Effect of increasing doses of enrofloxacin on chicken articular cartilage

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Abstract

Enrofloxacin is a synthetic chemotherapeutic agent from the class of the fluoroquinolones that is widely used to treat bacterial infections in animals. Fluoroquinolones cause severe lesions in articular-epiphyseal cartilage complexes of growing mammals. The aim of the present study was to determine whether enrofloxacin has chondrotoxic, dose- and time-dependent effects on avian articular cartilage. 21-day-old male broiler chickens were treated orally with a single or five doses of 10, 50, 100, 300 and 600 mg/kg/day of enrofloxacin. 24 hours after the last dose the animals were killed and femoral head with condyles and tibial condyles were subject to a gross and histopathological investigation. The lesion scoring system was used to determine the progression of lesions. The mean score in birds treated with a single dose of 300 and 600 mg/kg of enrofloxacin was significantly increased when compared to the control group, while the administration of one dose of 10, 50 and 100 mg/kg of the drug did not cause substantial changes in the examined articular cartilages. The mean score was significantly greater in birds dosed for 5 days with 50, 100, 300 or 600 mg/kg/day of enrofloxacin when compared to the control group. Histologic changes included, among others, occurrence of chondrocytes with shrunken cytoplasm and pyknotic nuclei, spindle-shaped cells, clusters of chondrocytes and loss of proteoglycan. In conclusion, our results indicate that the use of enrofloxacin in growing chickens at recommended dosage is safe from the point of view of possibility of chondrotoxic effect. Only very high dosage of enrofloxacin, significantly exceeding the therapeutically applied doses, can induce toxic effects in articular cartilage and intensity of chondrotoxicity is dose- and time-dependent. Moreover, our findings suggest that quinolone-induced arthropathy is considerably less expressed in birds than in mammals.

Key words: enrofloxacin, quinolones, arthropathy, chondrotoxicity, chickens

Introduction

Enrofloxacin, a fluoroquinolone antimicrobial agent, is useful because of its rapid, broad-spectrum bactericidal activity at therapeutic concentrations, infrequency of bacterial resistance and postantibiotic effect in vitro (Beluche et al. 1999). The use of quinolones is restricted because their toxic effects on articular-epiphyseal cartilage complexes (in this paper we use simplified description: articular cartilage). Quinolone-induced arthropathy has been described in juvenile animals of multiple species such as dogs (Burkhardt et al. 1990, Machida et al. 1990, Burkhardt et al. 1992, Takizawa et al. 1999b, Stahlmann et al. 2000).