

PorkFACTS™

AN UPDATE OF RECENT SWINE RESEARCH

Pasteurella multocida as a Component of PRDC – Antimicrobial Selection for Therapeutic Success

▶ INTRODUCTION

Porcine respiratory disease complex (PRDC) remains a common problem in swine herds despite initiatives and precautions employed by pork producers and veterinarians to optimize health, genetics, growth, and environmental conditions.¹ Because PRDC typically involves a combination of multiple infectious agents, the syndrome can be difficult to treat. Causative agents include porcine circovirus type 2 (PCV2), porcine reproductive and respiratory syndrome virus (PRRSV), swine influenza virus (SIV), *Mycoplasma hyopneumoniae* (*M. hyo*), *Pasteurella multocida*, and other bacterial pathogens.²

While much current research is directed toward the viral agents and primary bacterial threats like *M. hyo*, the role of ubiquitous *P. multocida* in the PRDC syndrome should not be overlooked. Estimates suggest that 95% of pigs harbor *P. multocida*, but the microbes rarely cause pneumonia on their own. Rather, *P. multocida* most commonly contributes toward pathogenicity when occurring in combination with other agents.

▶ BACKGROUND²

- *Pasteurella multocida* is a gram-negative coccobacillus bacterium, a facultative anaerobe with 5 serotypes (A, B, D, E, F).
- Serotypes A, B, and D are found in swine, A and D being the most common in the United States and Europe.
- Serotype A is most commonly associated with PRDC, although as Figure 1 shows, serotype D has become increasingly common in PRDC cases in recent years, rising from just 2% of *P. multocida* strains isolated in 1996 to over 33% in 2003.

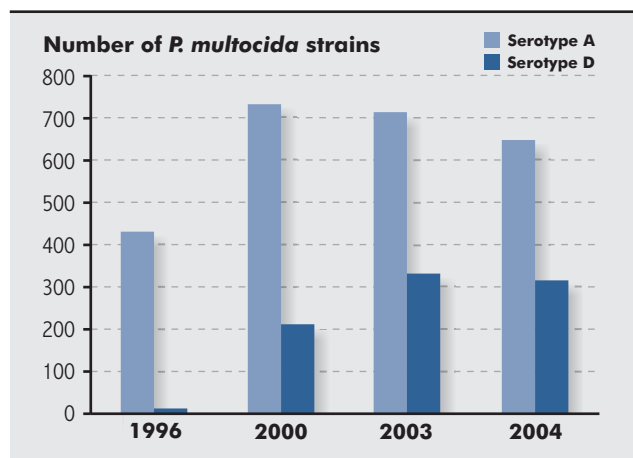


FIGURE 1: Number of *P. multocida* strains isolated and characterized with sensitivity profiles (ISU Veterinary Diagnostic Lab).

***P. multocida* is a significant contributor to PRDC, so its control is crucial for successful management of swine pneumonia.**

***P. multocida* is generally considered an opportunistic secondary pathogen.**

Cases of swine pneumonia submitted to the ISU diagnostic laboratory are often associated with *P. multocida*.

▶ EPIDEMIOLOGY²

- *P. multocida* is most commonly spread via nose-to-nose contact, although it is capable of aerosol transmission.
- *P. multocida* alone does not appear to pose a threat to swine health. Studies attempting to reproduce *P. multocida* infection in pigs have found that the infectious agent is quickly cleared from the respiratory system.¹
- *P. multocida* is generally accepted to be an opportunistic or secondary pathogen, meaning it is not pathogenic unless paired with primary pathogens. Thus, various co-infection models are used to produce PRDC with *P. multocida* as a component.

