Health Problems, Welfare and Biosecurity Measures at Dairy Farms

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Abstract. Modern technology of cattle breeding is followed by large number of health problems, especially on dairy farms. Many of these farms have tie housing system, where the movement of the cows is limited, i.e. they are kept in inadequate housing conditions.

In combination of these with inadequate diet and feeding regime this contributes to the formation of a complex clinical picture, indicating threatened welfare of these animals. Regarding that, reproductive problems of dairy cattle dominate at the examined farms: abortions after 150 days of gravidity, anoestrus, small ovaries, cysts, ovaries that are inactive for more than 60 days postpartum and endometritis are most often registered.

The most common health problems in calves were diarrhea and respiratory diseases. Puerperal paresis, ketosis and abomasal displacement have been usually noted in cows in puerperium, and indigestion were reported in cows during lactation and puerperium. Hoof diseases (aseptic pododermatitis and panaritium) have occurred in cows in the most of the year. The significant improvement of health, reproduction, and increasing of production was achieved by improving the management and herd health control in examined farms.

Key words: dairy cows, health problems, welfare, biosecurity

INTRODUCTION

Contemporary cattle production has as a target increasing milk production. However, this demand is often followed by inappropriate housing conditions, care and nutrition, which have led to the appearance of so called productive diseases (technopathies). Among them metabolic diseases dominate, such as: ketosis, fatty liver syndrome, a syndrome of infertility, puerperal paresis, rumen acidosis, aseptic pododermatitis, and some other diseases that have been arisen as a consequence of the trace elements and/or vitamins deficiency.

High production in cattle-breeding is based on the successful raising of calves, especially in the youngest category. Growing conditions should enable the fulfillment of their basic needs, such as: optimal air quality, enough space to move and rest and adequate nutrition, and watering (Bloom, 1991). If basic needs are not completely satisfied it brings into the question the level of calves’ welfare. Consequences of disturbed welfare are usually manifested as changes in health status of calves and the occurrence of various diseases and deaths. Losses of calves are caused in the first place by diseases of the digestive and respiratory organs (Bojkovski et al., 2005a, 2007, 2008, 2010, 2011b; Bugarski et al., 2005).

MATERIALS AND METHODS

On our dairy farms, losses are particularly present in the calves’ transition from one to the other category (Bojkovski et al. 2007a, b). Health and welfare risks in the term of calves housing conditions are discussed by Bojkovski and Relić (2010).
In this paper a review of studies that have been directed toward solving some health, welfare and biosecurity problems at Serbian dairy farms is presented.

RESULTS AND DISCUSSIONS

Health problems related to the management, housing conditions and nutrition of calves.

In the first weeks of the life some cardio-respiratory and metabolic disorders in calves can be diagnosed, which arise from the necessity for very rapid adaptation to extrauterine life in conditions of the modern cattle production. The vitality of calves may be affected by the failures of the pregnancy management, especially in the cows’ nutrition in the last third of pregnancy. The increased need for beta-carotene in pregnant animals should be emphasized, considering often occurrence of calf diarrhea in herds where the concentration of beta-carotene in the blood serum of highly pregnant cows was very low (Ivanov et al., 2001).

It is well known that adequate colostrum intake is essential for survival and growth of the newborn calves. Through colostrum they are supplied by nutrients - proteins, amino acids, fatty acids, lactose, vitamins, macro-and microelements, as well as immunoglobulins, hormones, enzymes and other substances (Arthington et al., 2000, Bondi, 1987). Concentration of the main ingredients of cows’ colostrum has been examined by Bojkovski et al. (2003, 2005, 2008a).

During the first weeks of calves’ life insufficient or excessive amounts of colostrum should be avoided. In the first 24 hours of life a calf should receive colostrum in 3-4 times. However, the first volume usually comes 10-12 hours after birth. In such cases severe gastrointestinal disorders may arise. It is also wrong to give colostrum from fresh cows to calves aged 3-4 days. The possibility to use colostrum derived from cows suffering from mastitis, as well as colostrum which contains toxins in the calves feeding should be completely excluded. Diarrhea in calves can be a consequence of the mycotoxins presence in the colostrum (Ožegović, 1995).

