TITLE: ENTRY, OCCURRENCE, BEHAVIOR AND EFFECTS OF PHARMACEUTICALS IN THE ENVIRONMENT.

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ABSTRACT:
The entry, occurrence, behavior and effects of veterinary drugs in the environment have been intensively investigated during the last years. Due to their frequent use in amounts of several thousand tons worldwide, veterinary drugs, their metabolites and transformation products were found in the mg/kg range in cattle manure and pig slurry. The fertilization of soil with liquid manure transfers veterinary drugs in agricultural soils (>> 100 µg/kg) and subsequently to our ground water resources (lower µg/L-range). Furthermore, the transfer of veterinary antibiotics into plants and the occurrence in dust from animal confinement buildings has been reported.

Severe toxic effects of veterinary drugs in the environment have already been demonstrated for ivermectin and diclofenac. Exposure to ivermectin via the dung from treated animals results in a reduction in growth rate of various dung-inhabiting insects and in adult and larval mortality. The use of diclofenac for the treatment of cows and domestic goats in India led to a dramatic decline of at least three vulture species. The birds were exposed to toxic doses of diclofenac through consuming the carcasses of treated livestock.

The widespread use of antibiotics, e.g. tetracyclines, and sulfonamides, in livestock farming probably leads to more subtle environmental effects. There is evidence that antibiotic resistance genes arise in soil after manure application. Furthermore, effects on the soil microorganisms have been demonstrated including an ecological function disturbance and an impact on the diversity of the microbial soil community. However, a final assessment of the role of environmental residues of antibiotics in the development of antibiotic resistance in soil bacteria is still not possible.

Therefore, the entry of veterinary drugs into the environment should be reduced whenever possible. Various approaches including veterinarian, legislative and technological measures are necessary to reach this goal and will be discussed.