

THE ASSESSMENT OF THE SEVERITY OF RESPIRATORY DISEASE IN CHICKEN, PIGS AND CATTLE

Reeve-Johnson L.¹, Otte J.

De même que des informations sur la prévalence et l'incidence d'une maladie sont importantes, analyser la sévérité d'une maladie peut s'avérer particulièrement utile pour estimer son impact économique. Ceci est particulièrement difficile quand on considère des symptômes relatifs à une maladie endémique présentant une faible mortalité et une forte morbidité. La quantification de la sévérité clinique est plus difficile à exprimer que l'incidence ou la prévalence.

Divers critères objectifs et subjectifs de sévérité de la maladie ont été relevés sur des animaux souffrant de pathologie respiratoire de nature endémique. Les données histopathologiques, sérologiques, bactériologiques, ainsi que des variables cliniques subjectives et objectives ont été représentées graphiquement pour le poulet, le porc et le veau, pour illustrer les différents niveaux de corrélation entre eux. Pour un animal souffrant d'une maladie donnée, cette information fournit une indication de la fiabilité des différentes mesures de sévérité clinique de la maladie. Ceci illustre la valeur attendue de ces critères comme indicateurs prédictifs de sévérité de la maladie dans la population, si on extrapole à partir des valeurs d'un échantillon représentatif.

Assessments of severity are routinely used by the practicing veterinarian in prescribing treatments, assisting in diagnosis and giving prognoses of outcome after a course of treatment. Usually these are subjective assessments based upon the clinician's wider experiences. If assessments are to be compared, however, a means of standardising the criteria and their magnitude is needed. Examples where this is particularly relevant is communicating clinical information in scientific publications, or in the assessment of the efficacy of a therapeutic product by regulatory authorities.

MATERIALS AND METHODS

In this study we considered respiratory disease in three animal species each with distinct aetiologies, and each of major economic importance to their respective industries.

Chickens

Three hundred and sixty specific-pathogen-free Leghorn chicks were maintained in cages in isolated facilities. At the age of 6 days, the birds were weighed individually and distributed over 6 groups of 60 birds by a stratified randomization procedure according to weight. On day 10, chicks were inoculated intratracheally and into the sinus with a culture containing approximately 10^7 *Mycoplasma gallisepticum* organisms. Respiratory symptoms were observed. Birds were killed after 21 days. Lesions of air sacs and peritoneum were scored. Tracheas were collected for mycoplasma culture from all chickens and sera were collected and tested by the slide agglutination test (1,2).

The airsac lesion scoring system :

- 0 No lesions
- 1 Cloudiness of airsacs
- 2 Airsac membranes thickened
- 3 "Meaty" appearance of membranes, with large accumulations of "cheesy" exudate confined to one airsac
- 4 As 3 but lesions in 2 or more airsacs

Respiratory (auscultation) score :

- 0 No respiratory sounds
- 1 Slight respiratory sounds
- 2 Moderate sounds, clear 'crackles'
- 3 Severe, crackles and advanced respiratory distress

Peritoneal lesion score :

- 0 No lesions
- 1 Mild lesions, 'tagging' on small sections of the peritoneum
- 2 Moderate lesions covering less than half of the peritoneal surfaces
- 3 Widespread lesions covering majority of peritoneum

Cattle

Fifty Holstein-Freisian and Jersey (10) calves aged between 8 and 14 days of age with a weight range of 24-45 kg, were infected intratracheally with a dose of 2×10^7 - 1×10^9 cfu of *Pasteurella haemolytica* type A1. The rectal temperature, respiratory rate and clinical demeanour scores were all recorded. The lungs of all calves were inspected post-mortem.

¹ Veterinary Epidemiology & Economics Unit, Department of Agriculture, University of Reading, P.O. Box 236, Reading RG6 6AT, UK.

5

Demeanour score

- 0 Normal Alert calf, responds to presence of observer, ears pricked
- 1 Subdued Response decreased, not as 0, but alert
- 2 Apathy Ears turned down, coat losing lustre, less responsive to observer, not totally inappetant
- 3 Marked depression Failure to respond to observer, hunched stance, may be inappetant

Pigs

Trial 1 : Five groups of 8 pigs were deeply endobronchially inoculated with 10^4 *Actinobacillus pleuropneumonia* (APP) serotype 9 organisms.