▶ CLINICAL DISEASE²

- Pigs infected with serotype B strains of *P. multocida* commonly exhibit acute pasteurellosis; however, these strains are not found in North America or Europe.
- Much more common in the United States and Europe is subacute and chronic clinical disease caused by serotypes A and D.
- Subacute disease is characterized clinically by coughing, emaciation, and poor performance.
- Chronic *P. multocida* pneumonia is characterized by coughing, “thumping,” and mild fever, symptoms that are clinically indistinguishable from infection with *M. hyo*.¹
- Pathognomonic lesions are not associated with *P. multocida* infection, but cranial-ventral lung lobes are often consolidated, occasionally with pleuritis. On a microscopic level, chronic purulent to necrotizing broncho-pneumonia is typical.
- Figure 2 shows the percentage of recent PRDC cases presented to the Iowa State University Veterinary Diagnostic Laboratory which involved *P. multocida* and *M. hyo*.²

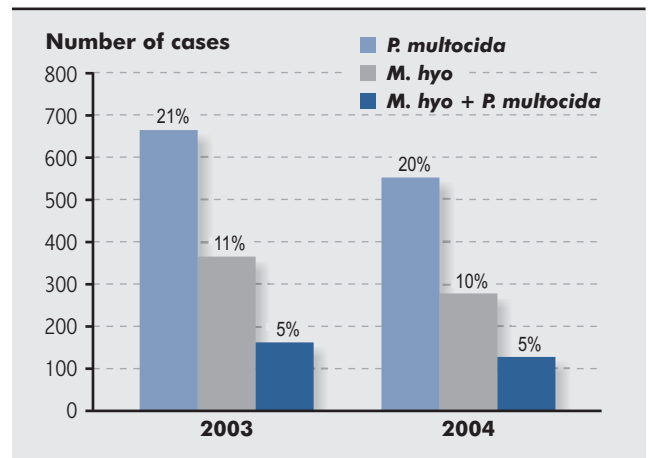


FIGURE 2: Cases of pneumonia associated with *P. multocida* and/or *M. hyo*, and percent of total cases represented by each category.

▶ ANTIMICROBIAL TREATMENT²

- Figure 3 displays drugs accepted for swine respiratory treatment by the Clinical and Laboratory Standards Institute (CLSI), and the susceptibility percentages of these agents against the relevant A and D serotypes of *P. multocida*.³

Tiamulin, erythromycin, and lincomycin (clindamycin) demonstrate poor in vitro activity against P. multocida.

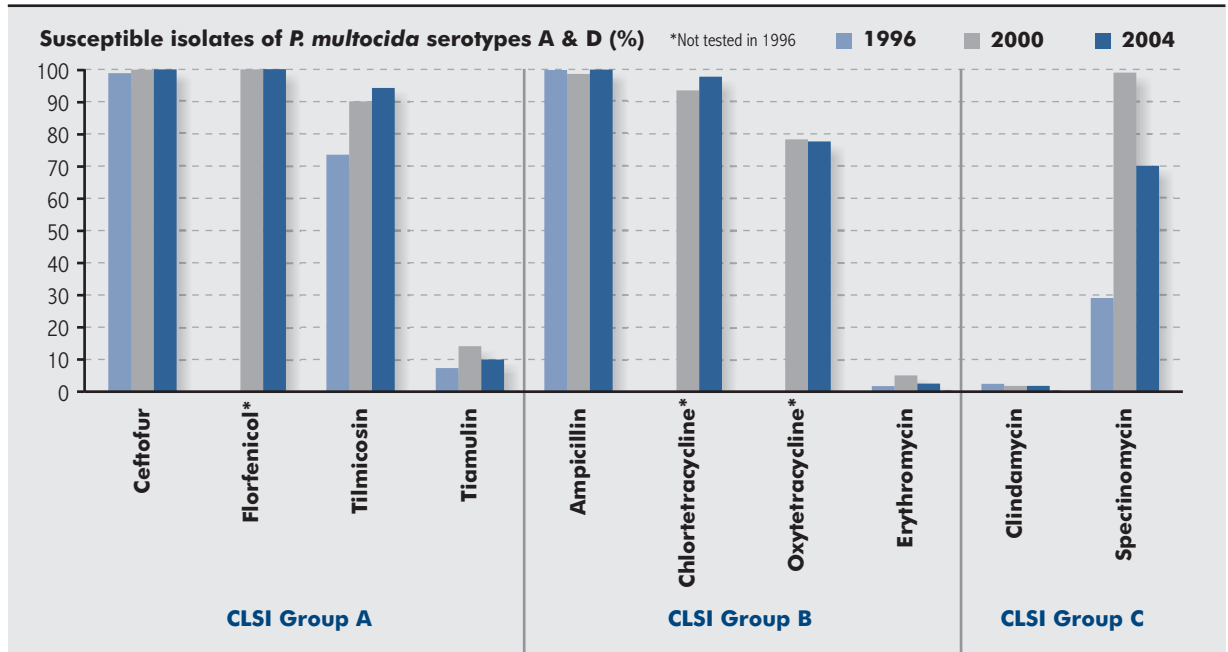


FIGURE 3: Percent of *P. multocida* serotype A and D isolates susceptible to CLSI-listed antimicrobials.

