Chapter 22
Brazilian Charqui Meats

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Salted meat products in Brazil can be broadly divided in two classes: first, the intermediate moisture meat products (IMMP), with shelf life of months at room temperature (charqui (*charque*) meat itself and its derivative jerked beef are the main representatives of this family), and, second, non-IMMP with shelf life of days presenting a relatively low content of salt and high moisture and high water activity (aw). *Carne-de-sol*, sun meat, is the representative of this kind of meat product and known under various names as *carne-de-sertão*, *carne-do-ceará*, *carne serenada*, *carne-de-viagem*, *carne-mole*, and *carne-do-vento*, all very popular in the northeastern region of Brazil.

Charqui meat (CH) also known as *carne seca*, dry meat, has its name etymologically derived from the Quechuan language of the Andes region from the word *ch'arki* and the salted meat manufactured from llama meat. CH consumption in Brazil has its roots closely related to the country's own history. During colonial times, it was consumed largely in the northeastern region, and it is nowadays consumed all over the country due in particular to migration movements. Because of an

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extreme dry season in 1780, animals were few in number locally; thus, the production moved down to Pelotas city in Rio Grande do Sul state, transforming economically this region, and CH was its main food product. There is a report stating its importance as exportable product for over 150 years in particular to Cuba, Uruguay, and even the USA (Marques 1992). Pelotas no longer produces so much CH, and the production is concentrated in the southwest regions, in particular in the São Paulo state. It is an ingredient of one of the most popular dishes known as "feijoada" cooked with black beans and other meat products.

The total charqui consumed is approximately 206 thousand ton/year, a consumption of 1.0–1.5 kg/capita equivalent to app. to US$1.000 mi annually (Brazilfocus 2007). According to the Brazilian legislation, CH should contain 40–50 % moisture and 10–20 % salt (Brasil 1962) and 0.75 the final value of its water activity ranking it as an IMMP (Torres et al. 1994). On the other hand, jerked beef (JB) is officially characterized by Brazilian legislation by having maximum moisture of 55 %, sodium nitrite of 50 ppm, salt concentration of 18 %, and final a_w value of 0.78 and should be vacuum packed and technologically is an improvement from CH (Brasil 2000; Shimokomaki et al. 2003).

Despite the high consumption, CH and JB have their production based on traditional technologies applying a heavy salting and drying under the sun associating to the wind therefore reaching the intermediate a_w values being microbiologically safe products. Recently, it was reported that some fermentative halophylic bacteria were present in the processing, in particular *Staphylococcus xylosus* and *carnosus*, and it has been suggested that enhancing those bacteria as starter culture would improve flavor and taste (Pinto et al. 2002).

The charqui meat preparation, essentially, has its processing starting from deboning the carcass, followed by wet salting when the ingredients are incorporated and evenly distributed into the meat accelerating the curing and stabilizing its color. The whole piece is immersed in concentrated brine approximately 20–25°B containing 1–2 % potassium or sodium nitrite for hours allowing the solution to diffuse into the meat. Nowadays, this brine solution is injected into the meat accelerating this first step of salting followed by tumbling the meat in order to guarantee the uniform distribution. Thereafter, meat samples are subsequently submitted to dry salting with rock salt overnight. The meat pieces are stacked into piles separated from each other by a layer of coarse marine salt, approximately 5 mm thick. Daily, throughout four subsequent days, the meat is restacked, and the uppermost meat pieces are repositioned on the bottom of the new piles activity known as *tombo*. After restack and rinsing excess salt from the meat surfaces, samples are hung in a stainless steel rail under the sun and wind for an approximately 8 h period when the temperature reaches 40–45 °C. At night and in rainy days, samples are collected and piled in a concrete floor and covered with tarpaulin, and finally the product is either vacuum packed for jerked beef or no vacuum for charqui meat although in markets today, vacuum-packed CH can also be found (Shimokomaki et al. 2003). The fermentation process may occur at two particular steps, while at the *tombo* phase when the piled meat is kept still, and during the drying period when the samples were collect at night and piled (Fig. **22.1**).

