Meat technology update

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Safety in the Microbiological Testing Laboratory

Many export and domestic meat plants are now testing meat for *E. coli* and/or total counts and some are testing meat for *Salmonella*. This publication is an update on No. 95/4, 'Facilities and Resources Necessary for Microbiological Testing at Meatworks'.

These are guidelines only. In the case of export, as mentioned in the AQIS Notice 96/46, it is a requirement that all on-plant laboratories will have a form of NATA accreditation and pass an approved proficiency testing program (criteria for which are being developed by an Industry-AQIS-NATA working party). The NATA accreditation and proficiency testing program for export plants will also require on-plant laboratories to comply with other relevant occupational and safety requirements.

Microbial testing involves culturing organisms so that a few bacterial cells grow into many millions. If the test is a total plate count it is probable that most of the organisms being cultured are harmless, but there could be some pathogenic bacteria on a total plate count. There is a greater risk that pathogenic organisms may be present in large numbers on a coliform or *E. coli* plate.

Prevention of transfer of bacteria to meat or people must be ensured:

- In Australian Standard AS/NZS 2243.3:1995, it is stated that a sound knowledge and use of good laboratory practices are of the utmost importance in the safe handling of infectious material.

- When pathogenic organisms are cultured, there may be a health risk, both to the person carrying out the test and to other people in the vicinity. Australian Standard AS/NZS 2243.3:1995 sets out the conditions needed to handle bacteria in a laboratory.

It must be remembered that even on non-selective media, e.g. those used for total aerobic counts from work surfaces, there may be colonies of pathogens. All bacterial cultures should be treated as being potentially pathogenic and should be disposed of using the procedures set out in AS/NZS 2243.3:1995 and summarised below.

For several pathogens (e.g. *Salmonella*), microbiological standards or specifications require their absence in 25 g (or larger) samples. Neither the traditional analytical procedures nor the newer rapid ones are sufficiently sensitive to be able to directly detect low numbers of bacterial cells without a preparatory stage. Preparatory or

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enrichment stages (or resuscitation steps) are required to encourage any cells that are present to recover from injury and multiply in numbers to many thousands per gram of sample. These enrichment stages are necessary, but risky if laboratory procedures are inappropriate.

The Australian Standard classifies microorganisms according to the degree of hazard or risk. The classification is based on pathogenicity of the agent, mode of transmission, host range of the agent, availability of effective preventive measures and availability of effective treatment.

The Australian Standard describes how laboratories should be designated according to the required physical containment level. The physical containment level generally corresponds to the risk group of the organisms being cultured but AS/NZS 2243.3:1995 states that food industry laboratories can be designated as physical containment level 1. The Standard lists the laboratory facilities and practices for physical containment level 1.

Meatworks' laboratories working with *Salmonella*, and other pathogens, should meet the more stringent requirements (physical containment level 2.).

Australian Standard AS.2982-1987 sets out laboratory construction requirements. This Standard should be consulted in addition to the Standards on safety in microbiological laboratories.

This Meat Technology Update gives **recommendations as to the microbiological testing facilities, practices and personal hygiene which should apply in plants which are not testing for pathogens.**

Laboratory facilities

The laboratory should be supplied with adequate illumination.

Open spaces between and under benches, cabinets and equipment should be accessible for cleaning.

The work surfaces, walls, ceilings and floors of the laboratory should be smooth, easy to clean, impermeable to water and resistant to commonly used re-agents and disinfectants.

The bench top surfaces should be resistant to solvents and able to withstand heat generated by general laboratory procedures:

Where the laboratory is provided with open windows, fly-screens should be fitted.

A hand wash basin - with hot and cold water services - should be provided, preferably near to the exit (to facilitate hand washing before leaving the laboratory). The taps should be of the type that can be operated without being touched by hand. Hand sanitisor and paper towels should also be provided.

Internal fittings and fixtures, such as lights, air ducts and utility pipes should be arranged to minimise the horizontal surface area on which dust can settle.

Facilities, separate from the work bench, should be provided for reference documents and for writing reports.

Work practices

The laboratory supervisor should be properly qualified and ensure that access to the laboratory by casual visitors, especially other employees, is restricted (i.e. adequate separation from plant and plant personnel).

Management should provide lockers and laundry facilities for laboratory clothing, and eating, drinking and rest areas outside the laboratory.

Food or drink should not be present, or consumed, within the laboratory. Smoking and the application of cosmetics should not be allowed in the laboratory.

Protective clothing should be worn at all times. It must be laundered regularly and separately from protective clothing of meat handlers. Closed footwear should be worn.

