Intensive (pasture) beef cattle operations: the perspective of New Zealand

S.C. Hathaway

Ministry of Agriculture and Fisheries Regulatory Authority, P.O. Box 646, Gisborne, New Zealand

Summary

Beef production in New Zealand has characteristics typical of a temperate climate and pasture-based animal husbandry. The specific pathogens which may contaminate fresh beef and which are empirically considered to be of public health importance are similar to those in other countries with temperate climates, i.e. Salmonella, Campylobacter, Escherichia coli O157:H7, Listeria monocytogenes and Toxoplasma gondii. With the exception of T. gondii, it is likely that almost all transmission of these hazards through consumption of beef results from unseen microbial cross-contamination from gastrointestinal sources during slaughter, dressing and further processing.

Gaining comprehensive information on carcass contamination levels is an essential first step in establishing food safety objectives for a particular beef production system, and in designing risk-based hazard analysis and critical control point (HACCP) plans. It is likely that the lower mean and maximum numbers of indicator micro-organisms on New Zealand carcasses (when compared with other countries) are in part due to the pre-slaughter cleanliness status of cattle reared under temperate, pasture conditions. Similarly, the failure to detect specific pathogens of gastrointestinal origin in a comprehensive baseline survey most probably reflects the limited pathway for faecal contamination during slaughter and dressing under processing conditions in New Zealand. The New Zealand example provides strong evidence for the need to design HACCP plans according to the specific national (or regional) situation.

Reducing all pathways for faecal contamination of products to the maximum extent practicable will be the most important factor in achieving desired food safety objectives for fresh beef. Variable densities of microbial pathogens in gastrointestinal contents are also likely to have a significant effect on subsequent contamination levels of beef carcasses: however, effective controls for limiting the presence of most pathogens of concern in the live animal have yet to be identified.

Keywords

Beef – Cattle – Food safety – Hazard analysis and critical control points – Microbial contamination – New Zealand – Public health.

Introduction

Foodborne risks to public health associated with consumption of red meat are an important contemporary issue. Although the large majority of cases are unreported, serious outbreaks of disease associated with consumption of contaminated red meat have been documented in several countries in recent years. In the United States of America (USA), an estimated 6 to 33 million cases of foodborne microbial illness occur each year (3). In New Zealand, which has a much smaller population, the estimate is 300,000 cases (4). A significant proportion of these illnesses are due to microbial contamination of red meat.

Foodborne hazards may be of biological, chemical or physical origin, but there is now general recognition that foodborne microbial hazards constitute by far the most important source
of risks to consumers. In considering contamination of red meat, foodborne pathogens can be placed in two general categories: those derived from the slaughtered animal, and those introduced as a consequence of processing and handling of the product. This paper is restricted to a discussion of foodborne biological pathogens of fresh meat which are derived from the slaughtered animal, and this includes micro-organisms and parasites.

Beef production in New Zealand has characteristics typical of a temperate climate. Neither beef nor dairy cattle are housed during winter, and the long growing season allows pasture feeding for most of the year. Any supplementary feeding in winter generally occurs in a field environment rather than in feeding lots, and to date there are only two commercial feedlot enterprises in operation. As with all animal production systems, these husbandry characteristics, together with the geographical position of New Zealand, contribute to a particular hazard profile with respect to contamination of beef products.

New Zealand is a major exporter of fresh chilled and frozen meat to world markets. These products are unprocessed and the micro-organisms present will not have been modified by any microbiocidal process. Consequently, the micro-organisms of primary food safety concern are those normally found at some level on fresh meat carcasses as an inevitable consequence of slaughter and dressing.

