DETERMINING THE POINTS OF CONTAMINATION IN PROCESSING FRESH PORK SAUSAGE

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Story in Brief

By determining the points of potential microbial contamination during the manufacturing of fresh pork sausage, steps can be taken to reduce this potential and help assure a safe product with longer shelf-life. This project was designed to monitor the production of fresh pork sausage at a commercial processing plant in an effort to identify those critical points. Microbial analysis was completed using duplicate product samples at each step of the processing during two separate processing days. Results indicated that on the first day of processing, initial microbial levels of the trimmings were high ($3.13x10^5$ CFU/g) but did not change throughout the process. Day 2 production showed 10^3 CFU/cm^2 microbial levels in the trim, but were not different from day 1 at the bowl chopper (Step 2). Gram negative bacteria were also high (10^5 CFU/cm^2) during day 1, while day 2 started at 10^3 CFU/cm^2 and increased to 10^6 CFU/cm^2 by the end of the process. This study reveals that the processing steps of fresh pork sausage do not decrease the numbers of microorganisms and will result in higher numbers if precautions are not taken.

(Key Words: HACCP, Fresh Pork Sausage.)

Introduction

The United States produces over 1.1 million pounds of fresh sausage (uncooked, no nitrite) under Federal Inspection each year, with pork sausage representing approximately 80% of the total production. Consumer acceptance of a fresh sausage product is dependent on appearance as well as flavor. A reduction in shelf-life indicated by off-flavors and appearances, can be caused by a number of things, one of which is microbial contamination. Without the addition of nitrite, microbial growth is not inhibited and can result in reduced shelf-life. The purpose of this project was to monitor the production of fresh pork sausage, identify the points where contamination occurs, and suggest methods to reduce those points of contamination.

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Materials and Methods

All steps of processing were carried out at a commercial processing plant. The processing steps at which product samples were taken are outlined in Table 1. Duplicate product samples were taken at each step, placed in plastic bags, and transported in a styrofoam ice chest to Oklahoma State University. Each sample was individually placed in a sample bag with an equal amount of sterile water (weight basis) and homogenized using a stomacher for one minute. A pour plate method was used with total plate count agar (TPC) and total gram negative agar (TGNA) to give dilution's ranging from 10^1 to 10^5 (Speck, 1976). Poured plates were allowed to gel for 20 minutes at room temperature (70°F) prior to incubation at 100° F for 48 hours. Following incubation, each plate was counted, with the means of duplicates reported as colony forming units per gram (CFU). Means were separated using Fischer's least significant difference.

Results and Discussion

Microbial contamination enumerated at selected steps during the manufacture of fresh pork sausage is depicted in Figure 1. It should be noted that throughout the processing for both day 1 and day 2 there was no decrease in microbial numbers. Fresh pork trimmings (Step 1) used during this process were a combination of those obtained from outside vendors and those trimmed from carcasses during in-house processing. The pork trimmings used for day 1 processing had 3.13×10^5 CFU/g and did not show linearity ($P>.05$) throughout the rest of the process. For day 2 processing, the pork trimmings had 4.55×10^3 CFU/g and showed a linear increase ($P<.05$) throughout the remainder of the process. Since there is no step in the process of fresh pork sausage that will effectively reduce microbial numbers, special steps must be taken to maintain low numbers. Proper sanitation of both equipment surfaces and handlers is extremely important. As indicated by Figure 1, there was a rise in microbial numbers after the trimmings were taken from the bowl chopper. There are two

Table 1. Processing steps and microbial sampling locations in fresh pork sausage manufacturing.

Processing step	Sampling location
1	Trim
2	Bowl chopper
3	Grinder
4	Overnight chilling
5	Patty machine
6	Finished product

