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Strengthening Biosecurity and Water Sanitation in Animal Husbandry practices: Prevention of Waterborne Diseases for Sustainable One Health

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Introduction

Water is indispensable for survival, production, and welfare and it is the lifeline of every animal. It keeps them hydrated, helps in digestion, controls body temperature, and drives all vital body functions. Yet, the same water that sustains life can also turn into a hidden enemy. When contaminated with germs, water becomes a vehicle for spreading dangerous diseases among livestock.

Waterborne diseases are illnesses that spread when animals drink or come into contact with contaminated water. Waterborne diseases are a silent but serious threat to animal health, farm productivity, and rural livelihoods. In many developing regions, where animals often depend on rivers, ponds, or open wells, the risk is especially high. Polluted water can carry bacteria, viruses, protozoa, and even worm eggs that cause diarrhoea, fever, poor growth, infertility, abortions, and sometimes even death in animals.

The losses go beyond animal suffering. Farmers face reduced milk yield, slower weight gain, increased costs of treatment, and even restrictions in trade. Young calves and poultry are the most vulnerable, but no species is fully safe. What makes the issue more worrying is that many of these waterborne germs like *Leptospira*, *Cryptosporidium*, *Giardia*, and *Salmonella* can also infect humans. In other words, unsafe water not only harms animals but also threatens human families who depend on them, highlighting the true "One Health" connection between animals, humans, and the environment.

Climate change is adding another layer of risk. Floods, droughts, and shifting patterns of disease-carrying vectors such as snails are increasing the chances of outbreaks. This makes it more urgent than ever for farmers, veterinarians, and policymakers to work together.

This article will explore the different types of waterborne diseases in animals such as bacterial, protozoal, viral, and helminthic, its causes, impacts, prevention, and what they mean for both animal and human health.

Waterborne Diseases

Major Bacterial diseases:

Animals, like humans, are highly vulnerable to diseases caused by contaminated water. When livestock drink from ponds, rivers, or wells polluted with sewage, manure, or floodwater, they can contract serious bacterial infections that affect their health and productivity. Common bacterial waterborne diseases in animals include salmonellosis, which causes diarrhoea, fever, and weakness in cattle, poultry, and pigs. Leptospirosis, often spread through water contaminated with rodent urine, leading to fever, jaundice, abortions, and even death in cattle, dogs, and horses. Colibacillosis, caused by *Escherichia coli*, which is particularly dangerous for young calves and poultry, resulting in severe diarrhoea and dehydration. Poor water quality also contributes to outbreaks of pasteurellosis and other bacterial infections in farm animals, especially under stress conditions. These diseases not only reduce milk, meat, and egg production but also increase veterinary costs and economic losses for farmers. In addition, many of these pathogens are zoonotic, meaning they can spread from animals to humans, creating a wider public health risk.

Viral diseases:

Water can act as a carrier for several viruses that affect farm animals, especially young ones.

Viruses such as rotavirus, adenovirus, and enterovirus are commonly spread through contaminated drinking water. In calves, lambs, and piglets, these viruses usually cause severe diarrhoea (scours), dehydration, weakness, and sometimes death if not treated on time. Viral outbreaks spread rapidly in herds because infected animals continue to shed the virus into water sources.

Protozoan diseases:

Tiny parasites called protozoa are another major cause of waterborne diseases in animals. Organisms like Cryptosporidium, Giardia, and Eimeria can survive for long periods in water tanks, ponds, or rivers. Once ingested, they infect the intestine, causing persistent diarrhoea, poor feed absorption, weight loss, and growth retardation in livestock. Cryptosporidiosis in particular is dangerous because it can spread to humans as well, highlighting the One Health risk of shared water contamination.

Parasitic Helminthic Infections:

Water and wet grazing fields also play a role in the life cycle of several worms (helminths) that infect animals. The most important is the liver fluke (*Fasciola* spp.), which spreads when animals graze near water plants or marshy areas. Fluke infection leads to liver damage, anemia, reduced milk yield, and poor body condition. Other helminths, including roundworms and tapeworms, may also use water as a route of infection. These parasites silently reduce animal productivity and increase treatment costs for farmers.

Risk Factors and Epidemiology

The spread of waterborne diseases is not random. It is influenced by specific risk factors and follows certain epidemiological patterns which help to understand when, where, and why outbreaks occur. The risk factors and epidemiology of waterborne animal diseases show that outbreaks are closely tied to environmental contamination, farm management practices, seasonal changes, and animal susceptibility.

