

Healthy animals: safe products: a healthier community

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INTRODUCTION

Homo sapiens and the ancestors of our domestic animals were recognisable some 2 million years ago and by 500 000 BC there was planned hunting of animals – as evidenced by archaeological findings. By 5 000 BC the world had arrived at the age of settled agriculture and with it domestication of sheep, cattle and pigs. The present agricultural economy is based on cereal crops and in South Africa mainly animals that eat grass, rather than the deer-pig based economics on which mankind relied in antiquity¹³. The grain- and grass-eaters have always been preferred to carnivores by civilised man, and these species form the basis of our meat supplies today, albeit supplemented by rabbit, poultry and game meat. Albert Einstein reminds us of the cosmic religious belief that 'an empty stomach is not a good political adviser' and cats, dogs and even rats have been consumed in times of famine, stress and war, an example being at Mafikeng during the Anglo-Boer war. However, the long-standing man-deer relationship was important because it showed a trend towards animal husbandry of a deer population on which there was a high degree of economic dependance⁴¹. This complex and delicately balanced association is revealed in the diggings at Molino Casarotto, where 75 percent of the animals killed consisted of young individuals, which cannot be considered as random culling¹³. This apparent deliberate concentration on only certain species, ages and sexes, implies a form of intelligent management of animal resources¹⁸.

The word 'abattoir' is derived from the French word meaning to 'knock down', and as humane slaughter results from the control exercised in such establishments, it is preferred to the old English word 'shambles'. Napoleon I established 5 abattoirs in France in 1807 and by 1879 there were meat inspection laws. A similar control mechanism was developed in the United Kingdom over the 30 years up to

1877. The laws of licensing, hygiene and prevention of the fraudulent practice of substitution and misrepresentation, formulated in Renaissance Florence in the 13th and 14th centuries to control the powerful butchers guild, still hold today. In the United States of America the advent of refrigerated transport revolutionised the meat industry, and meat-packing houses blossomed with such disregard for hygiene that fingers were sometimes found in pies and cans. This chaos was presented to the American Senate following public outcry when Upton Sinclair's sensational novel 'The Jungle' was published and compulsory inspection and sanitary control resulted.

Animals were chased and slaughtered in the streets of Cape Town until an abattoir was established there in 1699. The Dutch East India Company also introduced compulsory meat inspection. This and the abattoir were abandoned when the British occupied the Cape. Fortunately the Dutch hygiene consciousness was carried north from the Cape by the Great Trek in 1835/36, as each commando had a '*vleis korporaal*' whose duty it was to inspect meat and pass it as fit for human consumption. The Public Health Act of 1919 had the famous regulation about food (good, sound, wholesome, unadulterated and free from contamination) and it is on this principle that the health control of foodstuff in many spheres was and is based.

This selected historic overview of quality assurance in food hygiene indicates that it is nothing new. The hygiene of food of animal origin encompasses all measures necessary to ensure that the product of animal origin is safe, sound and wholesome in all stages of its growth, synthesis, production, handling, transport or manufacture/processing until its final consumption as an aesthetically acceptable product at a reasonable price. The concept that the hygiene of food of animal origin starts on the farm, *i.e.* of longitudinally integrated quality assurance, is also nothing new, but it is gaining momentum globally in advanced countries. Gerats (1990), quoted by Snijders *et al.*³², identified 4 stages in the

development of safety and control systems. In passive control no specific system for end-product control exists, with little possibility of ever achieving improvements in safety and quality. With end-product control, control is focused on the product rather than the production system and rejections tend not to improve identified problem areas or abnormalities. The Hazard Analysis Critical Control Point system (HACCP) focuses control on the production line (process control), and for each critical control point good manufacturing practice (GMPs) and check systems are created and controlled. In an integrated quality control (IQC) system, attention is paid to the entire production system³². The concept of longitudinally integrated quality control summarises the prime vision of the Department of Animal and Community Health and, in accordance with the logo of the World Association of Veterinary Food Hygienists, inspired the theme of this inaugural address: healthy animals: safe, affordable products: a healthier community.

