

Effect of agricultural use of streptomycin on the bacterial flora of animals

Scherer Alexandre, Vilei Edy, Perreten Vincent and Frey Joachim, Institute of Veterinary Bacteriology, University of Bern.

Key words

Streptomycin resistance, multidrug resistance, fire blight, Escherichia coli, Staphylococcus ps. tracer sheep

Aim of the study

With the authorization of streptomycin use against fire blight in Switzerland in 2008, a monitoring has been required in order to assess the effect of use of streptomycin in open systems on antibiotic resistance of bacterial species in animals.

Material and methods

Four ewes (*ovis aries*) and 10 three-month old lambs (5 females and 5 males) which animals had never undergone antibiotic treatment, were placed together for 3 days and then separated into 2 flocks, a test group and a negative control group. Each flock containing 2 ewes and 5 lambs (randomly chosen) were placed into two distinct pastures of the Vetsuisse Faculty of Bern of about 2000 square meters each and separated by 2 fences situated two meters apart. Animals were treated twice against parasites with Dectomax (Pfizer Inc., New York, USA). The application of streptomycin directly to the grass of the pasture of the study group was made to correspond to concentrations of drift values occurring from treatment of orchards with streptomycin. Before and after the treatment of pastures with streptomycin *Escherichia coli* was isolated regularly from faeces and *Streptococcus* sp. was from the nasal cavities during a period of totally 90 days. Antibiograms were made from all isolates.

Results and significance

Before the application of streptomycin, the percentage of streptomycin-resistant *E. coli* was 15.8% in the control group and 14.7% in the test group. The overall number of streptomycin-resistant *E. coli* after the application of streptomycin was significantly higher in the test group (39.9%) than in the control group (22.3%) (p-value=0.0001). Resistance to streptomycin was often linked to up to four additional resistances. The streptomycin resistance genes strA, strB, aadA and class 1 integron were detected in the streptomycin resistant *E. coli* isolates. Isolates of *Staphylococcus* sp. were only found to be streptomycin resistant in the test group after application of streptomycin and not in the control group. Streptomycin resistant *Staphylococcus* sp contained the str gene. The proportion of streptomycin resistant *E. coli* and *Staphylococcus* sp. steadily increased in the test group of sheep with the four streptomycin applications to the pasture and then decreased 50 days after the last application to a level that was significantly higher than before the applications. In the control group the level of streptomycin resistant *E. coli* at the end of the observation period was the same as before the applications and remained zero for *Staphylococcus* sp. This study showed that the application of streptomycin on pastures selects for a multidrug-resistant flora in grazing animals.

Publications, posters and presentations

Scherer, A. (2011) Effect of agricultural use of streptomycin on the bacterial flora of animals. Inaugural Dissertation, Vetsuisse Faculty, Universität Bern

Project 1.10.03

Project duration October 2009 – July 2011