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ANIMAL HEALTH:
A BREAKPOINT in
ECONOMIC DEVELOPMENT?

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From Farm to Table: Ensuring Food Safety and Public Health

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Abstract
The single most important realisation that has arisen from new scientific approaches to food hygiene is that control measures must be designed and implemented within a farm-to-table context. A pro-active and multidisciplinary response at both the national and international levels should incorporate new regulatory frameworks and the ability to implement hygiene measures at those steps in the food chain where they are of greatest value. Application of a risk management framework in the development of standards must be embedded in the farm-to-table approach and industry should be offered flexibility in the way it achieves specified food safety performance objectives. It is also necessary to nurture risk assessment capability in developing countries so that they can adequately protect their own citizens and properly benefit from a globalising market in food. The WTO SPS Agreement aims to enhance trade in food on a global scale but problems remain in application of provisions supporting an equitable farm-to-table food safety environment.

Keywords: Farm-to-table, food safety

Introduction
International reassessment of traditional approaches to food hygiene began in earnest around the time of the “FAO/WHO Conference on Food Standards, Chemicals in Food and Food Trade (in cooperation with GATT)” in 1991. Three waves of scientific change are clearly identifiable since then:

- Science-based specification of GHP in the early 1990’s
- HACCP in the mid - 1990’s
- Risk assessment in the late 1990’s.

The World Trade Organisation Sanitary and Phytosanitary (WTO SPS) Agreement, signed in 1994, has had a major influence on these waves of change. The Agreement requires that hygiene measures be based on scientific principles and an assessment of the risks to human health, using risk assessment techniques developed by the relevant international organisations.

Further to the signing of the Agreement, concern over the safety of food in international trade has recently led intense consumer-led debate. This in turn has led to increasing demands for strengthening of food safety assurances by competent authorities. In parallel, the differing economics of regional food production continue to drive national efforts for fair and equitable conditions of trade.

The single most important realisation that has arisen from new scientific approaches to food hygiene is that control measures must be designed, evaluated and implemented within a farm-to-table context. As a veterinarian, my work in the area of food safety has been primarily focused on food from animals rather than food from plants. Additionally, New Zealand has a strong international presence as an exporter of foods of animal origin. As these are areas I know best, I will focus my comments in this paper on farm-to-table aspects of foods of animal origin in international trade.

A farm-to-table approach to ensuring the safety of food in international trade should include:

- New regulatory frameworks at the national level
- The opportunity to implement hygiene measures at any step in the food chain
- Production of food that meets international standards
- Where specified, achievement of the appropriate level of protection (ALOP) of an importing country
- Cost-effective and efficient production, processing and distribution
- Representation of the interests of all relevant stakeholders.

National Regulatory Frameworks
Traditional legislation usually defines “food safety” in general terms and regulations based on good hygienic practice (GHP) are often unsupported by good science. However, new national legislative frameworks that specifically incorporate a farm-to-plate approach to food safety have become an important global trend. This is predicated by adoption of risk management principles.

Institutional Change
Recent government policy changes in many countries reflect the demand for significantly increased resources to protect public health against food-borne diseases of animal origin. While strengthening institutional structures in relation to food safety, many countries are also promoting cross-sector networks that facilitate risk-based “farm-to-plate” approaches. This trend is leading to greater co-ordination between different competent authorities operating at different segments of the food
chain and a number of countries have consolidated food safety regulation under the umbrella of a single competent authority. In parallel, many of the international trade provisions of the WTO SPS Agreement have flowed through to domestic standards and signatory countries are now reducing differences between import and domestic requirements.

**Veterinary Public Health**

The traditional focus of veterinary food hygiene has been at the level of the slaughterhouse, but a farm-to-table approach demands integrated involvement in food control throughout the food chain. Where zoonoses are concerned, it is clear that there often is an overlap between public health and animal health objectives. Veterinary competence can be shared in these circumstances and a number of countries are exploring such synergies in the reform of legislative systems.

**HACCP and Risk Assessment**

At the programme level, implementation of HACCP and risk assessment is resulting in fundamental changes in the writing of national hygiene regulations. HACCP, a more sophisticated food control system than GHP, “identifies, evaluates, and controls hazards which are significant for food safety”. This demands consideration of the farm-to-table continuum when setting critical limits, even if this does not genuinely include risk assessment.

Many countries now consider that food control measures should be proportionate to health risks presented by identified hazards and are investing heavily in risk analysis (see below). Intrinsic to this approach, risk managers must pay to the feasibility and practicality of available control measures. The outcome should be food safety measures applied at those points in the food chain where they will be of greatest value in reducing foodborne risks to consumers.

**Role of Industry**

Changes in approach to regulatory programmes impacts on industry in a number of ways. Although governments have final responsibility for public good decisions on required levels of consumer protection and verifying compliance with regulations, industry has now been given the primary responsibility for implementation of food safety control systems. Industry must also demonstrate compliance on an on-going basis. Alongside HACCP, self-driven quality assurance systems that optimise hygiene practices from farm-to-table can result in considerably less verification activities by the competent authority.