Trial 2 : Eight groups of 6 pigs were challenged with 9×10^5 cfu APP serotype 3 by intra-nasal spray.

Respiratory and clinical demeanour scores and rectal temperatures were recorded at twice daily examinations for 14 days, following infection. In pigs it is difficult to count respiratory rate particularly in healthy animals where the breathing cycle is not obvious, but only becomes so with increasing respiratory compromise, a representative scoring system was therefore developed. Pigs were killed for post-mortem examination 14-15 days after challenge and examined for pneumonic lesions.

Respiratory score

- 0 Normal
- 1 Respiratory rate slightly increased - have to watch carefully to notice
- 2 Respiratory rate obviously increased
- 3 Respiratory rate rapid

Demeanour score

- 0 Normal alert pig responds to observer entering pen, normal behaviour, evades handling
- 1 Slightly subdued less active and alert than normal
- 2 Dull, evades handling but only walks short distances, does not exhibit many normal behaviour activities, may lie down while observer is in the pen
- 3 Very dull, requires prodding to move, prefers to lie, may not stand for more than 1 or 2 minutes

Results

Figure 1

Chickens : The correlation between respiratory score, mycoplasma reisolation and serology with clinical score in chickens infected with *Mycoplasma gallisepticum*.

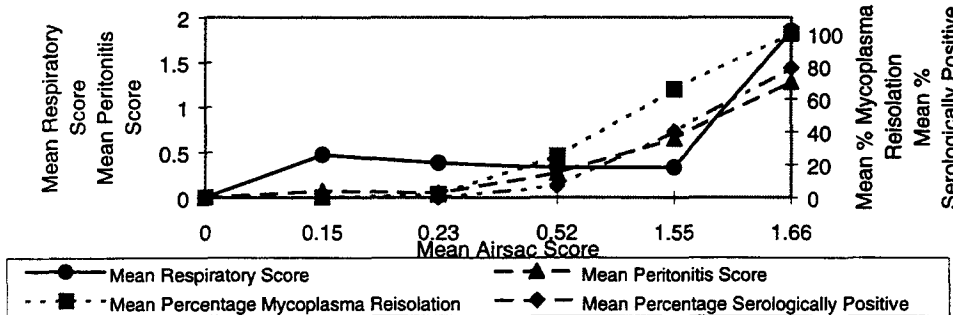


Figure 2

Calves : Correlation between 3 discrete objective response variables and clinical demeanour scores for 50 calves infected with *Pasteurella haemolytica* Type 1A.

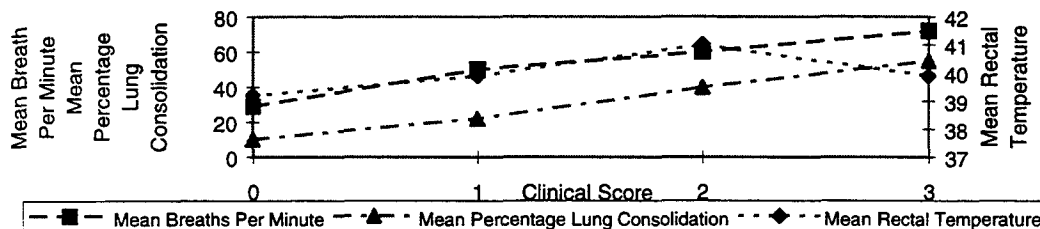


Figure 3a

Pigs : Trial 1 : Correlation between 3 discrete objective response variables and clinical demeanour scores for 60 pigs infected with *Actinobacillus pleuropneumonia ser 9*

