

**ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD**

**FRUIT AND VEGETABLES : FSA WORK ON MANURES AND SLURRIES**

1. The attached paper outlines the work being undertaken by the FSA in relation to the spreading of organic waste on agricultural land and the microbiological safety of fruit and vegetables.
2. A programme of research has been underway since 1999 and draft guidance has recently been produced for farmers on the use of manures, aimed at minimising the risks of microbiological contamination of ready to eat crops. Member are invited to comment on the guidance.
3. The paper will be introduced by Dr Jonathan Back.

Secretariat  
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## **FRUIT AND VEGETABLES : FSA WORK ON MANURES AND SLURRIES**

1. Over the past few years there has been increasing concern over the potential risk of the transfer of pathogens to food via the spreading of organic waste on agricultural land. The House of Commons Select Committee for the Environment, Transport and Regional Affairs and the Commons Agriculture Select Committee on Food Safety both examined the disposal of organic wastes in 1998. In response to their reports, the Government stated that it intended to set in place a structured programme of research and risk assessment into the use of all organic wastes on land. DETR, Water UK and the Environment Agency subsequently began a programme of research on sewage sludge and MAFF (later the Food Standards Agency) began a programme on manures and abattoir waste.
2. Very little information was found to exist on levels of pathogens in manures and abattoir waste. The research programme was therefore aimed at providing a significant body of data from laboratory and field experiments as well as surveillance.
3. Two projects were commissioned to obtain this data:
  - A major project (BO5003) on pathogen levels in fresh and stored manures and survival during storage and after application to land.
  - A smaller project (BO5008) on pathogen levels in abattoir waste (blood, gut contents and lairage)
4. The results of the research would then be used in a risk assessment. The outcome of which should enable the Food Standards Agency to assess whether further action is required to ensure the microbiological safety of fruit and vegetables. Details of the research projects commissioned under this programme can be found in Annex 1.
5. It was felt important that action should be taken to ensure food safety before the outcome of the risk assessment. Sufficient knowledge on good practice was believed to exist to be able to produce guidance for farmers on the use of manures in relation to the highest risk crops. Therefore, before any experimental work was undertaken, a report was commissioned entitled 'A study of farm manure applications to agricultural land and an assessment of the risks of pathogen transfer into the food chain' (FS2526). The report highlighted best practice in relation to manure/slurry storage and spreading and was used (in conjunction with the initial results of the research) to develop guidance for farmers on minimising the risks of microbiological contamination of ready to eat crops (Annex 2).
6. The FSA is shortly to carry out a public consultation on these guidelines in order to obtain feedback, particularly from parties involved in the fruit and vegetable industry, on the implications and practicality of the proposals. A stakeholder workshop is also being held as part of the consultation process.

7. In addition to the work being carried out on manures and abattoir waste, a review was commissioned on the potential risks to food safety from the use of water in agriculture. This may point towards where further research is needed and/or where guidance to farmers on best practice is required.
8. A programme review will be held once all the projects have finished in early 2003. A decision will then be taken on whether there is a need for further research. The outcome of the risk assessment may also point to areas where more data is required.

**ANNEX 1**

<b>Project code</b>	<b>Project Title</b>	<b>Contractor</b>	<b>Start date</b>	<b>End date</b>	<b>Cost</b>
FS2526	A study on farm manure application to agricultural land and the risks of pathogen transfer into the food chain	ADAS	1.6.99	30.11.99	£52,000
BO5003/4	Pathogens in animal manures: their levels and survival both during storage and following application to agricultural land	ADAS University of Southampton	1.7.99	28.2.03	£887,828
BO5008	The levels of pathogens in abattoir waste	University of Bristol	1.11.99	31.5.02	£293,847
B17001	A review of the use of water in UK agriculture and the potential risks to food safety	ADAS	1.5.01	28.2.02	£57,563
B17002	Assessment of the risks to food safety associated with spreading of animal manure and abattoir waste on agricultural land	WRc-NSF	1.5.01	30.4.02	£48,753

**DRAFT**

**MANAGING FARM MANURES FOR  
FOOD SAFETY**

**Guidelines for Growers to Minimise the Risks of  
Microbiological Contamination of Ready to Eat Crops**

## **INTRODUCTION**

Farm manures (both solid manures and slurries) are applied to agricultural land to meet crop nutrient requirements and to improve soil fertility. Around 90 million tonnes of farm manures are applied to approximately 4 million hectares of agricultural land each year in the UK. These manures can contain pathogenic microorganisms (e.g. *E.coli* O157, *Salmonella*, *Listeria*, *Campylobacter*, *Cryptosporidium* and *Giardia*) which may cause food borne illness. The number of microorganisms in manures is affected by factors such as the age, diet and management of animals, as well as regional and seasonal influences.

