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Introducing young dairy goats into the adult herd after parturition reduces social stress

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ABSTRACT

The aim of this experiment was to compare social stress, as measured by social behavior and adrenocortical activity, in young dairy goats during the first week after introduction into a herd of adult goats either during the dry period of the herd (i.e., all goats in the herd being pregnant or dry: PD) or shortly after parturition (i.e., all animals lactating or with their kids: LK). Thirty-two young goats that had had no contact with adult goats from the age of 7 wk were introduced into adult goat groups. Adult goats were kept in 2 groups of 36 animals each. Young goats were introduced (in groups of 4 animals each) into each of these 2 groups either during the PD period (2 repetitions) or during LK (2 repetitions); goats with different rearing experience were balanced over introduction periods. Young goats were more often receivers of agonistic social interactions when introduced during PD than during LK. Irrespective of the period of introduction, young goats had other young goats as neighbors more frequently than expected by chance alone, although this was even more distinct during PD. Cortisol metabolite levels increased markedly from baseline during PD, but not after parturition. Rearing showed an effect only on the nearest neighbors, with mother-reared young goats staying closer together. Our results indicate that young goats experience less social stress when being introduced into a herd of adult dairy goats shortly after parturition and with kids still present rather than during the dry period. Whether this effect is due to the period and lactational stage itself or to the presence of kids needs to be tested in future studies.

Key words: dairy goat, regrouping, social behavior, cortisol

INTRODUCTION

Wild or feral goats live in relatively stable herds based on female family groups (for review see Sambraus, 1978; O'Brien, 1988). That is, female offspring stay in the group of origin with their mother and siblings, whereas male goats leave their group. In dairy goats, however, young animals are generally reared separately from adult animals and introduced into the adult herd after several months of separation, usually when pregnant or after the first parturition. The social structure of goat herds (as in other social animal species) is characterized by an established (strict) dominance hierarchy (Keil and Sambraus, 1996; Barroso et al., 2000; Coté and Festa-Bianchet, 2001). Changes in group composition, either by mixing unfamiliar animals or by introducing a few unfamiliar animals into an already established larger herd, require the establishment of new dominance relationships. Consequently, increased levels of agonistic behavior are observed after mixing (e.g., cattle: Bøe and Færevik, 2003; goats: Alley and Fordham, 1994; Andersen et al., 2008), leading to an increased risk of injury, as demonstrated in dairy cows (Menke et al., 1999, 2000) and goats [E. Nordmann (Institute of Animal Husbandry and Welfare, University of Veterinary Medicine, Vienna, Austria), N. M. Keil (Agroscope Reckenholz-Tänikon ART, Ettenhausen, Switzerland), S. M. Waiblinger, unpublished data]. Physiological stress reactions (increase in cortisol: goats: Patt et al., 2012, cattle: Hasegawa et al., 1997) and a reduction in milk yield (cattle: Hasegawa et al., 1997; von Keyserlingk et al., 2008; goats: Fernández et al., 2007) also indicate the social stress experienced by animals during mixing, independent of species.

However, the level of stress experienced during integration may depend on different environmental and animal-related factors. For example, differences in the likelihood of becoming targets of aggression and in behavioral signs of stress are reported for the integration of single heifers compared with a group or pairs of heifers (Menke et al., 2000; O'Connell et al., 2008;

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Neisen et al., 2009). Regarding animal-related factors, the early social environment and previous social experiences may influence the way animals deal with situations of regrouping and encounters with unfamiliar animals (Le Neindre, 1991; Sachser et al., 1998; Wagner et al., 2012). Different reproduction stages (pregnancy, lactation) may also affect responses to challenging situations (Vierin and Bouissou, 2001). Hormones are known to be a major mechanism ensuring coordination between individuals (Adkins-Regan, 2005), influencing social behavior, among other factors (Hurnik et al., 1975). Some dairy goat farmers, as well as dairy cattle farmers, report fewer fights when animals are grouped shortly after parturition. Similarly, Schwarz and Sambraus (1997) found that in a dairy goat herd, social agonistic interactions were more frequent when one group of young goats was introduced into the herd during pregnancy rather than after parturition.

