Meat, Chemical Residues, Trade and Human Health

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ABSTRACT

International and domestic markets have a right to expect that the animal products they are buying are safe, wholesome, and true to label. However, residue testing is being used more today to control access to markets than it is for food safety. The general public has a grossly distorted perception of the relative risks that "residues" pose to their health. Insistence and then reliance on the results of increased rates of end-product testing is an inefficient and largely ineffective means of controlling product "quality". There is an urgent need for the world to refocus its thinking and resources towards more effective control measures and more pressing food safety issues.

INTRODUCTION

Recently the meat industry has been racked by repeated food safety crises. From verotoxigenic *E. coli* killing school kids, through to hypothesised link between new variant CJD and BSE. Consumers confidence in meat has taken a pounding. Consumers are now finely pi to negatively respond to the merest hint of a new "contaminant" or "adulterant". Regulatory standards and Government inspections are so be lagging behind consumer expectations. Supermarkets are responding with increased demands on suppliers to have tighter controls on all as of production. The often quoted "from pasture to plate" concept of quality control is increasingly becoming a trading reality.

"Food safety assurances" have become a marketing tool, and like all marketing tools everyone is looking for an "angle". Something w distinguishes their product from the others to give them an edge. Marketers will tell you "perception" is everything, "reality" is only important it is exposed to an extent that it negatively impacts on "the image". From an advertising point of view anything "natural" is good, anything as an additive or contaminants is bad.

Increasingly we are seeing the use of marketing tools such as "Quality Marks" and additional claims such as "produced in accordance sustainable agricultural practices". Some sellers are responding to more specific public concerns and promote claims such as "hormone f "antibiotic free", or "no avoparcin used", to give examples of three which are topical at present. How many of these "food safety" justified mar claims are grounded in reality. By exploiting marketing opportunities such as these is the industry further fuelling consumer concerns and ultim denigrating the image of their product.

CONSUMER ATTITUDES

Consumer and market surveys have consistently highlighted food safety as one of if not the most important criteria considered by buyers. W various food safety parameters are listed, concerns over the chemical residue content of meat seem to be ranked unduly highly. The preval of salmonella and campylobacter in poultry doesn't seem to get a mention, but there is a common perception all meat has been derived from an raised on antibiotics and hormones and contains residues of these compounds.

Mention science and you get an automatic response, science didn't protect us from thalidomide, DDT or BSE. But how else can you objec describe hazards and rank risks to allow the limited resources to be best apportioned to address those food safety issues of most significan Where in the ranking does chemical residues sit with respect to other food safety hazards. I'll confuse the issue further by asking has a risk b established in the first place? Why are residues in meat given so much importance? It is arguable the reason rests more with the world's his of trying to control access to their markets to protect their domestic industries than it does with consumer protection. Whereas the detectio a single non-compliant result in an imported consignment can have huge cost and market access implications, the fact that total diet surveys aro the world have consistently implicated vegetables, grains and fruits as the foods that contribute most to our "residue diet" seems to be los consumers and regulators alike.

FOOD SAFETY

Food safety is an often quoted term but can mean different things to different groups. The following is a quote from the assistant Director Gen of the FAO at a the recent Joint FAO/WHO Expert Consultation on Risk Management and Food Safety held in Rome (January 1997) "Altho industry and national regulators strive for production and processing systems which ensure that all food be "safe and wholesome", complete freed from risks is an unattainable goal. Safety and wholesomeness are related to a level of risk that society regards as reasonable in context, an comparison with other risks in every day life." There are some important concepts in this paragraph: More than ever before food today is the re of complex production and processing systems, nothing is risk free in this world, and the level of risk deemed acceptable is a societal judgem

INTERNATIONAL TRADE OBLIGATIONS

The SPS Agreement is a good place to start with respect to food safety and trade. It requires all related measures applied to imports to be justi by "risk assessments". It further states that the processes involved should be "transparent", that there should be demonstrated "necessity" for measure, that the level of protection applied should be "consistent", and lastly that alternative measures which deliver an "equivalent" outco should be recognised. However, it needs to be emphasised the "measures" are not required to be equivalent, just the final sanitary or phytosani outcome and different food production processes may justify different controls.