There must be an on-site safety officer, whose responsibilities must include the establishment and maintenance of a laboratory safety system, including the preparation of a laboratory safety manual.

Safety glasses, face shields and other protective devices should be worn where appropriate to protect eyes and face from splashes and other hazards.

Mouth pipetting should be prohibited. Rules for the correct use of pipetting devices and syringes should be followed. Blowing out residual volumes from pipettes creates aerosols; therefore it is preferable to use pipettes calibrated to deliver.

Work benches should be decontaminated following spills, and also when work is completed.

Special precautions should be taken to ensure that reading and writing materials do not become contaminated.

Labels should not be moistened with the tongue. The use of self-adhesive labels is preferred.

Laboratory staff should disinfect work benches and other surfaces after working on them as final laboratory work procedures each day. A list of effective disinfectants is given in AS/NZS 2243.3:1995

Laboratory waste should be decontaminated prior to disposal. If desired, decontamination may be performed with household bleach that has been appropriately diluted. (See AS/NZS 2243.3:1995, Table B1.)

Particular care is to be taken when carrying material likely to contain live organisms between laboratories, and to autoclaves. All infectious materials are to be sterilised by autoclaving or by chemical disinfection and then preferably disposed of by incineration.

Personal hygiene

It is essential that all personnel handling any bacterial cultures pay particular attention to personal hygiene.

Hands must be washed using bactericidal soap both before and after handling bacterial testing materials.
Hands should also be washed before and after carrying out tests on work surfaces, equipment or meat surfaces.

Staff should remove laboratory coats, store them in the facilities provided, and thoroughly wash and sanitise hands before moving to areas outside the laboratory. Laboratory coats should be easily differentiated from protective clothing worn in the factory (by colour, etc). Laboratory coats must not be worn outside the laboratory, i.e. canteen, tearoom, processing area.

Hands, pens and pencils, which can become contaminated, should be kept away from the face.

Long hair should be covered or tied back as it constitutes both a fire risk and a risk of contamination.

Precautions for handling total plate count Petri dishes and Petrifilm™

Since it is not known what specific types of bacteria are present on the surfaces being tested, it is possible for pathogenic bacteria to be present in large numbers amongst the colonies on the incubated test plates. It is therefore important to use considerable care in the handling of used Petri dishes which have cultures growing on them. The following points should be noted:

(a) If plates are used to demonstrate to the cleaning team how well or poorly a cleaning procedure has been done, stick the top and bottom of the plate (or Petrifilm™) together with tape. The incubated total plate count Petri dishes and Petrifilm™, etc should not be removed from the laboratory.

(b) After use, autoclave or incinerate to destroy microorganisms.

(c) Clean up spills of bacterial cultures with paper towels and disinfectant. Place paper towels in a plastic bag and

ensure that the bag is sterilised properly.

Where neither autoclaving nor incineration is possible, the next (but much less preferred) method of disinfecting used bacterial sampling materials is to treat them with a strong solution of chlorine. ***This method is only applicable to Petrifilm™-like products.*** *The used materials are placed in a lidded bucket and covered with a 1% chlorine solution. These used materials can be accumulated (or held) for up to a week (lid on). At the end of each week, the materials are then disposed of with other uncontaminated rubbish.*

Used bacterial sampling and testing materials must be disposed of properly. The best method of disposal is by autoclaving these materials to destroy all bacteria present on them. The appropriate autoclaving treatment is 20 minutes at 15 psi. If a pressure cooker is substituted for a genuine laboratory autoclave (and this is always tempting on cost grounds) then that pressure cooker should be fitted with an accurate pressure gauge. If an autoclave or pressure cooker is not available, incineration is the next best option, but it is necessary to ensure that everything is completely burned. Note, however, that some State authorities may not allow incineration.

Infectious laboratory waste such as scalpel blades, glass slides, contaminated broken glass and disposable Pasteur pipettes should be collected in a rigid puncture-proof container labelled 'sharps'. Samples, used Petri dishes, gloves and disposable culture bottles should be collected in a double layer autoclavable plastic bag and held in a leak-proof vessel. Infectious non-disposables should be collected in a puncture-proof autoclavable container.

Non-infectious material should be collected in a disposable bag and the bag should be transferred to a bin outside the laboratory.

If there is any doubt associated with the ability to dispose of contaminated materials on site, commercial collection and disposal services are available. These companies will supply the necessary containers or bags in which to place used materials.

Further reading

Standards Australia, *Laboratory construction,* AS.2982-1987.

Standards Australia, *Safety in laboratories. Part 3: Microbiology,* AS/NZS 2243.3:1995.
Both these Standards are available from Standards Australia: Phone: (02) 9746 4600.

Contact us for additional information

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