

Appendix 2.

Managing human exposure to contaminants

Feedlot wastes include a range of pathogens and may contain traces of hormonal growth promotants (HGPs), paraciticides and other chemicals used within the feedlot. This appendix outlines the main areas and activities where people may be exposed to these contaminants and describes practical ways to minimise risks.

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Risk assessment

An assessment of the risks that pathogens and chemicals in feedlot wastes pose to humans found that

- Pen manure is the waste of most concern.
- Fine particles in the air, particularly from pen manure, pose a relatively high risk.
- Pathogens pose most risk, although there are practical ways to reduce their numbers.
- The overall risk to people posed by hormones and paraciticides in manure is low to negligible, even under high exposure.

Contaminants in feedlot manure

The most abundant pathogens in manure from Australian feedlots are

- (EHEC/EPEC) *E. coli* group
- *Listeria monocytogenes*
- *Campylobacter jejuni*
- *Cryptosporidium parvum*
- *Giardia lamblia*.

Less abundant, but still sporadically detected, are

- *Salmonella enterica*
- *Yersinia pseudotuberculosis*
- *Leptospira* spp
- *Coxiella burnetii* (Q Fever)
- *Mycobacterium paratuberculosis*.

Chemicals are generally present in low concentrations, if at all.

General recommendations

– for staff

A number of practices will help to protect staff.

Management should

- have high quality (P2) face masks available for staff working under dusty conditions, and encourage staff to use these.
- avoid transporting or handling very dry manure. Consider wetting the manure beforehand, or moving or handling it when it is damp e.g. early morning or after light rain.
- provide machinery with an enclosed cab and recirculated air conditioning.
- fit offices with air filters.

- make staff aware that
 - fine pen dust poses the greatest risk
 - manure, particularly pen manure, contains pathogens that may cause illnesses
 - health risks can be minimised by adopting good hygiene practices. Staff should always wash their hands well after handling manure, compost, effluent or mortalities, especially before touching food, eating or drinking utensils, their eyes or other people.

Staff should avoid or minimise

- pen riding or other work in the pen area under dusty conditions e.g. windy days or later in the afternoon when there is increased cattle activity.
- working downwind of dusty activities for long periods without protection.
- disturbing, moving or transporting dry pen manure.
- interaction with dust on machinery, fences and roads.

– for feedlot visitors

Recommendations for on-farm visitors include

- discouraging people from visiting the feedlot if they have a medical condition that reduces their immunity, are pregnant or are accompanied by children.
- making visitors aware that:
 - feedlot wastes, particularly pen manure, contains pathogens that may cause illnesses
 - fine pen dust poses the greatest risk
 - health risks can be minimised by adopting the same good hygiene practices recommended for staff.

Reducing risk

– from manure handling

The following are recommendations for those handling manure

- Minimise dust generation and exposure during pen cleaning and initial handling of harvested manure. For instance, avoid pen areas during cleaning unless wearing a protective mask or staying within an enclosed cab.
- Avoid frequent exposure to dust plumes from aged manure and compost. Infrequent periodic exposure is less of a concern.

- Standardise manure processing methods to minimise risk and maximise pathogen destruction e.g. regularly measuring windrow temperatures and ensuring sufficient storage time before utilisation.
- Composting or other disinfection is strongly recommended before manure and effluent are utilised or sent off-site. Pathogens are inactivated by high manure temperatures so all material must be exposed to heat. Monitor windrows to ensure they heat up and maintain temperatures of >55°C for at least three consecutive days then turn. Repeat two more times. Higher temperatures will promote more rapid destruction. As a guide, composting manure for two months should minimise the most abundant pathogens. Windrow storage alone is insufficient.
- A windrow monitoring and recording system should include
 - recording of the date each windrow is started, turned, watered or amended
 - regular measurement of the core temperature at ten points within each windrow to ensure high temperatures are sustained for sufficient time (at least three consecutive days) after each windrow turn
 - details of the types and amounts of any amendments used.
- Pathogen destruction can be verified using E. coli and enterococci testing, e.g. Enterolert™ and Colilert™ to ensure numbers are <10 mpn/g (mpn = most probable number).

– from manure utilisation

Recommendations covering manure utilisation and transport include

- Do not spread manure during windy conditions.
- Avoid spreading very dry manure.
- Do not use spinning disc spreaders without dust management (e.g. sufficient moisture content in manure to minimise releases of fine aerosols).
- Before exporting manure, store for at least two to four months to reduce pathogen numbers.
- Compost manure using best management practices before sending off-site.
- Provide manure recipients with information about the pathogens that may be in manure and compost, and ways to avoid exposure.

- Ensure that recipients are aware of the need to provide appropriate warnings, disinfection /processing summaries and possibly microbiological quality control test data with commercially sold material.
- Cover loads of composted and aged manure if they are to be transported along public roads.
- Manure from grazing cattle would normally contain much higher pathogen loads than any composted or aged manure. Thus the use of manure for broadacre farming is reasonable.
- Do not spread manure when rain is expected or under overcast conditions.
- If manure or compost will be utilised in horticulture and organic farming, ensure pasteurisation is effective.

– from effluent utilisation

Recommendations pertaining to effluent irrigation include

- Make staff aware that effluent is likely to have a high pathogen content.
- If possible, store the effluent for at least a month before irrigation.
- Effluent should be irrigated only when the soil is dry and no immediate rain is forecast.
- Low-pressure spray irrigation is recommended.
- Avoid high-pressure irrigation systems that generate aerosols.
- Avoid working downwind of spray irrigators.
- Avoid irrigating on windy days.
- Flood irrigation reduces aerosols. Well-designed flood systems are recommended where suitable.
- Keep vegetated buffers between utilisation areas and watercourses and farm boundaries.
- Irrigate the effluent evenly and at environmentally sustainable nutrient rates.

– to livestock accessing utilisation areas

To reduce the pathogen risks to livestock grazing utilisation areas

- Apply a withholding period of 21 days after spreading manure or effluent, including tailwater and stormwater runoff from utilisation areas.
- Do not irrigate effluent onto a hay or silage crop during the week before harvest.
- Do not spread carcass compost onto areas being grazed by livestock.

Further reading

DAFF 2011, Using weather conditions to reduce odour impacts, Department of Agriculture, Fisheries and Forestry, Brisbane, Qld.

Roser D, Tucker R, Khan S, Klein M, Coleman H, Brown L, et al. 2011, Microbiological and chemical human health risks arising from cattle feedlot wastes: Their characterisation and management, Report for MLA Project FLOT.333: Managing the Contaminants in Feedlot Wastes, Meat & Livestock Australia, North Sydney, NSW.

Wilkinson KG. 2007, 'The biosecurity of on-farm mortality composting', *Journal of Applied Microbiology*, 102:609–618.