

# Examining growth patterns of starter cultures in Swiss cheese

**Author:** Clifford Park

**Major:** Food Science and Technology

**Project Advisor:** Sheryl Barringer & Hardy Castada

Swiss cheese production involves two main flora, thermophilic lactic acid bacteria (LAB) such as *Streptococcus thermophilus* and *Lactobacillus* spp. and propionic acid bacteria (PAB), *Propionibacterium freudenreichii*. These microorganisms play specific roles in the development of the sweet and nutty flavor, eye-production, and texture of Swiss cheese. Understanding the growth of these species is important because their growth and metabolism are directly associated with the fermentation and ripening of Swiss cheese. The objective of this study was to measure the growth pattern of LABs and PAB during the manufacture of Swiss Cheese. Samples from two Ohio-based factories at four different manufacturing stages (out of press, pre-cool, warm-room, and at cheese cutting) were obtained. Enumeration of the bacteria was performed using a viable plate count after each manufacturing stage. For both companies, LABs and PAB exhibited different growth patterns. The colony forming units (cfu) of LABs at the out of press, the pre-cool, and warm-room stages were  $10^6$ ~ $10^8$  cfu/mL. Then, cfu at the cheese cutting stage decreased to  $10^5$  cfu/mL. Unlike LABs, PAB showed a range of no growth to  $10^5$  cfu/mL at the out of press and the pre-cool stages. However, by the warm-room stage, PAB showed a range of  $10^6$ ~ $10^7$  cfu/mL. Then, cfu at the final stage decreased to  $10^5$  cfu/mL. In other words, LABs showed greater growth than PAB at the out of press and pre-cool stages. However, growth of LABs and PAB were similar at the warm-room and the final stage. These results agree with the theory of initial fermentation by LABs and subsequent fermentation by PAB during Swiss cheese manufacture. Furthermore, this study could guide further studies to monitor what fermentation pathways are active during specific stages of the Swiss cheese production and how they contribute to the ripening of Swiss cheese.