**International Food Safety Standards**

Codex standards take a central role in facilitating a farm-to-table approach to food safety. Food products that comply with Codex standards can move freely in international trade without jeopardising the health or interests of consumers and WTO SPS recognition of these standards as a benchmark against which national food standards should be evaluated has considerably increased their importance.

Codex has fully embraced a farm-to-table approach. Early manifestations are codes of hygienic practice that now provide detailed guidance on food control throughout the food chain, including much increased attention to good agricultural practice and good veterinary practice at farm level. New codes of practice and other types of food standards will increasingly be based on risk assessment and the Codex actively seeks wider strategic alliances with other international organisations such as OIE, IPPC and OECD to further facilitate a farm-to-table approach.

In addition to establishing international standards for animal health, it is the mandate of the World Organisation for Animal Health (OIE) to establish standards for zoonoses. A food-borne zoonotic disease is any disease or infection of both animals and man that is transmitted through food and OIE is now broadening its work to cover such diseases.

Zoonoses are the subject of renewed concern as “emerging” pathogens. OIE defines an emerging disease as “a new infection resulting from the evolution of an existing pathogen or parasite resulting in a change of host range, vector, pathogenicity or strain; or the occurrence of a previously unrecognized infection or disease”. There is increasing collaboration between OIE, CAC and WHO on scientific matters relating to emerging pathogens e.g. *E. coli* H7:O157 and the agent of BSE/vCJD.

**Risk Analysis as a Key Discipline**

Risk analysis in food safety has its contemporary roots in the emerging global climate of “free trade” that is based on removal of barriers constituting unjustified protection of domestic economic advantage. However, the global community fully recognises the sovereign right of countries to place appropriate controls on food products crossing their borders so as to protect human health. This risk-based representation of a farm-to-table approach to food safety is having an increasing impact in international trade.

Risk analysis constitutes an interplay of several tasks and is generally recognised as having three components: risk assessment; risk management, and risk communication. This discipline is increasingly becoming cross-sectoral in nature. It is not my intent to describe the details of food safety risk analysis in this paper. However, it is important to recognize that application of a risk management framework is critical to implementing farm-to-table food safety measures.
Risk Management Framework

Preliminary risk management activities: Following identification of a food safety issue, this initial process includes the establishment of a risk profile and provides as much information as possible to guide further action. The risk manager may commission a detailed risk assessment as an independent scientific process.

Assessment of risk management options: Potential food safety measures that may be applied at any point in the food chain are identified, and then selected according to appropriate decision-making criteria. This will usually involve balancing expectations in terms of minimising public health risks against available food control measures, and may include reaching a decision on an ALOP.

Implementation: Implementation of control measures will usually involve regulatory requirements but may include other actions e.g. consumer education. Flexibility in choice of individual measures applied by industry is a desirable element, as long as the farm-to-table measures can be objectively shown to achieve stated food safety goals.

Monitoring and review: Gathering and analysing of human health data gives an overview of food safety and consumer health. Where there is evidence that required food safety goals are not being achieved, redesign of food safety measures will be needed.

Decisions on Management of Risk

While the overarching objective is maximising risk reduction while ensuring the efficiency and effectiveness of the measures employed, decisions on level of consumer protection can be influenced by a wide range of economic, social and political inputs. Evaluation of all available control options throughout the farm-to-table continuum is the ideal scenario when managing food-borne risks. However, different stakeholders may impose their requirements in international trade situations e.g. importing country ALOP decisions, supplier contracts let by supermarket chains.

Benefits of a Farm-to-table Approach to Food Control

In addition to the direct social and economic benefits from reducing food-borne illness, a farm-to-table approach to food safety can result in considerable cost-benefits to competent authorities and industry.

Food Safety Objectives

Food safety objectives (FSOs) are a new concept that have the potential to markedly affect future food safety systems. FSOs link the level of hazards in food at the point of consumption to the level of consumer protection that results. In the ideal situation, a risk assessment model will be used to set a FSO for a particular food/hazard combination.

Performance objectives (POs) derived from FSOs will provide food safety “targets” for industry and can be set anywhere in the farm-to-table continuum. As long as the level of hazards present at a particular step in the food chain is less than the target, the required level of consumer protection can be considered to be achieved. With the advent of FSOs, industry will be able to utilise hygiene measures that are the most cost-effective in a particular context.

Equivalence

Application of the principle of equivalence is becoming an important driving force in the “globalisation” of food hygiene. Where competent authorities can show that alternative food safety measures or systems in an exporting country can be shown to deliver the public health outcomes required by an importing country, significant benefits can accrue to the exporting country. Different hygiene measures that are more cost-effective in a particular food production context can be accommodated and “systems-based” verification of compliance offers distinct advantages to the regulator. The principle of equivalence can also be applied in national settings.