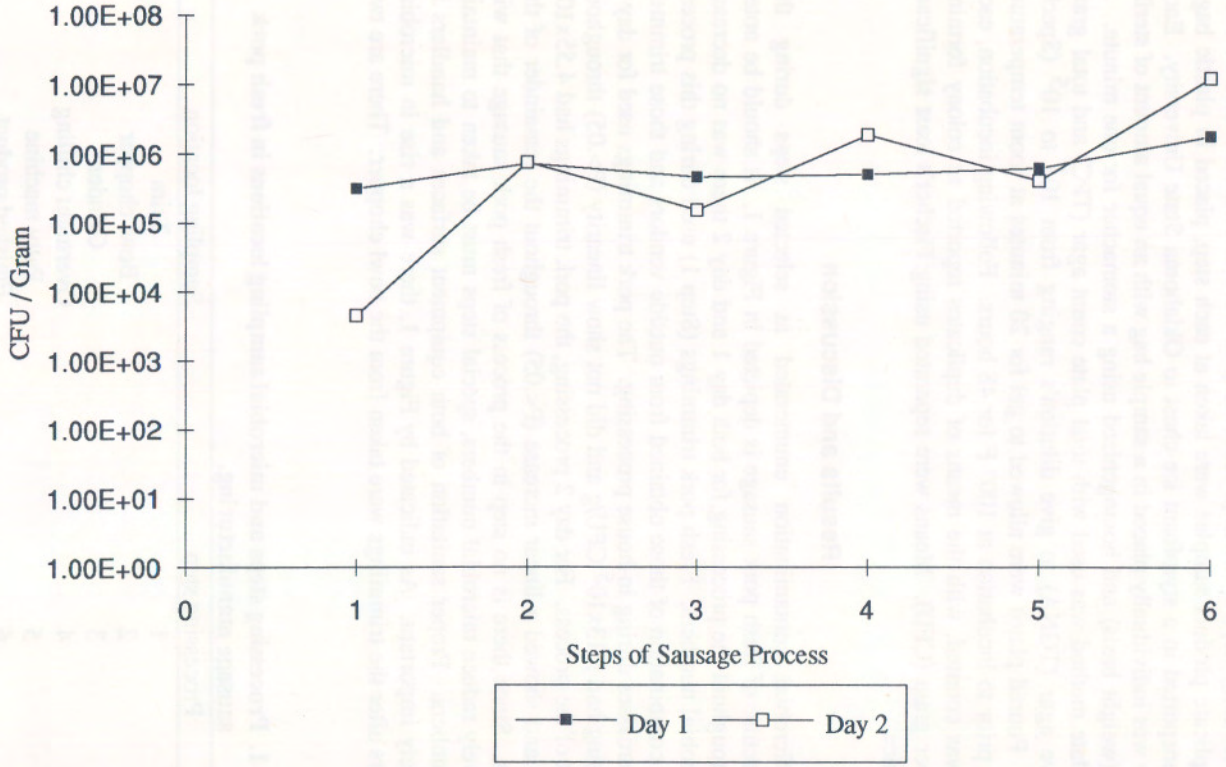

Figure 1. Fresh pork sausage total plate count.

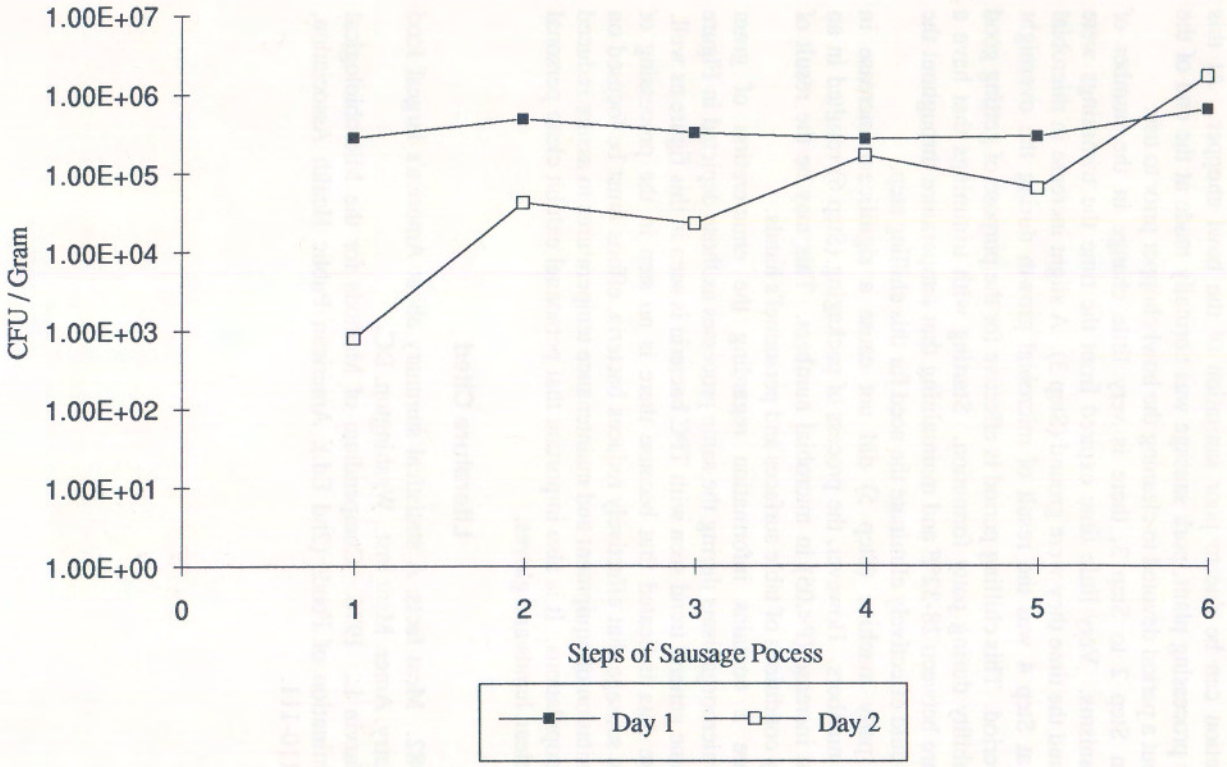

Figure 2. Fresh pork sausage gram negative plate count.

potential sources for the increase. The first is the inoculation of the trimmings through the addition of spices. Although commercial spices are treated to reduce contamination, some microorganisms can remain. The second source of contamination can be due to poor sanitation of the bowl chopper. At this particular processing plant, pork sausage was normally made at the end of the day without a period devoted to cleaning the bowl chopper prior to use.

From Step 2 to Step 3, there is very little change in the number of microorganisms. Very little time expired from the time the trimmings were chopped and the time they were ground (Step 3). A slight increase in microbial numbers at Step 4 was the result of microbial growth during the overnight chilling period. This chilling period is effective for the purpose of getting good forming ability during patty formation. Starting with trimmings that have a temperature between 28-32°F and maintaining that temperature throughout the process would effectively eliminate the need for this chilling step.

The patty machine (Step 5) did not cause a significant increase in microbial numbers. However, the process of packaging (Step 6) resulted in an significant increase ($P<.05$) in microbial numbers. This may be the result of unsanitary conditions of table surfaces and personnel's hands.

Figure 2 contains information regarding the enumeration of gram negative microorganisms during the same processes as those depicted in Figure 1. The same general trend seen with TPC bacteria is seen in this figure as well.

These data indicated that because there is no step in the processing of fresh pork sausage that effectively reduces bacteria, efforts must be focused on proper sanitation of equipment and maintenance temperatures to assure reduced bacterial populations. It is also important that personnel exhibit clean personal hygiene, clean hands and gloves.

Literature Cited

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