Major Factors includes:

- Contaminated Water Sources: Animals often depend on ponds, canals, rivers, or stagnant water bodies for drinking. These water bodies are often get contaminated with sewage, manure, or carcass, making them prime reservoirs of pathogenic microbes.
- Poor Farm Sanitation and Drainage: Accumulation of animal waste, such as urine, slurry and dirty bedding around sheds increases the chances of microbial contamination of nearby water troughs. Further, without proper drainage, water stagnation becomes a breeding ground for pathogens.
- Rodents and Wildlife: Rodents are carriers of various microbes specially *Leptospira* spp., which its shed in urine. When rodents have free access to animal feed or water storage areas, they contaminate drinking water sources, leading to leptospirosis outbreaks. Similarly, wild birds and animals can spread diseases to domestic livestock.
- Climate and Seasonal Variation: Heavy rains, floods, and waterlogging increase bacterial survival and transmission. Outbreaks of leptospirosis and hemorrhagic septicemia are particularly common during monsoon months in South Asia and tropical regions. In contrast, dry seasons with limited clean water force animals to drink from unsafe stagnant sources.
- Overcrowding and Stress: When too many animals are kept together, water troughs are easily contaminated with saliva, faeces, and urine. Stress due to transport, heat, or poor nutrition lowers immunity, are also making animals more vulnerable to infections.
- Unhygienic Water Storage and Supply: In many farms, water for livestock is stored in open tanks or containers without covers. This allows dust, insects, and bird droppings to contaminate the supply and thereby increase the bacterial load.
- Zoonotic Spillover Risks: Close human-animal interaction on farms creates a two-way risk: humans may transmit bacteria to animals through contaminated handling, and animals may spread zoonotic pathogens back to humans through shared water, food, or direct contact. By maintaining water hygiene, farmers can protect their animals' health, safeguard their livelihood, and reduce the chances of bacterial diseases spilling over into human populations.
- Age and Species Susceptibility: Young animals like calves, lambs, kids, and chicks are more vulnerable because of their underdeveloped immune systems. For example, colibacillosis is particularly severe in neonatal calves and poultry. Cattle and buffaloes are highly prone to leptospirosis and pasteurellosis, while poultry often suffer from salmonellosis and *E. coli* infections.

- Geographical Distribution: Waterborne bacterial diseases are more common in tropical and subtropical regions where high rainfall, poor sanitation, and close human-animal contact prevail. In flood-prone areas of South Asia, Southeast Asia, and parts of Africa, leptospirosis and hemorrhagic septicemia outbreaks are frequent. In intensive poultry systems worldwide, salmonellosis and colibacillosis remain persistent threats.

Diagnosis and Surveillance

Waterborne diseases in animals are often difficult to recognize at an early stage because its signs such as diarrhoea, loss of appetite, weakness, and reduced milk or meat production can look very similar to other illnesses. Proper diagnosis therefore plays a key role in protecting animal health and farm livelihoods. Therefore, testing of water quality at regular interval is utmost important, which can alert farmers to the presence of harmful microbes before an outbreak occurs. Surveillance goes a step further by keeping watch over animal populations and water sources on a regular basis. It can be as simple as farmers reporting sudden cases of diarrhoea in calves. By combining on-farm vigilance, rapid diagnosis, and coordinated surveillance, waterborne animal diseases can be detected early, controlled faster, and prevented from spreading to humans, ensuring both healthy livestock and safer food for communities.

Prevention and Control Strategies: The prevention is always better than cure more cost-effective, and safer, even more critical under the One Health framework. While treatment of affected animals is important. Preventive measures like regular deworming, safe grazing practices, and proper drainage of waterlogged fields go a long way in protecting livestock from infections.

