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Brisket disease of dairy cattle and risk factors in Mantaro Valley, Peru

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Abstract. The aim of the study was to determine if the brisket disease is a limiting factor of the development of the dairy production and to identify its risk factors on the basis of farmer's perception. The work has been carried out in the provinces of Concepcion, Jauja, Huancayo, Yauli and Chupaca, belonging to the Mantaro Valley in Peru, during the period of drought of 2013. Information was compiled by survey made with 86 producers, and thanks to interviews with several veterinarians, engineers and inseminators of the valley. The impact of the problem and its factors were identified thanks to farmer's perception. Results showed that the incidence of brisket disease is decreasing these last eight years in the Mantaro valley. It concerns today about 4% of the cows. Main risks factors identified are related to cattle management (nutrition, welfare, health), genetic selection (use of insemination, selection criteria) and the environment (hypoxia, cold, solar radiation). The use of artificial insemination seems to be a major risk factor, mainly because farmers are not trained or prepared to use these types of cows. In fact, most farmers reported problems when they started a genetic specialization of the cattle for dairy production. Therefore, more complete information given to farmers and implementation of selection schemes appropriated to mountains rearing conditions would be a good alternative.

Keywords. Brisket disease – Bovines – Dairy cattle – Risk factors – Mantaro valley – Peru.

Mal d'altitude des bovins laitiers et facteurs de risques dans la Vallée du Mantaro, Pérou

Résumé. *L'objectif de cette étude était de déterminer si le mal d'altitude est un facteur limitant du développement de la production laitière et d'identifier les facteurs de risque, à partir de la perception de l'agriculteur. Le travail a été réalisé dans les provinces de Concepción, Jauja, Huancayo, Yauli et Chupaca, appartenant à la vallée du Mantaro, durant la saison sèche en 2013. L'information a été obtenue par des enquêtes réalisées chez 86 producteurs, ainsi qu'au cours d'entretiens avec plusieurs vétérinaires, ingénieurs et inséminateurs de la vallée. L'impact du problème et ses facteurs ont été identifiés à partir de la perception de l'agriculteur. Les résultats ont montré que l'incidence du mal d'altitude est en diminution durant ces huit dernières années dans la vallée de Mantaro. Il touche aujourd'hui environ 4% des vaches. Plusieurs facteurs de risques identifiés sont liés à la conduite du bétail (nutrition, bien-être, santé), la sélection génétique (utilisation de l'insémination, les critères de sélection) et l'environnement (hypoxie, froid, rayonnement solaire). L'utilisation de l'insémination artificielle semble être un facteur de risque majeur, principalement parce que les agriculteurs ne sont pas formés ni préparés à utiliser ce type de vaches. En fait, la plupart des agriculteurs ont signalé des problèmes quand ils ont commencé une amélioration génétique des bovins pour la production laitière. Par conséquent, apporter une information plus complète aux agriculteurs et mettre en œuvre des schémas de sélection appropriés aux conditions d'élevage en montagne semble être une bonne alternative.*

Mots-clés. *Mal d'altitude – Bovins – Vaches laitières – Facteurs de risques – Vallée du Mantaro – Pérou.*

I – Introduction

Brisket disease is a high altitude disease which occurs over 2000 m above sea level when oxygen partial pressure is low. The chronic exposure of one animal to these conditions can unbalance the homeostasis, mainly of the respiratory, cerebral and circulatory system (Ayón y Cueva, 1998). Today, several animal scientists and veterinarians listed this disease, and formulated the hypothesis that incidence may increase in several years. The causes are variable and mostly not revealed by scientific studies. One of the reasons is that genetic specialization, through the widespread use of artificial insemination, will increase this problem. Indeed, improved animals by their high metabolism, which can produce a lot of milk, would suffer more the oxygen shortage (Calderón, 2010).

The environment, with its low oxygen partial pressure, seems to be the main determinant of this disease. Some mammals living at high altitudes are predisposed to develop brisket disease. Susceptibility to this disease is clearly determined by genetic factors, but at present, the genes that determine chronic maladjustment to the altitude are not known (Rhode, 2005). However, there are other risk factors, as the type of management and its various components, such as feed, animal welfare or health management. The relative importance of each of these factors has also been poorly studied.

The environment complicates the development of livestock in the valleys of Colorado and New Mexico, in the Andes or in Ethiopia. In Peru, cattle are reared at different altitudes, even over 3 900 m (Brunschwig, 2001). In Peru, dairy or dual-purpose breeds that predominate are the Brown Swiss, Holstein and Creole. Creole cattle, brought by the Spanish, has adapted to these conditions. The Brown Swiss cows are reared at high altitudes (over 3800m) while the Holstein cows are more difficult to adapt to this environment. Anyway, a lot of farms have developed Holstein in the Peruvian central valley (Aubron, 2006). During the last thirty years, cattle genetics has made great progress, using artificial insemination. Thus, the animals are now more specialized in milk production.

This study aims to assess the current situation in the Mantaro Valley (Junín, Peru), where dairy farming has developed over 3000 m above sea level. We look if brisket disease is a limiting factor for the development of dairy farming in the Mantaro Valley, taking into account the experience of the farmers on this problem.

II – Materials and methods

The investigation has been done in 5 districts of Mantaro valley, in the central Andes of Peru, between 3200 and 3700 m above sea level. We carried out eighty six surveys with farmers in this area. First, general data has been asked about farm management. Then, the survey focused on the brisket disease, asking if farmers faced this problem, how the problem has been evaluated, which were the symptoms of the disease, which were risks factors and how farmers prevented this disease. The survey has been made with multiple choices and opened questions.

