Current status on the role of Ornithobacterium rhinotracheale (ORT) in respiratory disease complexes in poultry

Derzeitiger Stand der Kenntnisse über die Bedeutung von Ornithobacterium rhinotracheale (ORT) bei Atemwegserkrankungen des Geflügels

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Introduction

Respiratory disease conditions are continuing to cause heavy economic losses in the poultry industry by increased mortality rates, increased medication costs, drops in egg production, reduction of egg shell quality, and decreases of hatchability. Since Dec. 1991 respiratory manifestations with different clinical courses have been observed in poultry flocks in different countries (Table 1). Bacteriological examinations have resulted in isolation of pleomorphic gram-negative rods (PGNR) from the lungs and air sacs of infected birds. Further identification using classical methods have failed to identify the organism. The described bacterium could not be isolated from poultry and avian materials examined in the Stuttgart State Veterinary Lab. from 1981 to 1991. Similar bacteria were isolated in the USA (CHARLTON et al., 1994) from chickens and turkeys suffering from respiratory diseases. In South Africa Du PREEZ (1992) described mild respiratory disease conditions accompanied with air sac turbidity in broilers between 26th and 30th day of age with mortality rate ranging between 1–2%. Bacteriological examination resulted in isolation of a similar micro-organism. The detected bacteria were designated as Pasteurella-like-organism or Taxon 28 until 1994. VAN DAMME et al. (1994) carried out further identification of isolates obtained from the respiratory tract of different avian species from different countries (Table 2) using genetic taxonomic methods and designated that bacterium as Ornithobacterium rhinotracheale gen. nov., sp. nov. in the rRNA-Superfamily V.

Clinical signs

Clinical signs in broilers generally appear between 3rd and 4th week of age, with a mortality rate of 2–10%. The clinical signs identified are depression, decrease in food intake, reduced weight gains, transit nasal discharge, sneezing, followed by facial oedema (DU PREEZ, 1991 and VAN BEEK et al., 1994). In broiler breeders the disease primarily affects the birds at the peak of production or soon before entering production, mostly between 24th and 52nd week of age. Before the main symptoms are detected, a slight increase in mortality and decrease in feed intake may be observed. The first signs are mild respiratory manifestations. The mortality is variable and relatively low in uncomplicated cases. The symptoms are generally accompanied with a drop in egg production, decrease in egg size and poor egg shell quality. Fertility and hatchability are unaffected in many cases.

In turkeys outbreaks mostly have been observed in male birds over 14 weeks of age (HAEZE et al., 1993). However

Table 1. History of clinical observation on ORT

<table>
<thead>
<tr>
<th>Year</th>
<th>Country</th>
<th>Species</th>
<th>Clinical Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>South Africa</td>
<td>Broiler</td>
<td>Respiratory symptoms, Air sacs turbidity, Retarded growth</td>
</tr>
<tr>
<td>1991</td>
<td>Germany</td>
<td>Turkey</td>
<td>Respiratory symptoms, Air sacs turbidity, Increased Mortality</td>
</tr>
</tbody>
</table>

Table 2. Origin of isolates for Genetic-taxonomic investigation

<table>
<thead>
<tr>
<th>Countries</th>
<th>Birds</th>
<th>Author</th>
</tr>
</thead>
<tbody>
<tr>
<td>South Africa</td>
<td>Broiler</td>
<td>DU PREEZ (N.K.)¹</td>
</tr>
<tr>
<td>France</td>
<td>Turkey</td>
<td>BISSEUL (1988)</td>
</tr>
<tr>
<td>Belgium</td>
<td>Turkey</td>
<td>VAN DAMME et al. (1988–1989)</td>
</tr>
<tr>
<td></td>
<td>Chicken</td>
<td>VAN DAMME et al. (1988–1989)</td>
</tr>
<tr>
<td></td>
<td>Partridge</td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>Turkey</td>
<td>BAXTER-JONES (N.K.)¹</td>
</tr>
<tr>
<td>Germany</td>
<td>Rook</td>
<td>MUTTERS et al. (1981–1994)</td>
</tr>
<tr>
<td></td>
<td>Turkey</td>
<td>HAFEEZ (1991)</td>
</tr>
</tbody>
</table>