Feeding frequency in calves should be regular. Otherwise, in the next feeding time calf takes too much milk and too quickly. Oesophagogastric reflex was not able to fully perform its function and to carry whole amount of milk (3 to 3.5 l) to the abomasum; the part of the milk returns to the rumen, where decay processes begin.

The properties and the type of the diet in the period before weaning can significantly influence the development of digestive organs and the occurrence of pathological processes in them (Mattiello et al., 2002, Quigley et al. 2006). Inadequate hygiene of containers and feeders, and especially detergent or disinfectant remains on their surfaces can damage the digestive tract mucosa and lead to gastro-intestinal disorders. Disorders of the gastrointestinal tract are considered as the major problem in calves rearing. Diarrhea is a syndrome of complex etiology, resulting from the interaction of the environment, nutrition and the mutual action of several different infectious agents. According to the research Bojkovski and Radojičić (2004, 2007) and Bojkovski et al. (2009) the most important causes of gastrointestinal diseases in calves were enteropathogenic strains of E. coli and Cl. perfringens (A, B, C, D). Only dominant E. coli strains that progressively proliferate in the frontal parts of the small bowel have a role in development of the disease. Gastrointestinal diseases caused by clostridia are especially characteristic for calves younger than 3 weeks, which are more susceptible comparing to adult animal.
Viral gastrointestinal diseases (*Rotavirus, Coronavirus, adenovirus, parvovirus, enteroviruses, BVD*) occur when virulent strains suppressed the local intestinal immunity and reduced the intestinal bacterial flora. Viruses are not considered as the primary causes of disease, even when they are isolated from the feces of calves with diarrhea. The presence of enteropathogenic strains of *E. coli* improves viruses’ pathogenicity, while inadequate hygienic conditions and irregular feces elimination favor the pathogens retention in the stall.

Synergistic action of bacteria and viruses is important for the occurrence of respiratory diseases of calves as well, and particularly in over-populated facility with poor microclimate conditions (low temperature and high air humidity, high concentrations of ammonia, presence of draft), and in animals with weakened immunity. Respiratory infections represent a constant problem with seasonal intensifying, especially in farms with poorly implemented zoohygienic measures. Milder respiratory infections were observed with calves that were kept in the open space and semi-open space. The most common causes are viruses (Bugarski *et al.*, 2005), bacteria and mycoplasma (*Mycoplasma bovis*). Pathogenic effects of viruses and mycoplasma allow further pathogenic action of bacteria.

According to Bojkovski *et al.* (2011) isolates from nasal swabs of calves suffering from respiratory infections usually are *Pasteurella multocida, Mannheimia haemolytica* (*Pasteurella haemolytica*), *Arcanobacterium pyogenes, Haemophilus sp.*, and *Klebsiella pneumoniae*.

The occurrence of the infectious bovine keratoconjunctivitis in calves is also common in our farms, especially in the summer period. In the eye swabs taken from the 4 months old calves *Moraxella bovis, P. multocida, Streptococcus spp and Nocardia spp* was isolated (Bojkovski *et al.*, 2008).

Among parasitic diseases in intensive cattle production problem are protozoan infections and ectoparasites. Poor hygienic and microclimate conditions in the buildings, and large stocking density favor the maintenance of adult and developmental forms of parasites in the facility, as well as the spread and occurrence of disease. Protozoan infections are very common in calves, and the most common are *coccidiosis, cryptosporidiosis* and *toxoplasmosis*. Helminths’ infections rarely occur in this age and intensive (stall) systems are almost eliminated.

*Coccidiosis* of cattle is an acute or chronic disease, and in some countries their significance is in the top among the parasitic diseases. It occurs mostly in younger categories, and in older animals if is provoked by conditions that reduce immune system functions (stress, transport, some other gastrointestinal diseases, mycotoxins in food etc.). The most pathogenic *Coccidia* species are *E. bovis* and *E. zurni*, and pathogen effects in the small intestine are also manifest by *E. alabamensis* and *E. auburensis*. The first symptoms appear 2-3 weeks after infection in the form of long-term persistent smelly diarrhea with traces of blood and mucus. There is loss of the appetite, general weakness and rapid weight loss, as well as anemia if the illness lasts longer. Intestinal peristalsis is accelerated with constant tenesmus which can cause rectal prolapse. The disease is usually acute and severe in calves than in older animals.

