

DE-BONED BEEF - AN EXAMPLE OF A COMMODITY FOR WHICH SPECIFIC STANDARDS COULD BE DEVELOPED TO ENSURE AN APPROPRIATE LEVEL OF PROTECTION FOR INTERNATIONAL TRADE

SUMMARY

De-boned beef from which lymph nodes and risk material associated with bovine spongiform encephalopathy have been removed, is a product which can be produced for safe international trade irrespective of whether the locality of production is recognised as free from so-called transboundary diseases or not. Further processing of such beef provides an additional safety factor. However, this approach requires specific control measures being in place, supported by appropriate auditing and certification procedures.

This document presents the arguments supporting this concept and details how safety in respect of both animal diseases and human food safety can be achieved using an integrated HACCP (hazard analysis & critical control points) approach.

INTRODUCTION

Bovine meat (beef) is frequently traded internationally; it is projected that in 2007 more than 10% of world production (i.e. 7.2 of the total of 67.5 million tonnes produced globally) will be traded with 3.9 million tonnes being exported by developing countries. However, least developed countries (LDCs) do not contribute significantly to international beef exports (FAO's Meat Outlook for 2007 - <http://www.fao.org/es/esc/en/20953/21014/index.html>).

As is the case for trade in all commodities, large-scale purchasers of beef need to be satisfied that the product conforms to international and national standards for quality, safety in respect of human food safety and animal diseases, price and delivery. The supplying company also needs assurance that it will receive timely payment for the commodity that exceeds the local cost of production, packaging, export taxes and other charges that need to be met by the supplier. For that reason, both the purchaser and seller need credible guarantees in respect of quality, price/payment and delivery. Guarantees in respect of quality issues are usually provided in the form of certificates that need to be credible in the eyes of purchaser and also fair as far as the seller is concerned.

Using the 2005 FAO average price of US\$3,507 per tonne and their forecast of 7.2 million tonnes, the value of internationally traded beef in 2007 is likely to be in the region of US\$25 billion. Boneless beef makes up approximately 84% (i.e. about \$21 billion-worth) of total trade in beef and increased in value in parallel with total beef and edible offal trade, i.e. at 11% per annum, over the period 2002-2005 (C. Blignaut, personal communication, 2007). Trade in preserved beef and bovine offal (i.e. beneficiated products) were valued at US\$2 billion (8% of the total trade in beef - International Trade Centre [ITC], Geneva and United

nations COMTRADE statistics). However, the rate of increase in the value of benefited beef products was greater than for beef products in general over the period 2001-2005 (C. Blignaut – personal communication, 2007).

The tariffs importing countries apply to bovine cuts, fresh or chilled as well as to processed beef are often extraordinarily low although variable for developing countries. For example, in the case of the USA's Agricultural Growth and Opportunity Act (AGOA) the rate is zero. For African-Caribbean-Pacific Rim (ACP) countries exporting beef to the European Union in terms of the Lomé Convention/Cotonou Agreement, the import duties on unprocessed beef can be as low as 8% for defined volumes (M. Raborokgwe, personal communication, 2006; ITC and COMTRADE statistics).

These figures show that the volume and value of international trade in boneless beef, whether raw product or processed, is large and that tariff barriers for developing and least developed countries are frequently low or non-existent. Non-tariff barriers appear to be a key limiting factor in international trade in beef from these countries

Equitable market access, particularly for developing countries, continues to be a major focus of debate and negotiation within and around the World Trade Organisation (WTO). While, as explained above, progress in achievement of more equitable international tariff arrangements has been and is being made to assist developing countries access markets of all kinds in the developed world, non-tariff barriers are increasing. The determining factor in effective access to markets generally, and high value markets in particular, is the capacity to upgrade and produce according to specific requirements for quality, health and environmental standards as well as consumer preferences and tastes (United Nations, 2003) and to be competitive in this process.