Contemporary meat hygiene programmes

Regulatory and industry controls for foodborne hazards, at both the pre-harvest and post-harvest stages, will obviously have an important influence on levels of biological contamination of fresh meat, and on subsequent foodborne risks in consumer populations. In this respect, meat hygiene programmes in a number of countries are currently undergoing unprecedented re-evaluation and 'modernisation'. There is a markedly increased desire for quantitative data on the actual risks to human health associated with consumption of red meat, and traditional meat hygiene requirements are under increasing scientific scrutiny. In parallel, industry is paying increasing attention to pre-harvest quality assurance programmes which include food safety components. In this contemporary food safety environment, satisfying the need for hygiene measures which are scientifically justified, efficient and cost-effective requires the application of a risk-based approach (5).

In this context, recognition of the difference between 'hazard' and 'risk' is a fundamental issue. A hazard is a biological (or chemical, or physical) agent in food with the potential to cause an adverse public health effect. In contrast, risk is a function of the probability of an adverse health effect and the severity of that effect in a particular consumer population, consequential to the presence of a hazard in food. Understanding the difference between a change in level of hazards in food in a particular segment of the food chain, and a change in the level of risk of adverse health effects in the exposed consumer population, is of particular importance in the design and application of food safety controls.

A number of countries now have comprehensive strategies to develop integrated risk analysis-based approaches for hazards associated with red meat. Hazard analysis and critical control point (HACCP)-based food control systems are essential components, and the design of genuine HACCP plans has essential links with risk analysis (1). Countries such as New Zealand which export a large proportion of the national meat production have a particular interest in a risk analysis approach, and this is shaping the response to control of biological hazards in fresh meat. As well as meeting the challenges of the domestic food safety environment, the authorities must meet the food safety expectations of importing countries (6).

Hazard analysis for fresh beef in an intensive pasture environment

Biological contamination of fresh beef and beef products is a consequence of a wide array of factors in the pre-harvest, harvest and post-harvest continuum. Pathogens of potential public health importance which are derived from the slaughtered animal may arise from intrinsic conditions of the animal (including low grade bacteraemia at the time of slaughter), or from cross-contamination from the hide, gastrointestinal tract and other surfaces of the animal during slaughter and dressing. In identifying pathogens of public health importance likely to be present in fresh beef, there must be acknowledgement that final contamination levels will largely be a reflection of the following:

- the epidemiology of biological hazards in the cattle farmed in the particular geographical region
- the conditions of transport, lairage, slaughter and processing
- the efficacy of industry and regulatory controls.

Hazard identification

Meat-borne pathogens ranked in recent international reviews as being of most public health significance are Salmonella, Campylobacter, Escherichia coli O157:H7, Listeria monocytogenes and Toxoplasma gondii; this general situation
also applies to New Zealand. With the exception of *T. gondii*, almost all transmission of these hazards through beef is likely to result from unseen microbial contamination of the carcass and viscera during slaughter and dressing.

Known meat-borne hazards which may be present as asymptomatic gastrointestinal infections in cattle in New Zealand are *Salmonella*, *Campylobacter*, *E. coli* O157:H7, *L. monocytogenes* and *Clostridium perfringens*. *E. coli* O157:H7 has not been isolated from carcasses to date: however, the presence of a very low incidence of individual human cases suggests the possibility of a bovine reservoir. Although *C. jejuni* and *C. coli* are common causes of foodborne illness in many countries, beef has not been implicated as a significant source and this is probably the situation in New Zealand. Similarly, *L. monocytogenes* is implicated in sporadic cases of foodborne illness on a worldwide basis but there is little evidence to implicate beef as a significant source. Contamination of beef carcasses with *C. perfringens* is likely to originate predominantly from the processing environment.

A number of other micro-organisms of asymptomatic gastrointestinal origin have been posed as potential meat-borne pathogens, e.g. *Yersinia*, *Cryptosporidium*, *Aeromonas* and *Arcobacter*: however, beef has not been incriminated as a source of any of these bacteria to date.

Detailed information on meat-borne microbial pathogens associated with grossly-detectable abnormalities in beef carcasses and viscera in New Zealand (and most other countries) is not available. However, there are strong indications that there is little involvement of pathogens other than those already mentioned above. Although *Mycobacterium bovis* infection occurs in cattle in New Zealand, there is no evidence on a world-wide basis of meat-borne transmission of this hazard.