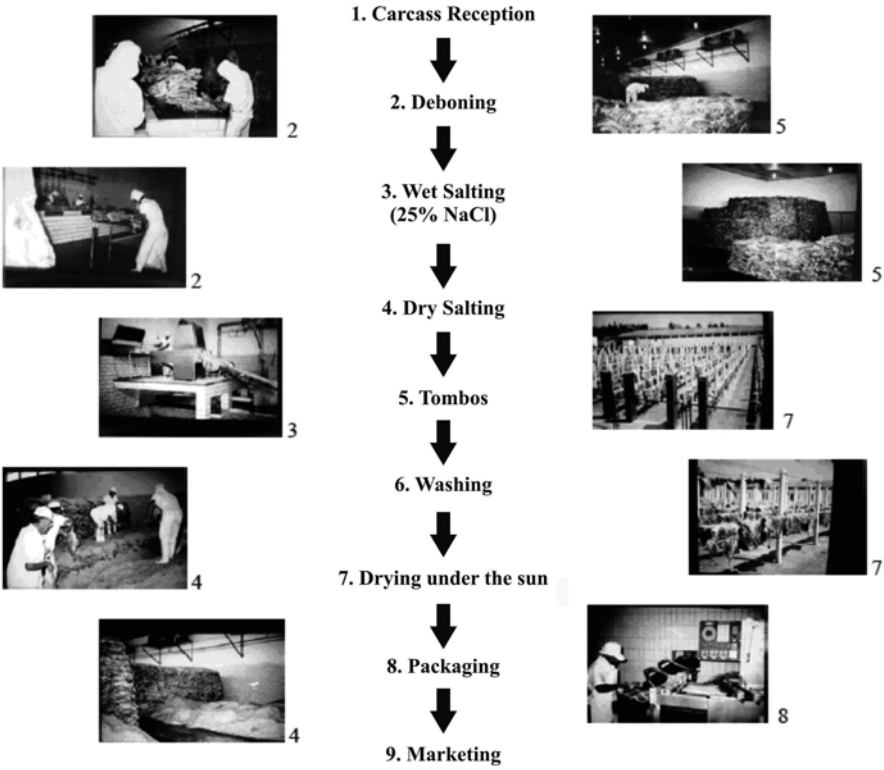

Fig. 22.1 Flow diagram showing charqui or jerked beef processing consisting of *1*, raw material; *2*, deboning; *3*, brine injection; *4* and *5*, dry salting and *tombos*; *6*, washing the meat piece surface; *7*, sun dry in stainless steel rail; *8*, packaging; and *9*,marketing (Shimokomaki et al. 2003)

For centuries, production of either *carne-de-sol* or charqui meats was considered a prehistorical practice. In fact these products are similar to European meat products in particular those of the Iberian Peninsula brought into South America by settlers from the Colombian period onwards. It seems however that CH meats were originally processed in America because these kinds of products are not found in Europe. Although timid yet, there are attempts to modernize this manufacture processes in order to make them feasible to be standardized by applying quality management tools, implementing HACCP, ISOs, etc. This is necessary to make them exportable products. JB is an example of this trend and is an excellent food product derived from the hurdle technology theory (Leistner 2000) to obtain a safe product (Shimokomaki 2006). Salting, curing, drying, water activity, and vacuum packaging are hurdles sequentially applied in order to hinder microbial growth, and the chemical oxidation deterioration is inhibited by the presence of nitrite which acts both as botulism inhibitors and as lipid antioxidant (Shimokomaki et al. 1998). Despite the harsh conditions of processing, its biological value evaluated with experiments in rats resulted in high protein efficiency ratios, high net protein utilizations, and high

nitrogen balances, thus showing a high biological value and also high true digestibility, with net protein utilization similar to casein (Garcia et al. 2001).

Lastly, charqui meats are at a turning point today for production from ancestral practices to modern technologies justified by the food safety demanded by the markets and also by financial incentives.

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