Review paper

INFLUENCE OF INTENSIVE ANIMAL BREEDING TO THE APPEARANCE OF INFECTIOUS DISEASES (ZOONOSES)

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Abstract

Intensive animal breeding and production is based on farm breeding of animals which represents a major source of raw material for food production. Preserving health of animals requires a good practice during breeding, appropriate feeding and watering, adequate control of pests and wild animals. Animal breeding and production of food of animal origin requires significant engagement of veterinary services within the frame of epizootiological, epidemiological, veterinary and sanitary surveillance. Farm manner of cattle breeding can represent a danger of air, water and ground contamination. In the farms situated in a small space, overcrowded with animals there are ideal conditions for the appearance and spreading of causative agent of infectious diseases (prions, viruses, rickettsiae, chlamydia, bacteria, parasites and fungi), which can be transmitted also to humans and wild animals. From the aspect of public health, special attention should be given to the farms with large number of animals and farms with intensive breeding conditions. This is especially important in pig and poultry breeding, where moderate or high prevalence of infections such as salmonellosis and campylobacteriosis are often present, regardless of the fact that the level of clinical illness caused by these infections is relatively low. Intensive production in animal husbandry leads to increased animal waste, and the richest source of infectious agents represents animal feces.

Key words: *biohazard, epidemiology, farms, zoonoses*

Introduction

Food animal production methods have undergone substantial changes over the past fifty years. Herd health and production management programs are examples of this development. The main focus of these programs is on-farm economics and especially operational management through the application of veterinary and zoo technical skills and a wider knowledge of the commercial and societal consequences of disease in the food-producing animal (Noordhuizen and Collins, 2002; WTO, 1995). Key elements in such a program include risk assessment and priority setting at the start, followed by farm inspections and clinical examination of animals, data monitoring and herd/flock problem analysis and prevention. The approach has to be adapted depending on the species of animal involved and the intensity of the farming enterprise (Brand et al., 1996).

Primary producers must take all reasonable measures to prevent the entry of pathogenic agents onto his/her holding. They are responsible for the health of their stock and must adopt a positive approach to animal health on the farm with the objective of eliminating or minimizing exposure of food-producing animals to zoonotic agents (Noordhuizen and Collins, 2002). This is an essential component of the longitudinal integrated safety assurance (LISA) schemes now being adopted in many developed countries.

Control of zoonoses on farms

As a starting point, maintenance of the integrity of the herd or flock as a distinct and self-contained entity, if possible, remains a key objective of health control in food animal production. It is essential to ensure the origin of such stock so as to define as far as possible the health status of the herd of origin. Also, it is very important to ensure the traceability of the animals and their production as they move through the food chain. Traceability of all inputs to the farming enterprise, both goods and stock, is important because if a farm manager is unaware of the origin of inputs, he/she cannot be assured that best practices were applied to the production (Noordhuizen and Collins, 2002).

Selective pressure associated with the inappropriate use of antimicrobials can generate multidrug-resistant organisms which can become a public health problem (Abury-Damon et al., 2004). Vaccination can raise herd immunity and reduce the risk of disease and the consequent application of antibiotics. Husbandry practices such as segregating age cohorts, feeding with colostrum’s, isolation of sick animals and adequate disinfection can prevent the spread of disease and contribute to maintaining the health of the herd or flock (CEC, 2000). Appropriate ecto and endo-parasites prevent animals from becoming debilitated and more susceptible to other diseases. Policies for the use of animal remedies should be science-based and all usage should be documented and continuously reviewed (Abury-Damon et al., 2004).

In larger enterprises, system of quality management can be established easy, since there are documented procedures and a regimented approach is adopted. Confirmation of the disease-free status of recently purchased animals is best achieved through pre-purchase testing and segregation before such animals are allowed to join the flock/herd (Noordhuizen and Collins, 2002). This concept of quarantine is best continued throughout the production system, with persons other than farm personnel directly engaged on the farm being allowed only limited access to animals or feed (CEC, 2000).

The enforcement of sanitation rules including the use of disinfectants at key points and the wearing of protective clothing and footwear, together with effective controls on the hygienic quality of feedstuffs and water sources, including rodent and pest control, are standard biosecurity practices which are necessary if the integrity of the production unit wants to be maintained. The practice of an "all in/all out" policy of stock movement together with the early segregation of all clinically ill animals offer a direct means of enforcing disease control and prevention at the herd or flock level (Noordhuizen and Welpelo, 1996).

In farm breeding of animals several hazards can be identified: biological, chemical and physical. Biohazard includes biological agents and/or threatening diseases which can be transferred to humans by food or water. Special problem represent zoonoses which are identified as infectious diseases that can be spread by natural way among people, wild and domestic animals. Today, over 1415 different species of infectious organisms are known, which are pathogenic for humans, including 217 viruses and prions, 538 bacteria and rikettsiae, 307 fungi, 66 protozoa and 287 helmints. Out of the total, 868 or 61% are classified as zoonoses and 175 as pathogenic species which can be connected to the appearance of the disease. From the group of 175 pathogens, 132 species or 75% have a zoonotic potential. There are several factors which can influence the breakout of new zoonotic diseases and also diseases that were under control and reappear again. These factors are: growing number of people in the world, ecological changes, intensive agricultural production, travels, need for more funding, new strains of causative agents, exotic traveling, etc. Actions which are taken for the reduction of risk from zoonoses have to be practical, economically acceptable and flexible.

