

Appendix 2: Food Hazards: sausages and hamburgers

The Victorian Department of Health Food Safety has responded to the findings released in the VCEC1 report on the burden to business of food regulation in this state. From 1 July 2010 the Food Act will introduce a new classification system. There will be four classes of food premises, and the aim of this system is to allow regulation to be better matched to the level of food safety risk which each class of food premises needs to manage. The new classes will be:

- **Class 1** – for premises where there is a high risk such as those handling and supplying high risk ready to eat food predominantly for vulnerable population groups (the elderly, children aged 5 years or less, hospital patients, and others whose immune systems are compromised).
- **Class 2** – for premises engaged in manufacture or handling of any unpackaged, potentially hazardous foods, such as food that requires temperature control.
- **Class 3** – for premises handling low risk food (for example, baking bread) or wholesale of pre-packaged food, or selling pre-packaged, potentially hazardous food that requires temperature control. Also includes some community group food events.
- **Class 4** – for premises selling shelf-stable, pre-packaged food or running low risk community food activities, such as sausage sizzles where this food is cooked and served immediately.

Further information on the classification system can be found at the Food Safety Website.

The changes as proposed will affect a number of community groups. For example, a community group that is currently cooking and serving hamburgers or barbecuing sausages ("sausage sizzle") for immediate consumption would have been classified as Class 2 businesses under the previous system. Under the new system, the business that serves hamburgers is classed under Class 3, while the community group that is offering very simple barbecued sausages (no salads) in bread is now to be classified as a Class 4 premise. While both sausages and meat can be considered to be comminuted meat products [1], the level of risk associated with these two meat products is not equivalent. This paper reviews the evidence for the differentiation of these food groups on basis of risk.

Microbiological hazards, including the bacterial pathogens Enterohaemorrhagic E.coli and Salmonella, are of particular importance in food derived from animal sources (meat, eggs, dairy). Reducing the incidence of diseases associated with these foods requires attention to production and processing hygiene, effective temperature control at all points in the food supply chain, and effective and thorough cooking of the products.

Hamburgers

The particular association of ground meat products with Enterohaemorrhagic E.coli (EHEC) is why community groups that provide potentially hazardous foods to consumers are classed at the higher risk level, in Class 3. The initial reports of illness with EHEC were in 1983, when an outbreak of 47 cases haemorrhagic colitis were reported across two US states and an association

¹ Victorian Competition and Efficiency Commission

was made with the disease and the, then rare, O157 serotype of E.coli [2]. Since that time, there have been numerous outbreaks of illnesses attributed to EHEC, with particularly large-scale outbreaks in USA, Japan, the UK and Canada. Most, but not, all outbreaks are linked to the O157 serotype, but other serotypes are capable of producing the typical clinical symptoms of haemorrhagic colitis (HC) (abdominal cramping, bloody diarrhoea) and haemolytic uraemic syndrome (HUS) (anaemia, reduced renal function)². Serious renal or neurological complications following infection are more frequently seen in children or the elderly; and this was observed in the only large scale outbreak of illness in Australia to date. In the 1995 outbreak a non-O157 strain (O111:H-) found in a semi-dry fermented meat sausage ("mettwurst") affected 23 children ranging in age from 4 months to 12 years of age [3]. Of these 23 patients, 16 required renal dialysis and one child died.

The infectious dose for these organisms is believed to be very low, and illnesses have been associated with the consumption of many foods (unpasteurised apple juice, sprouts, cheese curds, produce, and water) and with participation in petting zoos and exposure to animals at rural events³. However, outbreaks have predominantly been associated with under-cooked red meat products, particularly ground (minced) beef used in hamburgers [4] and surveillance indicates that these organisms are present in beef cattle in Australia [5]. Outbreaks of E.coli HC and HUS associated with beef consumption in the US have not been restricted to large volume retailers as small premises⁴ have been implicated; as has food served in private homes and religious groups and clubs⁵.

The management of the risk of foodborne illness with these (and other) pathogens involves taking a through-chain approach to food safety, and the decline in cases in the US has in part been attributed to improved hygienic practices in the meat processing sector of the food supply chain⁶. HACCP⁷-based food safety programs were introduced in Victoria in 2000, and consistent with this approach the control points for hamburger production are the adequate chilled storage of raw meat prior to cooking; cooking adequately to kill microorganisms present in the food; and treating cooked hamburger as a potentially hazardous food by holding at temperatures outside the temperature danger zone⁸.

A community group offering hamburgers to the community would be considered a Class 3 business because of the significance of the pathogens that have been associated with hamburgers. Predictive modelling conducted by Australian researchers suggests that the risk of illness associated with the consumption of undercooked hamburgers in Australia is "medium" [6].

Sausages

Class 4 businesses are considered to provide food of relatively low-risk to consumers. A community group providing only sausages that are cooked prior to consumption, which may be served with bread, cooked onion and sauce has been

² <http://www.microbionet.com.au/vtactable.htm>

³ <http://www.cfsan.fda.gov/~mow/chap15.html>

⁴ <http://www.cdc.gov/mmwr/preview/mmwrhtml/00026029.htm>

⁵ <http://www.cspinet.org/foodsafety/outbreak/outbreaks.php?column=pathogen&colval=E.%20coli%20O157:H7>

⁶ <http://www.cdc.gov/mmwr/PDF/wk/mm5553.pdf>

⁷ Hazard Analysis Critical Control Point

⁸ <http://www.health.vic.gov.au/foodsafety/bus/keeping.htm>

allocated to this lower risk category. A sausage is defined by the FSANZ Food Standards Code⁹ as

“meat that is minced, or comminuted meat or a combination thereof, which may be combined with other foods, encased or formed into discrete units, but does not include meat formed or joined into the semblance of cuts of meat” where meat is defined in the standard.