The management and handling of farm manures, particularly the length of time they are stored, are important factors in the survival of microorganisms. The method and timing of manure applications to land can affect the length of time that pathogens survive in the soil, and the likelihood of their getting onto food crops. In order to reduce any risks of food borne illness resulting from the use of farm manures, there is a need for due diligence in the growing, harvesting and packing of ready to eat crops.

### **Scope**

This booklet provides practical guidance on ways of reducing the risks of food borne illness resulting from the microbiological contamination of ready to eat crops by farm manures. It is equally applicable to both conventional and organic growers.

The best way to minimise the risks of food borne illness from ready to eat crops is to prevent contamination. Four key stages in reducing the risks of microbial contamination are outlined in this guidance note.

### **What Crops Pose the Greatest Risks?**

The microbiological contamination of crops that are unlikely to be cooked before they are eaten is a risk to human health. Such crops include salads, fruit and some vegetables - commonly referred to as ready to eat crops. Crops with a short growing season, such as salads and strawberries, are particularly vulnerable. Up to 10% of the area growing ready to eat crops may receive farm manures prior to planting.

Washing crops thoroughly after harvest will significantly reduce the risks of food borne illness. However, not all crops are routinely washed so other precautions must be taken.

## Sources of Microbial Contamination

Contamination by farm manures may occur through:-

- Application to land before a crop is established
- Application to growing crops
- Runoff from solid manure field heaps
- Leaking or overflowing solid manure stores and slurry lagoons
- Transfer via contaminated equipment and vehicles
- Aerosol or windborne contamination
- Contamination of surface and irrigation water by livestock or manures.
- Livestock having access to cropped areas

## What Kills Pathogenic Microorganisms?

Pathogens can be killed either in the manure itself or after application to land. The main factors that will lead to a reduction in numbers are:-

- **Temperature** – in general, the higher the temperature the greater the level of kill, with temperatures above 55°C being particularly effective. Freezing can also reduce numbers.
- **Sunlight** – exposure to sunlight and in particular ultra violet radiation will significantly increase die off.
- **pH** – microorganisms generally survive best at a neutral pH. A low pH (acid) or high pH (alkaline) environment will speed up the rate of kill.
- **Drying** – microorganism numbers are generally reduced by drying.
- **Time** – pathogenic microorganisms die out over time. The rate at which this happens depends on environmental conditions. In some conditions they can survive for several months.

## **STAGE 1 – MINIMISING RISKS BEFORE CROP ESTABLISHMENT**

Pathogens such as *E.coli* O157 can survive in soil for several months following the spreading of farm manures or deposition during grazing. They may also be present in dirty water, yard runoff and leachate from stored manures.

### **Site Selection**

You can minimise the risks of microbiological contamination by careful choice of where you grow the crop. Where possible:-

- Avoid fields that have recently received manure or have been used for livestock grazing. This may be difficult where the nutrient supply and soil conditioning benefits of manure are fundamental to the system. Consider if you can adopt a rotational manuring policy and apply manures before a lower risk crop, such as a cereal.
- Minimise the risks of airborne contamination, by choosing fields that are not adjacent to livestock units.
- Avoid fields where there is a risk of surface runoff from yards or manure storage areas.

### **Use of Fresh Manure**

**You should NOT apply fresh manure to land where you intend to grow ready to eat crops, unless there will be at least a 6 months period between the manure application and harvest.**

Dung deposited by livestock should also be considered as a potential source of pathogens.

**You should leave at least a 4 months gap between livestock last being in the field and harvest of a subsequent ready to eat crop**

### **Use of Stored and Treated Manure**

The *batch storage* of solid manures and slurries for at least 3 months (i.e. no additions of fresh manure are made to the store during this period) or ‘active’ treatment, are effective methods of killing pathogens.