WHAT ENSURES SAFE FOOD

"Producing prime NZ lamb might be a long way from producing satellites but there is a common link: once you have made the product it is very difficult to change it". Pre harvest controls not post harvest testing delivers safe food Producing safe food is about process control. Its about ensuring a whole range of often conflicting variables are integrated in a manner which best controls the risks to food safety while ensuring the product produced is saleable. The principles of Risk Analysis and Hazard Analysis Critical Control Point (HACCP) are tailor made for providing assurances with respect to residues and food safety.

FOOD PRODUCTION IS A PROCESS

This process not only involves the pre-harvest and post-harvest components encompassed by the often quoted "from pasture to plate", but also those factors determining the availability and use of agricultural chemicals. While the process is in control the outputs will be predictable. If components of the process are out of control then the outputs will be less predictable. However, not every component of the process has the same ability to irreversibly and negatively affect the outcomes. Furthermore, not every measurable outcome parameter has the same relative effect on the overall safety of the food. It is worthwhile to reemphasise that food safety is the relevant outcome we after and must be defined in terms of relative risk to human health.

HACCP, RISK ANALYSIS AND FOOD SAFETY

A systematic application of HACCP and/or risk analysis methodology to the process is the best way to achieve an overall assessment of risks and benefits, to devise risk management strategies as appropriate, and to allocate resources and priorities accordingly. Note, risk has been defined as: "A function of the probability of an adverse effect, and the severity of that effect, consequential to a hazard(s) in food"; risk assessment as "a scientifically based process consisting of the following steps: (i) hazard identification, (ii) hazard characterisation; (iii) exposure assessment, and (iv) risk characterisation"; and risk management as "the process of weighing policy alternatives in the light of the results of a risk assessment and, if required, selecting and implementing appropriate control options including regulatory measures".

Hazard Analysis on the other hand, has been defined as "The process of collecting and evaluating information on hazards and conditions leading to their presence to decide which are significant for food safety and therefore should be addressed in the HACCP plan". Risk management involves both the identification of the standards of acceptable risk appropriate to different types of food hazards, and the establishment of procedures to ensure that the risks are kept within the limits set by those standards. It has to be recognised different risk management approaches may produce the same food safety outcomes. Equivalence of outcomes as opposed to measures is what is relevant.

CHEMICAL RESIDUES AND FOOD SAFETY

Assurances with respect to food safety come from verification that agrichemical use, and/or exposure, is within defined parameters allowing predictable risk scenarios to be calculated. While affording consumers a high level of assurance, controls must not be so restrictive or expensive that there is an incentive for them to be circumvented such as the case where black markets have flourished. Controls must be practical and closely correlated with current practice if they are to be effective in managing risk. So what are the points of control, and how out of control does the use of agricultural chemicals have to be before there is an "appreciable risk" that the level and prevalence of chemical residues will have an adverse impact on consumer health. Remember under the SPS Agreement that's the only legitimate parameter justified with respect to international trade.

CONTROLS

The basic controls available to countries and the industry are as follows:

1. Border controls
2. Agrichemical registration systems
3. Distribution controls
4. Education
5. On-farm practises and quality systems
6. Buyer / Seller communication

Control over what and how agrichemicals are supplied to the market place is a "critical control point" (CCP) for Governments. The uncertainty and potential hazards associated with the uncontrolled use of illegal non-assessed chemicals means risk scenarios cannot be accurately predicted, nor effectively be controlled at a later stage in the process. Restricting sale through professions governed by ethics, such as veterinarians, while not being a critical control point is very definitely a mechanism for exerting more control over use of certain chemicals.

Although not under the direct control of most governments, on-farm practises and quality systems also can be considered a CCP. Misuse, abuse, and/or mistakes on farms can not effectively be controlled at a later stage in the process. Accordingly, as written previously "controls must be practical and closely correlated with current practice if they are to be effective in managing risk". Lastly, buyer / seller communication is an important control to ensure what's being purchased is fit for purpose. Mutual communication and cooperation which recognises both parties needs has to be one of the most powerful and effective controls available.

VERIFICATION

Both system audits and direct measures such as residue testing are effective verification tools. Within a country, required frequency of au factor of demonstrated performance, the risk associated with non-conformance, and the balance between the incentive not to conform vers disincentive or penalty applicable if caught. The more integrated the controls are, and the greater the industry involvement in both the contr their verification, the lower the frequency of audit required by Government to provide consumer and market access assurances.

