Medicina Veterinária

Pharmacokinetic modeling of amoxicillin for the treatment of joint infections caused by Streptococcus suis in pigs

Giovanna Cantero Simonato - Bolsista PIVIC- UFLA

Bárbara Fernandes Dorante - 9° módulo de Medicina Veterinária - UFLA

Francisco Emanuel Mendes Chaves - 8º módulo de Medicina Veterinária - UFLA

Lara Quintanilha Goulart - 6° módulo de Medicina Veterinária - UFLA

Sibely Aiva Flores - Mestranda do PPGCV-UFLA

Marcos Ferrante - Professor da FZMV- UFLA - Orientador(a)

Resumo

Streptococcus suis (S. suis) is a family of pathogenic grampositive bacterial strains that represents a primary health problem in the swine industry worldwide. In practical routine, one of the most common clinical signs is septic arthritis, resulting in reduced productivity and significant economic losses worldwide. This microorganism has a complex population consisting of heterogeneous strains and classified into 35 different serotypes, making therapeutic treatment difficult. Amoxicillin has become a major antimicrobial substance in pig medicine for the treatment and control of severe, systemic infections such as S. suis. Like other penicillins, Amoxicillin is a critically important antibiotic for humans, and its prudent use in the animal industry is crucial to reducing antimicrobial resistance, so PK/PD analyses are an important instrument for basing their use on scientific evidence focused on each species. Therefore, the objective of this work is to build a pharmacokinetic model to optimize the dose used in the treatment of joint infections caused by S. suis. Data from pharmacokinetic studies of amoxicillin in pigs, administered intramuscularly, were used to construct the pharmacokinetic model. Different PK models were tested for intramuscular administration (oral/extravascular), with and without delay, first-order and zero-order absorption, one, two, or three compartments, linear elimination, and rate and clearance parameterization, using Monolix 2023 R1 software (Lixoft SAS, a Simulations Plus Company). The PK model was exported to Simulx 2023 R1 software (Lixoft SAS, a Simulations Plus Company) where doses of 1, 2, and 3.5, 7, and 15 mg/kg were simulated. The doses were tested based on the minimum inhibitory concentration (MIC) of 0.06 ug/mL. The PDT (pharmacokinetic/pharmacodynamic target) used for integration was the time at which the concentration exceeds the MIC, T>MIC: 40% and 60% of 24 hours greater than the MIC, respectively. The PTA was calculated in Rstudio and considered when reaching 90% of the population. The dosage commonly used in the treatment of joint infections is 15 mg/kg; however, the 3 mg/kg dose has been shown to be effective in achieving 100% PTA in T>40%*24h and 94% PTA in T>60%*24h. Since amoxicillin is a time-dependent antimicrobial, its antimicrobial efficacy is enhanced when maintained above the MIC, configuring the dose of 3mg/kg as effective, also validating the PK/PD analysis for the review of therapeutic doses.

Palavras-Chave: Arthritis, Veterinary pharmacology, Pharmacodynamics.
Instituição de Fomento: Universidade Federal de Lavras (UFLA)

Link do pitch: https://youtu.be/WQsyKmqV3PY