25.3 HACCP and prerequisite programmes

For those readers unfamiliar with the concept, HACCP is the acronym for Hazard Analysis and Critical Control Points, which is a systematic and science-based approach to the identification, assessment and control of food safety hazards. The principles of HACCP have been clearly defined by Codex Alimentarius, and it is considered to be one of the most useful tools for the proactive identification and control of hazards in foods. Prior to the application of a HACCP system, it is essential to have basic prerequisite programmes in place, which include what are commonly referred to as good manufacturing practices (GMP). Therefore prerequisite programmes include, for example, personal hygiene routines, pest management systems and foreign body prevention schemes.

Although this chapter will not describe in detail the principles of a good food safety management system, it is important to note that food safety in chocolate processes should be managed through the implementation of prerequisite programmes and HACCP. It is for this reason that the hazard categorisation used in this chapter to define the different types of food safety hazards follows that used by the HACCP methodology – namely physical, chemical, biological (microbiological) and allergen hazards.

25.4 Physical hazards

Foreign bodies can be defined as matter that is present in a food, but which, whether of intrinsic or extrinsic origin, is undesirable (George, 2004). An intrinsic foreign body is associated with the food itself, for example a nut shell or raisin stalk. An extrinsic foreign body is introduced from external sources and includes matter such as glass, metal, wood, plastic, insects and human hair.

Physical hazards are foreign bodies that are hard and/or sharp. They may cause physical injury, such as cuts to the mouth, throat or digestive system or choking.

The sources of physical hazards during chocolate manufacturing and processing usually fall into one of the following categories:

- Incoming raw materials;
- Processing equipment;
- Failures in prerequisite programmes.

25.4.1 Physical hazards in incoming raw materials

It is important to ensure that all ingredients used in the manufacture of chocolate are received free of foreign materials. Any ingredients derived from raw materials of an agricultural origin, such as cocoa products, nuts or sugar, must have suitable control measures in place during processing by the supplier to remove physical hazards.

A major potential source of foreign materials is unprocessed cocoa beans. The fermented, dried beans may be contaminated by many foreign materials, including stones, wood, metal, glass, fibrous material, loose shells, dust and sand. An essential step in the processing of cocoa beans is cleaning, where various methods are used to separate out the foreign bodies, including air separation, vibration, sieving and magnets. Similar controls are also used for the separation of foreign bodies in nuts.

Further removal of foreign material occurs after the beans have been broken. During winnowing, the shell is separated from the nib, and at this point it is important to remove any other hard residues such as sand and dried pulp remains, as well as the shells.

In addition to the intrinsic hazards present in the incoming raw material crops, it is also possible that the plant, equipment and manufacturing practices used to process the ingredient could contribute extrinsic physical hazards.

It is important to have confidence that the suppliers of such ingredients have effective foreign body management systems in place, both for the intrinsic hazards in the ingredient and for their own manufacturing processes; this can be achieved by audits of the supplier's food safety controls, and the building of a relationship between supplier and chocolate manufacturer.

Incoming raw materials should be adequately protected during transport and storage to ensure that foreign materials such as dirt and wooden splinters from pallets and so on cannot contaminate the material. Metal staples should not be used as part of the ingredient packaging. The condition of incoming ingredients should be checked on delivery and damaged goods rejected.

25.4.2 Physical hazards during processing

Figure 25.1 shows some examples of foreign materials that could inadvertently enter the production process if suitable preventive measures are not in place. These are soft and hard plastic, paper, foil wrapping material, wood, rubber, metal wire and shavings, loose screws, string and threads.

Attention should be paid at the intake and tipping points of ingredients into the chocolate making process to prevent the addition of physical hazards. Operators must be careful during unpacking and tipping of non-bulk ingredients, such as those delivered in paper or plastic sacks, or boxes, to make sure that wrapping materials, string, knives and ingredient scoops do not unintentionally enter the process at this stage. Any entry point of ingredients into the process, such as bulk ingredient delivery points, dry ingredient tipping stations and fat melters, should be designed to minimise the risk of physical hazard entry.

It is common to have additional physical hazard controls in place at such intake points, including in-line filters and magnets for liquid ingredients and sieves for dry ingredients such as milk powder. These controls should be regularly inspected, both for the accumulation of any foreign material and for any damage to this equipment, such as a broken sieve mesh.