

Other dairy ingredients such as whey protein, demineralised whey or lactose may be added to milk chocolate. The limiting amount is determined by taste, processing, economic benefits and legal regulations. For example, up to 5% lactose may be substituted for sucrose, and whey-based powders are legally accepted up to 5%, but they must be declared as an added other foodstuff (Bolenz *et al.*, 2003).

Technologies such as spray drying, membrane separation, fat fractionation and crystallisation allow for the production of dairy ingredients that are optimised for functional performance in chocolate. The processes used to produce milk ingredients are summarised in Figure 5.1. Continuing advancements in spray drying and membrane processing technologies result in improved processing efficiencies and the creation better ingredients for chocolate applications. The key to the success of designing milk ingredients for chocolate is understanding the requirements of the final application and manipulating the processing parameters to produce ingredients with the optimal properties for the specific application.

This chapter focuses on industrial milk ingredients used in chocolate. The chapter begins with a review of the major components of milk and their influence on chocolate. The composition, manufacturing processes and process variables that influence the functionality of concentrated milk fat-based ingredients and milk powders are discussed. Other factors that need to be considered when using these ingredients in the chocolate manufacture are also addressed.

5.2 Milk components

5.2.1 Milk protein

Milk protein contributes to the flavour, colour, flow and texture in chocolate (Keogh *et al.*, 2002). The total protein in milk is made up of two categories, the casein and the serum (whey) proteins. Each category is broadly defined by their chemical composition and physical properties and contains several proteins with different amino acid compositions and functional properties. More than 30 specific proteins have been identified in milk (Yamada *et al.*, 2002). Milk protein contains the nine essential amino acids required by humans. Milk protein is considered to be a good source of quality protein, adding to the nutritional profile of chocolate.

5.2.1.1 Milk protein composition

In cows' milk, the casein accounts for approximately 82% of the protein and the serum proteins are approximately 18%. The casein proteins contain phosphorus and coagulate at pH 4.6, their isoelectric point. The serum (whey) proteins do not contain phosphorus and remain in solution at pH 4.6. The term serum and whey are often used interchangeably to refer to the soluble proteins in milk. The

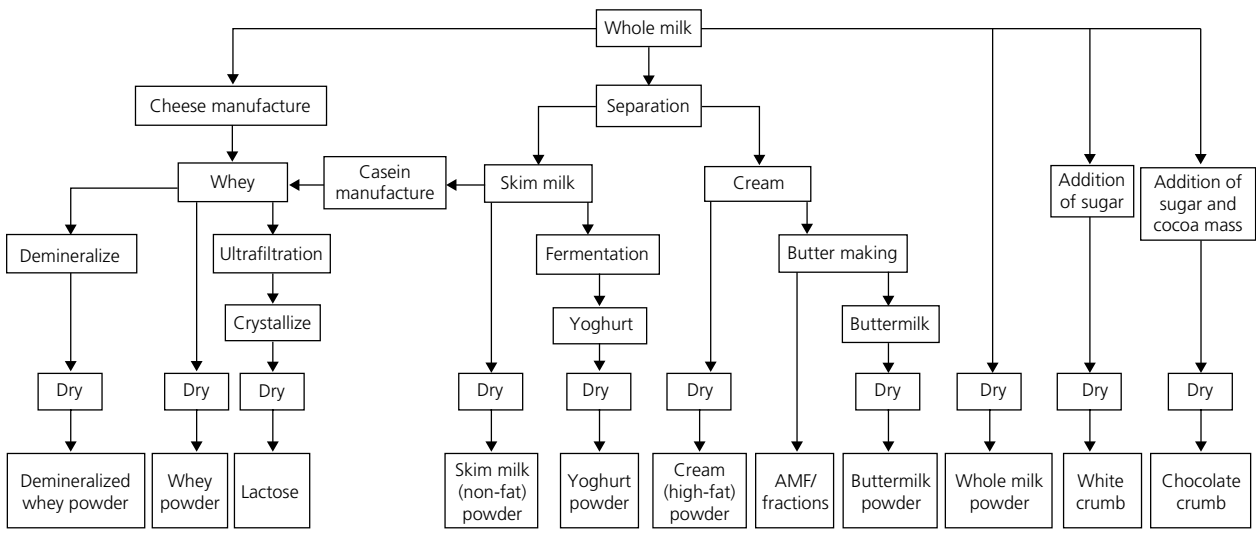


Figure 5.1 Flow chart of dairy processes and products used in milk chocolate.