*Cryptosporidium* is a protozoan zoonosis caused by coccidia *Cryptosporidium parvum*. The disease is characterized by high morbidity and mortality. The parasites are located in the epithelium of the ileal microvilli, jejunal villi epithelium and squamous epithelium of the colon villi. Due to presence of the parasites in a short time destruction of these cells occurs, which results in reducing or completely preventing the physiological functions of intestines or reduced digestion, malabsorption and diarrhea. In infected 1-3 weeks old calves the clinical signs vary from moderate to severe diarrhea, enteritis (yellowish, watery or mucous feces, and rarely with blood in traces), along with anorexia, loss of body
weight, dehydration, depression, weakness and vomiting (Pavlović and Andelić-Buzadžić, 2011).

Toxoplasmosis caused by *Toxoplasma gondii*, parasitic coccidia that for the first host has cats and as the intermediate hosts mammals, reptiles and birds persists (i.e. more than 280 species, including humans). *T. gondii* infection occurs by ingestion of infective (sporulated) oocysts or by tissue with *T. gondii* cysts, as well as by placental/ovarian path. *Toxoplasmosis* in cattle is manifested by abortions. Milk and meat of infected cattle may represent a source of human infection if not treated thermally (Pavlović, 2006; Pavlović and Ivanović, 2005, 2006).

Dominate ectoparasitic infection at farms is mange, caused by *Sarcoptes scabiei var. bovis*, *Psoroptes equi var. bovis* and *Chorioptes bovis var. bovis*. *Sarcoptes* is located on the head skin where it spreads to the neck and chest. The skin becomes very dry and wrinkled, and later sores and scabs arise. There is a constant itch, animals are scratching, skin lesion with secondary infection occurs. *Psoroptes* mange is located at the skin around the base of the tail, on the dorsal side of the neck, in the perineal region, the udder, the scrotum, and at the medial and lateral side of extremities, and the whole body may be affected. The skin thickening, crusts and inflammatory processes may occur and consequently hair loss. *Chorioptes* mites can be found in the base of the tail, where it spread to the perineal region, the udder, the scrotum and distal parts of the hind legs, and then at back and neck of the animal. Rarely the whole body is occupied. The disease has an easy flow and appears during the winter period (Pavlović, 2005; Pavlović and Andelić-Buzadžić, 2011).

**The most common health and reproduction problems in dairy cows**

Health problems of adult cattle were largely conditioned by feeding and rearing, primarily by restrictions in tied systems (Bojkovski *et al.*, 2000, 2001, 2008a). Considering that, in all farms a complex clinical picture with numerous health and reproductive problems is observed. This situation imposes the need to continuously control the cows’ health to prolong their production life at least 5 lactation (Bojkovski *et al.*, 2004, 2007a, 2007b, 2009a; Šamanc *et al.*, 2007b; Djokovic *et al.*, 2007b). The most common disorders are related to the inadequate nutrition (Bojkovski *et al.*, 2008a; Radojičić *et al.*, 2008), and consequently indigestion, disorders of metabolism, abomasal displacement, paresis, enteritis, diarrhea and significant number of reproductive disorders (temporary sterility in the form of a long service period and a large index of insemination) are presented (Bojkovski *et al.*, 2007c, 2007d, 2008, 2009a; Petrujkić *et al.*, 2005, 2007, 2009b). Ovarian dysfunction, subclinical endometritis, ovulation disorders, and abortions mostly during the summer period were noted. Heat stress at temperatures above 27 °C interfere physiological mechanisms of the health control and bioclimatic factors influence on dairy cows certainly leads to fertility decrease (Petrujkić *et al.*, 2009a).

Aseptic pododermatitis is one of the most common health problem in almost all farms during the year which primarily occurs due to introduction of large amounts of easily digestible carbohydrate feeds (rumen acidosis). Pododermatitis development can be contributed by other factors e.g. short and uncomfortable bed. Etiological factors of hooves diseases appearance and its control are discussed by Relić and Damnjanović- Radenković (2009).

