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PROPOSED DESIGN OF A «STABLE TO TABLE» INFORMATION SYSTEM FOR FOOD SAFETY

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La sécurité alimentaire est devenue une question internationale majeure au cours des dernières années, en particulier à cause d'incidents à conséquences importantes. Alors qu'il existe beaucoup d'aide pour utiliser les procédures permettant de s'assurer que la nourriture provient d'animaux à très faible risque et que pendant les opérations de manipulation et de transformation, des précautions adéquates ont été prises pour protéger le consommateur, ces systèmes se concentrent beaucoup trop sur les équipements, les procédures et la surveillances comme témoins du véritable objectif de réduction du risque.
Ceci échoue dans les cas importants et n'est pas adéquat au plan coût-mesures efficaces pour atteindre l'objectif.
Une nouvelle approche est nécessaire, qui adoptera non seulement une stratégie de gestion du risque plutôt qu'un programme qualité moins clairement ciblé, mais également s'adaptera progressivement avec l'expérience accumulée et permettra de meilleures décisions dans des cas particuliers, plutôt que la façon empirique actuelle.
EpiMAN (Food Safety) doit devenir le système national de suivi des produits animaux de l'étable à la table, en utilisant l'information collectée tout au long du chemin de transformation, grâce à des systèmes experts et des actions recommandées pour maintenir le risque d'effets néfastes sur le consommateur suffisamment bas pour ne pas être inquiétant.

INTRODUCTION

There is increasing concern worldwide about food safety, arising from a growing range of incidents over recent years in which there have been serious human health effects from disease agents contaminating food products on a large scale - or where there have been scares of such contamination or of health risks from food constituents, though little or no human disease. Such poorly founded scares may have economic effects as least as serious as true outbreaks, and may be much more difficult to control since rumours are highly contagious (disseminated by the communications media), and difficult to control since they have no clear factual basis to which an expert can respond, and the rumours mutate rapidly as they are passaged through news reporters, to ensure continued successful transmission.

Any food safety system must be able to support action against rumours of disease as well as against actual outbreaks. Traditional meat inspection is designed to detect visible pathological lesions or other organoleptic change, and is very poor at protecting against most of the genuine hazards currently associated with food of animal origin, and the hypothetical hazards embodied in rumours and news stories. Over the last decade or more there has been considerable effort to develop pre-harvest food safety and hazard analysis/critical control point (HACCP) approaches to complement traditional methods of detecting health hazards in food. There is currently much talk of «stable to table» or «paddock to plate» food safety systems, which it is agreed should form the basis for future protection of human health and product quality.

However so far little progress has been made in providing the data to support claims of being able to document the history of product from the farm to the point where it reaches the consumer's plate. The decision support system EpiMAN was developed initially for control of major contagious diseases such as foot and mouth disease, and is now being extended to handle endemic disease control programs. Because EpiMAN integrates spatial data about the location of farms with history data about each farm, it provides the core requirements to set up a genuinely effective stable to table record, which could be traced back through the chain where necessary. Expert systems have been developed within EpiMAN to facilitate such tracing procedures for contagious diseases, and to assess the significance of particular incidents in relation to contagious disease. The same principles are applicable to food safety, and prototypes of expert systems applicable to a food safety risk management system have been developed to test the approach (van der Logt and Morris, 1997).

REQUIREMENTS FOR A NEW SYSTEM

Two basic changes in the philosophy of food safety are essential if human health is to be protected against zoonotic diseases and confidence in foods of animal origin is to be maintained.

1. To provide a food safety system which genuinely protects the consumer, it will be necessary to move on from «certification» approaches based on specification of process and facility requirements which must be met. These currently form the basis of food safety assurance procedures but provide a false sense of security that they have specifically reduced risk, whereas in reality they are not sufficiently tightly targeted at true risk factors.

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2. Surveillance systems alone do not have the detection power to support food safety certification in the way that they can support certification of area disease status, and it will be necessary to adopt instead a quantitatively based risk management approach which makes use of risk factor evidence to focus on managing those specific issues which affect food safety.

REASONS FOR LIMITED PROGRESS

There are three major difficulties in making this change, which is why there has been far more talk than action about its practical application.