*Composting* is a particularly effective method of controlling pathogens in *solid* manures, but for best results needs to be actively managed. Turn the manure regularly (at least twice) either with a front-end loader or preferably a purpose built compost turner. This should generate high temperatures over a period of time (e.g. >55° C for 3 days) which are effective in killing pathogens.

Other forms of ‘active’ treatment, which are particularly suited to the treatment of *slurries* and can result in a significant reduction in pathogens are:-



- **anaerobic digestion** (typically at 30-35° C with 12 days retention for pig slurry or 20 days for cattle and poultry slurry).
- **lime treatment** (addition of quick lime or slaked lime to raise the pH to 12 for at least 2 hours).

**You should NOT apply batch stored or treated manures to land where you intend to grow ready to eat crops, unless there will be at least a 2 months period between the manure application and harvest**

### **Land Application and Soil Incorporation**

To make best use of manure nutrients and to minimise air and water pollution, you should follow advice in the relevant Codes of Good Agricultural Practice (see Sources of Information and Advice).

Design and locate manure storage areas to ensure that water pollution risks are minimised. This should include adequate containment measures.

Apply manures uniformly and with due regard to the environment. Observe any no spreading zones (e.g. next to watercourses or boreholes) identified in a Farm Waste Management Plan. This will minimise the risks of runoff and indirect contamination of nearby crops. Keep a detailed record of manure application date, type and rate.

Although pathogens can be killed by exposure to sunlight, you should incorporate manures into the soil as soon as is practicable, as this will reduce the potential for direct crop contamination and also reduce odour and ammonia emissions.

## **STAGE 2 - MINIMISING RISKS AFTER CROP ESTABLISHMENT AND DURING THE GROWING SEASON**

### **Manure Applications**

Manure should not come into direct contact with ready to eat crops during the growing season.

**Do NOT apply manure to ready to eat crops during the growing season**

### **Field Operations**

Avoid spreading manure on neighbouring fields if runoff will be a potential source of contamination of growing crops. Spreading is a potential source of wind borne contamination. Use low trajectory equipment and do not spread manures on windy days upwind of ready to eat crops.

Whenever working in ready to eat crops ensure that equipment is clean. Do not drive vehicles through any manure or effluent on the way to the field.

### **Irrigation and Water Use**

Water used on the farm is a potential route of microbiological contamination. It is very important that manure storage areas and field heaps do not contaminate watercourses or sources of irrigation water.

### **Keep Livestock out of Growing Crops**

As far as possible, you should prevent livestock from having access to ready to eat crops. Where necessary, check that fences and hedges are stock proof. Ask the public to keep dogs on leads where footpaths run through cropped areas.

## **STAGE 3 – MINIMISING RISKS AFTER HARVEST**

The following guidance should be read in conjunction with other advice on good worker hygiene, packing and storage protocols and maintenance of temperature regimes.

### **Harvesting**

Ensure that all harvesting machinery and equipment are clean. Do not drive vehicles through any manure or effluent between the field and the packhouse.

When you harvest ready to eat crops, make sure that containers and packaging are clean. Take particular care if the crops are packed in the field and will not be washed. Keep all animals and birds out of packhouses and storage areas.

### **Produce Washing**

The main risks of contamination after harvest relate to the possible contamination of water used for washing or transporting produce. Use only potable water for washing produce and transporting produce in flumes.

## **STAGE 4 - GENERAL MANAGEMENT**

You should include the handling, storage and application of farm manures in your assessment and control of microbiological hazards, and in your Control of Substances Hazardous to Health (COSHH) assessment.

Record all manure applications on a field by field basis detailing the type, rate, date of application, source and management of the manure before spreading.

Always follow Good Agricultural Practice and guidance in the relevant Codes (see Sources of Information and Advice)

You can obtain further guidance on worker hygiene and ways to minimise the risks of microbiological contamination from amongst others, the Fresh Produce Consortium.

