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Caprine intramammary infection: quality of milk

A Contreras, JC Corrales, D Sierra

Enfermedades Infecciosas, Facultad de Veterinaria, Universidad de Murcia, Campus Universitario de Espinardo, 30071 Murcia, Spain

Summary — This paper reviews the information on clinical and subclinical mastitis in Spanish goats and discusses their relation to the bacteriological and hygienic quality of raw milk. Particular attention is drawn to subclinical infection in the Murciano–Granadina goat (30% of the females studied). Staphylococci and their capacity for slime production are also discussed. We also comment on a study made 2 years ago, on bacterial counts in raw goat's milk, which detected a greater quantity of bacteria than is to be permitted by the EEC on January 1994, and this at a time when industry is setting up a system of milk payment depending on the quality of milk with bacterial counts below the limits set by European standards. Lastly, we provide data on the infrastructure of 2 farming associations with regard to milk quality.

goat's milk / bacteriological quality / mastitis

Résumé — Infection intramammaire de la chèvre. Qualité du lait. *Des informations sur les mammites cliniques et sub-cliniques de la chèvre en Espagne sont présentées ainsi que leur influence sur la qualité bactériologique et hygiénique du lait de chèvre cru. Une attention spéciale est portée aux infections subcliniques des chèvres de race Murciano-Granadina (30% des animaux étudiés). La présence de staphylocoques et leur aptitude à produire des polysaccharides sont également discutées. Un commentaire est également fait sur les résultats d'une étude récente sur la flore bactérienne du lait de chèvre en faisant apparaître des taux supérieurs à ceux qui seront admis dans la CEE en janvier 1994, et ce au moment où l'industrie commence à mettre en place le paiement du lait à la qualité pour des taux de bactéries inférieurs aux limites établies par la réglementation européenne. Enfin, des données sont fournies sur l'infrastructure mise en place dans 2 associations fermières, dans le but d'améliorer la qualité du lait.*

lait de chèvre / qualité bactériologique / mammite

INTRODUCTION

Of the various milk-producing breeds of goat that exist in Spain, the 3 most important are the Murciano–Granadina, Malagueña and Canaria. In most cases, farmers form associations to maintain the genetic control of the breeds and increase the milk production of their herds. Female milk production is controlled monthly, and records are kept in the genealogical book of each breed. We present data on these associations in Murcia and Granada (Murciano–Granadina breed) (table I).

INTRAMAMMARY INFECTION – MILK QUALITY

The geographical distribution of the Murciano–Granadina goat covers the southeast of Spain. In the Murcia region alone there is a census of > 100 000 animals. Due to its high milk production and ability to adapt to different areas, this breed is becoming increasingly important for export to other European and Mediterranean countries (Contreras *et al,* 1992 ; Corrales, 1992).

We studied the prevalence of nonclinical intramammary infections in 369 glands taken from 10 commercial herds used for milk production. Infection was detected in 30% of the animals and 18% of the mammary glands. Of the infected samples, 18% had between 400 and 800 CFU/ml, 40% between 900 and 1 900 CFU/ml, 23% between 2 000 and 3 900 CFU/ml and only 18% > 4 000 CFU/ml (table II). With regards to aetiology, we stress the high prevalence (71%) of staphylococci. Besides other virulence factors, these pathogens are characterised by their slime production. Slime plays a critical role in the bacteriological quality of raw milk as it helps bacterial colonisation of the epithelial tissue, prevents opsonisation by macrophages, decreases chemotaxis and inhibits antibiotic–bacterial contacts (Ducha and Latre, 1992 ; De la Cruz *et al,* 1993). Other detected pathogens were *Corynebacteria* (12%), *Mycoplasma* (9%), *Pasteurella* (3%), streptococci (1%) and yeast (1%).

We believe that the initial contamination of milk by all such pathogens should be considered seriously, as it means the milk may have increased contaminant levels before being transported to industry. Healthier glands, therefore, are crucial to maintaining raw milk quality standards.

