

Best Management Practices to Prevent Veterinary Pharmaceutical Contamination of Water Bodies

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What is a BMP?

- BMPs are recommended methods, structures, or practices designed to prevent or reduce pollution while maintaining economic returns.
- Implicit within the BMP concept, are:
 - A voluntary, site-specific approach, and
 - Environmental and economic sustainability.

BMP Selection Criteria

- A recommended BMP must be:
 - Effective in reducing pollution
 - Affordable
 - Practical
 - Complementary with other types of pollution control



Types of Pharmaceutical BMPs

- Livestock Management
- Manure Management
- Land and Water Management



Livestock Management BMPs

- Antibiotic BMPs based on recommendations from the American Veterinary Medicine Association
- Two types:
 - 1) BMPs that reduce antibiotic use
 - 2) BMPs for antibiotic use

1) BMPs to Reduce Antibiotic Use

- Limit antibiotic therapy to sick animals.
- Emphasize preventative measures such as
 - Good hygiene
 - Routine health monitoring
 - Immunizations
- Consider other types of therapies before choosing antimicrobial therapy.
- Avoid antimicrobials for uncomplicated viral infections.



2) BMPs to Guide Antibiotic Use

- Only treat animals for as long as is necessary.
- Use narrow spectrum antibiotics whenever possible.
- Maintain accurate records regarding all antimicrobial use.



Manure Management BMPs

- Two types:
 - 1) BMPs that speed degradation of pharmaceuticals
 - 2) BMPs that limit off-site transport



1) BMPs to Speed Degradation of Pharmaceuticals

- Aeration speeds bio-degradation.
 - Lagoon aeration can reduce antibiotic and hormone concentrations in wastewater.
 - Actively composting (including turning as necessary to mix and aerate) speeds antibiotic removal.



1) BMPs to Speed Degradation of Pharmaceuticals

- Possible future BMP developments include the use of photolysis and phytoremediation.
 - Exposure to light speeds photolysis.
 - Phytoremediation can degrade tetracyclines and possibly other pharmaceuticals.



2) BMPs to Limit Off-site Transport

- Maintain ability to collect runoff from 25-yr, 24-hr storm at all times.
- Line retention ponds and lagoons to reduce seepage (and maintain liners).



2) BMPs to Limit Off-site Transport

- Site corrals and manure storage areas at least 150 ft from wellheads, creeks, or ponds.
- In humid regions, store manure under roofed areas.



Land and Water Management BMPs

- 1) Manure application BMPs
- 2) Soil conservation BMPs
- 3) Irrigation BMPs



Manure Application BMPs

- Make field-specific application decisions.
- For example, avoid
 - Sandy soils over shallow groundwater or tile drains OR
 - Clayey soils on steep slopes near surface water bodies



- Avoid application to saturated or frozen soils if possible.

Manure Application BMPs

- Incorporate immediately after application or inject manure directly belowground.



Soil Conservation BMPs

- Many pharmaceuticals are strongly sorbed to soil particles.
- Therefore, preventing soil erosion also prevents pharmaceutical contamination of surface water.
- For example, use:
 - Conservation tillage
 - Cover crops
 - Filter strips
 - Terracing
 - Strip cropping
 - Grassed waterways

Soil Conservation BMPs



Grassed waterway



Strip cropping






Terrace

Irrigation BMPs

- Avoid over-watering to prevent leaching and runoff.
 - Monitor soil moisture and irrigate based on crop needs.
- Manage irrigation systems for optimum uniformity and efficiency.



Conclusion



- Complementarity exists between pharmaceutical and nutrient BMPs.
- Therefore, many pharmaceutical BMPs overlap with nutrient BMPs already in practice.

Future Outlook for BMPs

- As our scientific knowledge base expands, we will be able to develop more effective BMPs to protect water bodies from pharmaceutical contamination.