## Sources of Information and Advice

**Available free from DEFRA Publications, Tel: 08459 556 000 or [www.defra.gov.uk/envIRON/cogap/cogap.htm](http://www.defra.gov.uk/envIRON/cogap/cogap.htm)**

- The Water Code (Code of Good Agricultural Practice for the Protection of Water) - PB0587. *Information on farm waste management plans and avoiding water pollution.*
- The Air Code (Code of Good Agricultural Practice for the Protection of Air) - PB0618. *Information on farm waste treatment, minimising odours and ammonia losses*
- The Soil Code (Code of Good Agricultural Practice for the Protection of Soil) - PB0617. *Information on soil fertility, erosion and contamination.*
- Code of Practice for the Management of Agricultural and Horticultural Waste, MAFF/WOAD/SOAEFD . The code describes measures for minimising plant health risks from the management of agricultural and horticultural wastes.

**Available free from SEERAD, Tel: 0131 244 6360**

- Code for Prevention of Environmental Pollution from Agricultural Activity (PEPFAA), SOAEFD. *Information on preventing pollution from agricultural operations and activities.*

**Available from DANI, Tel: 02890 525041**

- The Code of Good Agricultural Practice: Preventing pollution by solid manures – number 5.
- The Code of Good Agricultural practice: Preventing pollution by slurry – number 2

**Available free from local Health and Safety Executive offices**

- HSE Preventing Access to Effluent Storage and Similar Areas on Farms. HSE Information sheet AIS 9.

**Available free from ADAS, Tel: 01623 844331 or [www.defra.gov.uk/envIRON/pollute/farmwaste.htm](http://www.defra.gov.uk/envIRON/pollute/farmwaste.htm)**

- Managing Livestock Manures: Booklet 1 – Making better use of livestock manures on arable land. ADAS, IGER, SRI
- Managing Livestock Manures: Booklet 3 – Spreading systems for slurries and solid manures. SRI, ADAS, IGER

**Available free from DEFRA, Tel: 08459 335577**

- Farm Waste Management Plan: A step-step guide for farmers. MAFF/WOAD.

**Available from the Fresh Produce Consortium Tel: 020 7627 3391**

*The Control of Microbial Hazards – A Produce Industry Guide.* Provides comprehensive guidance on controlling microbial hazards.

**Fertiliser Recommendations for Agricultural and Horticultural Crops** - MAFF (RB 209) 7<sup>th</sup> Edition. *Comprehensive reference book on the use of organic manures and inorganic fertilisers.* Seventh edition 2000, available from The Stationery Office (£15)

**National Farm Waste Management Plan Register** – a list of local consultants who can provide professional advice on waste management planning. Tel: 01398 361 566

**The Soil Association** or [www.soilassociation.org](http://www.soilassociation.org) – provides information and guidance for organic farmers and growers. Tel: 0117 9290661

## **Managing Farm Manures for Food Safety**

### **Guidelines for growers to minimise the risks of microbiological contamination of ready to eat crops**

#### **STAGE 1 – BEFORE CROP ESTABLISHMENT**

- Select fields carefully so as to minimise the risks of indirect contamination via surface runoff from manure heaps and stores, or following the land spreading of manures
- You should NOT apply fresh solid manures and slurries within **6 months** of harvest
- You should NOT apply treated or batch stored solid manures and slurries within **2 months** of harvest
- Allow at least **4 months** between livestock last being in the field and harvest

#### **STAGE 2 – DURING GROWING SEASON**

- Do NOT apply manure to ready to eat crops during the **growing season**
- Store solid manures and slurries well away from growing areas
- Avoid contamination of growing crops e.g. from aerosol and windborne drift during manure spreading, or by runoff from adjacent fields where manure has been spread.
- Ensure water sources used on the farm are not contaminated with pathogens
- Ensure all equipment (including vehicles) is clean
- Keep livestock out of cropped areas

#### **STAGE 3 – AFTER HARVEST**

- Ensure all equipment (including vehicles) is clean
- Only use potable water for washing produce and transportation flumes
- Keep livestock away from packing and storage areas
- Ensure staff observe good hygiene practices

#### **STAGE 4 – GENERAL MANAGEMENT**

- Include manure handling, storage and application in your assessment and control of microbiological hazards, and COSHH assessment
- Record all manure applications on a field by field basis
- Make all manure applications according to guidelines in the relevant Codes of Good Agricultural Practice.