The two parasites which may be transmitted through uncooked beef are *Taenia saginata* (beef tapeworm) and *T. gondii*. New Zealand has an extremely low prevalence of *T. saginata* infection in cattle (approximately 5-30 infected animals reported per year from post-mortem meat inspection). The prevalence of *T. gondii* is similar to other countries (10%-20%), but the oocysts are not detectable at post-mortem inspection.

**Contamination of products**

**Microbial contamination associated with slaughter and dressing**

With the realisation that unseen microbial contamination of the carcass during slaughter, dressing and further processing is the most important source of meat-borne pathogens, a number of countries have conducted microbiological baseline surveys. Both indicator organisms and pathogens have been utilised in an attempt to quantify levels of contamination on carcasses.

Although use of baseline surveys as a primary tool in developing strategies to control microbial contamination of red meat is a sound approach, there are several limitations:

- outcomes will be specific for a particular geographical region and meat production system
- indicator organisms will only be useful for identifying the extent of different pathways of contamination, with aerobic plate counts (APC) being indicative of general sources, and *E. coli* being indicative of faecal sources
- correlations between indicators and the prevalence/level of contamination with particular pathogens will be limited
- surveys are unlikely to establish a quantitative relationship between the microbiological prevalence/level at a particular step observed in a fresh meat production system and the risks of foodborne illness in the consumer population.

Representative surveys of beef carcasses which have recently been conducted using similar bacteriological methods are summarised in Table I. Although comparisons are of limited value because of differences in design (especially related to sampling), variable rates of carcass contamination with APCs and *E. coli* are apparent. The prevalence rate of *Salmonella* varied from 0% (in New Zealand) to 2.7% (cows/bulls in the USA), and *E. coli* O157:H7 varied from 0% (in New Zealand) to 0.4% (in Australia).

These differences are likely to be attributable, in part, to the animal husbandry conditions applying in New Zealand compared with the USA and Australia. Virtually no cattle are sourced out of feedlots, where gross faecal contamination of the hide is an inevitable problem. Notwithstanding an analysis of the impact of methodological differences on survey results (2), the lower mean and maximum numbers of *E. coli* on New Zealand carcasses appear to match the pre-slaughter cleanliness status of cattle reared under pasture conditions. The failure to detect specific pathogens of gastrointestinal origin in the New Zealand survey is probably another reflection of this limited pathway for faecal contamination during slaughter and dressing.

A further factor likely to contribute to the favourable microbial profile of New Zealand beef carcasses is the high standard of processing hygiene. Most fresh beef produced in New Zealand is exported to the USA and countries of the European Union, and New Zealand has replicated the different hygiene requirements of both these markets for many years. These added requirements have inevitably contributed to a relatively low level of cross-contamination (and growth) of micro-organisms during processing.
Table I
Selected summary data from microbiological baseline surveys of beef carcasses in New Zealand, the United States of America and Australia (2)

<table>
<thead>
<tr>
<th>Type of carcass</th>
<th>Aerobic plate counts (a)</th>
<th>Escherichia coli</th>
<th>Salmonella prevalence</th>
<th>EHEC (b) prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Maximum</td>
<td>Mean</td>
<td>Maximum</td>
</tr>
<tr>
<td>New Zealand steers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag</td>
<td>1.12</td>
<td>3.93</td>
<td>-0.89</td>
<td>1.32</td>
</tr>
<tr>
<td>Flank</td>
<td>1.70</td>
<td>4.24</td>
<td>-0.54</td>
<td>1.61</td>
</tr>
<tr>
<td>Brisket</td>
<td>1.20</td>
<td>3.69</td>
<td>-0.81</td>
<td>1.62</td>
</tr>
<tr>
<td>New Zealand cows</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lag</td>
<td>1.10</td>
<td>4.15</td>
<td>-0.76</td>
<td>0.80</td>
</tr>
<tr>
<td>Flank</td>
<td>1.61</td>
<td>4.10</td>
<td>-0.67</td>
<td>1.71</td>
</tr>
<tr>
<td>Brisket</td>
<td>1.05</td>
<td>3.61</td>
<td>-0.77</td>
<td>1.31</td>
</tr>
<tr>
<td>United States of America</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heifers/steers (c)</td>
<td>2.68</td>
<td>7.0</td>
<td>1.54</td>
<td>6.0</td>
</tr>
<tr>
<td>Cows/bulls (c)</td>
<td>3.05</td>
<td>7.0</td>
<td>1.52</td>
<td>6.0</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All classes of cattle (c)</td>
<td>3.02</td>
<td>NA</td>
<td>1.05</td>
<td>NA</td>
</tr>
</tbody>
</table>

