9.1: Chapter Introduction

Note: Big Idea

Build peak bone mass during youth to preserve bone mass during aging.

Milk has been and will continue to be a key component in the diets of millions of people. During the agrarian age, people drank milk from the animals they raised. At the dawn of the twentieth century, nutritional science appeared on the scene and quickly acknowledged milk’s importance as a part of a balanced diet. For over one hundred years, several US government nutrition programs have highlighted milk’s value. How does milk get from a cow to your doorstep?

In the early nineteenth century, raw milk was distributed in carelessly washed metal pails and was, at times, still warm from the cow when it reached its destination. If you got up too late to fetch your milk you received little of the coagulated cream on top. This distribution method did not suffice for the widespread delivery of fresh milk to the masses living in cities, thus milk and its preparation methods had to be changed in several ways. Consuming raw milk can be a potential health hazard as harmful bacteria such as Salmonella, E. coli, and Listeria may be present, all of which are known as culprits for many foodborne illnesses. Pasteurization, homogenization, fortification, and eventually packaging in plastic containers were developed to address distribution and food-safety issues.

In 1863, Louis Pasteur invented pasteurization. Pasteurization involves heating the milk to a high temperature (greater than 161 degrees Fahrenheit) for a short time (less than 20 seconds) and is an effective method of killing 99.999 percent of bacteria, molds, and yeast. Pasteurization was a welcome technology as it extended the shelf life of milk by about two to three weeks and destroyed infectious bacteria, such as those that caused diphtheria, typhoid fever, tuberculosis, and scarlet fever, thereby making milk safe to drink. Unfortunately, pasteurization also destroys vitamins, enzymes, and some beneficial bacteria. Milk may also be microfiltered, a process that pushes milk forcefully through ceramic filters that remove bacteria. Milk is homogenized so that it does not separate into butterfat globules and milk fluid. During homogenization, milk is emulsified under intense pressure as it is pumped through narrow tubes. Fat globules are
broken into smaller ones and they do not recoagulate. The homogenization process, however, does not have a negative effect on the milk’s nutritional value or effectiveness.

\[\text{Figure 9.1.1: Milk: An ever-changing product of the dairy industry. © Shutterstock}\]

The dairy industry has gone through many changes to increase milk production, quality, and distribution. As a result of pasteurization and to meet the health needs of the American population, a public-policy decision was made in 1933 to fortify milk with vitamin D to prevent childhood bone disease. More recently, changes include expanding the number of cows per herd, increasing milk production per cow by over six-fold, improving dairy cow nutrition and herd management practices, and advancing technologies that increase storage time and decrease bacterial contamination. How did milk production increase six-fold per cow? Most cows are Holsteins, bred with optimum genetics for producing milk. They are provided with the best nutrition, a dietary pattern taken from many scientific studies that provides optimal nutrients specifically for cows to make milk. Some people are concerned about the changes that were brought about by controversial methods, such as injecting dairy cows with bovine growth hormone. This increases milk production by about 15 percent but also increases the risk of udder infection in the cows. As a result, antibiotics are widely used in the dairy industry. There is evidence linking widespread antibiotic use with the increase in the resistance of bacteria. This practice also decreases the effectiveness of antibiotics in humans.

Note: You Decide

How will you ensure that you are building strong bones and will be able to avoid detrimental bone loss in old age?

It is estimated that every three seconds around the globe, an osteoporotic fracture occurs. Over two hundred million women worldwide suffer from this disease. Kanis, J. A. *WHO Technical Report*, (University of Sheffield, United Kingdom, 2007): 66. Statistics also show that one in three women and one in five men over sixty will experience an osteoporotic fracture. European Foundation for Osteoporosis and National Osteoporosis Foundation. “Who Are Candidates for Prevention and Treatment for Osteoporosis?” *Osteoporos Int 7*, no. 1 (1997): Melton 3rd, L. J. et al. “Perspective. How Many Women Have Osteoporosis?” *J Bone Miner Res 7* (1992): 1005. Kanis, J. A. et al. “Long-Term Risk of Osteoporotic Fracture.” *Malmo Osteoporos Int 11* (2000): 669. How can you prepare yourself and fortify your bones against this disease? Milk is a ready and convenient source of calcium and vitamin D, but one glass of milk per day is not sufficient to provide adequate intake of these nutrients and many people have an allergy or intolerance to dairy products. Other good sources of calcium and vitamin D are soybeans, parsley, kale, salmon, broccoli, eggs, tuna, beans, and fortified products such as soymilk, rice milk, and almond milk. As you read this chapter you will learn the importance of building and preserving healthy bones through proper diet and exercise. Whatever you decide, know that your bone health will be affected by your dietary and lifestyle choices for years to come.