Managing human health risks of chicken litter application

Chicken litter can be the basis of a valuable and productive fertiliser for optimal dairy pasture production. It supplies nutrients, organic matter and trace elements.

Raw chicken litter may contain contaminants that present a potential threat to human health if permitted to enter the food chain or water resources. It is therefore important to use appropriate management techniques to minimise the risk of environmental contamination when applying chicken litter to pastures.

Potential risks to human health

Chicken litter may contain pathogens (potentially harmful organisms), antibiotics and antibiotic-resistance genes, hormones and heavy metals. Potential risks to human health and how best to manage the risk.

Pathogens

Pathogens such as bacteria and viruses can be present in chicken litter. Several affect only poultry or birds, but some may also be harmful to humans. Most of these are fragile organisms, which would not survive on pasture for the three-week withholding period recommended between application of chicken litter and allowing cattle to graze.

The health risks to the farmer from these pathogens can be minimised by good hygiene practices.

Further, the risk of pathogens contaminating milk after ingestion by dairy cattle is unlikely. Pasteurisation of milk also reduces the risk of pathogens surviving in dairy products. Therefore, consumers are most unlikely to be exposed to these pathogens.

The main pathogens and an assessment of potential risks to human health under Australian conditions:

Campylobacter coli/jejuni:

- a fragile organism that is unlikely to survive any drying or heating process e.g. spreading on pasture or composting
- known to survive on pasture for 10 to 20 days
- poultry are a primary reservoir where Campylobacter can be normal flora as well as cause of disease
- a major cause of human gastro-enteritis.

Potential contamination of pastures can be reduced by:

- exposure to the elements for three weeks prior to grazing
- composting chicken litter prior to application.

Risks to humans can be minimised by:

- good hygiene being practised by farmers
- pasteurisation protecting consumers of dairy products.

Staphylococcus aureus:

- infections are common in poultry
- 50% of poultry strains of S. aureus are capable of causing food poisoning in humans
- a relatively resistant organism that remains a risk to the dairy farmer handling chicken litter

Risks can be minimised by:

- good hygiene being practised by farmers
- pasteurisation of dairy products protecting consumers.

Clostridium spp:

- spore-forming organisms with a capacity to survive for prolonged periods in the environment

- Cl. perfringens and Cl. botulinum are widely distributed in the environment
- Cl. perfringens can cause gas gangrene and food poisoning in humans:
    - if present in chicken litter used as a fertiliser, there is no direct exposure of the consumer to the bacteria
    - the risk to farmers is considered low as there is no strong link of human infections back to poultry litter.
- Cl. botulinum can cause botulism - an acute intoxication
    - types C and D, which affect chickens and other animals including dairy cattle, do not cause disease in humans.

Salmonella spp:

- can be present in the gut of poultry in high numbers without any symptoms of disease
- shown to survive on pasture for up to 53 days
- can be destroyed by effective composting or deep-stacking of chicken litter prior to spreading on land
- typically causes acute enteritis in humans
- the most important route to the consumer is in foods contaminated by animal faeces.

Risk to humans is low due to:

- pasteurisation of dairy products
- types that cause serious diseases in humans are not likely to be found in chicken litter in Australia.

Escherichia coli:

- a common, normal bacteria in the gut of most mammals and birds
- most types in poultry are harmful to birds only and do not cause infections in humans
- the strains responsible for serious diseases in humans are mainly associated with inadequately cooked beef or sheep products.

Not likely to be a problem due to low prevalence in chickens.

Cryptosporidium:

- disease in humans is associated with reuse of human waste and exposure to cattle, sheep and pig waste
- causes fever and watery diarrhoea in humans.

Unlikely to be a problem in use of chicken litter as the type that infects chickens does not affect humans.

Erysipelothrix rhusiopathiae:

- more important disease in turkeys than chickens
- can survive for up to 14 days on pasture
- causes erysipeloid, a local skin lesion that occurs chiefly as an occupational disease of people handling and processing meat, poultry and fish.

Low prevalence means it is unlikely to be a risk when using chicken litter as a fertiliser.

Listeria monocytogenes:

- rarely reported in Australian poultry
- can cause serious diseases in humans.

Considered unlikely to be a significant pathogen in the use of chicken litter due to its rarity.