HEALTHY ANIMALS

Realisation of the importance of preventive veterinary medicine to both producers and the community is also not a new concept. 'I do not have to emphasise to an audience of veterinary scientists the great economic importance of preventive veterinary medicine and control measures to animal breeders, farmers and the general populace' Owen Horwood 1967¹². Yet in his book '*From the horse's mouth*', published in 1983, Prof. S W J van Rensburg expressed the opinion that veterinarians are inadequately prepared at University to enter into the sphere of livestock production with confidence³⁷. In 1985 I suggested, as President of the South African Veterinary Association, that an imbalance in basic training compounds the veterinary manpower shortage in the rural areas. This occurs in spite of the comforting words the year before during the 13th World Congress on Cattle Diseases in Durban, that positive steps were being taken towards the establishment of the rural veterinarian in agriculture in South Africa

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through the erection of livestock hospitals, the promotion of the total herd health concept and more meaningful involvement of the rural veterinarian in meat and milk hygiene. Sobering were the words of Dr Barry du Casse in his Natal Branch Chairman's address (1966) 'Our future does not rest on professional preference alone, but that the dire need for human food will help control our destiny'. Veterinarians will have to play a vital role for the world, and Africa in particular, to solve the increasing problem of food shortage. Lord Carter, in a debate in 1993 on biotechnology, remarked that in the next 23 years (*i.e.* by the year 2020), when it is probable that the world population will have reached 8 billion, world agriculture will have had to produce as much food as has been produced in the last 10 000 years¹⁹. As the 21st century approaches, there can be no doubt about the enormous challenges that face the veterinary profession to assure the future well-being of people and their animals³³. Herd health is an holistic approach to managing the health and production efficiency of production animal populations – dairy and beef cattle herds, beef feedlots, pig herds and sheep and goat flocks – and is essentially about the efficient production of food- and fibre-producing animals. The primary objectives are to improve and maintain animal health, reproduction, growth and production at the most efficient level that will provide maximum economic returns to the farmer (performance-related diagnosis) while maintaining a balance between animal health and production. In addition, the welfare of animal populations must be ensured within an holistic, sustainable resource management programme and the provision of a safe, sound and wholesome animal product to the consumer^{26,28}.

Consider now some thoughts on animal welfare and environmental health. There are 'four essential elements of holistic veterinary preventive medicine that can be derived from the *ethos-ecos* paradigm: right breeding (avoidance of inbreeding of harmful traits), right nutrition, right environment and right understanding, for example, good stockmanship¹⁷. *Ethos* is the nature of animals, *telos* their role and purpose in nature, and *ecos* the nature of the ecosystem they inhabit, all of which are interconnected. Can the veterinary profession afford not to broaden its *telos* horizons and become more involved in animal welfare and environmental health, thus promoting ethoveterinary and ecoveterinary medicine? No it cannot, for it is the veterinary profession

that must help educate humanity to understand its critical role in maintaining this fine balance – a balance that it can so easily destroy through ill-judged human influences. 'Poverty poses the most serious environmental threat to the less developed areas of South Africa'⁴⁰. It is through close attention to the health and welfare of all animals, domestic and wild, that the earth's natural resources are preserved. Environmental changes will have important implications for the pattern of animal disease, and animals are important sentinels for monitoring the environment²⁰. With increased intensification of livestock, the disposal of farm animal waste will become an environmental health problem about which the veterinarian must be aware and able to offer advice. Managing our environment demands special skills that veterinarians possess³³.

At the Community Health Association of Southern Africa (CHASA) Agricultural Health Forum in 1995, in a lecture entitled, 'Residues in food of animal origin', I said that the role of the veterinarian in agricultural health is the animal-related occupational health of people (physical, chemical and biological) and the control of veterinary drugs as food and product contaminants. We have a unique situation with agrochemicals in South Africa compared with the rest of the world. Product group sales in South Africa are uniquely of a toxic rather than a remedial nature and therefore potentially more dangerous in agricultural health (Sykes RD, Coordinating Technical Advisor to the Registrar, Act 36/1947, pers. comm., 1995). Nevertheless, with an enlightened herd health approach a trend will be seen in the next decade, with a steady move away from drug-based control of animal disease to that based on biological products³.