a) \( \log_{10} \) colony forming units (CFU)/cm²
b) enterohaemorrhagic Escherichia coli 0157:H7
c) composite samples
NA: not available

Microbial contamination associated with grossly-detectable abnormalities

With the increasing application of risk-based approaches to meat hygiene, several studies have been initiated to determine the likely contribution of non-detection of gross pathology at post-mortem meat inspection to levels of contamination of red meat with microbial hazards. An extensive study of abnormal tissue of ovine viscera which was detectable by gross post-mortem examination found that the pathogens isolated of known public health importance were almost always those normally present in the gastrointestinal tract or on body surfaces, and such isolations were rare. These results led to the conclusion that post-mortem inspection of the viscera of this class of slaughtered livestock was of relatively little importance to public health (8). Detailed studies on the likely public health impact of visual versus more detailed post-mortem inspection of the carcass and viscera of finisher pigs have indicated similar outcomes with respect to the relative contribution of grossly-detectable pathology to biological contamination of products (9, 11).

Unfortunately, comprehensive evaluations such as these have not been made for cattle to date. However, general analyses of abnormal tissue detected at post-mortem inspection of cattle in some countries concur with the above findings for other slaughter species in modern meat production systems, and a formal hazard analysis process carried out for fresh beef produced in the USA also suggests a similar pattern (10). Obviously, the likely level of consumer exposure to hazards arising from undetected abnormalities can be subjected to a risk assessment approach (5).

Contamination due to parasites

As T. saginata infection of cattle is an important foodborne zoonosis in many countries, a formal risk model was developed to identify the level of contamination of beef produced in New Zealand and to quantify the annual impact on public health (12). New Zealand has an extremely low prevalence of T. saginata infection in cattle, and the post-mortem detection rate was quantified over a two-year period. A scenario tree describing the sequence of steps leading to the occurrence of human infection was formulated, and the probabilistic risk model estimated that the mean number of human infections per year as a result of consuming beef produced in New Zealand was 0.50 and 1.10 in the export and domestic markets respectively. In a scenario set where specific post-mortem inspection procedures for T. saginata were not applied, the mean number of human infections per year was estimated to increase from 0.50 to 0.61 in the export market, and from 1.10 to 1.30 in the domestic market. These risk estimates are extremely low on any scale of foodborne disease, especially considering that T. saginata infection in humans results in mild and readily treatable symptoms.

Development of formal risk assessment models such as this can quantify the actual level of hazard in the end-product, and can also provide essential information on proportional application of regulatory food safety resources according to the greatest benefit in preventing foodborne risks.

The level of contamination of fresh beef in New Zealand with viable cysts of T. gondii is unknown.
Control strategies for contamination of beef

Pre-harvest strategies
In acknowledging that variable densities of microbial pathogens in gastrointestinal contents are likely to have a significant effect on subsequent contamination levels of beef carcasses, consideration of pre-harvest controls must be included in any farm-to-plate food safety strategy. However, the design of HACCP plans at the farm level which will limit specific pathogen loads to 'acceptable' levels currently suffers from a lack of epidemiological information. General attention to livestock management, environmental hygiene and transport are well-established methods of limiting the numbers of cattle shedding Salmonella. However, specific interventions to significantly reduce or eliminate infection with Campylobacter, E. coli O157:H7, L. monocytogenes and T. gondii have yet to be identified. Thus contamination rates with the latter pathogens will not be significantly altered by currently-available pre-harvest control strategies, and much more research is required in this area.