Mycobacterium avium:

- rare in Australia
- causes tuberculosis of poultry
- most human infections are associated with a different type to the type in chickens.

Due to its rarity, not likely to be a significant pathogen in the use of chicken litter.

Pasteurella multocida:

- causes fowl cholera, a severe septicaemic disease of chickens
- infection is rare in humans, generally being associated with cellulitis resulting from animal bites or licks.

A fragile organism that is not likely to present a significant risk in use of chicken litter.

Brachyspira (Serpulina) pilosicoli:

- in Australia, infection is unknown in broilers but common in older poultry
- it has been isolated in humans.

A fragile organism that is susceptible to drying and considered unlikely to be a significant pathogen in the use of chicken litter.

Yersinia pseudotuberculosis:

- causes septicaemia in poultry
- causes diarrhoea and septicaemia in humans.

Rare in Australian poultry so unlikely to play a role in litter reuse.

Rotavirus:

- causes enteritis and diarrhoea in chickens
- major cause of diarrhoea in humans especially young children.

Avian types do not affect mammals so it is not a significant pathogen in litter reuse.

Parasites:

- the parasites of poultry, both worms and coccidia, are not transmissible to humans.

Antibiotics

- Antibiotics including growth promotants and anti-coccidial agents:
- likely to be present at only low levels and persist for a short time in chicken litter
- spreading chicken litter on pasture and exposure to sunlight should ensure these substances breakdown rapidly.

Antibiotic-resistant bacteria

- Antibiotic-resistant forms of Salmonella, Campylobacter, E. coli and Listeria are either known, or are expected to exist.
- Overseas there is emerging evidence of a link between animal production facilities and infections in humans associated with antibiotic resistant bacteria.

No data available on levels of resistance in bacteria in Australian chicken litter.

Any potential risks can be minimised by:

- good hygiene being practised by farmers
- pasteurisation of dairy products protecting consumers.

Hormones

Supplementary hormones are not used in the Australian broiler industry.

Natural hormones (excreted by chickens):

- little research has been done in Australia on the presence of natural hormones in the environment as a result of using chicken litter as fertiliser.

If hormones are present in chicken litter, the risk of accumulation in the environment should be minimised by:

- dilution, when spread on pastures
- breakdown, when exposed to the elements during the three-week spelling period after application
- ensuring run-off into waterways is minimal.

Heavy metals

Heavy metals need to be monitored to ensure high levels do not accumulate in the soil. High levels in soil may be consumed by cattle or run off into waterways and end up in the human food chain.

Heavy metals may be found in chicken litter as:

- trace elements fed to poultry
- contaminants of bedding material.

Australian studies on heavy metals in chicken litter have shown:

- few problems are expected with heavy metals in chicken litter used as a fertiliser
- copper and zinc levels sometimes exceeded recommended guidelines for unrestricted compost use
- copper and zinc are required for plant and animal growth but excess amounts can affect soil fauna such as earthworms and could affect livestock health
- arsenic levels were generally below guideline levels
- no other heavy metals are considered a cause for concern.

To minimise heavy metal accumulation:

- limit rate of chicken litter application to pasture requirements
- minimise run-off into waterways.

Managing health risks to humans

Pathogens, nutrients and other contaminants that may be present in chicken litter can become a threat to humans if they build up on pastures and disperse into the environment potentially entering waterways and the food chain.

Transport of contaminants into the surrounding environment can occur by:

- run-off into surrounding surface water
- leaching into ground water
- wind.

Appropriate management is important to limit these risks.

Application needs to:

- optimise the rate to match the uptake of nutrients by pastures
- minimise the build up of excess nutrients and contaminants in the soil
- avoid windy conditions that increase the risk of inappropriate dispersal.

Management techniques are required to:

- monitor nutrients levels in the soil
- minimise the concentration of contaminants in run-off and leaching
- minimise the volume of run-off and leaching.

The key to the control of environmental contamination lies in:

- applying chicken litter to meet crop requirements and maximise crop development, without excessive nutrient build-up
- monitoring of soil to check for build-up of nutrients
- assessing the location to minimise the risk of run-off
- applying appropriate management techniques to limit run-off volume and content, to minimise contamination of waterways.

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