¹ N.K. = Not known

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in many cases young poults between the 2nd and 8th week could also be found to be affected (VAN BEEK et al., 1994). The severity of clinical signs, duration of the disease and mortality are extremely variable since they are influenced by many factors such as poor management, inadequate ventilation, high stocking density, poor litter conditions, poor hygiene, high ammonia level and concurrent diseases. The mortality ranges between 1 - 10% during the acute phase (8 days). Initial symptoms are coughing, sneezing and nasal discharge followed in some cases by severe respiratory distress, Dyspnoea, prostration and sinusitis. The symptoms are accompanied with a reduction in feed consumption and water intake (HAFEZ et al., 1993).

Post mortem

In broilers gross lesions include pneumatic lungs, pleuritis and airsacculitis. In the air sac accumulation of creamy exudate “Yoghurt-like” could be mostly detected. In turkeys lesions generally were localized in the lungs and included oedema and uni- or bilateral consolidation of the lungs with fibropurulent exudate. Pericarditis, airsacculitis, peritonitis and enteritis could be detected. In some cases, swelling of the liver and spleen plus degeneration of heart muscles have been observed (HAFEZ et al., 1993 and HINZ et al., 1993).

Serological examinations

Serum samples from 22 broiler breeders, 9 broiler, and 39 meat turkey flocks showing and/or recovered from respiratory diseases were examined for the presence of antibodies to ORT bacterium using self made indirect ELISA prepared from Stuttgart ORT-turkey-Isolate GGD 1269/91 (HAFEZ and STING, 1996). The results showed that antibodies to ORT were detected in 17 broiler breeder flocks (77.3%), in 2 broiler flocks (22.2%), and in 27 meat turkey flocks (96.2%). From totally examined 1094 serum samples, 16.3 to 30.5% showed positive results (Table 3).

Diagnosis and differential diagnosis

Diagnosis of ORT based on clinical signs and pathological lesions is very difficult since many other infectious diseases such as Pasteurellosis, Chlamydiosis or Turkey rhinotracheitis complicated with secondary bacterial infection can produce similar clinical signs and post mortem lesions. Diagnosis can only be confirmed by isolation and identification of the causative agent.

Table 3. Results of ORT serological examination in poultry flocks using ELISA

<table>
<thead>
<tr>
<th>Tested poultry flocks</th>
<th>No. of sera</th>
<th>Sera results</th>
<th>No. of flocks</th>
<th>Flock results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broiler</td>
<td>473</td>
<td>+</td>
<td>22</td>
<td>17</td>
</tr>
<tr>
<td>Breeder</td>
<td>123</td>
<td>%</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Broiler</td>
<td>498</td>
<td>%</td>
<td>39</td>
<td>27</td>
</tr>
<tr>
<td>Meat</td>
<td>%</td>
<td>30.5</td>
<td>69.5</td>
<td>69.2</td>
</tr>
<tr>
<td>Turkey</td>
<td>%</td>
<td>95.6</td>
<td>4.4</td>
<td>96.2</td>
</tr>
</tbody>
</table>

Test Results

Gram-Staining: +
Blood agar: +
Gassner-agar: +
MacConkey-agar: +
Growth in: Oxidase
Peptone water: +
Pasteurella-Broth: +
Todd-Hewitt-Broth: +
Brain heart-Broth: +
Growth at:
20 °C: +
37 °C: +
42 °C: +

Sugars fermentation: +
Catalase: -

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**Bacteriological examinations**

