Aetiology of Endemic Respiratory Diseases of Ruminants

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Abstract. Aetiology of endemic respiratory diseases was examined with bacteriological, virological and serological methods in Hungary. Several bacterium and virus species are included in the pathogenesis of endemic respiratory diseases of ruminants, however different environmental factors, nutritional and management deficiencies, overcrowding, ventilation problems and other stress factors predispose the animals to the disease. In the case of cattle parainfluenza-3 (PI-3) virus, adenoviruses and *Mycoplasma bovis* infection together with *Mannheimia haemolytica* serotypes A1 and A2, *Pasteurella multocida* serotype A and *Histophilus somni* proved to be the most important causative agents. Adenoviruses and PI-3 virus, serotypes A1, A2, A6, A8, A5 of *M. haemolytica* and *P. multocida* serotype A were most frequently detected in the aetiology of respiratory diseases of sheep. In the case of goats serotype A2 of *M. haemolytica* proved to be the dominating agent. Identification of the aetiologic agents of endemic respiratory diseases of ruminants is of special importance, since it is the basis of their control.

Keywords: *Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, *Mycoplasma bovis*, adenoviruses, parainfluenza-3 virus

INTRODUCTION

Respiratory diseases of ruminants have a great impact on ruminant stocks everywhere; however the economic losses are influenced by the management practices very much, too. It is difficult to evaluate the losses due to respiratory diseases, in Hungary about 5-20% of the losses are caused by respiratory diseases (Rusvai et al., 1999). Respiratory diseases occur in cattle, sheep and goats, and bovine respiratory disease (BRD) seems to be the most important one. Several viruses (adenoviruses, infectious bovine rhinotracheitis virus (BHV-1), parainfluenza-3 virus (PI-3), bovine virus diarrhoea virus (BVDV), respiratory syncytial virus (RSV) etc.) and bacteria (*Mannheimia haemolytica*, *Pasteurella multocida*, *Histophilus somni*, *Mycoplasma species*, among others *Mycoplasma bovis* are involved in the aetiology of BRD, however significant predisposing factors, such as transport, overcrowding, nutritional deficiencies, inadequate housing conditions, poor ventilation, accumulation of ammonia and other factors are needed to the appearance of the disease (Cusack et al., 2003; Nicholas and Ayling, 2003; Duchemin, 2004). BRD was formerly called respiratory pasteurellosis and shipping fever or transit fever emphasising the fact that the typical form of the disease could often be seen after prolonged transportation, especially in the case of animals bought from different farms, mixed and transported together (Gagea et al., 2006). Beside the acute form of shipping/transit fever, endemic respiratory disease also occurs especially in large herds, where different age groups cannot be properly separated. In the case of the endemic form typically the losses are not as great, and the onset is not so sudden, although it can still have a detrimental financial effect. In Hungary there are several large commercial milk producing...
units some with over 1000 milking cows. In these large farms endemic form of BRD is more typical and common.

MATERIALS AND METHODS

Nasal swab samples of cattle, sheep and goats were collected from animals showing typical clinical signs of respiratory disease in different farms of Hungary including large and middle size herds and flocks. Lung samples and mediastinal lymph nodes of animals died after respiratory disease were collected after post mortem examinations. Paired sera were taken from diseased animals and sera to serological examinations were collected from older animals.

Swab and organ samples were subjected to bacterium and virus isolation, the isolated bacteria and viruses were identified using standard methods (Barrow and Feltham, 1993; Hoskins, 1976).

Serum samples were used to detect antibodies against viruses and Mycoplasma bovis. Adenovirus serotype-specific, BHV-1, reovirus, RSV and PI-3 virus specific antibodies were detected by virus-neutralization test. An enzyme linked immunosorbent assay (Bio K 162 Bio-X Mycoplasma bovis ELISA Kit; Bio-X Diagnostics, Jemelle, Belgium) was used to detect antibodies to M. bovis.

RESULTS AND DISCUSSION

In cattle M. haemolytica, P. multocida and H. somni proved to be the most important bacterial agents involved in respiratory diseases. Two serotypes of M. haemolytica dominated in cattle, 60% of the strains belonged to serotype A1, while 24% of the strains belonged to serotype A2. The majority of P. multocida strains was of serotype A (90%), serotype D represented 2% and the rest of the strains could not be typed. H. somni was isolated in 15% of the herds. Antibodies to M. bovis were detected in all cattle herds, the rate of infection was very high, in 88% of the herds more than 60% of the animals had M. bovis antibodies. More than 90% of the cattle herds were infected with PI-3 and adenoviruses were involved as well.

In sheep M. haemolytica and P. multocida were found to be responsible for the pneumonia. With the exception of serotype A14 all serotypes of M. haemolytica were isolated from sheep, however serotype A1 (21%), A2 (17%), A6 (11%) A8 (10%) and A5 (9%) proved to be the most important ones; they were responsible for more than the two thirds of the cases. P. multocida could be isolated very frequently as well, serotype A (77%) and serotype D (13%) could be detected. All sheep flocks were infected with adenoviruses, bovine adenovirus-2 could be detected in each flock and ovine adenovirus-1 was seen in 50% of the flocks. Beside adenoviruses PI-3 antibodies were found in 70% of the flocks.

There is only limited amount of data from goats, only 3 flocks were examined. In goats M. haemolytica serotype A2 had the greatest importance, 94% of the strains belonged to this serotype.

CONCLUSIONS

The aetiology of BRD is complex. Different environmental factors, transport, overcrowding, nutritional and management deficiencies, poor ventilation predispose the animals to infection. Several infective agents are involved in the pathogenesis of respiratory diseases. Different viruses (adenoviruses, PI-3, BHV-1, etc.), mycoplasmas, especially M.
bovis colonise the upper respiratory airways of ruminants. The damage of the respiratory mucous membrane caused by them and their immunosuppressive effect make it possible for bacteria, *M. haemolytica, P. multocida* and *H. somni* to colonise the upper and later the lower respiratory airways. The typical clinical signs and the pathologic lesions are mainly caused by the bacterial agents. Since several virus and bacterium species and different serotypes are involved in the pathogenesis of the respiratory diseases of ruminants, diagnostic work is of especial importance. Correct diagnosis is absolutely essential to vaccine development and vaccination based prevention of respiratory diseases.

REFERENCES