Fresh beef like many commodities derived from livestock, presents two additional complications: (1) high potential for perishability and (2) the risks associated with such trade are not confined to the private domain. Risks to the public within the importing country are of two major types that overlap to some extent, *viz.* threats to human health where the imported commodity is destined for inclusion in human foodstuffs and, secondly, threats to animal populations in cases where the commodity, beef in this case, could potentially disseminate animal diseases that may have serious consequences for rural communities and the environment. These threats are real and of increasing concern to both individual importers and the guardians of the public good in importing countries (Royal Society, 2002). All responsible governments are therefore increasingly concerned with monitoring and securing control of livestock commodity imports that pose risks to the public. Of course, these non-tariff measures have also sometimes been used unfairly to exclude imports in order to protect domestic agricultural industries from fair competition and reduction of this practice is one of the objectives of the WTO (Athukorala and Jayasuriya, 2003).

At present, export of livestock and livestock products from the less developed regions of the world to high value markets is greatly constrained - and made virtually impossible in many instances - by non-tariff barriers based on the occurrence of a range of so-called "epizootic" or "transboundary animal diseases" (TADs). These diseases mostly do not occur in the

developed world and therefore great effort is expended in ensuring their continued exclusion through improved management of both legal and illegal trade. The reason is that, by their nature, these diseases are capable of causing serious losses to the agricultural and tourist economies of developed countries (e.g. foot and mouth disease [FMD]) and some are also capable of causing significant human disease, e.g. Rift Valley fever [RVF] (Royal Society, 2002) .

Conventionally, safe importation of foreign livestock commodities is dependent upon the absence of TADs from the country of origin. Alternatively, the zone (region) or “compartment”ⁱ from which the commodity is derived need to be proven free from trade-influencing TADs (OIE, 2006). WTO has designated the OIE (World Organisation for Animal Health) as the body responsible for setting standards and developing guidelines for the safe international movement of animals, animal products and germplasm (Thiermann, 1997). OIE, therefore, details standards by which member countries can claim freedom from TADs for countries, zones and compartments although the issue of compartmentalisation is still a matter under consideration. For 4 specific diseases (foot and mouth disease [FMD], contagious bovine pleuro-pneumonia [CBPP], rinderpest and bovine spongiform encephalopathy [BSE]), OIE provides a formal mechanism whereby member countries can apply for official recognition of freedom from disease or infection. For other “listed” diseases recommendations are provided. The OIE therefore sets the standards and in some cases adjudicates on their implementation.

Basing acceptable risk (referred to as “appropriate risk” in the WTO’s Agreement on Sanitary and Phyto-sanitary Measures) associated with importation of animals or animal products on freedom of countries or zones from TADs is logical except for the fact that to achieve eradication of most TADs requires technology, infrastructure and finance that far exceed those available in most developing countries. In short, eradication of most TADs from sub-Saharan Africa, for example, is presently unachievable. After decades of effort and hundreds of millions of dollars of expenditure, rinderpest (one of the technically simplest diseases to eradicate) is now possibly no longer in existence but a number of other TADs still provide a threat to trade in commodities derived from livestock. So, paradoxically, developing countries have derived little dividend in the form increased market access from the eradication of rinderpest because other TADs (e.g. FMD) are still prevalent. This precludes them capitalizing on the benefits of rinderpest eradication. Countries in tropical and sub-tropical regions, and Africa especially, are therefore faced with a conundrum. On the one hand increasing export of livestock commodities is essential for economic development of rural areas where the most deprived communities live. On the other hand there is little prospect of achieving the objective in the face of regulations and norms that are both unrealistic and, arguably, unfair.

To address this problem a different perspective on the safety of livestock commodity exports has been proposed (Thomson *et al.*, 2004). The basic premise is that different

ⁱ Compartment: means one or more establishments under a common biosecurity management system containing an animal subpopulation with a distinct health status with respect to a specific disease or specific diseases for which required surveillance, control and biosecurity measures have been applied for the purpose of international trade (OIE, 2006).

commodities derived from animals intrinsically present different levels of risk as far as disease transmission is concerned and therefore the hazard mitigation for different commodities should vary accordingly. Some of these commodities are essentially safe to trade internationally irrespective of the disease status of the country, zone or compartment from which they are derived. As an example, cow's milk is regarded as a safe commodity with respect to BSE because the BSE agent has not been detected in the milk of BSE-infected cows (United Kingdom Government, 2005; OIE, 2006).