RISK ASSESSMENTS ASSOCIATED WITH REGISTRATION OF AGRICHEMICALS

To register an agricultural chemical in the world today there is a huge amount of trialing and evaluation required. Consistent with the pri of science, the burden of "proof" of safety rests with the applicant and while a great deal of evidence is required to provide a level of assu very little evidence to the contrary is required to shed doubt. The assessment process consistently defaults to the most conservative interpr of results.

ESTABLISHMENT OF AN ACCEPTABLE DAILY INTAKE

A bank of toxicological trials are required to investigate everything from whether the chemical has a carcinogenic potential through to its po effect on unborn fetuses. The establishment of a potential effect in any one of the key trials may preclude the chemical from any further pro Only those chemicals for which a No Observable Effect Level (NOEL), or No Observable Adverse Effect Level (NOAEL) can be establish the most sensitive toxicological test applied to them, will progress further and have Acceptable Daily Intake (ADI) value estimated.

The ADI is usually established at a level 100 times less than the strictest NOEL or NOAEL. This additional 100 fold safety margin is the of the multiplication of two 10 fold safety factors, the first to take into account that humans may be more sensitive than the most sensitive s species tested, and the second to take in to account the biological diversity of the human population which could lead to a section of the popu being more sensitive than the rest. Further safety margins still are added if the toxicologists doing the assessment have any criticisms of any trial work. The ADI is considered that amount that could be consumed throughout the entire life of a subject with no observable adverse effect. However, it is not the ADI that countries enforce, rather Maximum Residue Limits (MRL) are established for each commodity the che is used in.

MAXIMUM RESIDUE LIMITS & EXPOSURE CALCULATIONS

These MRLs are established only as high as required associated with normal agricultural practices associated with the use of that agricu chemical. These MRLs are then tested to see whether they ensure the ADI will not be exceeded by calculating the associated Theoretical Max Daily Intake (TMDI) figure. When calculating the TMDI it is assumed all meat will contain the maximum level and will be consumed ever in very high amounts (300g meat + 100g of liver + 50g of fat + 50g of kidney + 1.5l of milk). Even when this gross overestimate of consum is performed less than 50% of the ADI is used up for most chemicals.

In reality, the average levels of residues present at the completion of slaughter withholding periods are substantially lower than the MRL a small percentage of the population will be treated and submitted close to the slaughter withholding period for many agrichemicals, and av consumption, even of the high level consumer, is substantially less than that used in the calculation of the TMDI.

So if the ADI is considered that amount that could be consumed throughout the entire life of a subject with no observable adverse health e and the MRLs are set at a level that should not be exceeded by even the worst proportion of the population when the product is used accor to normal agricultural practice, and the TMDI, which uses the MRLs, is a gross overestimate of actual consumption then it has to be asked much abuse/misuse is required before an appreciable food safety risk occurs.

FUNCTION OF RESIDUE TESTING PROGRAMMES

Residue testing programmes should not be considered one of the primary controls, rather they are better described as a tool for auditing effective the controls are at keeping residue levels below certain thresholds. Non-compliant results mainly tell us one of the controls is not wo one hundred percent effectively. Most do not by themselves confer a risk, or infer that the food is unsafe, or a sector of the population is a Rather than identifying cases, they represent subpopulations. Establishment of which control is not working, why, and the possible prevalenc and potential range of levels in, non-compliant product is far more important than the use of the result for taking a punitive action against supplier and/or making a product disposition judgement. Where non-compliant results are detected at port of entry, product disposition judgem are far less important than communicating the result to the country of origin to allow them to diagnose which control is out of alignment significance from a food safety point of view, and where appropriate to adjust the controls.

CONCLUSION

The need and extent of controls must be kept in perspective with the risks inherent in just about everything we do so that the community's sc resources are not unduly prioritised. In today's environment, insistence and then reliance on the results of increased rates of end-product te is an inefficient and largely ineffective means of controlling product 'quality'. There is an urgent need for the world to refocus its thinking resources towards more effective control measures and more pressing food safety issues. The challenge for countries today is to prioritise resou to those issues with the greatest food safety significance and work cooperatively, while recognising each others differences, towards ensuring world continues to be supplied with a safe and economically sustainable food supply.

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