

# PRINCIPLES AND COSTS IN THE REGULATION OF MICROBIALLY CONTAMINATED FOODS

George J Jackson

Division of Microbiology, US Food and Drug Administration, Washington, DC 20204, USA.

**Abstract.** A strong code of regulations exists in the United States to control pathogens and other microbes in food and drink. Despite strict enforcement, food-borne illness persists. Parasitic animals in foods are particularly difficult to detect because there are no simple culture systems for their multiplication and because sanitary measures against fecal contamination are ineffective against parasite species transmitted by other routes. To attain a high degree of safety, total processing of foods by heat- and/or irradiation-pasteurization combined with sterile packaging may be required. The cost of regulating food-borne microbes, while large, is probably surpassed by the cost of food-borne illness (estimated to be US\$ 50 billion annually), resulting in net savings.

## DISCUSSION

To protect consumers from food-borne microbial illness, the US Food and Drug Administration (FDA) uses the general provision of the US Federal Food, Drug and Cosmetics Act [under Section 402 (a)] which states that food shall not contain "any poisonous or deleterious substance which may render it injurious to health". This has been interpreted to include microorganisms or their products in amounts that may be harmful to the consumer. In addition to this provision, there are guidelines for certain foods that pertain to "filthy, putrid or decomposed" substances or items "otherwise unfit for food." Levels of microbial or other filth (ie, contamination that has not been proven harmful to health) that are regarded as unavoidable under good manufacturing practices must not be exceeded. To bring foods into compliance with the law and the pertinent regulations and guidelines, the FDA has the authority to prevent distribution of the food or (on a case-by-case basis) to require further processing or reconditioning of the product (US National Archives and Records Administration, 1990; US Food and Drug Administration, 1990).

The cost of regulating food-borne microbes in the USA is difficult to estimate because there is no information about how much food is reprocessed or disposed of before it has been released for sale to the public, and because food control is exercised by diverse federal and

local government agencies. Nevertheless, the costs (Archer and Kvenberg, 1985) of acute food-borne illness (now approximately US\$50 billion annually) would probably be much higher if foods were deregulated. To date, the costs of the chronic consequences of infections with food-borne pathogens (Archer and Young, 1988) have not been estimated.

Parasites cause a significant number of gastrointestinal infections in the USA. In 1984, the reported prevalence of giardiasis cases was 64% that of salmonellosis, the leading type of gastrointestinal illness (Centers for Disease Control, 1989 and previous years). Epidemiologists generally calculate that one-third of all gastrointestinal illnesses caused by bacteria are transmitted through food and drink, but for certain parasites the portion may be greater. It is certainly much larger for the almost exclusively meat-borne nematode *Trichinella spiralis*.

Approximately 85 types of parasitic animals may be food- and drink-borne (Jackson, 1990). Fortunately, not all of these diverse organisms account for the majority of human infections. Nevertheless, controlling parasites is not simple. While sanitary measures used to prevent fecal contamination can be effective in controlling the food transmission of such protozoa as *Entamoeba histolytica*, *G. lamblia* and *Cryptosporidium* sp., these means are useless against parasites that gain access to the food animal or plant by innate host-finding mechanisms or food-chain

transport through a series of hosts. Even for *Ascaris lumbricoides*, which is discharged fecally, ordinary prevention may be insufficient because the worm's eggs are able to survive for an extremely long time outside a host (Jackson *et al*, 1978). Also, there are no simple culture methods to multiply the small but infectious numbers of parasites in foods.

For a variety of reasons, and despite surveillance at the international, national and sometimes local level, food-borne illness appears to be persisting (Jackson *et al*, 1990). Consequently, total food processing (ie, pasteurization by heat and/or irradiation) combined with sterile packaging may be required to attain a high degree of safety.

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