Veterinary epidemiology is defined as the study of diseases in populations and the factors that play a role in these diseases (WHO definition). The prime aim is to deal with disease in populations, but it has expanded to include aspects of herd health and economics. Epidemiologists study disease in its natural habitat, away from the controlled environment of the laboratory. Epidemiology has 2 principle uses, which are not mutually exclusive. It serves as the investigative or diagnostic discipline for populations or herd medicine and it supports various forms of directed action against diseases³⁰. It is the integrated science of clinical epidemiology and biostatistics that provides the tools for collecting, analysing, and interpreting information from groups of patients¹⁷. Epidemiology

will increase in importance as population-oriented health maintenance programmes become more widely integrated into livestock production systems³⁶. Structured methods of problem-solving and the design and interpretation of clinical trials, when integrated with concepts of sensitivity, specificity, predictive value and agreement beyond random levels, will enable veterinarians to more adequately assess and improve their effectiveness in terms of diagnostic strategies and in prognostic and therapeutic activities²². Whether a science or a tool, epidemiology is a discipline that assists the endeavours of veterinary public health and herd health in achieving quality/safety assurance along the entire food production chain.

SAFE FOOD

In opening a session 'Effective Health Standards and Quality' during a National Milk Forum: Good Safe Milk – a Constitutional Right (1996), I said that since the early beginnings of industrialised mass-production and distribution of milk almost a century ago, it has become increasingly clear internationally that disease in cows and the production and handling of milk under poor hygienic conditions can lead to widespread outbreaks of human disease¹⁵. Statistics on milk-borne diseases in South Africa are not readily available, and an efficient surveillance system for the regular monitoring and further epidemiological investigation of such diseases requires coordinated development. We can assume that milk-borne diseases are probably at least as prevalent in South Africa as in other countries under conditions of industrialised mass production and distribution of raw and pasteurised milk and dairy products. Raw milk constitutes a risk factor significantly more serious than pasteurised milk¹⁰. However, pasteurised milk is not without risk because it cannot be completely protected from failures in the pasteurisation system and post-pasteurisation contamination. High standards of hygiene are essential throughout the production and distribution of milk.

The definition of Veterinary Public Health as the application of professional veterinary skills, knowledge and resources for the protection and improvement of human health has been expounded by many authors and in many documents⁵. Veterinary public health activities involve a diverse range of functions within public health, and the main scientific and applied disease-control principles reflect the broad

commonality of interests between veterinary and human medicine and indicate the opportunities for profitable interaction. Dr Brückner, Director of Veterinary Public Health, National Department of Agriculture, expressed the opinion that the World Health Organisation's definition 'implies in many ways a *carte blanche* assignment to the veterinary and paraveterinary professions, but is also restrictive as it only implies the application of veterinary knowledge and skills to protect and improve human health without acknowledging the coordinated and integrated effort necessary from all related disciplines in a fast-changing environment to achieve this goal'²⁴ 1996. However, while the veterinary profession claims to be the only health care profession involved in all stages of food production, it has not yet assumed a leadership role²⁵. In the same report, 'Veterinary Public Health in Africa'²⁴ 1996, it is conceded that in South Africa the current 'approach to and delivery of Veterinary Public Health services is characterised by a single and selective disciplinary approach, with the delivery of services by a fragmented and uncoordinated multitude of government agencies'. This fragmentation is referred to in a 1995 FAO report, 'Food Control Activities: Republic of South Africa'⁴, in which a recommendation is made for the consideration of combining all food control functions within a single government department or a National Food Control Body.

