Veterinary Pharmaceuticals in the Environment: A Risk Analysis

Bradley Weis

Faculty Mentor: Lee E. Kirsch, PhD
Occurrence of pharmaceutical products in the environment is a critical environmental and human safety issue

- Toxicity to small organisms
- Unintended effects to humans
- Antibiotic resistance
Veterinary medicine has received increased focus for pharmaceutical occurrence in the environment

- Antibiotics used as feed additives
Veterinary medications get into the environment by a variety of means.

Objectives

- To demonstrate the need for further study in this area by outlining potential risks associated occurrence of veterinary pharmaceuticals in the environment

- Propose possible plan for future investigation
Methods

- Analyzed three drugs commonly used in veterinary medicine that have been shown to be prevalent in the environment
  - Ivermectin
  - Oxytetracycline
  - Trimethoprim
- Analyzed for alerting structures
Methods

- Accomplished through literature review
- Google Scholar search for “veterinary medicines in the environment”
  - Published since 2000
- Cross referenced results to narrow focus to ivermectin, oxytetracycline, trimethoprim
Methods

- Pubmed search for each drug’s degradation products
  - ivermectin [mesh] degradation - 60 results
  - oxytetracycline [mesh] degradation – 78
  - trimethoprim [mesh] degradation – 50
- Focus on photodegradation
Methods

- Analyzed parent compound and degradation product structure for alerting structures

Results

Ivermectin

Results

Oxytetracycline

Results

Trimethoprim

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Future Directions

- More studies need to be done to confirm degradation products
  - Utilize forced degradation schemes
Future Directions

- Confirm toxicity risk to humans
  - Utilize physiologically based pharmacokinetic model
  - Find NOAEL by exposing organism to compound
  - Compare that to estimated human pharmacokinetic profile
Conclusions

- Occurrence of veterinary pharmaceuticals in the environment may pose safety risk to environmental and human health

- Veterinary pharmaceuticals have a clear pathway into the environment, but it is less clear their fate once in the environment
Conclusions

- Ivermectin, oxytetracycline, and trimethoprim all exist in the environment

- Each drug has its own alarming structures that have potential to cause harm to both the environment and humans
Future studies need to be done in this area to confirm degradation products of veterinary pharmaceuticals and potential health risks associated with their occurrence and persistence in the environment.
References


5. Cain TG, Kolpin DW, Vargo JD, Wichman MD. “Occurrence of Antibiotics, Pharmaceuticals and Sterols at Select Surface and Wastewater Sites in Iowa.” University of Iowa (State) Hygienic Laboratory. 2004.


Questions?

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