INCREASING FOOD SAFETY AND QUALITY REQUIREMENTS

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Annotation. Very few of the foods that we commonly eat have been subject to any toxicological testing and yet they are generally accepted as being safe to eat. However, all chemicals, including those naturally found in foods, are toxic at some dose. Laboratory animals can be killed by feeding them glucose or salt at very high doses and some nutrients such as vitamin A and selenium are hazardous at intakes only a few times greater than normal human requirements. Even very common foods such as pepper have demonstrated carcinogenic activity. Toxicity testing of a food or ingredient can tell us what the likely adverse effects are and at what level of consumption they may occur, but by itself this does not tell us whether it is safe to eat in normally consumed amounts.

Keywords: foods, toxic constituents, additives, ingredients, microbiological contamination, pesticide residues, clostridium botulinum.

Introduction. Three general classes of hazards are found in foods: (1) microbial or environmental contaminants, (2) naturally occurring toxic constituents, and (3) those resulting from intentional food additives or novel foods or ingredients. The most dangerous contaminants are those produced by infestations of bacteria or moulds in food, which can produce toxins that remain in the food even after the biological source has been destroyed. Other contaminants, such as pesticide residues or heavy metals, are usually well controlled in modern food supplies but can be significant hazards in particular localities. Naturally occurring toxic constituents are usually present in doses that are too small to produce harmful effects when foods are eaten normally, except in the cases of atypical consumers who may be sensitive to individual ingredients. Food additives or novel foods are generally the least dangerous hazards because their toxicology is well studied and the conditions of use are tightly controlled.

2. MICROBIAL CONTAMINATION

2.1 Pathogenic bacteria

Outbreaks of acute gastroenteritis caused by microbial pathogens are usually called food poisoning. They can be caused by foodborne intoxication (where microbes in food produce a toxin that produces the symptom) or foodborne infection (where the symptoms are caused by 3 the activity of live bacterial cells multiplying in the gastrointestinal system). Table 3 lists the most common bacterial causes of food poisoning, in order of the rapidity of onset of symptoms. In general the intoxications have a more rapid onset. The most important pathogens are Clostridium botulinum, Staphylococcus aureus, Salmonella species and Clostridium perfringens. The last three organisms account for about 70-80% of all reported outbreaks of

foodborne illness, but there are also many others as well as some viral and protozoan agents. The four most frequently identified factors contributing to food poisoning incidents are: improper cooling of food, lapses of 12 hours or more between preparing and eating, contamination by food handlers, and contaminated raw foods or ingredients [3].

The reported incidence and cost of foodborne illness in most countries is increasing, although it is difficult to measure this exactly. [4] It is estimated that less than 1% of cases are captured in existing notification schemes. Some of the reasons for increasing rates of foodborne illness are: new and emerging pathogens, changes in the food supply (including more intensive animal husbandry and longer shelf life fresh chilled products), aging populations, and a greater proportion of food eaten away from home. Around 60-80% of foodborne illness arises from the food service industry.

2.2 Control of Food

Poisoning The trend in all countries today is to require more formal training of all food handlers and the development of food safety plans wherever food is prepared and served to the public, based on the principles of Hazard Analysis of Critical Control Points (HACCP). HACCP is a preventive approach to quality control, used worldwide in all segments of food production, from primary production, to food manufacture and food service settings. [5] It is based on seven principles:

* identifying all potential hazards at each step in the food chain and possible preventative actions

* determining the critical points in the operation where the hazards must be controlled * establishing limits at each critical control point. Examples of control procedures are washing hands, sanitising food preparation surfaces and tools, cooking food to specific temperature, 4 maximum food storage times [6].

* setting up procedures to monitor each critical control point.

* planning the corrective actions to be taken if a critical limit is exceeded

* establishing a recording system to document performance of the process

* verifying that the HACCP process is working.

2.3 Mycotoxins

Moulds, or fungi, are capable of producing a wide variety of chemicals that are biologically active. Humans have used some of these as effective antibiotics, but there are also a number of diseases resulting from accidental exposure to fungal products that contaminate food. Some examples are as follows:

Aflatoxins These are a group of highly toxic and carcinogenic compounds from the common Aspergillus fungus species. They are stable to heat and survive most forms of food processing. Aflatoxin contamination can occur whenever environmental conditions are suitable for mould growth, but the problem is more common in tropical and semitropical regions. Aflatoxins were first recognised in the 1960s in peanuts. On a world-wide basis, maize is the most important food contaminated with aflatoxin.

