lating a solid substance from solution by freezing the solution and then evaporating the ice under vacuum [7].

In this chapter, we have attempted to cover some of the key historical events that led to the development of modern day freeze-drying or lyophilization, and its widespread applications expanding from basic food needs to biotechnology products. Special consideration is given to lyophilization process, and the history of lyophilized vaccines and biopharmaceuticals.

Historical Events in Development of Lyophilization

Prehistoric Events

The method of freeze-drying, although not claimed as named "freeze-drying," has been utilized from ancient time since 1250 BC. Freeze-drying procedure can be traced back to prehistoric times of Eskimos, who preserved the fish in the cold temperatures of artic by dehydration [1–4]. In 1250–850 BC, ancient Peruvian Incas placed their potatoes and crops above Machu Picchu that caused freezing of their produce. They did not realize that low pressure at the high altitudes vaporized or sublimed the water from the produce and basically freeze-dried it [3, 9]. Although this process was relatively slow, but during drying the quality of the food was preserved due to its final frozen state. Interestingly, South Americans living in the Andes used a primitive freeze-drying method to preserve potatoes. They carried the tubers high into the mountains where temperatures drop below the freezing point of water and atmospheric pressure is low [3]. It is also known that monks living on Koya, the famous Buddhist sacred mountains, were packing tofu in snow on mountain sides that were conducive for drying due to high altitudes and extremely cold winds [3]. Vikings freeze-dried their favorite food, cold fish, by utilizing the local cold and dry conditions [10]. Such dehydration occurs under a vacuum, where the plant or animal product is solidly frozen during the process. The shrinkage of product is minimized or eliminated that result in a good preservation and long lasting.

Realization of Freeze-Drying Process: Early 1900s

In 1890, Altman reported that he was able to obtain dry tissue, at subatmospheric pressures, at a temperature of approximately −20 °C [1, 11]. The report in the literature does not easily reveal who named or first called the equipment as freeze-dryer. In 1905, Benedict and Manning reported the drying of animal tissue at pressures less than 1 atm by means of a chemical pump [11]. Shackell independently rediscovered the technique in 1909 for the preservation of biologicals, and was the first one to realize that the material had to be frozen before commencing the drying process, hence freeze-drying [12]. In 1910, Shackell took the basic design of Bene-