Meat Hygiene

Meat hygiene constitutes a fertile area for reaping the cost benefits of a farm-to-table approach to food control. Post-mortem meat inspection procedures are a unique set of food hygiene measures and a number of recent studies have used a risk assessment approach to determine their relative value. A targeted and cost-effective inspection programme that is tailored to the particular type and geographical origin of slaughtered animals can achieve essentially the same level of consumer protection at the end of the food chain as a traditional inspection programme. As an example, a probabilistic risk model has been developed to evaluate traditional post mortem inspection of slaughtered cattle for cysts of the beef cestode Taenia saginata (Van der Logt and others, 1997) and this illustrates multiple cost benefits that can accrue from a farm-to-table approach to hygiene measures.

Zoonotic pathogens ranked in recent international reviews as being of most meat hygiene significance are Salmonella, Campylobacter, E. coli O157:H7, Listeria monocytogenes and Toxoplasma gondii; with the exception of the latter it is likely that almost all transmission of these hazards results from unseen microbial contamination of the carcass and viscera during slaughter and dressing. Minimising food-borne risks from
this source requires farm-to-table strategies that include consideration of hygiene controls at the farm as well as the pre-slaughter level. As examples, it is well established that general attention to livestock management, environmental hygiene and transport may limit the numbers of animals shedding _Salmonella_, and improving the cleanliness (and dryness) of pre-slaughtered animals can significantly reduce carcass contamination. Recent risk models have also indicated that inadequate meat handling and preparation practices in the home will considerably increase risks of food borne illness from enteric pathogens.

National microbiological databases are becoming an important tool in the evolution of a farm-to-table approach to food safety. They constitute a statistical monitor for demonstration of hygiene performance at both a premises and a national level and can also provide: a means of verifying HACCP plans on an ongoing basis, ensuring regulatory intervention when hygiene is deficient investigating specific pathogens, and a reference system for regulatory and commercial assurances for purposes of market access.

**Milk Hygiene**

With the advent of a farm-to-plate approach to food safety, Codex has recognised that traditional insistence on the absence of hazards at particular steps in the dairy food chain does not necessarily equate with achieving expected levels of consumer protection. Flexibility in hygiene provisions was recently introduced to a new draft code of hygienic practice, as long as a specified level of consumer protection could be achieved at the end of the food chain. This flexibility has been further extended in the case of small-holding dairies.

The draft code recognises that when raw milk commodities are produced, the hygiene measures applied by industry at primary production are one of the most important determinants of consumer protection. By applying risk management principles, the code now accommodates the wide range of food safety approaches that exist for the production of raw milk products in different countries. However, the equivalence of optimal pasteurisation regimes and alternative pasteurisation technologies that can provide maximum benefits to industry and consumers cannot be properly evaluated without risk assessment.

Unlike meat hygiene, veterinarians have traditionally had a minor role in dairy hygiene. This is probably due to the fact that pasteurisation is a statutory requirement for milk in many countries and has an excellent food safety record.

**Codex Standards**

As well as protecting consumers’ health, availability of international hygiene standards that are based on a farm-to-table approach reduces the costs of doing business e.g. risk of fraud and the costs of finding reliable trading partners. In providing such benefits, Codex standards promote economic welfare and are a pre-requisite to the operation of a well-functioning market. If standards are harmonised between countries, they naturally facilitate trade (international and domestic) and trade itself is generally judged to promote economic development.

**WTO SPS Agreement**

Competent authorities in developed countries have now gained considerable experience in making use of the WTO SPS Agreement to maintain and expand farm-to-table trade opportunities. Despite this, there are increasing political pressures on competent authorities to respond to public perceptions of food-borne disease and the requirement that food safety measures be based on risk assessment has often resulted in delays in decisions to allow market access, and caused conflict between trading partners. The science-based foundation of the WTO SPS Agreement accentuates these problems where there is a shortage of technical capability and this occurs in both developed and developing countries.

**Summary**

Achieving the potential benefits from a farm-to-table approach to food safety and public health presents a number of challenges. Problems exist in many countries not necessarily because of lack of legal infrastructure but because of broad disparities in the means to adequately and consistently respond to food safety needs in specific sectors of the food chain, many of which spill over into other sectors.

If a farm-to-table approach to food hygiene is to take root, an integrated, pro-active and multidisciplinary response is required. A “General Food Law” (including relevant aspects of animal feeding) that is readily understandable by all food operators is one means of enhancing food hygiene. Risk analysis and application of a risk management framework in the development of standards must be embedded in this response and industry should be offered flexibility in the way it achieves specified performance objectives at certain points in the food chain.

International standards also must incorporate modern food control concepts and be representative of regional needs. This includes nurturing of risk assessment capability in developing countries so that they can adequately protect their own citizens and properly benefit from a globalising market in food.

**References**