T. gondii infection of cattle presents a good example. Notwithstanding the lack of knowledge on undercooked beef as a potential pathway for human infection, the effect of attempts to limit feline faecal contamination of the animal husbandry environment is unknown. In contrast, pre-harvest control strategies to prevent completion of the life-cycle of T. saginata can have a dramatic effect on carcass infection rates, and there are other opportunities for establishing preventive measures which will improve detection and control, e.g. intensified post-mortem inspection of cattle from 'suspect' farms.

Post-harvest strategies
Data from baseline microbiological surveys is increasingly being utilised to establish 'performance targets' demonstrating control of microbial contamination on fresh red meat to acceptable levels. HACCP plans can be designed so that appropriate food safety objectives (FSOs) for particular segments of the meat production system can be met on a continuous basis, and can be verified by end-product testing at appropriate intervals. Utilising FSOs as an 'outcome-based standard' for the design of HACCP plans is more likely to achieve public health goals than designing HACCP plans according to a 'process standard' approach (7).

In the New Zealand context, microbial FSOs agreed by the regulatory authority and industry are now being incorporated in generic HACCP plans for red meat slaughter and dressing. All export beef slaughter and packing premises monitor carcasses on a weekly basis according to a standardised sampling programme, and accredited laboratories forward results for national aggregation. A national microbiological database is then used to establish national performance targets, to be incorporated in FSOs for individual HACCP plans. These targets can be used to identify processors not performing to national expectations, and serve as a vehicle for continuous improvement in process control. The national microbiological database also serves to validate individual HACCP plans when there are significant changes in raw material or processes.

While microbial FSOs are an essential component in the design of HACCP plans (7), the fact that there will only be a qualitative association between FSOs based on particular levels of control of microbial contamination in fresh red meat and risk in consumer populations must be acknowledged. Knowledge of the bacterial ecology of specific pathogens on beef carcasses at different steps throughout the food chain is still limited; as an example, FSOs based on prevalence of contaminated carcasses rather than levels of contamination of individual carcasses may represent disparate risks. Similarly, E. coli may be a good indicator of the level of faecal contamination, but different on-farm and pre-slaughter stress factors may be the primary determinants of levels of contamination of products with particular pathogens such as E. coli O157:H7.

A risk-based approach
The contamination levels of the raw material entering the food chain dictate the character of the initial microflora, but this can be modified considerably by subsequent events. Construction of detailed scenario sets describing all steps from production and processing through to intended end-uses of a food describes exposure, and targeted research is required to accumulate appropriate microbial data. Predictive modelling of the fate of microbial hazards in food produced according to a specified process is playing an important role in this respect. As a result of the wide variability inherent in much biological data, Monte Carlo simulation modelling which generates probabilistic risk estimates offers considerable promise in supporting risk management decision-making (12). However, the probability that application of microbiological risk assessment approaches in the short term will more commonly utilise qualitative approaches than mathematical models must be remembered.

As a general model for fresh meat, microbial risk assessment will mostly be concerned with evaluating different levels of contamination which are incurred from the harvesting and processing environment. This can be achieved as follows:
- measuring levels which result from current and reasonably achievable good manufacturing practices
- measuring differences in these levels which may be brought about by different processes and/or technological interventions
- using microbiological risk assessment (as it becomes available) to determine the effect on public health of the current levels, and any changes to those levels
- introducing HACCP-based systems which ensure that the hygiene parameters chosen as representative of an acceptable level of microbiological safety are met on a continuous basis
- further investigating the ability to exclude sporadic contamination with known 'high priority' pathogens by preventing introduction into the processing environment through the raw material.