Gram-negative pleomorphic rods could be isolated only from the trachea, lungs and airsacs on blood agar with 10% sheep blood incubated at 37 °C for 24–48 h under 5–10% CO2 tension. The colonies are grey-white, opaque, non-haemolytic and differ in size (1–3 mm). In contaminated samples with fast growing bacteria such as E. coli, Proteus or Pseudomonas, ORT colonies may be overgrown and therefore cannot be detected in routine investigation. Culture of heart blood and liver tissue under field conditions has revealed negative results (HAPEZ et al., 1993). The bacteria could be however, isolated from those organs as well as from joints and brains after experimental infections (VAN EMPSEL, 1994). The growth characteristic and biochemical reactions of the isolated strains are show in Table 4. Identification trials carried out using a commercial biochemical test-kit (API 20 NE, Bio-Mérieux, France) failed to identify the organisms. However, colonies with reaction code of 02 0 000 4 or 0 0 2 000 4 in these API 20 NE systems are highly suspected and confirmation could be carried out using positive antisera (VAN EMPSEL, 1994).

The SDS-PAGE profiles of isolated strains (Fig. 1) were identical and varies widely from the SDS-PAGE profiles of Pasteurella multocida subsp. multocida strains (Fig. 2) isolated from turkey flocks (HAPEZ et al., 1993). According to VAN EMPSEL (1994) at least three different serotypes are exists. Serotype A includes the chicken isolates from South Africa and the Netherlands, while chicken isolates from USA belong to the serotype C. On the other hand, all turkey isolates from Germany and the Netherlands serologically belong to serotype B. In addition, cross reactions between all serotypes exist.

**Sensitivity to antibiotics in vitro**

All tested isolates (100%) showed high sensitivity to amoxicillin, chloramphenicol and chlortetracycline. 90% and 36% of the isolates were found to be sensitive to erythromycin and furazolidone respectively. In addition, 1 out of 16 tested isolates was found to be sensitive to enrofloxacin. None of the isolates was susceptible to apramycin, neomycin, gentamycin and sulphonamide/trimethoprine (Fig. 3). The sensitivity to enrofloxacin seems to be origin-
related, since most of the turkey isolates from Germany and the Netherlands are resistant (HAFEZ, 1994 and VAN EMPEL, 1994), while 98% of the strains from France (DUDOUYT et al., 1995) and 71% of isolates from Belgium (DEVRIESE et al., 1995) are sensitive to enrofloxacin.

Treatment trials

Water medication using chloramphenicol (500 ppm) and/or amoxicillin at a dose level of 250 ppm were used for 3 to 7 days and gave satisfactory results in most cases (HAFEZ et al., 1993).

Vaccination

Vaccination trials using inactivated vaccine in broiler as well as in turkey flocks were carried out. The primarily results are promising (VAN EMPEL, 1995, personal communication). However the development of live vaccine is necessary and still in progress.

Conclusions

Further work is required to improve the isolation and identification of the microorganism under field condition, and to determine the role of this bacterium in respiratory disease complexes in poultry as well as its interaction with other microorganisms.

Summary

Respiratory disease conditions are continuing to cause heavy economic losses in the poultry industry. Since Dec. 1991 respiratory manifestations with different clinical courses have been observed in poultry flocks in different countries. Bacteriological examinations have resulted in isolation of pleomorphic gram-negative rods (PGNR). The detected bacteria were designated as Ornithobacterium rhinotracheale gen. nov., sp. nov. in the rRNA-Superfamily V. The present paper reviews the literature related to ORT aetiology, clinical signs and diagnosis in broiler, broiler breeder and meat turkey flocks.

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Zusammenfassung


Die vorliegende Arbeit gibt eine Literaturübersicht bezüglich der Ätiologie, Symptome und Diagnose bei Masthähnchen, Mastelternrittern und Mastputen.

Stichworte

Broiler, Puten, Hygiene, Krankheit, Erreger, Bakterium, Atemwege

References


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