- Provision of Safe and Clean Water Supply
  - Protected water sources: Animals should drink from protected wells, borewells, or piped water instead of open ponds, rivers, or floodwater, which are more likely to be contaminated.
  - Water treatment: Simple measures like chlorination, or filtration can be used which significantly reduce bacterial load. In large farms.
  - Covered storage: Water tanks and troughs must be covered to prevent contamination by dust, rodents, birds, and insects.
- Farm Hygiene and Sanitation
  - Clean water troughs: Drinking containers should be washed and disinfected regularly to prevent bacterial buildup.
  - Proper drainage: Standing water near sheds acts as a reservoir for pathogens. Good drainage system prevents waterlogging and limits vectors and bacterial growth.
  - Waste management: Animal dung and urine must be disposed of systematically, either by composting or biogas plants, instead of being allowed to seep into water bodies.
- Rodent and Wildlife Control
  - Rodents are major carriers of *Leptospira*, while wild birds and stray animals can introduce *E. coli* or *Salmonella*.
  - Controlling rodent populations through traps, rodenticides, and keeping feed/water areas closed is essential.
  - stricked biosecurity measures specially boundary fencing can limit the entry of stray animals or wildlife into farm premises.
- Vaccination: On time Vaccination in animals is vital to protect from deadly and contagious diseases.
  - Hemorrhagic Septicemia: Vaccination before the rainy season in endemic zones prevents mass mortality.
  - Other bacterial diseases: Depending on local risk, vaccination against salmonellosis and colibacillosis may also be advised in poultry farms.
- Good Animal Husbandry Practices
  - Avoid overcrowding: Overcrowded sheds lead to faster contamination of water sources with faeces and urine.
  - Balanced nutrition: Well-fed animals have stronger immunity to resist bacterial infections.
  - Quarantine of new animals: Newly purchased animals should be kept separately for at least 2 weeks to prevent introduction of diseases into the herd.
- Seasonal and Climate-Responsive Measures
  - During rainy and flood seasons, extra precautions are needed as water contamination peaks. Animals should not be allowed to drink stagnant or floodwater.
  - During droughts, ensure adequate supply of clean water, as scarcity often forces animals to drink from unsafe water.

- Early Detection and Veterinary Care
  - Farmers should recognize early warning signs of waterborne diseases such as fever, diarrhoea, reduced appetite, jaundice, abortions, or sudden deaths.
  - Prompt reporting to veterinarians allows timely treatment and prevents spread within herds.
  - Sick animals must be isolated to avoid contaminating shared water sources.
- Farmer Awareness
  - Regular training programs and extension services are crucial to teach farmers about safe water, hygiene, and disease prevention.
  - Posters, charts, and infographics in local languages can simplify concepts for easy adoption at the grassroots level.
  - Awareness on zoonotic risks ensures farmers also protect themselves by wearing gloves, gumboots, and washing hands after handling animals.

Farmer's Checklist: Preventing Waterborne Animal Diseases

✓ Do's (Good Practices)

- Give animals only clean drinking water (from tube wells, bore wells, or protected tanks).
- Cover water tanks and troughs to keep out dust, birds, rodents, and insects.
- Clean and disinfect drinking troughs regularly (at least once a week).
- Provide proper drainage around animal sheds to avoid stagnant water.
- Dispose of dung and urine safely through composting or biogas units.
- Vaccinate animals regularly
- Control rodents and stray animals that contaminate feed and water.
- Quarantine new animals before mixing them with the herd.
- Observe animals daily for early signs of disease (fever, diarrhoea, reduced appetite, abortions).
- Call a veterinarian immediately if unusual sickness or deaths occur.
- Wash hands and wear gumboots when handling sick animals to protect yourself.

✗ Don'ts (Things to Avoid)

- Don't allow animals to drink from ponds, drains, or floodwater.
- Don't keep water in open containers where birds, rodents, or insects can enter.
- Don't let dirty bedding, dung, or urine mix with drinking water.
- Don't overcrowd animals — it spreads infections faster.
- Don't ignore signs like abortions, sudden deaths, or outbreaks of diarrhoea.
- Don't delay vaccination in high-risk seasons (especially before monsoon).
- Don't mix sick animals with healthy ones.
- Don't allow feed to be mixed with dirty or untreated water.

☞**Remember:**

Clean water = Healthy animals = More milk, meat, and profit for farmers

Conclusion

Waterborne diseases remain a serious hurdle to healthy and productive livestock, while also posing risks to human health. Germs such as bacteria, viruses, protozoa, and worms spread easily through contaminated water, leading to economic losses, poor animal growth, reduced milk and meat yield, and even zoonotic infections in people. The problem is made worse by climate change, antibiotic resistance, and poor sanitation in many farming regions. To overcome this, farmers and veterinarians must work together using a One Health approach. This means ensuring clean and safe water supply, maintaining good farm hygiene, practicing regular vaccination and deworming, and spreading awareness through farmer education. Looking ahead, new tools such as rapid diagnostics, vaccines for neglected pathogens, and better water management systems will be key to long-term control. Above all, the simplest and most powerful solution is also the most affordable: clean water. Safe water is truly the best medicine for animals, protecting livestock health, improving farm profits, and ensuring safe food and public health for everyone.