The incidence of food-borne diseases is increasing throughout the world. 'Food of animal origin plays an important role and people should be more aware of the potential dangers of pathogens in food, especially as the presence of many zoonotic diseases is often unsuspected or unrecognised in animals'¹⁴. Food-associated disease generally occurs as a result of a combination of severe infectious pressure and a lack of resistance to that level of pressure in animals, together with inadequate hygiene control and 'temperature abuse' in foods of animal origin²⁵. The food animal, the farmer's husbandry techniques or the abattoir are not always to blame. Organisms may also be transferred to food by the food handler, either directly, or by cross-contamination through the use of hands, surfaces, utensils and equipment that have not been adequately cleaned and disinfected. Food-transmitted diseases of microbial aetiology do not only lead to the classic, acute syndromes, but may often result in

serious chronic sequelae²⁵. These are reviewed in an article by Mossel²⁵, but cholecystitis, colitis, endocarditis, meningitis, myocarditis, septicaemia and pancreatitis can all, for example, be caused by salmonellosis and campylobacteriosis.

The assessment and management of risks arising from zoonoses and the identification of ways of reducing or controlling them throughout the food chain are as important to the farmer as they are to the consumer. If there is anybody who doubts this statement, think for a moment about the effect plague had on the Indian economy, or more relevant to our own situation, the recent crisis in our ostrich industry and the sad loss of life caused by Crimean Congo haemorrhagic fever. Bovine spongiform encephalopathy (BSE or mad cow disease) shook the world, crippled the beef industry in Europe, drastically changed eating habits and caused immeasurable economic loss to the beef producer. It will comfort meat-eaters to see the most recent conclusion in this regard issued by the Institute of Food Science and Technology: 'that provided that the control measures are fully implemented, muscle meat, milk, milk products, gelatin and tallow would appear to be without significant risk of causing Creutzfeldt-Jakob disease in humans and that BSE will become extremely rare'. These control measures entail, amongst others, correct sterilising procedures for condemned material and a ban on the use of nerve tissue as a binder or filler material in manufactured products.

A HEALTHIER COMMUNITY

The reconstruction and development programme (RDP) is an 'integrated programme, based on the people, that provides peace and security for all and builds the nation, links reconstruction and development and deepens democracy'³⁵. The Committee for the Development of a Food and Nutrition Strategy for southern Africa (1990)¹⁶ made an effort to identify the nutritional deficiency and their report suggests that 47 per cent of black people live below the poverty line. However, based on anthropometric rather than income criteria, 2.3 million people in South Africa can be considered for nutritional assistance, as against the 16.3 million according to income criteria. Street food-vending has arisen as a consequence of social, political and economic pressures and it might help meet the need to supply food to large masses of the population in urban areas². It plays an important role in the economy

of the country, as it incorporates many persons in the labour force and offers low-priced food to the urban consumer, whose preferences hinge on the ease of finding food that satisfies their taste and economy rather than safety. 'The problems facing us today cannot be solved by thinking the way we thought when we created them' (Albert Einstein). The food chain needs to be more cost-effective, with innovative thinking and marketing, including direct selling from producers to consumers, but with risks to consumers being assessed, prioritised and managed accordingly. Consumers must be given the opportunity to make correct choices based on appropriate education, with information supplied in a sustained, coordinated programme so that discriminating consumers can identify their preferred sources of animal-derived food with full awareness of risks as well as benefits.

The vision is that the RDP will integrate growth, development, reconstruction and redistribution into a unified programme. The aim is to create a restructured agricultural sector that spreads the ownership base, encourages small-scale agriculture, further develops the commercial sector and increases production and employment. Agriculture must be oriented towards the provision of affordable food to meet the basic needs of the population and towards household food security³⁵. In contrast to most other African countries, the bulk of rural household income in South Africa does not derive directly from smallholder agriculture. 'It is often mistakenly assumed that the self provision of food equates to security of food supply'³⁹. Research shows that a high percentage of rural households are in fact net consumers of food, even though many of them are engaged in food-crop agriculture. Sales of food are also highly skewed, with a small minority of households accounting for more than 80 % of sales³⁹. Nevertheless, the contribution of livestock to food supplies in developing countries is increasing at a higher rate than that of cereals. Heinz quotes FAO figures of a total meat production in developing countries of 30 million tons in 1970 rising to a projected 105 million tons in the year 2000 and 143 million tons in 2010¹¹. Sadly in Africa the benefit of increased livestock food products providing essential amino-acids, minerals and vitamins in a concentrated form and fat as an energy source (especially to the young, the old and pregnant women) is lost as the human population grows faster than that of the livestock; meat is scarce and the cost is high.

