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Effects of Lyophilized Colostrum and Different Colostrum Feeding Regimens on Passive Transfer of Immunoglobulin G in Majorera Goat Kids

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ABSTRACT

Three experiments were conducted including 180 Majorera kids. In the first experiment, the effect of use of lyophilized colostrum vs. frozen colostrum on immunoglobulin G (IgG) blood serum concentration was evaluated. Kids (n = 40) received the same management and IgG mass [3368 mg/kg of body weight (BW)] during the colostrum feeding period. The IgG in blood serum of kids from the lyophilized colostrum group was greater than that for kids that received frozen colostrum. The second experiment evaluated the effect of total IgG ingested by kids (n = 60) on IgG in blood serum during the colostrum feeding period. Three groups of animals received 3368, 1684, and 842 mg of IgG/kg of BW in 4 feedings for 2 d [high IgG concentration (H-IgG), medium IgG concentration (M-IgG), and low-IgG concentration (L-IgG), respectively]. The IgG blood serum in the kids that received H-IgG was greater than in the other 2 treatment groups, and no statistical differences were found for IgG in blood serum of kids that received either M-IgG or L-IgG. The third experiment evaluated the effect of timing of lyophilized colostrum meals on IgG blood serum concentration. Four groups of kids (n = 80) were used. Two groups received 1684 mg of IgG/kg of BW (higher level-1 d and higher level-2 d) and the other 2 groups received 842 mg of IgG/kg of BW (lower level-1 d and lower level-2 d). Two groups received 2 feedings in 1 d, and the other 2 groups received 4 feedings over a 2-d period, as denoted. Higher level-1 d kids had greater IgG blood serum concentration than the higher level-2 d kids, and no statistical differences were found between lower level-1 d and lower level-2 d kids.
(**Key words:** goat kid, colostrum, lyophilized, immunoglobulin G)

Abbreviation key: CAEV = caprine arthritis encephalitis, **H-IgG** = high concentration (3368 mg/kg of BW) of IgG, **HL-1d** = high concentration of IgG in lyophilized paste in 1 d, **HL-2d** = high concentration of IgG in lyophilized paste in 2 d, **L-IgG** = low concentration of IgG (842 mg/kg of BW), **LL-1d** = low concentration of IgG in lyophilized paste in 1 d, **LL-2d** = low concentration of IgG in lyophilized paste in 2 d, **M-IgG** = medium concentration of IgG (1684 mg/kg of BW).

INTRODUCTION

To minimize or even annul the mother-kid link, which is established in the first hours after birth (Ramírez et al., 1996) in artificial rearing management, the kids must be removed after parturition. This practice facilitates the acceptance of being bottle-fed, thus improving the adoption of artificial rearing. The latter system is of particular interest in areas where diseases such as caprine arthritis encephalitis (**CAEV**) are present, as colostrum is one of the direct means of transmission (Guerrault, 1990). To control CAEV, the colostrum has to be pasteurized. This procedure, however, reduces the colostrum IgG concentration (Argüello et al., 2003); therefore, it can be argued that lyophilized colostrum could be more effective, as it maintains a higher IgG concentration. In ruminants, the placenta impedes the transfer of Ig from the dam to the fetus; consequently, the consumption of colostrum by the progeny of these species holds a fundamental role in the acquisition of immunity. Some studies have found lyophilized colostrum to be stable, easy to handle, and suitable for the passive immunization of calves (Klobasa et al., 1998; Husu et al., 1993). Dos Santos et al. (1994) found no relationship between colostral IgG concentration and serum IgG concentration in 1-d-old kids. Chen et al. (1999) observed significant differences in serum IgG concentrations between kids fed colostrum with high or low protein concentration (20 and 10 g/dL). In calves, the IgG colostrum concentration is more important than the quantity of colostrum fed if the total IgG colostrum fed was the same. Stott and Fellah (1983) observed that IgG serum was higher in calves fed 1 L of colostrum with 60 mg/mL of IgG than in those fed 2 L of colostrum with 30 mg/mL of IgG. The relationship between the IgG fed and

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IgG in the calf's blood was linear according to Stott and Fellah (1983). In kids of the Majorera breed, the quantity of IgG consumed presented a high positive correlation with IgG blood concentrations, particularly in the first 72 h of the animal's life, but this correlation diminished significantly at 84 h (Argüello et al., 2004b).

No literature has been found related to the use of lyophilized goat colostrum in kids. The present experiments will be the first to approach the use of this technology in goat kids and will try to explain how the principal effects (IgG colostrum concentration, timing of lyophilized colostrum meals, and amount of IgG fed) will affect the IgG serum blood concentration in kids.

