatment and milk group. At day 31 the powdered goat milk group kids have a significant lower vitamin E blood level than the other groups while the vitamin E blood level in the milk replacer group is significantly higher than the other groups. The high standard deviation in the Vitesel and placebo group at day 31 indicates large differences between kids within the groups, caused by differences in goat milk and milk replacer. At day 102 differences fades away and groups have the same vitamin E level.

[8]. Zelmo Yellow Organic, Twillmij BV, Stroe, the Netherlands

[9] Vitesel (Vitamin E + Selenium), Norbrook Laboratories Ltd, Northern Ireland

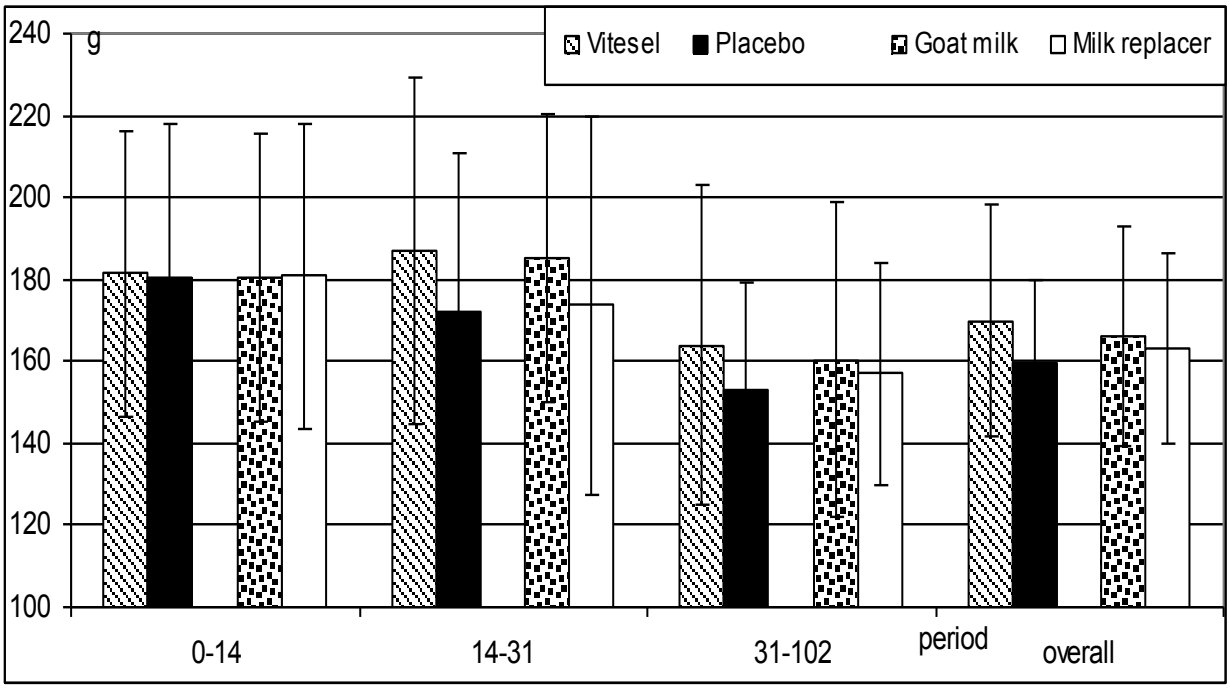
Table 2. Mean ± stdev of GSH-Px-values in blood of organic goat kids treated with Vitesel or placebo and fed with powdered full goat milk or milk replacer

Group	Treatment		Milk	
	Vitesel	Placebo	Goat milk	Milk replacer
Day 0	384±71	435±110	427±121	392±56
Day 31	840±155	697±172	660±170	877±104
Day 102	887±266	844±255	933±125	797±333

Table 3. Mean ± stdev of vitamin E-values in blood of organic goat kids treated with Vitesel or placebo and fed with powdered full goat milk or milk replacer

Group	Treatment		Milk	
	Vitesel	Placebo	Goat milk	Milk replacer
Day 0	0.18±0.10	0.31±0.30	0.38±0.27	0.11±0.02
Day 31	6.41±5.89	5.36±5.47	0.67±0.60	11.10±2.75
Day 102	2.34±0.83	2.46±0.76	2.22±0.80	2.58±0.69

Figure 1. Mean and stdev of daily gain (in g) of organic goat kids per period in treatment and milk groups



The daily gain of the kids in different periods is given in figure 1. There are no significant differences in daily gain between groups, nor within treatment groups nor within milk groups.

The health status of the kids was good. In the treated group two kids had meningitis and one kid was lame. In the placebo group one kid was lame, one had diarrhoea and one kid died for unknown reason. In the goat milk group one kid had meningitis, one was treated for diarrhoea and one was lame while in the milk replacer group one kid had meningitis, one was lame and one kid died for unknown reason.

Discussion

The GSH-Px- values are at a high level from day 31 on. In goat the reference values are adapted from cattle and should preferably be between 120 and 600 U/g Hb (Dercksen et al, 2007). It seems that not only older goats but also goat kids use selenium in feed very efficient: at day 31 the mean values in all groups exceeds the upper reference value. The vitamin E values at day 31 are at a very low level in the goat milk group, due to a lack of vitamin E in the diet and despite the treatment with Vitesel. The kids in the milk replacer group showed extreme high vitamin E blood values at day 31. After weaning and with a diet of roughage and concentrates the vitamin E values equalizes over groups at a low level, compared to reference values (Smolders et al, 2010). Seeing the development of the daily gain of the kids in the different periods and overall, these different vitamin E values do not have an effect on development of the kids. All groups realize an acceptable weight gain. Circumstances and management on the farm were the experiment was executed was excellent, with much focus on offering good quality roughage and concentrates during and after the weaning period. In those conditions injection of selenium and vitamin E seems not effective. Even with the lower mineral and vitamin content of powdered full goat milk, compared to the content in milk replacer, daily gain and health of the kids were not negatively affected.

Suggestions to tackle the future challenges of organic animal husbandry

In organic goat husbandry prevention of diseases should be the main focus, preferably in natural surroundings. That also includes feeding according to requirements with a diverse diet offering goat kids at a young age good quality roughage and high quality concentrates supports sufficient intake of minerals, trace elements and vitamins and promotes resistance and a better chance to self cure and no need for using antibiotics.

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