The commercial agricultural sector will remain an important provider of food, fibre, jobs and foreign exchange – without unnecessary controls and levies³⁵. However, while commercial agriculture in South Africa has seemed highly sophisticated and successful, detailed analysis shows otherwise: 'the development pattern was inadequate, inefficient and centralised – therefore unsustainable'³⁸. Owner-operated farm enterprises appear to have clear advantages over other forms of operation when most of the goods are produced for the market. Under the new Act on the Marketing of Agricultural Products, 1996, the control boards and the various schemes fall away (including the execution of statutory functions and the collection of statutory levies), with the result that the marketing of agricultural products will be left to the free market. ('The days of single-channel marketing, fixed prices and control boards are over' Mr Derek Hanekom, Minister of Agriculture and Land Affairs, 1996). In essence, the new act allows government to retain control over the introduction of any statutory measures, but the implementation of such measures remains the responsibility of the agricultural industries. Provision is made for a National Marketing Council and for the current assets of marketing boards to be paid over into trusts, more than likely established within Article 21 companies. These companies will act on behalf of the various segments of the industry as national policy-making bodies for the execution of sensitive statutory functions *e.g.* privatisation. Cost-recovery functions (*e.g.* collection and collation of industry related data, primary meat inspection services and the physical execution of classification) are functions that will be contracted out to third parties. The Article 21 company will not be funded directly from statutory levies, but will charge a fee for performing certain industry-related functions.

The Department of Animal and Community Health is ideally suited to service computer-based bureau systems for all the food animal segments of the industry. Software programmes are already in place to efficiently analyse, interpret and use the data collected by and in consultation with the different segments, thereby servicing farmers on a regular and timeous basis with meaningful basic reports. A development of this nature, alone or in conjunction with other role-players, will form an integral part of the holistic approach to herd/flock health maintenance in South Africa, a field in which we will become internationally recognised. With its wide expertise, the

Department is ideally placed to improve health education and extension to and personal involvement with farmers and consumers. Its personnel can address the specific needs of all communities, promoting a herd health approach and with it, improved farmer attitude/cooperation, in monitoring, controlling and eventually eradicating specific food animal zoonoses while improving knowledge on pet-related zoonoses. The Department is involved in and must expand its involvement with the promotion and auditing of acceptable, cost-effective quality assurance and management programmes in food production, harvesting, processing and handling (HACCP) and in creating community awareness and understanding of food quality and safety. The basic epidemiological approach to community health problems must be expanded to identify needs as well as resources.

The World Health Organisation has recognised that the laboratory is one of the cornerstones in programmes aimed at guaranteeing food safety¹. The Departmental laboratories are already rising to the challenge and striving to become centres of excellence in selected areas of diagnostic work related to food of animal origin. The improved diagnostic techniques form a vital link between what is happening at grass-roots level, improved veterinary health technologies, improved veterinary research and improved animal health and production. It must now be quite apparent that the concept of healthy animals, safe, affordable products and a healthier community is an integral link in the socioeconomic impact animal health (as opposed to animal disease) has on the improved quality of human life. The Department offers a curriculum that is ideally suited to equip the veterinarian to become an integral part of the health team at executive, legislative and consultative levels within a holistic multidisciplinary approach to animal and community health. In teaching and researching this wide field the Department can act as an educational facilitator and as a source of reference, both locally and further afield in Africa. Veterinary advice will become more accessible and true, relevant information on veterinary-linked community health problems more effectively disseminated within the community, which will contribute to the RDP programme.