Patulin is an antibiotic that is produced by the mould Penicillium caviforme. It has been implicated as a possible carcinogen from one study in rats although other studies have not confirmed this. Patulin in primarily associated with the apple rotting fungus and so apple juices and some baked goods with fruit can contain patulin [5-7].

Fumonisins are carcinogenic mycotoxins from the Fusarium fungus associated with corn. There were first characterised in 1988 and are known to be potent inhibitors of sphingolipid synthesis. Ingestion of fumonisin-affected corn has been shown to be carcinogenic in rats. In 1990 it was reported that use of mouldy corn with high levels of fumonisins to make beer in 5 the Transkei of South Africa was associated with a very high incidence of oesphageal cancer.

3. ENVIRONMENTAL CONTAMINATION

3.1 Heavy metals and minerals

Selenium is one of the most toxic essential trace elements. The level of selenium in foods usually reflects the levels in the soil and in a few high-selenium areas, such as North Dakota and parts of China, excessive selenium intake has been associated with gastrointestinal disturbances and skin discolouration. In China in the early 1960s, selenium intoxication affected up to fifty per cent of the population in certain villages, with brittle hair, skin lesions and neurological disturbances the main symptoms.

Mercury. Fish can contain 10-1500mg/kg of organic mercury, and even higher levels when mercury wastes are released into lake waters. Serious poisonings from mercury in fish have occurred in Japan, the most famous being that in Minamata Bay (from 1953 to 1960). Another example of widespread mercury intoxication occurred in Iraq in 1971/72 as a result of bread made from wheat treated with mercury-based pesticides. Most countries have now established 7 maximum permitted levels on mercury in fish in the range of 0.4-1.0mg/kg. [8]

Cadmium is a toxic element that accumulates in biological systems. Chronic exposure at excessive levels can lead to irreversible kidney failure. Plants readily take up cadmium from the soil, and there has been a slow increase in the cadmium levels in soils due to the use of phosphate fertilisers and the affect of air and water pollution. The average food-based cadmium intake is now approximately 10-50μg per day, which is approaching the provisional tolerable weekly intake. Measures to control cadmium contamination include controls on waste disposal, and developing new crops that accumulate less cadmium.

3.2 Criminal adulteration

Modern food regulations began in the nineteenth century when there widespread examples of adulteration of foods to increase profits. Milk was diluted with water, cocoa with sawdust, and butter with borax. Today standards in the food industry are much higher and risks from illegal adulteration are rare. However, there are still some notorious instances. In Spain in 1981 there was an outbreak of an apparently new disease characterised by fever, rashes and respiratory problems. Many thousands were hospitalised and over 100 people died. The agent responsible was identified as cooking oil that had been fraudulently sold as pure olive oil but in fact was mostly rapeseed oil intended for industrial uses, which was contaminated with aniline. In China in 2008, at least six children died of acute kidney failure and nearly 300,000 fell ill after consuming tainted infant formula. Melamine, a synthetic nitrogenous product found in many industrial goods, was found to have been illegally added to milk-based foods to make them appear higher in protein than they really were [9].

3.3 Packaging migration

The materials used to package food can sometimes result in contamination of the food itself. At one time the lead used in the solder of metal cans was a significant source of contamination of infant formulae, but this problem has been eliminated by the introduction of non-soldered cans. Bisphenol A (BPA) is an industrial chemical used as the starting material for

the production of polycarbonate plastics and synthetic resins [11]. BPA is found in containers that come into contact with foodstuffs such as drinking vessels, baby bottles, and the internal coating on cans for tinned food. BPA belongs to a group of substances that can act in a similar way to some hormones, and studies in laboratory animals suggest that low levels may have an effect on the reproductive system. In 2010, the FDA released a report on the safety of BPA, which raised concern about its potential effects on the brain, behavior, and prostate gland in fetuses, infants, and young children. Subsequently manufacturers of baby bottles around the world have agreed to move to BPA-free bottles as soon as possible.

Adabiyotlar, References, Литературы:

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