Lately, more and more the cows with spastic paresis of the hind legs has been revealed, an genetic disorder with the characteristic position hind legs and uneven load of hoof sole, and consequent appearance of pododermatitis. The use of mineral mixtures with buffer effect (Mix Plus) in the diet of cows in the first 100 days of lactation favorably influence in preventing digestive disorders and food rumen acidosis, and therefore other health problems of which aseptic pododermatitis is at the first place (Šamanc *et al.*, 2005).
Dairy cows are often exposed to stress. In such situations a significant health problems that associated with metabolic disorders occur (Borozan et al., 2007). Metabolic disorders are particularly manifested in high pregnant cows, during puerperium and early lactation. The 5-12% occurrence at our farms is the reason to recommend regular control of the biochemical parameters relevant for assessing the metabolic status of high-producing dairy cows (Djokovic et al., 2007).

In some of our research the influence of ketone bodies on reactive acid and nitrogen forms creatin, and degree of lipids and protein damage in blood plasma samples from cows with different content of ketone bodies were studied. As a result of the ketone bodies effects superoxide anion radicals and hydrogen peroxide production increases, which is reflected in the change of superoxide dismutase and katalase activities. By their influence the occurrence of the oxidative stress can be explained. In the presence of the ketone bodies and depending on their concentration reactive nitrogen forms appear, which is reflected by increasing concentrations of nitrite. Combined oxigen and nitrogen radicals effect increase cell membranes lipid peroxidation and accelerate proteolysis, consequently lactate dehydrogenase content is increased, a hepatocytes damage marker isoenzyme forms of LDH₅ in particular, and therefore the liver loses its functional activity (Borozan et al., 2007).

Furthermore, one of the goals of the research was to determine the functional state of the liver, by determining glucose, cholesterol, total bilirubin, and albumin levels and asparatat-amino transferase (AST) activity in cows in the peripartal period, as well as determining the relationship between blood concentrations of these parameters and histopathological changes in liver of cows in early lactation by tissue biopsies. The mild fatty liver infiltration and cell degeneration in cows suffering from ketosis was found. Hypoglycemia, hypocholesterolemia, hypoalbuminemia in cows with ketosis indicate reduced function of liver cells, while significantly increased sera total bilirubin and AST activity as well as a significant positive correlation between AST and bilirubin levels with fat content in the liver point on the compromised morphological integrity of the liver cell in cows suffering from ketosis (Djoković et al., 2007a).

By monitoring farm of Holstein-Frisian cows with average milk production of over 7000 liters as the most common health problems during the year we identified: sepsis, ketosis, indigestion, enteritis, diarrhea, changes in the position of abomasum, puerperal paresis, arthritis, fractures bone, panaricium, distocia, uterine torsion and death of unknown etiology. Reasons for exclusion were death, slaughter or exclusion required for economic reasons (Šamanc et al., 2005a).

Problems related to welfare and biosecurity in the cattle production.

Considering the numerous health problems listed above, calves and cattle welfare in intensive production is often threatened. In the term of housing conditions an inadequate ventilation, air velocity and air temperature, and exposure to pathogens and parasites represent most common risk for welfare of the animals. For the complete picture of the welfare status nutrition and management should be considered, e.g. calves’ feeding or weaning procedures. Data about housing conditions on the farm, and the analysis of potential welfare risks show a possible reason of appearance the already present health problems of calves, as well as problems which can appear in the future (Relić and Bojkovski, 2010).

Cattle diseases prevention also represents protection of their welfare. Relić et al. (2006) discusses the importance of biosecurity measures at dairy cows farms, in order to prevent an infectious material introduction or its spreading at the farm. Research in aim to assess biosecurity level at dairy cows farms of different production technology and capacity were conducted, considering the position of farms in relation to possible sources of biological risks in wide environment. Results indicate serious failures in all tested farms related to the
possibility of the infectious agents’ introduction in the herd, and its possible spread to the environment. All studied farms are fenced, and the position of most farms is generally favorable. However, the lack of the open space and the green belt, presence of wild birds and rodents in facilities for cows and feed storages, as well as contact of employees with cows that do not belong to the farm represent serious threat to health and production at the farms (Stanković et al., 2011).

CONCLUSION

In long-term studies at dairy farms in Serbia numerous health problems in all cattle categories, especially in the tied system, have been detected. They are directly associated with the state of welfare and biosecurity at the farms. Etiology of diseases is usually multifactorial. Poor hygienic and microclimate conditions have the greatest importance in infectious and parasitic disease outbreak.

Improving of the housing conditions and the health and welfare of animals represents a legal obligation, purpose and task for cattle breeders and experts.

REFERENCES