The Pew Report (1989)²⁷, the European Association of Establishments of Veterinary Education (1990)⁶ and the report of the Working Party to Veterinary Undergraduate Education from the RCVS

(1991)²¹ all state that it is no longer feasible nor realistic to attempt to produce an omniscient veterinary graduate. 'Abandon the unrealistic concept of the universal veterinarian who can minister to the health needs of all creatures great and small' Pritchard (1989)²⁷. The undergraduate course is a basic educational platform and changes must consider both the changing environment and the changing needs of society and ensure that the profession will be in a stronger position⁹. The proposed new curriculum correctly places more emphasis on herd health and we must heed the cries from abroad that 'the emphasis in the veterinary curriculum should be changed from almost total concentration on clinical practice to include the important public sector needs for veterinarians'²⁷. I believe sufficient emphasis is placed on public health training for veterinarians in South Africa and this is endorsed in the new curriculum. Yet from the report 'A Framework for Transformation' of the National Committee on Higher Education (NCHE)³⁴ we learn that South Africa's output in natural science, engineering and technology is low by international standards and that there is a severe shortage of graduates in these very fields that are considered to be 'The intellectual engine of economic development'. The NCHE report highlights the fact that 1 black (African, coloured and Indian) school pupil to every 60 white school pupils obtains a matriculation exemption certificate with higher grade passes in physical science and mathematics. 'Low African student enrolment in areas such as the natural sciences, engineering and agriculture is therefore not surprising' (NCHE)³⁴. However, if *massification* is the process through which participation in higher education is both increased and widened, then this deficiency at primary and further education levels needs to be addressed as a matter of extreme urgency to ensure continued veterinary relevance to the overall needs of society. Larger numbers of students must be recruited from socially more diverse backgrounds into tertiary education in the natural sciences, engineering and agriculture. To meet the demands of the 21st century within a reformed South Africa, the veterinarian will have to respond creatively with foresight and imagination to the changing agricultural, demographic, scientific and economic landscape. Our approach to veterinary education must result in the development of scientific skills that enable the veterinarian to identify and describe problems, the ability to access relevant

literature/databases and confidence in the field to jointly promote animal health and product safety in a multidisciplinary way. The traditional role of healer of individual sick animals is gradually being complemented by the delivery of totally integrated health management programmes (herd health: food animal production medicine). On individual farms maximum productivity will only be achieved if modern veterinary skills are properly applied to prevent disease and increase productivity in a clearly cost effective manner¹⁹. 'Sad though it is for all concerned, the James Herriot approach has to be relegated to history' (Stevens 1986)¹⁹.

The principles of international trade within the World Trade Organisation (WTO) stipulates trade without discrimination, with transparency, a predictable and growing access to markets, promotion of fair competition and the encouragement of development and economic reform. The Agreement of Sanitary and Phytosanitary Measures (SPS) encourages the wider use of systematic risk assessment among member governments and for all relevant products. It encourages governments to establish national SPS measures consistent with international standards, guidelines and recommendations – a process referred to as 'harmonisation'. Food supplies are thus being rapidly globalised and with increasing urbanisation, food chains become more complex from producer to processor to distributor to retailer²⁹. Nobody really knows what the future will hold: 'that depends on too many imponderables'³¹. 'Global pollution and water contamination will impact on the microbiological safety of food of animal origin. Increased urbanisation represented by 36 % of the world population and expected to increase to 52 % by 2010 will force consumers to lose more control of the food they eat'⁸. Implementation of good hygiene practices in the handling of food of animal origin is essential to prevent the transmission of animal diseases to man and to provide a safe, sound and wholesome product for his consumption. Equally important is to reduce losses in the product and its by-products and to prevent transmission of animal diseases to other animals.

The farm or production unit is the preharvest point in the food chain and the start of longitudinally integrated quality assurance. A challenge for which we must help the veterinary profession to prepare will be how to apply integrated quality control throughout the entire production system, irrespective of size, nature or

sophistication. At the same time, the academic curriculum must provide students with a sufficiently broad-based scientific education to enable them, as graduates, to respond adequately to current animal welfare and environmental issues⁷. We need to be more aware of the fact that good teaching and good research are inseparable²⁰ and essential in striving for our improved role within the production animal industry. Irrespective of the sophistication of the production system, longitudinally integrated quality assurance will help to achieve a food supply that is safe, healthy, nourishing, pleasant, inexpensive and available.

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