The composition of sausages is also prescribed in Standard 2.2.1, and they should contain no less than 50% of fat free meat flesh; and the fat proportion of the sausage can be no more than half that of the fat free meat content. In practice, sausages can contain preservatives, fillers, stabilisers, antioxidants and colours [7]. Additives that can be used in sausages are specified in Schedule 1 of Standard 1.3.110. Sausages as applied in Class 4 community groups do not include uncooked fermented comminuted products (such as salami).

The main foodborne illness risks with these products appear to be *Salmonella* spp. and *Campylobacter* spp [7-9], although viral outbreaks may have been linked to ingesting sausages [10, 11]. Overall, there is little data in Australia linking sausages as served at community events (i.e. barbecued for immediate consumption) to foodborne illnesses. A review of OzFoodNet reports showed two associations between sausage consumption and foodborne illness. Home-made Italian sausage was linked to a household outbreak of *Salmonella* Typhimurium 135a [12] but it is not clear whether this was a salami type sausage or a barbecued meal; and sausages were suspected to be involved in a restaurant outbreak of Norovirus [11] which affected 65 people, but again the manner of cooking and serving these sausages is not recorded in the report and the evidence was not strong. No other notifications of foodborne illness linked to sausages were identified in the OzFoodNet reports¹¹. An Australian outbreak of unknown aetiology (?viral) included sausages in the epidemiological investigation but these could not be related to the outbreak which was likely to be water-borne [13].

The international data was reviewed to support the contention that barbecued sausages present a low level of foodborne risk. *Salmonellae* may certainly be present in raw sausages [7, 14]. It has been shown that, at least in the UK, less expensive sausages have higher prevalence of *Salmonella* spp. and the authors suggest that this is because they contain cheaper meat, such as mechanically deboned chicken, than the higher priced products. This study [7] showed that artificially contaminated sausages that were barbecued for a short time, six minutes, would still contain *Salmonella* spp.. The internal temperature of the sausage did not reach 70°C in chilled sausages that were barbecued, and certainly didn't even come close when sausages were barbecued from frozen for six minutes. A recent Swiss outbreak may be linked to *Salmonella* contaminated sausages [15]. However, the outbreak(s) appears to be a complex one, with at least three strains of *S. Typhimurium* involved and relatively few patients interviewed for food history (24 of 65 cases). While most of the interviewed cases reported eating meat (either lamb, horse, beef, chicken or pork) only a few reported that they had been to a barbecue. Barbecued meats were determined as the most likely source of the infection(s) through the epidemiological data (cases were over-represented in teenagers, and the outbreaks occurred during the summer barbecue season), but the identified likely source is pork meat, and not specifically sausages.

⁹ http://www.foodstandards.gov.au/srcfiles/Standard_2_2_1_Meat_v103.pdf

¹⁰ http://www.foodstandards.gov.au/srcfiles/FSC_Standard_1_3_1_Additives_Part_2_v107.pdf

¹¹ <http://www.ozfoodnet.org.au/internet/ozfoodnet/publishing.nsf/Content/reports-1>

A risk assessment conducted in New Zealand reviewed outbreaks of this pathogen associated with sausage consumption: although a number of linkages were recorded, the authors noted that the epidemiological evidence was “relatively weak” [9]. This is despite Scandinavian evidence that campylobacteriosis is linked to consumption of grilled sausages or other grilled meats eaten at barbecue [8]. It is worth noting that this latter report pre-dates modern approaches to food safety including HACCP¹² plans in food manufacturing, and Norway implemented broad HACCP legislation in 2008¹³. An outbreak of campylobacteriosis in the UK was linked to a barbecue event, but to chicken not to sausages (epidemiological data) [16].

Other barbecue-linked outbreaks have included botulism [17], staphylococcal enterotoxin [18], and Norovirus [19] but the sausages were not the source of the outbreak in any of these cases. In the botulism outbreak it appears that the home-butchered pork that was also cooked at the barbecue was responsible, while salads had the strongest epidemiological linkage to illness in the other cases. Finally, a large viral outbreak in the US was attributed to a caterer supplying barbecued products (including sausages) to a sorority event: again, no food could be clearly identified as responsible. The catering premise had two critical violations on inspection after the outbreak and it is likely that poor food hygiene practice overall contributed to this outbreak [10].

In conclusion, this review supports the view that the supply of barbecued sausages that have been adequately cooked for immediate consumption, as is the case in sausage sizzles presents low risk to the consumer. This accords with predictive modelling of the risk conducted by Australian researchers [6] where the risk of illness associated with sausage consumption is considered to be low. Providing food for the community has some fundamental requirements, regardless of the class of business. Appropriate temperature control of raw products; attention to hygienic handling and adequate cooking of raw meat products are essential. Food handlers in both Class 3 and Class 4 premises should have a basic understanding of food hygiene. Printed materials (provided by the department) exist that council can supply to these organisations, and on-line training in food safety will be available through the department from November 2009.

¹² Hazard Analysis Critical Control Point

¹³ http://www.cbi.eu/marketinfo/cbi/docs/norway_legislation_hygiene_of_foodstuffs_haccp

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