A CBR however is non-lauric, being manufactured from the partial hydrogenation of other vegetable fats such as palm olein, cottonseed or rapeseed amongst others. CBR fats contains palmitic, oleic and stearic acid in much the same way as cocoa butter. The triglyceride composition is however much more complex than that found in cocoa butter, the hydrogenation process leading to the formation of some *trans* geometric isomers that crystallise and pack differently to the *cis* geometric isomers found naturally in cocoa butter. The high level of *trans* fats and possible link to heart disease means that CBR fats are often no longer used by manufacturers. CBR fats do not exhibit polymorphism in the way that cocoa butter does so that they do not require tempering. Chocolate compounds manufactured from CBR fats are not entirely compatible with cocoa butter due to the differences in crystallisation and do cause eutectics, although not as pronounced as those from the mixing of CBS and cocoa butter. Chocolate compounds manufactured using CBR fat will tolerate sufficient cocoa butter (up to 25%; Talbot, 2003) to allow the cocoa content of the chocolate compound to come from cocoa mass rather than fat reduced cocoa powder. This allows for the flavour of the chocolate compound to be much closer to the flavour of chocolate, providing the subsequent processing, in particular conching, is of a similar standard (see Section 19.8 and Chapter 20).

19.2.1 Ice cream coatings

Finally, we have chocolate coatings that do not try to mimic the properties of chocolate. The most common usage of these is for the coating of ice cream. Due to the manufacture and storage of ice cream products occurring at temperatures between –18 and –30 °C, it is often desirable to use fats that are more suited to consumption at low temperatures and that can give the texture desired despite the extremes of temperature. When eating ice cream the temperature in the mouth is reduced due to the coldness of the ice cream. Therefore fats with low melting points between 25 and 30 °C are less likely to give a waxy sensation in the mouth than is the case when chocolate is used. Using chocolate on ice cream, often used in premium chocolate-coated ice cream products, more often than not results in a product that cracks and crumbles when bitten into. It is also necessary to use fat contents in the region of 50% to achieve the necessary viscosity parameters for the chocolate to solidify on contact with the ice cream coating and to give the correct thickness of chocolate on the product so that the chocolate to ice cream ratio is at its most desirable level. Such high usage of cocoa butter makes the use of chocolate on ice cream expensive. The use of vegetable fats other than cocoa butter gives much greater cost-effectiveness. The manufacturing process for chocolate-coated ice cream also makes tempering infeasible as the cooling of the product in freezer conditions does not promote the desirable crystal growth. Tempering is not necessary as the resulting storage temperatures do not allow the transitions in fat crystal structure to occur that would result in bloom forming on the product. Cooling is exceptionally rapid,

hence fat incompatibility and eutectic concerns do not really play a part when the reality is that the chocolate or chocolate coating used transforms from liquid state to solid state in less than 10 s. This allows a much wider range of vegetable fats to be used in the manufacture of chocolate ice cream coatings.

Chocolate ice cream coatings can be as simple as a standard chocolate (with fat content in the region of 30%) that has its fat content raised to the 50% level with the addition of a vegetable oil. Most commonly used are coconut oil, palm kernel olein or palm olein but, if a softer texture is required, a fat with lower melting point such as rapeseed or cottonseed oil can be used. This can be purely for cost reasons without impacting greatly on the flavour of the chocolate or may be to improve the texture, creating a less brittle coating. More common is to replace the entire cocoa butter content with vegetable fat. This gives a much greater advantage in terms of material cost. Again, coconut oil palm kernel olein and palm olein are the most common fats utilised but other fats are also used. This is particularly the case if the texture needs to be softer or if a greater time is required between the dipping of the ice cream product into the chocolate and the time that the chocolate coating becomes solid, for example where inclusions such as biscuit pieces or cereal flakes are to be adhered to the coating. In these cases often the coating needs to remain semi-solid for up to 15 s to allow inclusions to adhere and therefore requires the use of lower melting point oil such as sunflower, rapeseed or cottonseed oil to be used in conjunction with coconut oil, palm kernel olein or palm olein. Using mixtures of vegetable oils to give a desired melting point is also used in chocolate sauces for use in pouring onto ice cream desserts. The intention being for the chocolate sauce to be liquid at ambient (20 °C) temperature but to solidify rapidly on contact with the ice cream dessert (–18 °C). The use of such vegetable oils gives great flexibility but ensures that the coatings do not meet the legal requirements to be considered chocolate.

19.3 Manufacture of compounds and coatings

The manufacture of chocolate compounds and coatings is similar to that of chocolate. First, there needs to be a mixing process to combine the raw materials together, then the particle size must be reduced to a size that is not coarse on the palate and, finally, the product needs to be conched or liquefied to make it suitable for intended purpose. When deciding what method of manufacture to use one should consider the type of chocolate compound to be manufactured, the intended usage of the chocolate compound, how large the production area available is and how much investment will be required.

A traditional chocolate manufacturing process can be used utilising a mixer, pre-refiner, refiner and conch, but this requires an expensive initial outlay of capital to purchase such equipment and a substantial available floor area to