Many biosecurity measures are general and not specific to particular zoonosis and should be part of good farming practice (Brand et al., 1996; Noordhuizen and Welpelo, 1996). The control of *Campylobacter spp*, but elements of campylobacter control can be applied in principle to the prevention of exposure to other zoonotic agents in a variety of animals, particularly those reared under intensive conditions (Noordhuizen and Schukken, 1996).

Important zoonozes

Tuberculosis in cattle and its importance as a disease in some human populations represents one of the principal reasons for the introduction of direct inspection methods for meat control and the pasteurization of dairy products. As a clinical entity in cattle, this disease has now been almost completely eradicated in most developed countries. Isolated incidences in which there is direct involvement of infected cattle as the source of *Mycobacterium bovis* infection in humans still occur (Hensel and Neubauer, 2002). One of the beneficial effects of national bovine tuberculosis eradication programs has been the effective removal of most infected cattle before they reach the clinical stages of the disease and before the major organs show overt signs of involvement. Animals which show a high responsiveness to bovine tuberculin are the animals most likely to display gross lesions at slaughter. This demonstrates that the tuberculin test is an effective screening test and it may, therefore, provide a basis for the strategic removal of reactors at local or regional level in countries in which financial constraints prevent the implementation of a national eradication program for this disease. Meanwhile, every effort should be made to prevent the entry of such infection into herds of cattle and, in some regions, sheep flocks and herds of goats and deer as well, through the unwitting purchase of infected stock or contact with neighboring infected herds or flocks and wildlife affected with tuberculosis. Segregation of stock of differing ages, effective composting of manure, attention to sanitary issues, including disinfection and a prudent culling program have significant importance in maintaining a tuberculosis-free herd or flock, particularly in regions in which the prevalence of tuberculosis in the animal population is a concern.

*Mycobacterium avium paratuberculosis (*MAP) is the causative agent of paratuberculosis (Johne's disease), a production disease in ruminants, and a hypothesis exists that MAP may be involved in the etiology to Crohn's disease, a chronic inflammatory bowel disease in humans. The hypothesis is not proven, but the general principle that diseased animals should not be used as a source of food for humans should be accepted. However, control to John's disease in dairy herds is difficult and based on two principles, namely, the identification and elimination of infected animals and the prevention of new infections. Essential to this process is a clear understanding of above mentioned principals from the herd owner. These include next measures: determining the prevalence of the disease in the herd; culling clinical and subclinical cases identified by the available diagnostic tests; reducing the contact between newborn calves and their dams, where the status of the dam is unknown; managing the farm and its environment to ensure that stock do not graze on contaminated pasture; strictly assessing the status of bought-in stock based on serological testing.

Verocytotoxogenic *Escherichia coli (*VTEC) is present in the gut and faces of healthy cattle and sheep and these animals therefore act as reservoirs from which humans can become infected. Livestock is a reservoir for most VTEC, with cattle being the principal source of *E. coli* O157:H7 and other VTEC. Studies from the United Kingdom (UK) and the USA have shown that VTEC is, at least occasionally, present on most farms. The organism can survive in soil for several months (Hensel and Neubauer, 2002). The effects of animal husbandry practices on the prevalence of VTEC in animals are to a considerable extent unknown. Moreover, no defined carrier has been identified which can be targeted for an intervention program. Therefore, eradication of VTEC from the farm livestock or farm environment does not seem to be a reasonable goal.

Brucellosis is an infectious disease of man and animals, mainly cattle, caused by the bacteria, *Brucella spp.* Infection is acquired from infected females during or after abortion, from contaminated milk, sexually transmitted or acquired from a contaminated environment. Infected animals harbor the bacterium in their lymph nodes, udder and uterus, and in the case of bulls, in the male genitalia and related lymph nodes. The bacterium survives for upwards of six months in contaminated slurry and can be spread from farm to farm, and can infect people, during spreading.

Above mentioned disease is or has been the subject of an eradication program in many countries. Control programs can use two principal methods, namely, vaccination and the removal for slaughter of infected and exposed animals based on serological testing. These measures are supported by movement controls and quarantine on infected farms (Noordhuizen and Collins, 2002).

If infected the cows are not identified early, and are not removed immediately, they are a source of infection for other animals and people, either through direct or indirect exposure. Furthermore, farmers and their families, and farm workers, can be exposed to infection by drinking raw milk. Pasteurization makes dairy products safe, but does not deal with the issue of the direct or indirect contact routes of transmission to humans.

Conclusion

Zoonotic hazards that are associated with food animal production and food processing may arise on the farm, in the food plant and in the distribution chain. Awareness on the part of food animal producers and the members of the food industry that such hazards may exist in foods is the first step towards their control. Good hygiene practice throughout processing and, finally, cooking, provides further safeguards for the consumer. The measures currently applied to prevent or control the transmission of zoonotic agents via the food chain in the post-harvest phases are unlikely to be successful in isolation. Effective control relies upon the implementation of a consistently high level of production hygiene at all stages of production both on the farm and in the processing plant, and throughout the remainder of the food chain. In respect to this the role of education remains paramount for all stakeholders at every level of the food industry.

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