Apart from the differential risks that various commodities derived from animals pose, processing of products derived from animals is often capable of providing decisive risk reduction by destroying pathogens that may be present.

The principles behind this so-called commodity approach are accepted by the OIE and indeed OIE has made a formal commitment to investigate and promote opportunities with international and regional organisations in developing new standards for risk reduction to trade in livestock commodities (OIE/AU-IBAR, 2004).

Risks associated with international trade in cattle are considerably higher for most important infections of cattle than the risks associated with trade in fresh or frozen beef for reasons that are explained below. In Britain the de-boning of imported beef has a proven track-record of decisively reducing the risk of importing FMD from endemically infected countries. It was first introduced for imports from Argentina in 1969 under the modified Bledisloe Agreement between Argentina and the UK and this allowed Argentina to resume the trade it lost as a result of the 1967-68 UK FMD epidemic. The policy was subsequently extended to several other beef exporting countries in South America and southern Africa and has been a remarkable success story with many hundreds of thousands of tons of de-boned beef being exported to FMD-free countries in Europe, North America and elsewhere without untoward experience (Blajan and Callis, 1991).

This paper proposes a model export system for de-boned beef and processed de-boned beef products, to illustrate how the application of different processes mitigates the risk of eight priority trade-influencing TADs as well as factors important for food safety. The purpose is to demonstrate the appropriateness of the commodity approach generally and to highlight the need for increased impetus by OIE to develop appropriate standards for this approach.

CONSIDERATIONS

Eight high priority diseases that are currently believed to have the potential for introduction into free areas through importation of beef and beef products are considered below. They are:

- foot and mouth disease (FMD)
- bovine spongiform encephalopathy (BSE)
- Rift Valley fever (RVF)

- rinderpest
- contagious bovine pleuro-pneumonia (CBPP)
- lumpy skin disease (LSD)
- bluetongue
- Congo-Crimean haemorrhagic fever (CCHF)

Six of these diseases were included in the former List A group of diseases defined by the OIE as the most important in terms of impact and trade. BSE, which was not an A List disease, has assumed a unique position when it comes to trade in beef and is therefore an important disease in this respect (MacDiarmid, 2004). CCHF is an infection that could, in future, become problematic because of its zoonotic potential.

Official reports on the geographical distribution of these diseases can be found at: http://www.oie.int/eng/info/hebdo/A_INFO.HTM.

For importers of beef, especially those located in developed countries, an overriding pre-occupation when it comes to the acceptability of imported animal products is human food safety. Therefore, exporters of beef and beef products need to be able to provide convincing evidence that the commodities destined for export are safe for human consumption. Standards for general hygiene to be applied in the abattoir and during preparation of the beef are contained in the *Codex Alimentarius* (1997). Increasingly, additional private standards imposed by multi-national agri-businesses and supermarkets (e.g. EUREPGAP and ISO 22,000) also need to be met by exporters to high value markets. These standards, of course, do not deal exclusively with infectious agents. So, for example, MRLs (maximum residue levels) associated with veterinary drugs, pesticides and other undesirable biologically active substances are set by both the *Codex Alimentarius* and private standard-setters to ensure safety for human consumption. Of course, this necessitates monitoring systems, laboratories and testing equipment to support attainment of set standards. It also means that the beef needs to be derived from cattle slaughtered in export approved abattoirs with acceptable levels of hygiene, ideally adopting the principles of 'hazard analysis & critical control points' (HACCP) stipulated by the *Codex Alimentarius* and most private standard-setters in relation to food safety. It is important to note that during the production of fresh meat, control steps that ultimately guarantee the absence of identified microbiological hazards are not possible. For this reason "pure HACCP" can only be delivered in the production of processed meats. For fresh, chilled meat the "principles of HACCP" are utilized to control identified hazards to "an acceptable level" (this level equates with the OIE's "acceptable risk" and "appropriate risk").