List of Major Waterborne Diseases in Animal

Type	Pathogens	Main Hosts	Clinical Signs in Animals
Viruses	**Rotavirus**	Calves, piglets, lambs, foals, poultry	Severe diarrhoea (scours), dehydration, weakness,

			high mortality in young animals
	Adenovirus	Cattle, sheep, goats, pigs, horses, poultry	Diarrhoea, respiratory problems, eye infection (conjunctivitis)
	Enterovirus	Cattle, pigs, sheep, goats	Diarrhoea, fever, poor appetite, sometimes nervous signs
	Hepatitis E virus	Pigs (main host), wild boar, deer, rabbits	Usually no signs in pigs, mild liver problems; important zoonotic risk
	Bovine Coronavirus	Cattle (calves & adults)	Diarrhoea in calves, winter dysentery in adults, cough & nasal discharge
	Calicivirus (Norovirus, Sapovirus, Vesivirus)	Cattle, pigs, dogs, cats	Diarrhoea, vomiting, poor feed intake, mild but spreads fast
	Astrovirus	Cattle, pigs, sheep, goats, poultry	Diarrhoea in young animals, sometimes nervous signs
Protozoa	***Cryptosporidium* spp.**	Calves, lambs, kids, foals, piglets, poultry	Watery diarrhoea, dehydration, weakness, weight loss
			(severe in young)
	Giardia	Calves, lambs, kids, dogs, cats	Chronic/intermittent diarrhoea, poor growth, rough coat
	Eimeria (Coccidia)	Cattle, sheep, goats, poultry, rabbits	Diarrhoea (sometimes bloody), poor weight gain, anemia, weakness, high mortality in young
	Balantidium coli	Pigs (main host), cattle (occasional)	Usually no signs; if severe → diarrhoea, dysentery, poor growth
	Toxoplasma gondii	Cats (main host), sheep, goats, pigs, poultry	Abortions, stillbirths, weak offspring; mild illness in pigs/poultry
Helminths (Worms)	**Liver fluke (*Fasciola*)**	Cattle, buffalo, sheep, goats	Chronic weight loss, anemia, bottle jaw, liver damage, less milk/meat
	Roundworms (*Ascaris*, *Toxocara*, etc.)	Cattle, buffalo, sheep, goats, pigs, horses, dogs	Poor growth, pot-belly, diarrhoea, weakness
	Tapeworms (*Moniezia*, *Taenia*,	Sheep, goats, cattle, buffalo, dogs (for	Diarrhoea, poor growth, cysts in

	Echinococcus)	Taenia/Echinococcus)	organs (economic loss at slaughter)
	Blood fluke (*Schistosoma*)	Cattle, buffalo, sheep, goats	Chronic diarrhoea, anemia, weight loss, edema, sometimes death
	Paramphistomiasis (Rumen fluke)	Cattle, buffalo, sheep, goats	Acute diarrhoea, dehydration, anorexia; chronic weakness, poor body condition
Bacteria	***E. coli* (Enterotoxigenic, Shiga toxin-producing)**	Calves, lambs, piglets, poultry	Neonatal diarrhoea, dehydration, sudden death in severe cases
	***Salmonella* spp.**	Cattle, pigs, poultry, sheep, goats	Enteritis (diarrhoea, sometimes bloody), fever, abortion, septicemia, high mortality
	***Leptospira* spp. (Leptospirosis)**	Cattle, buffalo, pigs, dogs, rodents (reservoirs)	Fever, jaundice, red/brown urine, abortions, reduced milk yield
	***Campylobacter* spp.**	Cattle, sheep, poultry	Diarrhoea, abortion in sheep/cattle, reduced fertility
	***Clostridium perfringens* (enterotoxemia)**	Sheep, goats, cattle, pigs	Sudden death, bloody diarrhoea, colic, enterotoxemia (“pulpy kidney”)
	Mycobacterium avium	Cattle, buffalo, sheep, goats	Chronic diarrhoea, wasting, poor milk yield

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