Conclusion

Beef production in New Zealand has characteristics typical of a temperate climate and pasture-based animal husbandry. Although some level of intrinsic biological contamination of fresh beef is inevitable because of the limitations of post-mortem meat inspection, extrinsic cross-contamination as a result of slaughter, dressing and subsequent processing is probably the most important source of hazards of public health importance. Bioloads of known foodborne pathogens will reflect both the epidemiology of those pathogens in the live animal population and the efficacy of industry and regulatory controls at all steps in the meat production process.

The specific pathogens which may contaminate fresh beef in New Zealand and which are empirically considered to be of 'significant' public health importance are very similar to those in other countries with temperate climates, i.e. Salmonella, Campylobacter, E. coli O157:H7, L. monocytogenes and T. gondii. With the exception of T. gondii, almost all transmission of these hazards through consumption of beef is likely to result from unseen microbial contamination originating from asymptomatic carriage in the gastrointestinal tract.

In establishing food safety control measures, New Zealand is particularly interested in a risk-based approach incorporating HACCP principles. In the case of fresh red meat, there is general acknowledgement that the objective of microbiological risk analysis is to facilitate reduction of microbial hazards to 'the minimum which is technologically feasible and practical' (1), and a risk-based approach can incorporate new food safety concerns such as 'emerging' pathogens, changes in the meat production and food industry, and changing consumer demographics. However, the transition from systems based on traditional principles of food safety and a 'command-and-control' regulatory involvement to industry-driven, quality assurance-based systems utilising risk assessment and HACCP principles is hampered by incomplete epidemiological knowledge. This is particularly the case in the pre-harvest area, where effective controls for limiting the presence of most pathogens of concern have yet to be identified.

Gaining comprehensive information on carcass contamination levels is an essential first step in establishing FSOs for a particular beef production system, and the lower mean and maximum numbers of indicator micro-organisms on New Zealand carcasses compared with other countries are probably due in part to the pre-slaughter cleanliness status of cattle reared under pasture conditions. Similarly, the failure to detect specific pathogens of gastrointestinal origin in a comprehensive baseline survey most likely reflects the limited pathway for faecal contamination during slaughter and dressing under processing conditions in New Zealand. The New Zealand example provides strong evidence for the need to design HACCP plans according to the specific national (or regional) situation.

Given that most meat-borne pathogens of concern are of gastrointestinal origin, reducing all pathways for faecal contamination of products to the maximum extent practicable will be the most important factor in achieving desired FSOs for fresh beef. Variable densities of microbial pathogens in gastrointestinal contents are also likely to have a significant effect on subsequent contamination levels of beef carcasses. Nevertheless, design of effective pre-harvest controls at the farm level will require considerable investment in further research.

Élevage intensif (au pâturage) des bovins de boucherie : la situation en Nouvelle-Zélande
S.C. Hathaway

Résumé
La production de viande bovine en Nouvelle-Zélande présente les caractéristiques propres aux élevages sur pâturage en climat tempéré. Les agents pathogènes spécifiques pouvant contaminer la viande bovine et qui sont, dans la pratique, considérés comme ayant une importance pour la santé publique,
sont similaires à ceux rencontrés dans d'autres pays au climat tempéré : *Salmonella*, *Campylobacter*, *Escherichia coli* 0157:H7, *Listeria monocytogenes* et *Toxoplasma gondii*. À l'exception de *T. gondii*, il semble que la transmission de ces micro-organismes par la viande bovine soit le plus souvent due à une contamination croisée microbienne inapparente, d'origine gastro-intestinale, lors de l'abattage, du dépeçage et des étapes ultérieures du conditionnement. Il faut commencer par obtenir une information complète sur les niveaux de contamination des carcasses avant de fixer des objectifs de sécurité alimentaire pour un système de production donné de viande bovine, et de concevoir des programmes dits de « l'analyse des risques, points critiques pour leur maîtrise » (hazard analysis and critical control point: HACCP). Le nombre moyen et maximum de micro-organismes indicateurs de contamination observé dans les carcasses bovines en Nouvelle-Zélande, bien inférieur à ceux d'autres pays, est certainement une conséquence de la bonne condition sanitaire des bovins qui arrivent à l'abattoir, favorisée par le climat tempéré et l'élevage au pâturage. De même, l'absence d'agents pathogènes spécifiques d'origine gastro-intestinale décelés lors d'enquêtes initiales globales, tient très vraisemblablement aux possibilités limitées de contamination fécale lors de l'abattage et du dépeçage, dans les conditions de transformation en usage en Nouvelle-Zélande. L'exemple de la Nouvelle-Zélande est la preuve indéniable que les programmes HACCP doivent être conçus en fonction de situations spécifiques au plan national (ou régional).