Farmers, who had been facing brisket disease during last 8 years in their farm, were asked to detail every situation (animal age when the problem occurred, physiologic status when it appeared, breed, reproduction method, origin of bull semen...). The survey duration took 15 to 30 minutes, depending on the farmer's knowledge of the disease, generally linked with his education level and the technical level of the farm management.

Then, ten surveys have been carried out with the farmers who had the highest technical level, to obtain a more detailed discussion. It enabled to collect the point of view of large size farm farmers, who had a general vision of the situation. This type of survey demanded one hour to one hour and a half. Eventually, 8 specialists of the agricultural sector have been interviewed: 3 veterinarians (independents, or working in dairy industry, or in slaughterhouses), 5 animal production engineers or inseminators.

We used the “snow ball” method to choose the sample of dairy farmers among 4 classes: small producers who had 2 or 3 milking cows, medium producers who had between 4 and 7 milking cows, big producers who had from 8 to 15 milking cows and biggest producers who had more than 16 milking cows.

III – Results and discussion

In our survey, small producers represent 42%, medium 29%, big 20% and biggest 9%. Considering the breeds, 47% of the cows are Brown Swiss, 37% Holstein and 16% are mixed bred or Creole.

The 62% of the farms visited have had at least one case of brisket disease in the past 8 years, with an average of 2.2 animals affected per farm and a maximum of 5 cases. This corresponds to a prevalence of this disease in about 4% of the total number of cows. The two slaughterhouses visited, reported having found cases of brisket disease at a frequency of 10 to 20 animals per year, mostly in Holstein breed but both of them reported that they worked more with Creole or mixed bred animals than with purebred animals.

Regarding the evolution of the brisket disease, 74% of farmers surveyed reported that the problem is decreasing nowadays. In addition, some coincide while reporting that, several years ago the problem was increasing, from the moment on that cattle breeders started to use artificial insemination as well as purchasing animals brought from low altitudes.

In general, farmers who never have had animals with brisket disease did not fear this problem. On the opposite, in the farms where the problem has been developed, 45% of farmers said having feared the disease, mainly because it is a disease that will not heal. The rest of the farmers reported that it was not a big problem, because the number of cases is decreasing due to the implementation of some preventive measures (providing better feeding to the animals; selecting animals according to strength rather than production). In addition, several farmers said they had now adapted cattle (other breed than Holstein).

Considering the farms where brisket disease occurred in the past eight years, the farmers reported that the symptoms of the disease were in the majority (78%) “breast oedema“, which is the most visible clinical sign of the disease. The other symptoms frequently cited are “jugular venous distension” (42%), weak animal (40%), “decreased appetite” (38%) and animal over agitated (36%). The other symptoms that were cited are diarrhoea (10%), difficult breathing (12%), and heart murmur, decreased body condition.

Four farmers reported that the sick animals had fever. This fever seems the first clinical sign, indicating the presence of an infectious disease. Then, if we take into account the classification of Andresen (2011), this would be a “secondary“ brisket disease sign, which is not caused by primary pulmonary hypertension, but by other pathological processes. Also, three farmers mentioned as an early sign of disease the fact that the animal ate earth. Some farmers did the necropsy of sick animals. In all cases, the heart was huge and bifid (with two points) with a hypertrophied right ventricle and presence of water in the body (*acitis*). Frequently, farmers said a veterinarian diagnosed the disease, but that the autopsy of the animal is essential in order to verify the authenticity of this claim. As we saw in the literature review, part of the clinical signs of the disease may be very similar to other diseases.

Cases of true altitude sickness are caused by a mismatch of animals to high altitude conditions. For this reason, breeders identify more cases in the first months of life. More incidences are also observed during times of stress, due to increased metabolic requirements: i.e. last months of pregnancy (14%), at delivery (16%), during lactation (16%) for cows with high productivity be-

cause nutrient and oxygen requirements are important. Breed also appears in this study as an important risk factor, the Holstein breed being the most sensitive (84% of cows affected).

Feeding management, particularly the mineral supplementation, is vital because satisfying nutrient requirements contributes to better animal condition. According to veterinarians interviewed, welfare is also very important, especially because a dry and warm environment at night minimizes the risk of developing pneumonia followed by cases of altitude sickness. Also, giving the cows the opportunity to stay in shaded areas when they are outside, in order to avoid heat stress, could contribute to limit brisket disease.

The problem of brisket disease in the Mantaro Valley is decreasing recently, and although several farmers said having feared it, the incidence of the problem is now very low (about 4% of the cows). This cardiovascular disease is mainly caused by hypoxia and cold. But it is clearly observed, that there is an influence with any kind of stress on the development of this disease. It could to be due to the animal itself, to the environment in which it develops or to the herd management. All farmers asked for a wider discussion on this disease, reported that changing at least one of the factors previously presented contributes to having fewer problems.

IV – Conclusions

Training of farmers is a very important aspect in order to lead them to get a better knowledge of the consequences of using artificial insemination with Holstein and the importance of selecting improved breeds for insemination. With more technical knowledge of this technology, the farmer could choose and see if using improved cattle is a good alternative and also what kind of adjustments would be needed to implement on their farms. Also, it appears that the selection criteria of the sperm bank, whose goal is to enable farmers to access to technology at a lower cost, are not adapted to the Andean conditions. Some experts proposed the idea of putting national centres for cattle selection in the three ecosystems of Peru: Andean mountains, Amazonian jungle and pacific cost, to develop selection schemes, tailored to each type of region.

With the time allowed for the study (Bes 2013) and the information obtained, this research represents a preliminary study in the area. It could be used as a basis for further studies, for example to assess precisely one of the few variables, such as the influence of selection on strength criterion. It would for example be interesting to see if the animals which effectively have more chest breadth are more resistant to brisket disease. It would also be interesting to do the same work in high pastoral areas, such as Puno (where many farms are situated above 3500 m).

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