It is also well worth noting that the principles of HACCP, which originally were derived from controls over potential failures in engineering processes, can be used in a number of different contexts. In the full "farm to fork" context the HACCP principles could be harnessed to analyse and control the animal health hazards presented by TADs and other important pathogens at the level of primary production. Such a systematic, disciplined approach would map-out the entire process, identify where the hazards can arise, and identify appropriate and effective control measures as well as specifying valid targets and critical limits, monitoring procedures, and corrective action. Documentation and records

would be properly controlled. This would bring the further benefit that the system would be audited, which would support certification to satisfy the concerns of the importers and their regulators.

HACCP principles are widely applied in the food industry and their application is an integral part of the European Union's new hygiene regulations to ensure food safety. In the context of the principles of HACCP, the definition of "hazard" is anything which has the potential to cause harm; "risk" is defined as a function of the probability of an adverse health effect and the severity of that effect, consequential to the realization of a hazard.

It is increasingly recognised that effective food safety and animal health control can only be assured by integrated traceability, control and monitoring of the entire production chain for any particular food commodity, encapsulated in catch-phrases such as 'farm to fork' and 'stable to table'. HACCP-based systems are apt in such circumstances and have, for example, been integrated into the primary production phase of the Danish swine industry (Nielsen et al., 1995). The extension of the HACCP principles into primary production is foreseen in the EU's food hygiene law.

For trade of specific commodities - processed or otherwise - to be successful, risk management requires credible certification, *viz.* assurance that the necessary risk mitigation measures have actually and satisfactorily been completed. Responsible importing countries as well as commercial importers require certification to demonstrate that the processing standards and quality requirements, international as well as importer-specific, of the commodity concerned have been fulfilled. Issues around this topic have recently been reviewed (Thomson et al., 2006).

PRINCIPLES ADOPTED

In order to understand the basis of the strategy proposed it is important that the principles underlying its development are scientifically sound – a prerequisite of the WTO's Sanitary and Phyto-sanitary Agreement [SPS Agreement] – and understood by stakeholders and regulatory authorities.

- Both food safety (i.e. safety for humans) and effective elimination of the potential for transmission of TADs by beef and beef products are normally vital for the acceptability of beef imported into any conventional trading country.
- All trade in livestock commodities implies some risk of disease transmission and therefore the concept of "zero" risk is no longer internationally acceptable (a principle accepted by the WTO). The acknowledged principle is that trade should occur only where the risk of the identified hazard occurring is below an acceptable level, referred to by the WTO as the "appropriate level of protection" (Article 5 of the SPS Agreement).

- Different livestock commoditiesⁱⁱ have intrinsically different potentials for transmitting TADs which can be exploited to reduce the risk of TAD transmission (Thomson *et al.*, 2004).
- Commodities which are inherently safe (i.e. do not contain transmissible quantities of agents capable of causing human disease or TADs) can be traded safely irrespective of the disease status of the country, zone or compartment (definitions available in the OIE's Terrestrial Animal Health Code [TAHC], 2006) from which they are derived.
- HACCP provides a practical, common, and adaptable approach to the identification of hazards and their effective control in respect of both food safety and prevention of spread of TADs. For food safety this is the conventional approach followed by the *Codex Alimentarius* and most private standard-setters but it is not yet routinely used in relation to animal diseases and therefore will not be found as a recommended approach in the TAHC (2006) but, on the other hand, HACCP principles do not conflict with those of the TAHC (2006).

A MODEL EXPORT SYSTEM FOR DEBONED BEEF DERIVED FROM COUNTRIES OR ZONES WHICH ARE NOT CERTIFIABLY FREE FROM ONE OR MORE IMPORTANT ANIMAL DISEASES

The essential requirements for ensuring that imported beef will fulfil international requirements for food safety and TAD transmission have been discussed above. It is evident that trading companies in each country or zone wishing to access international beef markets will need to base the initiative on sustainable access to a source of cattle capable of supplying beef of the quality desired by the importer. Furthermore, there is a requirement for at least one export abattoir which fulfils international standards for hygiene and ethical slaughter and in which de-boning can take place in accordance with requirements for maintenance of good hygiene.

