3 Evaluation of commercial kits and instruments for the detection of foodborne bacterial pathogens and toxins

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3.1 Introduction

Food poisoning can arise either through the ingestion of food containing bacteria, which become established in the host, resulting in illness (foodborne bacterial infection), or by ingestion of food containing preformed bacterial toxins (foodborne bacterial intoxication). In England and Wales, the most reported incidences of food poisoning in 1992 were attributed to Campylobacter (39,000 isolates), followed by Salmonella (31,000 isolates) and E. coli O157 (470 isolates). This represents a rise of approximately 18, 11 and 30%, respectively, over the figures for 1991 (Kimbell, 1993). The cases of listeriosis actually dropped from 280 in 1989 to 110 in 1992. Other food-poisoning bacteria such as Clostridium perfringens, Bacillus cereus and Staphylococcus aureus were less frequently attributed with incidences. The consequences of food poisoning can be serious for the individuals inflicted and the food producer involved. The annual costs of food poisoning to the UK food industry for 1990 were estimated at more than £350 million (Mintel, 1990).

In today’s competitive market, with a wide variety of food types (e.g. short shelf-life, modified-atmosphere packaged and cooked-chilled), together with the current strict food safety legislation, it is vital to streamline and increase the efficiency of modern food production and to ensure the safety of the products. Rapid microbiological methods must be considered in the context of modern QA systems (Patel, 1993). Most of the commercially available rapid methods to date still provide results that are only of retrospective value. Methods and instrumentation are required that will ensure positive release of products and/or remedial action to be taken during food production. To monitor critical control points (CCPs) within hazard analysis critical control point (HACCP) systems, methods are required that will give results in a matter of minutes, or hours, rather than days. Of course, these should also be considered in the context of suitable sampling plans for the product in question.

The objective of this chapter is to review the range of commercial rapid systems that are available for the analysis of foodborne pathogens and bacterial toxins. It should be noted that the cost-per-test data reported for commercial products have been obtained from the retail price list in 1993. Many of the manufacturers do give general discounts for bulk purchase. For products most recently released on the market, the prices quoted have been obtained through verbal communication with the companies concerned.
Rapid methods, *Salmonella*

- HGMF
- MSRV
- DIASALM
- *Salmonella* rapid test
- Biocontrol 1-2
- Dynabeads anti-*Salmonella*
- Tecra Immunocapture
- EIAFoss
- Electrical detection

Rapid methods, *Listeria*

- Vidas
- *Salmonella*-Tek
- Tecra-*Salmonella*
- Locate ELISA
- Path-stick EIA
- Gene-Trak probe

Classical method

- Food
- 6–24 h
- *Salmonella*
- Pre-enrichment broth
  (e.g. buffered peptone water)
- 24–48 h
- Selective enrichment broths
  (e.g. tetrathionate broth and
  Rappaport–Vassiliadis broth
  for *Salmonella* and, UVM and
  Fraser broth for *Listeria*)
- 24–48 h
- Selective and diagnostic agars
  (e.g. xylose lysine desoxycholate
  agar for *Salmonella* and Oxford
  agar for *Listeria*)
- 24–48 h
- Biochemical identification
  24 h
- Serological confirmation
  (for *Salmonella*)
  24 h

**Figure 3.1** Overview of commercial rapid methods for *Salmonella* and *Listeria* showing points of application within classical cultural techniques.

3.2 Detection of foodborne pathogens

The reader is referred to three excellent books that are currently available, which describe the range of pathogens considered in this chapter in terms of their pathogenesis, characteristics of the disease, properties of the toxic components,