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Tetracycline residues in bones of slaughtered animals

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Abstract

The incidence of tetracycline (TC) residues in bones of slaughtered animals (pigs, turkeys, chickens, ducks and calves) was investigated using a screening fluorescence test and HPLC analysis. Fluorescence findings vary from 18.8% to 100% depending on species. The concentrations of TCs in the bones were 0.14–50.0 mg kg^{-1}. Additionally, an experimental evaluation of the specifity and sensitivity of the fluorescence screening test was performed. Chickens were fed low dosages of oxytetracycline (OTC) and subsequently analysed for detectable residues after a withdrawal period of 1, 5, 15 and 25 days.

The results are discussed with regard to the possible toxicological significance of TC residues in bones.

Introduction

Tetracyclines have been widely used as growth promoters and therapeutics in animal husbandry. Despite early warnings about increasing resistances of microorganisms to tetracyclines and the banning of tetracyclines as growth promoters, actually more than 65% of the antibiotics prescribed for veterinary therapeutic use within the European Community (2294 of 3494 tons) are tetracyclines (FEDESA, 1998).

After Milch, Rall and Tobic (1957) having given first indications on the persistence of tetracyclines in bones, Buyske, Eisner and Kelly (1960) described residues of tetracycline and chlortetracycline in bones of treated animals and the specific fluorescence of bound tetracyclines in bones. Since then, this property of tetracyclines has intensively been used in medical sciences to study either their pharmacocinetics (Blomquist & Hanngren, 1966) or special physiological (Ballanti, Coen, Taggi, Mazzaferro, Perruza & Bonucci, 1995), embryological (van de Velde, Vermeiden & Bloot, 1985), and surgical issues (Aoyagi, Sasaki, Ramamurthy & Golub, 1996).

In 1993, we started to detect fluorescence in bones in order to screen for tetracyclines in slaughtered animals (Kühne & Ebrecht, 1993).

The aim was to get information about:

- Can fluorescence be used as a suitable screening for tetracycline residues in animals?

- To what extent do tetracyclines occur in bones of slaughtered animals?

It was the aim of this study, to assess the potential risk from mechanical deboning of meat, that contains significant amounts of bone meal and bone splinters (Varnam & Sutherland, 1995), and the use of meat and bone meal in animal feeding.

Section snippets

Experiments on the detection of residues of oxytetracycline (OCT) in bones after application to chickens

Material. Thirty chickens were fed an oxytetracycline (124 mg kg^{-1}) supplemented standard diet (medical premix bioptivet G-B™ from the 6th to 16th day of fattening. They were humanely killed the 1st, 5th, 15th and 25th day after withdrawal of the medicated feed. Additionally, 5 animals served as a control.

Method. The skeleton was thoroughly prepared (separation of fat and periosteum) and examined visually for yellow fluorescence using an ultraviolet (UV)-lamp (366 nm, 4 W; Merck Nr. 13203).

The

OTC in bones of chickens after withdrawal

After application of OTC, significant concentrations were found in the bones. UV radiation of bones led to yellow fluorescence of the bones. One day after withdrawal of the medicated feed a complete and regular fluorescence of the bones could be observed (Fig. 1a). On the 5th day after withdrawal the fluoresceing areas had decreased considerably (example: Fig. 1b). Individual variations within the group were observed. Samples collected 15 days after withdrawal showed a further reduction of

Discussion

1. *Screening for TCs in bones using the fluorescence test*. The therapeutical dosage of OTC when administered orally to chickens is 1000–1500 mg OTC kg^{-1} feed. To study the sensitivity of the visual detection we used the smallest recommended subtherapeutical dosage. This dosage (124 mg kg^{-1}) gave consistently positive results. As studied earlier by Brüggemann, Lösch, Merkenschlager and Offterdinger (1966), even smaller dosages (10 mg kg^{-1}) would lead to detectable residues in the bones, when

Conclusions

The occurence of TC residues in bones of slaughtered animals is more likely a normal than an exceptional finding. This fact has severe consequences for the potential toxicological risk of products that contain bone portions like mechanically deboned meat and meat and bone meal.

Screening methods, like the detection of fluorescence, are able to detect suspicious carcasses in meat plants.

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