To counter the risk of agents such as FMD, RVF and rinderpest viruses actively circulating among slaughter cattle involved in the export system, cattle destined for slaughter may need – depending upon prevailing circumstances – to be held in an all in – all out quarantine facility for at least 3 weeks where, upon entry, the animals would be treated with acaricides, de-wormed (taking care to observe minimum withdrawal periods) and vaccinated against appropriate diseases (as per OIE Standards for Vaccines & Diagnostic Tests) such as FMD and RVF (if appropriate to the circumstances) and black quarter before finally moving to the abattoir for slaughter and processing. Monitoring of the health, both general and in relation to specific diseases, of the animals involved would also be required during this quarantine period as would an appropriate traceability system. Subjecting animals in the export system to a quarantine period could be exploited for other purposes. For example, quarantine could be combined with “finishing” of the source cattle to improve

ⁱⁱ According to the Terrestrial Animal Health Code (2006), a commodity means “animals, products of animal origin intended for human consumption, for animal feeding, for pharmaceutical or surgical use or for agricultural or industrial use, semen, embryos/ova, biological products and pathological material.

the quality of beef produced for the market for which they are destined. Such a system could benefit both the quality of the final products as well as bio-security.

In essence therefore, a beef export system would need to have at least 3 components: (1) an export grade abattoir and meat processing facility where de-boned beef can be produced according to international standards, (2) a defined region from which quality cattle for beef production are supplied whose source is assured by an adequate traceability system and (3) a quarantine/holding facility in which cattle can be isolated for at least three weeks as well as treated and vaccinated to ensure bio-security of the system and particularly to preclude the possibility that animals slaughtered are not in the acute phase of infection with one or more of the TADs/zoonoses that concern international importers.

In order to ensure compliance with modern disease control requirements, the export system (i.e. establishments from which the animals are sourced, quarantine/finishing facility and the abattoir/processing plant) would need to fulfil the requirements for a compartment as defined by the OIE (TAHC Chapter 1.3.5). This means that it needs to be managed under an integrated bio-security system. The precise arrangements under which each system would operate would be dictated by circumstances prevailing in the locality concerned.

The above arrangement, provided it is adequately managed, would provide an effective barrier to the beef produced being contaminated by dangerous infectious or non-infectious agents. However, it is widely accepted in bio-hazard management that single barriers to counter identified hazards are inadequate and therefore that multiple barriers are a prerequisite.

The second major barrier to contamination of beef produced under the system described above by major animal pathogens will be provided by (i) the de-boning process (ii) the removal of lymph nodes and (iii) sourcing deboned beef from carcasses previously processed to separate out the tissues which, in countries which declare BSE, are removed by law. This will function to provide further confidence for consumers in the safety of the product, irrespective of the evidential need for such controls. Thus the system proposed will provide multiple barriers to the hazards posed by important pathogens.

For each of the important infections identified as important in respect of potential trade in beef, the risk mitigation effects would be:

FMD

- Vaccination will reduce the risk of FMD occurring in any batch of cattle. Vaccine and field strains would be matched (OIE 2006 2).
- Quarantine will create the opportunity for any animals in the batch of cattle to manifest disease. Should this occur the whole batch will be discarded;
- None of the animals slaughtered for beef production would be in the incubation phase of the disease - ensured by the quarantine period;

- Only clinically healthy cattle would be slaughtered and the only cases which could possibly contain large quantities of FMD virus would be animals in the incubation period which would be precluded (see both bullets above);
- Bones and lymph nodes would be removed from the beef to ensure these potentially virus-containing tissues are not present;
 - This is officially supported by the OIE – see Article 2.2.10.22 of the TAHC, 2006;
- Measures implemented to ensure effective *post-mortem* maturation of the beef, with consequent lowering of the pH of striated muscle to lower than pH 6.0 (i.e. adequate feeding of the animals and resting them before slaughter) eliminates FMD virus in muscle tissue (Henderson and Brooksby, 1948);

Metcalf et al. (1996), in a hypothetical model for the production of de-boned beef, which included the procedures above but not vaccination or quarantine, estimated that the combined risk scenarios for de-boned beef from an infected animal would be 6.48×10^{-9} or that virus would survive in 1 of every 154 million infected carcasses slaughtered. The inclusion of vaccination in the procedures will reduce the risk of FMD in meat and meat products to negligible levels (Sutmoller and Casas Olascoaga (2003).