Pour atteindre les objectifs de sécurité alimentaire souhaités concernant la viande bovine, il convient tout d'abord de limiter, dans toute la mesure du possible, les modes de contamination fécale du produit. La présence, à des densités variables, d'agents pathogènes dans le contenu gastro-intestinal semble également avoir un effet significatif sur les niveaux de contamination des carcasses bovines ; toutefois, il reste encore à définir quels sont les moyens de contrôler efficacement la plupart des agents pathogènes majeurs chez l'animal vivant.

**Mots-clés**

Analyse des risques, points critiques pour leur maîtrise — Bovins — Contamination microbienne — Nouvelle-Zélande — Santé publique — Sécurité alimentaire — Viande bovine.

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**Proceso intensivo de producción de carne de bovinos (criados a campo): la perspectiva de Nueva Zelanda**

S.C. Hathaway

**Resumen**

La producción de carne vacuna en Nueva Zelanda reviste características propias de los climas templados y los sistemas de producción animal basados en el pastoreo. Los patógenos específicos que pueden contaminar la carne y que se consideran importantes en materia de salud pública no difieren...
significativamente de los de otros países de clima templado, esto es: Salmonella, Campylobacter, Escherichia coli 0157:H7, Listeria monocytogenes y Toxoplasma gondii. Con la salvedad de T. gondii, es probable que casi todos los casos de transmisión de esos agentes por el consumo de carne sean producto de contaminaciones cruzadas inadvertidas a partir de focos gastrointestinales durante el sacrificio y las fases ulteriores del procesamiento de la carne. La obtención de datos completos sobre el nivel de contaminación de las canales constituye un primer paso fundamental, que permitirá determinar objetivos de protección alimentaria para cada sistema de producción de carne y elaborar planes de análisis de riesgos y control de puntos críticos (hazard analysis and critical control points: HACCP). En Nueva Zelanda, las canales presentan un número medio y máximo de microorganismos indicadores de contaminación muy inferior al de otros países. Es probable que ello guarde relación con las condiciones de especial limpieza previa al sacrificio que caracterizan a las reses criadas a campo y en climas templados. Análogamente, es muy posible que la ausencia de patógenos específicos de origen gastrointestinal detectados en el curso de un estudio básico de gran alcance obedezca a las escasas vías posibles de contaminación fecal durante el sacrificio y el procesamiento que dan lugar los sistemas aplicados en Nueva Zelanda. El ejemplo de Nueva Zelanda demuestra fehacientemente la necesidad de elaborar planes de HACCP en función de la situación nacional (o regional) concreta. La reducción, en la mayor medida posible, de todas las vías de contaminación fecal de los productos cárnicos va a constituir el factor más importante para alcanzar los objetivos de protección alimentaria de la carne vacuna. Es probable que la densidad de patógenos microbianos en el contenido gastrointestinal influya también en el subsiguiente nivel de contaminación de las canales. Sin embargo, todavía han de determinarse controles eficaces que permitan limitar la presencia en el animal vivo de la mayoría de patógenos.

Palabras clave

References