The objectives of this experiment were to determine the effect of lyophilized colostrum fed, the effect of total IgG fed to the kids, and the effect of the timing of lyophilized colostrum meals on IgG blood serum during the colostrum feeding period.

MATERIALS AND METHODS

Three different experiments were designed. A colostrum pool was made from fresh goat colostrum (16.84 mg of IgG/mL of colostrum), 4 L of which were frozen (–20°C) and 30 L were lyophilized, producing a colostrum powder with an IgG concentration of 61.041 mg of IgG/g. This pool was used to feed the kids in the 3 experiments. Lyophilized colostrum pastes were prepared by mixing lyophilized colostrum powder plus sterilized hot water (40°C) in accordance with the method used by Argüello et al. (2003). Majorera kids were used for these experiments. The Majorera breed is a dairy goat with an average milk production of 546 L/210 d. The Majorera goat kids have an average birth weight of 3.50 kg for males and 3.15 kg for females (Capote et al., 1992). The management of the kids before starting the experiments was the same. Immediately after birth, they were separated from their mothers and dried. Their umbilical cords were disinfected, and they were weighed, identified, and randomly distributed into groups with the same number of males and females. Frozen colostrum or lyophilized colostrum paste was administered by bottle-feeding at 2, 14, 26, and 38 h postpartum depending on the experiment.

In the first experiment, the effect of feeding lyophilized colostrum vs. frozen colostrum on the IgG kid serum was evaluated. The 40 Majorera kids (20 males and 20 females) were randomly assigned to 2 groups. The frozen colostrum group and the lyophilized group were fed with their respective form of colostrum 2×/d for 2 d. Each feeding in both groups contained 842 mg of IgG/kg of BW according to the management system proposed by Argüello et al. (2004c). The total IgG received by both groups was 3368 mg of IgG/kg of BW. Each kid from the frozen colostrum group received 50 mL of thawed colostrum/kg of BW per feeding. The frozen colostrum was thawed at room temperature and after that was warmed to 40°C (internal temperature) in microwave ovens (rotary microwave) in accordance with the system used by Argüello et al. (2003). The IgG concentration of the lyophilized colostrum paste was 22.88 mg of IgG/g. Each kid in the lyophilized colostrum group received 36.80 g of lyophilized colostrum paste/kg of BW per feeding (Table 1).

In the second experiment, the effect of the total IgG received/kg of BW on IgG kid serum was evaluated. Sixty Majorera kids (30 males and 30 females) were randomly assigned to 3 groups. All groups were fed with lyophilized colostrum paste 2×/d for 2 d. The first group (high IgG concentration; **H-IgG**) was fed using a lyophilized colostrum paste with an IgG concentration of 22.88 mg of IgG/g; each kid received 36.80 g of lyophilized colostrum paste/kg of BW per feeding, representing 842 mg of IgG per feeding per kg of BW. The total IgG received by the H-IgG kids was 3368 mg/kg of BW. The medium IgG concentration group (**M-IgG**) was fed using lyophilized colostrum paste with an IgG concentration of 11.44 mg of IgG/g, and each kid from this group received 36.80 g of lyophilized colostrum paste/kg of BW per feeding, representing 421 mg of IgG per feeding/kg of BW. The total IgG received by the kids in the M-IgG group was 1684 mg/kg of BW. The final group (low concentration of IgG; **L-IgG**) was fed twice using lyophilized colostrum paste with an IgG concentration of 5.72 mg of IgG/g. Each kid in this group received 36.80 g of lyophilized colostrum paste/kg of BW per feeding, representing 210.5 mg of IgG per feeding/kg of BW. The total IgG received by kids in the L-IgG concentration group was 842 mg/kg of BW.

In the third experiment, the effect of the timing of lyophilized colostrum meals per day on IgG kid serum was evaluated at 2 IgG concentrations/kg of BW. Eighty Majorera kids (40 males and 40 females) were randomly assigned into 4 groups. The first group received lyophilized colostrum paste 2×/d during 1 d; this group was assigned as **HL-1d** (high concentration, 1 d). The IgG concentration of the lyophilized colostrum paste was 22.88 mg of IgG/g. Each HL-1d kid received 36.80 g of lyophilized colostrum paste/kg of BW per feeding, representing 842 mg of IgG per feeding/kg of BW. The total IgG received by HL-1d kids was 1684 mg/kg of BW. The second high IgG concentration group received lyophilized colostrum paste 2×/d during 2 d; this group was assigned as **HL-2d** (high IgG concentration, 2 d). The IgG concentration of the lyophilized colostrum paste was 11.44 mg of IgG/g. Each HL-2d kid received 36.80 g of lyophilized colostrum paste/kg of BW per feeding, representing 421 mg of IgG per feedin/kg of BW. The total