Table I. Information on 2 associations of Murciano–Granadina goat breeders in Spain.
Informations sur 2 associations d'éleveurs de chèvres de race Murciano-Granadina en Espagne.

	Goats	*Herds*	*Milking machine*	*Individual cold-storage tank*
Murcia Assoc	11 000	69	40 (58%)	14 (20%)
Granada Assoc	25 000	90	70 (78%)	30 (33%)

Table II. CFU/ml levels in intramammary infections in Murciano–Granadina goats.
Taux de contamination (UFC/ml) au cours d'infections intramammaires chez des chèvres de race Murciano-Granadina.

Contamination rate	*Sample No*
Without infection	301
400–800 CFU/ml	12
900–1 900 CFU/ml	28
2 000–3 900 CFU/ml	16
> 4 000 CFU/ml	12

Another breed with a high dairy production is the Canaria, natural to the Canary Isles. Several researchers (Ferrer *et al*, personal communication), have studied clinical mastitis in this breed. Of a total of 104 pure cultures, these authors found *S aureus* and coagulase-negative staphylococci (CNS) in 55%. Other detected pathogens were Enterobacteria (20%), micrococci (10%), streptococci (5%), yeast (5%), *Mycoplasma* (3%) and *Bacillus* spp (2%).

We should also point out the negative effects of clinical mastitis on milk quality. It is very difficult to eliminate these infections completely, and the most frequent situation is the change of a clinical to a subclinical infection following antibiotic treatment during lactation (Craven, 1987), not to mention the negative effects of antibiotics in milk on cheese production and, most important of all, on human health.

Apart from the aforementioned studies, there are to our knowledge no recent data on intramammary (clinical or subclinical) caprine infections in field conditions in Spain. However, Rigau *et al* (1991) report intramammary infection in an experimental herd of Murciano–Granadina goats.

INFRASTRUCTURE OF FARMS: RAW MILK QUALITY

Farmers are interested in improving the sanitary level of the glands in their herds, particularly with a view to increasing milk production. The Murcia Association ACRIMUR has signed an agreement with the Veterinary Faculty, by which they aim to increase milk production *via* subclinical mastitis control. Moreover, they are interested in improving conditions of hygiene in order to adapt to the EEC standards that come into force in January 1994 (Decree 92/46 of the EEC Council), which do not allow raw ewe's or goat's milk to be marketed with > 1 000 000 CFU/ml at 30°C. Most farmers have a milking machine (table I), and ≈ one-third have a cold-storage tank. However, when farms are not productive enough to have their own tank, they buy one between 2 or 3. For example, of a total of 90 farms in the Granada Association, 50 have an individual tank and 30 use collective tanks to cold-store the milk until collected. Members of the Murcia Association usually milk once a day (early morning), except 2% that milk twice a day. Collection is between 2 and 4 h after milking, but for those who have a cold-storage tank, collection can be delayed for up to 48 h.

A study on the microbiological quality of raw goat's milk was made by a cheese company (Forlasa) in 1991. The time of highest milk production is between January and July, and the following data correspond to this period. Samples were studied from 3 000 goats from 40 herds, which produced a total of 4 500 l of milk. At the time of the study, only 35% of production was cold-stored on the farm. The results showed average bacteria counts of 4 944 000 CFU/ml for the coldest month

Table III. Mean monthly bacterial counts in 4 500 l of goat's milk during the maximum production period in Granada in 1991 (Román, 1993, unpublished data).
Moyenne mensuelle des dénombrements bactériens dans 4 500 l de lait de chèvre au cours de la période de production maximale à Grenade en 1991 (Roman, 1993, résultats non publiés).

Month	*CFU/ml x 1 000*
January	4 944
February	7 955
March	11 250
April	14 410
May	11 250
June	15 750
July	13 076

and 15 750 000 in the summer (table III). Despite their lack of compliance with EEC regulations, the company's technicians conclude that when farmers are rewarded for the quality of their milk (not yet a general practice), it will improve considerably. In fact, bacterial counts of 100 000 and 50 000 CFU/ml have been reported at the time of milk collection (Román, 1993, unpublished data).

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