BSE

- Any animal suffering from clinical BSE (most unlikely) would be removed from the quarantine facility and disposed by deep burial or other approved method;
- None of the cattle supplied for beef production will be younger than 12 months or older than 30 months of age; i.e. they will be slaughtered at an age when appearance of clinical disease would be precluded (see Chapter 2.3.13);
- None of the tissues which have been shown to contain the BSE prion in infected animals (e.g. brain, spinal cord, dorsal root ganglia) would be in the final product;
- The compartment from which the cattle are derived will supply independent and credible certification to the effect that none of the cattle within the compartment from which the cattle are derived were fed on meat and bone meal (or other animal material) at any stage of their lives.

RVF

- Vaccination of cattle entering the quarantine area against RVF and keeping them confined for at least 3 weeks prior to slaughter would preclude viraemia occurring in any slaughtered cattle (recommended by OIE; see Chapter 2.2.14 of the TAHC, 2006);
- Survival of RVF virus in the muscles of slaughtered animals, even when they are killed in the viraemic phase, is inhibited by maturation of the meat (Swanepoel & Coetzer, 2004; Article 2.2.14.11 of the TAHC, 2006).

Rinderpest

- Authenticated occurrence of rinderpest infection has not been proven in any country of the world in the 21st Century; it has therefore probably been eradicated;
- If it were considered necessary and in accordance with OIE recommendations, cattle entering the quarantine facility could be vaccinated against rinderpest with conventional vaccine which induced sterile immunity within 3 weeks of primary vaccination (Rossiter, 2004);
- Lowering of muscle pH during *post-mortem* maturation would inactivate any residual virus in beef (Scott, 1990);
- Removal of bones and lymph nodes from the beef would deplete lymphatic tissues for which rinderpest virus has a predilection (Rossiter, 2004).

CBPP

- The pathogenesis of *M. mycoides mycoides* (small colony) and its mode of transmission between cattle ensures that the agent cannot be transmitted by beef (Thiaucourt *et al.*, 2004).

LSD

- This virus cannot be transmitted through the agency of beef (Coetzer, 2004).

Bluetongue

- Although infection of cattle is common in regions where vectors capable of transmitting bluetongue occur, animal tissues and products, even from infected animals, can be disregarded as sources of infection (Verwoerd & Erasmus, 2004).

CCHF

- Treating all cattle with an acaricide as they enter the quarantine facility and keeping them there for 3 weeks would ensure that no cattle are viraemic with this virus at the time of slaughter;
- Lowering of muscle pH during the maturation process will inactivate virus present in the beef (Swanepoel & Burt, 2004).

FURTHER PROCESSING OF DE-BONED BEEF TO REDUCE THE RISK OF TRANSMITTING TADS

A significant proportion of beef produced in the way described above will be further processed, usually by some form of cooking, before being sold to consumers. Increasingly the trend among food manufacturers is towards product processing/beneficiation to add value to the product and thereby derive maximum economic benefit. All forms of cooking as

well as most other processing methods (e.g. drying, smoking, pickling) further decrease the extremely small probability of infectious agents capable of initiating TADs surviving in de-boned beef.

The OIE has developed standards that require risk to be expressed in terms of probability, rather than mere possibility. The OIE Handbook on Import Risk Analysis for Animals and Animal Products describes the methods for performing qualitative risk analysis and quantitative risk assessment (OIE, 2004).

SAFEGUARDS REQUIRED TO ENSURE HUMAN FOOD SAFETY

Consumers of food must be adequately protected against the possibility of food-borne hazards being realized. It is worth noting that several control measures proposed to minimize the risk of the transmission of TADs have an additional function in also protecting consumers against the realization of food-borne hazards as well as providing health reassurances to consumers.