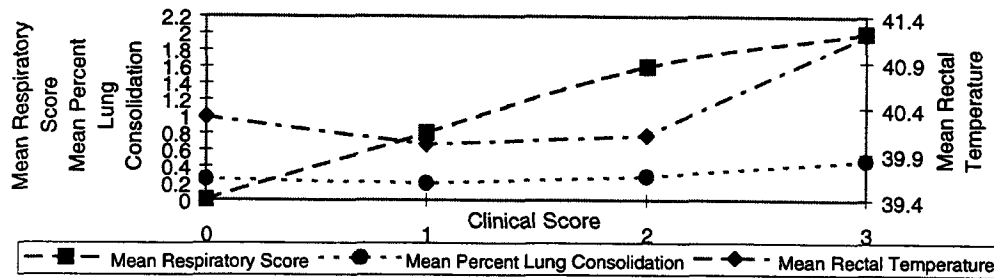
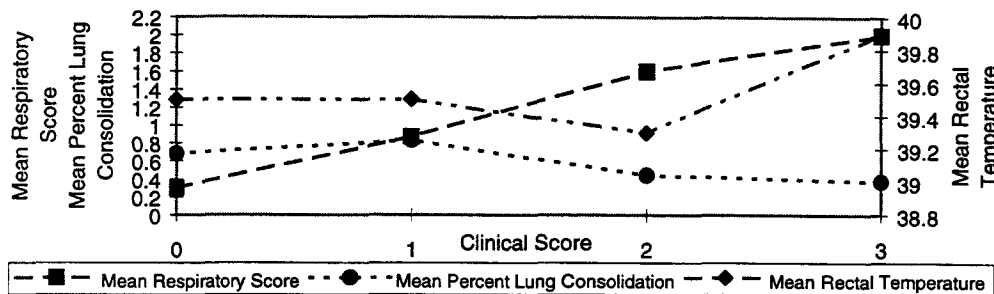


Figure 3b

Pigs : Trial 2 : Correlation between 3 discrete objective response variables and clinical demeanour scores for 60 pigs infected with *Actinobacillus pleuropneumonia ser 3*



DISCUSSION AND CONCLUSIONS

Live chickens are difficult to clinically score, it was difficult to develop a reliable system of scoring demeanour. Good correlation was found upon auscultation, between the 'respiratory score' and pathological parameters. Clinical signs could be detected very early in the pathological process. Pathological examination is also cheap and relatively quick and easy to perform. Provided the facilities are available serological examination and reisolation of mycoplasma proved to be easy to perform and correlated well with the gross pathological evidence of disease.

In pigs, demeanour was easily characterised by the scoring system developed and this correlated well with the respiratory score. Caution has to be exercised in our experience in interpreting rectal temperatures. We found that healthy pigs were most stressed by handling and often exhibited rectal temperatures above those of mildly ill animals, rectal temperature then increased as expected with severity of clinical symptoms although there was most variability in rectal temperatures in severely ill pigs as homeostatic controls were compromised (3). The relationship between clinical symptoms and gross lung pathology was not always clear. *Actinobacillus pleuropneumonia* is known to release endotoxins which may aggravate clinical symptoms (4). We found that the relationship between gross pathology and clinical symptoms differed between the two serotypes of the organism tested in these experiments. Differences in virulence between strains of APP is well documented (5), but this may also have been due to differences in the inoculation procedure used.

In calves there was good correlation between clinical score and respiratory rate and with the gross lung pathology. Rectal temperature increased with onset and severity of disease, however in severe disease there was a marked decrease in temperature consistent with a compromise in homeostasis.

The quantification of response variables used to assess efficacy, particularly pertaining to clinical demeanour remains a challenge. Non-linearity of responses, inter-species and intra-species variance in heterogeneous populations, and the different pathogenesis according to the organism or combination of organisms in conjunction with the environment, immune system and other factors all contribute to this. Importantly though, the clinical scoring systems used in the work contributing to this paper, are practical to use in the field situation and whilst an analytical approach should be used in their interpretation, they have been consistent as means of communicating subjective data on the clinical symptoms as recognised by the veterinarian authors.

BIBLIOGRAPHY

1. Reeve-Johnson L., Kempf I., Gesbert F., Guittet M. (1996). Efficacy of tilmicosin in the control of experimental *Mycoplasma gallisepticum* infection in chickens - initial findings. Proceedings of World Poultry Congress, Delhi, 359.
2. Kempf I., Reeve-Johnson L., Gesbert F., Guittet M. (1997). Efficacy of tilmicosin in the control of experimental *Mycoplasma gallisepticum* infection in chickens. Avian diseases (in press).
3. Reeve-Johnson L. (1997). The evaluation of efficacy of anti-microbial agents in clinical subjects and disease models for food producing animals. Keynote Lecture : Proceedings of the 7th EAPVT Congress, Madrid, Spain.
4. Nicolet J. (1992). *Actinobacillus pleuropneumoniae*. In : Diseases of Swine. Iowa State University Press, 401-408.
5. Haesebrouck F; Dom P. (1995) *Actinobacillus pleuropneumoniae* current developments. University of Ghent.