Firstly, the range of data available to make assessments of the risk attached to particular practices (both protective and risk-increasing) remains far too limited. It will be essential to gather more such data over coming years, so that experience will accumulate on which to base more precise decisions. This will come in part from purpose-designed studies of product-handling practices, to compare the impact of alternative procedures on various hazards (items or events which could have adverse consequences) or risks (the probability that a specified hazard will in fact be realised). However it will also be necessary to make extensive use of observational evidence gathered in the course of routine animal and product processing, since it will never be possible to carry out sufficient studies to identify and characterise the scope of the various risks attached to particular practices. At present there is no easy way of gathering such observational data without very high cost.

Secondly, since a proportion of the hazards associated with food arise from handling practices on the farm of origin, the lack of information about what practices are in use makes it impossible under current circumstances to accurately represent the «stable» or «paddock» end of the process of food production.

Thirdly, even if the required information was available, the amount of data would potentially be overwhelming, unless it was brought together in some coherent way.

These issues will not be resolved quickly, but maintenance of public confidence in food safety has re-emerged over recent years as a major international issue, and as epidemiologists we have both the skills and the responsibility to provide guidance on how appropriate systems might be designed and operated.

There has already been much discussion of the principles and practical procedures applicable to the problem, but it is clear that no system of food safety can be implemented effectively without a way of handling and interpreting the data which will arise from the adoption of a genuinely risk-based approach.

NATURE OF THE PROPOSED SYSTEM

All of the concepts proposed for EpiMAN (Food Safety) are already widely accepted as desirable, and there is nothing novel in the fundamental approach. However the development of suitable information technology over recent years, allows the approach to be implemented in much greater depth than would previously have been possible.

In New Zealand, the Ministry of Agriculture is currently completing development of a national farms database named Agribase, which contains digital map outlines of all farms, plus ownership and enterprise information on each property. This offers the potential for relating information collected at later stages in the processing of animals and their products back to the farm of origin, and to form such data into spatial and temporal patterns for the purpose of evaluating whether this information should be considered in the handling of (say) animal carcasses originating from that farm. While the level of information embodied in Agribase provides close to the ideal base infrastructure for operation of a comprehensive food safety system linked to the individual farm of origin, the system would still operate (though with less power for spatial analysis) with either point locations for farms or with no spatial data whatever. The main value of the spatial data is in being able to provide statements and make inferences about areas comprising multiple farms within a limited spatial area, which is one of the benefits of the system, but far from the only one.

The core concept in EpiMAN (Food Safety) starts with defining hazards (and any minimum levels of these hazards at which they would become of concern) which might potentially be associated with particular food products at the point they enter the retail part of the marketing chain. The unrestricted risk that a typical consumer would be exposed to a hazard of public health significance within broadly normal consumption patterns would then be evaluated against a pre-set criterion, for all of the hazards of concern. For example, the criterion might be set to a probability of less than 1 in 10 million that a single consumer would be exposed to sufficient of the hazard during the course of a year to exceed agreed maximum desirable intake levels of the substance. This would narrow the focus greatly to a limited number of chemical compounds and microbiological hazards, and on recent experience would strongly move the emphasis from chemical hazards (which have received attention far beyond their true relative importance simply because they are more measurable) towards greater focus on microbiological hazards.

For those hazards which remain above the risk threshold, EpiMAN (Food Safety) would then include expert systems for guiding on what strategies needed to be pursued for the handling practices on the farm of origin, animal handling during transport, product handling, nature of the consumer product to which the material would go, etc in order to achieve the required risk level at the retail level.

These expert systems will be embedded in a system which tracks animals through the marketing chain from their farm of origin, carrying accumulating risk-related data so that final product can be classified into risk categories and handled appropriately. Where decisions adversely affected the price received by the livestock producer, feedback would be provided about the nature of the deficiency and corrective action which the producer might undertake in future.

Progressively the aim would be to build up farm profiles of each supplier as a result of continuing submission of animals for slaughter (or milk for processing etc), so that the handling of product and its potential range of market

options would be influenced by the standing it had built up over time. Increasingly in New Zealand, farms are members of quality programs which require them to comply with various «codes of good practice» in order to gain favoured status for their products. It is anticipated that this program would form a key part of a quality assurance program, with such farms receiving favourable treatment with regard to inspection, sampling intensity etc, in view of their demonstrated compliance with standards which reduce health risks.

By bringing together spatial information, accumulating farm histories, handling practice data and other items into an integrated information system, epidemiological analysis tools could be applied to refining the information and hence adjusting the expert systems. While such a system presents some challenges, all of them have been solved in earlier information systems, and it is considered essential that an epidemiologically defensible system of this nature should replace the current outdated approach, which does not adequately protect human health against emerging health hazards, and rumours of hazards.

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