Chlortetracycline demonstrates higher in vitro efficacy against P. multocida than oxytetracycline.

- Drugs in group A have well-established criteria for veterinary use. For group B, human interpretive criteria are used in swine. Group C compounds have no interpretive criteria for use in humans or animals, and includes clindamycin as a class representative for lincomycin.³
- These data demonstrate the in vitro effectiveness of 3 of the 4 compounds in group A of the CLSI list. Good to moderately good efficacy against *P. multocida* is documented in the group B and C antimicrobials, except for erythromycin and clindamycin (lincomycin).
- Notably, of the tetracycline-class agents, chlortetracycline demonstrates higher in vitro efficacy than oxytetracycline.

► THERAPY SELECTION

- Choosing an antimicrobial treatment for PRDC often depends on which compound has the greatest efficacy against the most microbes involved in a typical case.
- For instance, *M. hyo* is predictably susceptible to tetracyclines, macrolides, quinolones, clindamycin, and spectinomycin.⁴⁻⁶ However, if *P. multocida* is the co-infecting agent, antimicrobial choice may be different, with chlortetracycline, florfenicol, and tilmicosin appropriate choices for targeting that combination of pneumonia.²
- Additional factors need to be considered as well,² such as pharmacokinetics (bioavailability, absorption, blood and lung tissue levels, etc.), label recommendations, ease of administration (i.e., feed-grade treatment vs injections), drug cost, and past clinical efficacy.

- Chlortetracycline (Aureomycin®) is an excellent therapeutic choice for controlling swine pneumonia complicated with *P. multocida*, offering high levels of pathogen susceptibility, drug penetration into respiratory tissues, low cost, and convenient (low-labor) feed-grade administration for group medication.

▶ CONCLUSIONS

Because of the multiple pathogens typically involved in PRDC outbreaks, treatment efforts can be complicated and frustrating. Although *P. multocida* is a secondary PRDC pathogen, control of this significant contributor to clinical PRDC is crucial for overall success in any attempt to treat swine pneumonia. Antibiotic selection for treatment efforts must consider multiple factors such as pathogen susceptibility, pharmacokinetics, cost, and convenience. Chlortetracycline (Aureomycin) represents an excellent choice for the treatment of swine pneumonia complicated by *P. multocida*, offering high efficacy, appropriate pharmacokinetics, low drug cost, and convenient feed-grade administration for group medication.

REFERENCES

1. Pijoan C. Pneumonic Pasteurellosis. In *Diseases of Swine*, BE Straw, WL Mengeling, DJ Taylor editors. Iowa State University Press. 1999; 511-520.
2. Jordan D, Hoffman L, Thacker E. *Pasteurella multocida* as a component of porcine respiratory disease complex (PRDC). *Proc Am Assoc Swine Vet* 2006; 149-152.
3. NCCLS (CLSI). Approved Standard, supplement to M31-A2. Second ed. Performance standard for antimicrobial disk and dilution susceptibility tests for bacteria isolated from animals. 2004; vol 42.
4. Tanner AC, Erickson BZ, Ross RF. Adaptation fo the Sensititre broth microdilution technique to antimicrobial susceptibility testing of *Mycoplasma hyopneumoniae*. *Vet Microbiol* 1993; 36:301-306.
5. Ter Laak EA, et al. Comparison of methods for in vitro testing of susceptibility of porcine *Mycoplasma* species to antimicrobial agents. *Antimicrob Agents Chemother* 1991; 35:228-233.
6. Wu CC, et al. Testing antimicrobial susceptibility against *Mycoplasma hyopneumoniae* in vitro. *J Swine Health Prod* 1997; 5:227-230.