These are in particular:

- (1) measures to ensure that only animals below the age of 30 months are processed into food and (prior to de-boning) separation and removal of those tissues normally removed by law in countries which declare BSE; the application of these measures will effectively protect and reassure consumers against the extremely low risk that the BSE agent (prion protein) could be present in beef carcasses from which de-boned beef is prepared.
- (ii) removing lymphatic tissue, and also bone, will reduce the total food-borne hazards carried by the commodity.
- (iii) effective post-mortem maturation of beef lowers the muscle pH thus eliminating specific zoonotic agents such as CCHF and potentially inhibiting the growth of other micro-organisms.

Controls over food borne hazards that would have to be implemented on the range or in the feedlots include-

- (i) Effective control of drug residues in animals being presented for slaughter. This will be achieved by-
 - education of producers,
 - formal 'code of practice' agreed between participants in the scheme and management,
 - on-farm audit of production systems and control points, and
 - a surveillance scheme for testing a representative sample of the carcasses being processed.

- (ii) Control of the contact of animals with human faeces while cattle are being raised. This measure would reduce the possibility of meat becoming infected with the parasite *Cysticercus bovis*, which is harmful for food consumers when the cysts are ingested in undercooked meat and develop into the human tapeworm *Taenia saginata*.
- (iii) A “clean livestock policy” would be necessary. This will ensure that animals delivered to the abattoir are as clean as possible at the time of slaughter, thus minimising the ingress of contamination to the place of food processing.

Producers who fail these required sanitary control standards, incorporated into the ‘code of practice’ would be de-listed and penalized. The scheme must be credible and demonstrably effective.

Other necessary control measures that would protect consumers are conventional food safety pathogen reduction programmes found in all internationally approved abattoirs and meat plants. The management and maintenance of the abattoir including the building and all of the associated facilities would have to conform with the standards that are acceptable for international trade. This means that there would have to be (a) auditable and acceptable standards of GMP (good manufacturing practice) and GHP (good hygiene practice), (b) a comprehensive set of PRPs (programmes pre-requisite to the implementation of the HACCP principles), and (c) SSOPs (Sanitation Special Operating Procedures) to cover the control of food safety hazards that potentially originate from the environment in which the food is processed.

Over and above the control of food hazards on the range or feedlot and the hazards arising in the environment of the abattoir, a qualified multi-disciplinary team would analyse and address hazards that could arise from the product itself in a HACCP study. The study would produce a HACCP plan which would then be validated. This plan would need to be successfully implemented as a HACCP programme, and subsequently verified as serving the food safety objectives of the original study. The food business operator (FBO) would have to permanently maintain the HACCP system which would be independently audited in order to demonstrate the continuing effectiveness of the controls in place.

A component of the HACCP programme would be a pathogen surveillance programme, as part of the HACCP verification process, which would involve the microbiological testing of meat to quantify and identify pathogens, and identify trends. Surfaces where meat is handled would also be sampled and tested to verify standards of cleaning.

The food safety standards in the abattoir would be audited and enforced by an independent and authorized regulator or the NVS/Competent Authority. The regulatory activities would include routine and comprehensive veterinary ante-mortem and post-mortem inspections for all animals processed into meat as a commodity.

Overall these activities would function to provide sufficient confidence in the safety of the meat at the point of processing and demonstrate, by means of hygiene audit, the fitness of the food leaving the food factory for international trade with discerning markets.

CONCLUSIONS

The available scientific evidence as well as years of practical experience derived from the importation of de-boned beef into Europe, indicate that beef from which the bones and lymph nodes have been removed is a safe commodity to trade as long as necessary safeguards are observed. For the TADs most feared by developed regions of the world, it is shown in this document that as long as de-boned beef is produced and processed by well recognised methods – with accompanying credible auditing and certification – the risk posed to importing countries is well within the “appropriate level of protection” specified by the WTO. It is possible to achieve this objective even though the locality (country or zone) of production and processing may not be recognised as free from these undesirable infections. International acceptance of this fact will greatly benefit developing countries through provision of means by which income can be generated from livestock exports, thereby enabling re-investment in progressive control of TADs.

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