Therefore, the aim of this experiment was to compare social stress (as indicated by social behavior, injuries, and adrenocortical activity) in young dairy goats in the first week after introduction into a herd of adult goats either during the dry period of the herd (i.e., both young goats and adult goats in the herd were pregnant) or after parturition (i.e., all animals were lactating and with their kids). We hypothesized that introducing young goats after parturition and when kids are present would result in lower levels of social stress in young goats, indicated by less agonistic behavior, smaller increase in fecal cortisol metabolites (reflecting basal adrenocortical activity), and greater dispersion of young goats into the herd (i.e., not staying close together). Analyzing the neighbors of animals is a method of determining whether animals disperse at random or not (Sibbald et al., 2005). As cohesion within groups can vary with the degree of familiarity (Bouissou and Andrieu, 1978; Boissy and Dumont, 2002), we predicted that goats might stay in close proximity after their introduction, but to a lesser degree in the case of lower stress (i.e., after parturition).

MATERIALS AND METHODS

Animals, Housing, and Management

The experiment was performed with dairy goats (German Improved Fawn breed) of the Institute of Organic Farming in Trenthorst, northern Germany, between November 2008 and April 2009.

Adult Goats and Housing. Seventy-five adult dairy goats formed the lactating herd, with average milk yields of 570 kg/animal and year (3.35% fat, 3.01% protein) and an average age of 4.4 ± 1.64 yr (range: 2.7 to 7.7 yr). Three months (September 1, 2008) before the start of the experiment, the goats were separated into 2 groups of 36 animals (3 of the 75 goats were sold before as only 36 feeding places per group were available). Groups were balanced for milk yield, age, and presence of horns (group 1: 2 polled animals; group 2: 1 polled animal; all others horned). The composition of the groups did not change until the end of the experiment. The 2 groups were housed in a deep litter system (group 1: 5.0 m^2 and group 2: 5.4 m^2/adult goat) with a wooden palisade feed barrier with 36 feeding places (40 cm wide) and solid head partitions. Each group had access to a drinking trough, mineral blocks, and a brush. As soon as kidding started, an area with 2 hay racks that was accessible only to the kids was provided. All goats kidded in their groups and were then separated with their kids from the rest of the group by using metal elements. After about 5 d (5 to 7 d), the metal elements were removed and the goats were milked. The number of kids born was 63 in group 1 and 58 in group 2. Five goats lost their offspring in group 1 and 7 in group 2.

Young Goats and Rearing. The 32 young replacement goats were kept in one group before the start of the experiment (age at start: 1.8 yr). The rearing of these young goats differed during the first 45 d of life, with 17 (all horned) having being reared with their mothers and 15 (all horned except 1) reared artificially with automatic milk feeders from d 5 of life. From the age of 46 d, all young goats had no contact with adult goats until the start of the experiment and were kept as one group on pasture until the end of February 2009 or in a separate part of the barn thereafter. A calf shelter was provided on pasture. The animals had access to hay racks offering hay ad libitum and a drinking trough.

Mating and Kidding. Mating of adult goats took place in September and October; the adult goats were dried off at the end of November (1 d before the experiment started), and the kidding period lasted from February to the beginning of March 2009. To ensure constant group size and composition of adult goat groups 1 and 2 during introductions, the mating of young goats started after the mating of adult goats was completed and ended at the beginning of December. The kidding process for young replacement goats was equivalent to that for adult goats and took place between the middle of March and the beginning of April 2009.

Feeding and Milking. Goats were fed fresh hay at 0800 h in the dry period and at 0830 h during lactation; at 1230 and 1700 h, the remaining hay was pushed toward the feeding rack again. About 3 wk before expected birth, concentrate feed was added (2 × 250 g/d and animal). During LK, goats were milked twice daily in a side-by-side milking parlor with 10 milking places and 5 milking units in one row. The milking of both