Milk is the first food of humans and of every other mammal. For this reason the use of animal milk in the human diet is common throughout the world and has been so throughout recorded history. According to the recent statistics (15), world milk production accounts for an estimated 571 million tonnes. Cow milk represents 85% of this total, buffalo milk 11.3%, and goat and sheep milk 3.6%.

The 15 countries of European Union account for about 25% of milk production, where milk, by definition, includes only cow milk. North America accounts for 19.2%, Asia 13.4% and, Community of Independent States (CIS) 11%. Oceania is only 4.7%, but when expressed in terms of exported products, this percentage becomes much larger, 40% of the world exported butter, 33% of exported skim milk powder, 26% of whole milk powder, and 20% of cheese.

When expressed in terms of economic value, for 1999 a total turnover of $101 billion was expected, but the U.S. Dollar fluctuation might have changed this value. The world’s 20 largest milk processing companies were projected to achieve a joint turnover of around $104.8 billion in 2000.

Six of the top 10 companies are in Europe, three are in the USA, and one is in Japan. The cited figures explain why there is great interest in analyzing milk and milk products, in optimizing milk processing into various products, in assessing the authenticity of certain products, and why research is concentrated in some countries.

Near-infrared (NIR) spectroscopy, due to its versatility, is proposed as a powerful tool to face these very different issues and products. Historically, NIR spectroscopy was suitable for measurements in low moisture products. Its first applications in dairy were mainly in milk powders, but developments both in hardware and in software permitted the analyses of cheese and later liquid milk. A summary of NIR applications in dairy and eggs is given in Table 20–1.

Transformation of milk into cheese or fermented milk is a very complex sequence of events, where physical changes take place as well, as the milk shifts from a basically liquid structure toward a solid or semisolid structure. This change in sample configuration and consequently differences in sample presentation limit the possibility of monitoring a complete process by a single instrument. Nevertheless, as it will be seen in the following pages, several useful applications have been developed, and some appealing and stimulating opportunities can be designed for future applications.