what they may contribute to the sausage in the way of bacterial contamination. Contact plates made from the waxed paper showed the presence of 1 to 2 colonies per square inch. The cellophane had 2 colonies of mold per square inch in addition to 2 colonies of bacteria. The present methods used by paper manufacturers almost insure a sterile product. Therefore, it is evident that most any of the recommended locker wrapping materials are nearly free of bacteria.

A 50 gram sample was taken from each series at the time of packaging, after 24 hours in the freezer, 17 days storage, 28 days storage, and each 28 day period thereafter for 310 days. The sample to be used for bacterial plating was cut from the center of each one pound package with a sterile knife. By transferring the sample to a sterile petri dish it was possible to avoid further bacterial contamination. The specimen from each series was mixed in a wearing blender and plated immeriately for bacterial content. Difco's nutrient agar was used as the bacterial medium. It was found that sharp freezing does not materially decrease the bacterial content of the sausage. In fact, a slight increase in numbers was noted. This was thought to be due to two factors. Freezing of the ice crystals caused rupturing of the bacterial groups, thus breaking them into smaller fragments, and giving an increased number of colonies when the frozen sample was plated. It is also possible that some growth may have taken place during the freezing process. Unpublished data compiled at the Kansas Agricultural Experiment Station indicates that it requires 9 hours to completely freeze a two pound package of pork sausage in an air blast freezer at 0°F. This would seem to allow ample time for some growth to take place in the center of the package.

Experiments conducted elsewhere with garden peas and sweet corn showed that during rapid freezing, the water in the cells was not changed to ice crystals, but to a glass-like amorphous mass which resulted in less injury to the cell than when foods are frozen at a slower rate. Therefore, if slow freezing causes injury to the meat cells by the ice crystals, it may also break up the bacterial groups present, thus accounting for the slight increase in number of bacteria during freezing. A slower rate of freezing would also provide a greater opportunity for growth. These observations would seem to further justify rapid freezing. This potential growth period may be of considerable importance in the case of farm and home freezers or some locker plants where the rate of freezing is relatively slow.

Series M contained the largest number of organisms. The flora showed the evidence of some spore forming colonies, but the predominating organisms were of the non-sport forming type. This dominant type of organism was found to grow well at room temperature (70°F) but made little or no growth at body temperature (98°F). When a sample was allowed to remain in the chill room at 32°F. to 34°F. multiplication took place slowly after 24 hours. This organism is a non-spore forming, gram-negative, rod shaped psychrophilic organism. It has been reported that organisms of this description are common in fresh meat.

Observations from this study indicate that nearly 75 percent of the organisms naturally present die during the first two months of storage, after which the death rate for the remaining 25 percent is much slower. The vegetative and non-spore forming bacteria are most susceptible to low temperatures and therefore die early in the storage period. The spore formers being more resistant to freezing

were still present in large numbers after 310 days in storage.

Series N, O, and P contained relatively small numbers of the predominating organism, but about an equal amount of the spore forming colonies. Observations from this study indicate that during the 310 days storage period the total number of bacteria in the four series tended to become equalized, with the spore-forming type predominating at the end of the period. The bacteria added by the seasoning ingredients were of this type. This would seem to indicate that many of the spores were probably added during the seasoning and grinding process, and only a few spore forming organisms were actually present in the meat. The non-spore forming bacteria were found to die off more rapidly in the high count samples, than in the less populated samples, during the early part of the storage period. This was probably due to the presence of younger less resistant cells.

A portion of each pound package removed from storage was cooked and rated by a palatability committee. The scoring was based upon the following factors: color, texture, juiciness, flavor, and evidence of oxidation. The cooking samples were taken at the same time as the bacteriological sample in order to give a check on the quality.

The scoring showed a gradual loss of quality, but the difference between the four series is too small to be significant. It was unanimously agreed by the committee that series M, was the least desirable after 310 days storage. While the drop in palatability can not be attributed entirely to the influence of bacteria, it is belived that the presence of large numbers of bacteria may be a contributing factor in reducing the quality and shortening the storage life of fresh pork sausage. It is felt that a product with a higher initial bacterial count would have reflected a truer picture of the bacterial influence upon keeping quality. Sausage frequently contains much higher bacterial counts than were present in these samples. Sausage containing 25 to 100 million bacteria per gram might have given entirely different results. The study is being continued using sausage with higher bacterial count.

Miscellaneous Project

HOW MUCH MEAT FROM A STEER?

D. L. Mackintosh - R. W. Henrickson - D. B. Watt

How much meat should I have in my locker from a 1000 pound steer? This is the type of question that is asked most frequently by locker patrons. Many people, now using frozen food lockers have little conception of how much meat, the number of pieces, or the type of cuts that they should expect from one carcass. Neither do they realize what happents to a large part of a steer before reaching the locker. Actually a 1000 pound steer will yield approximately 180 pounds of steaks of varied kinds, 180 pounds of roast and pot roasts, and 90 pounds of stew and ground meat making a total of 450 pounds of table meat which is 45 percent of the live weight of the animal. A comparable shrinkage occurs when a hog or a lamb is butchered.

In order to familarize locker patrons with such facts, numerous studies have been made in the college meat laboratory and the resulting figures distributed where those who are interested may find them. The accompanying tables entitled "What Becomes of a Side of Beef?" "Suggested Breakdown of a Lamb Carcass," and "Suggested Breakdown of a Hog Carcass" are included here as a means of disseminating further this information. These tables are taken from class records at Kansas State College and are considered typical for each type of

animal. Some differences will result from different methods of breaking down the carcass, but on the average one will find that approximately 45 per cent of a steer will reach the locker, 40 per cent of a lamb and 65 per cent of a hog. In the case of the hog, about 50 percent of the products will be in meat cuts and 15 percent in rendered lard.

When in doubt as to the amount of meat placed in your locker by the locker operator, reference to these tables may prove of value in removing that doubt. They also may prove of some value in anticipating just how many T-Bone, or sirloin steaks to expect from a beef, how many pounds of cured or fresh meat to expect from a hog, or how many chops to expect from a lamb.

WHAT BECOMES OF A SIDE OF BEEF?

January 1, 1949

Animal No. 18—Live weight 790 lbs.—Dressing Percent (Hot) 58%

Grade—U. S. Good—Hot Wt.—Left Side.....224 Lbs.
Chilled Wt.—Left Side....212 Lbs.
Shrinkage—(14 days—.... 6 Lbs.—2.7%

Hind Qr.—102 Lbs.—47%—

Fore Qr.—116 Lbs.—53%—Cut New York Style—Partial Boning

Hind Qr.-102 lbs	No. Pces	Cut	Wt. lbs	Fore Qr. 116 lbs	No. Pces	Cut	Wt. lbs
Loin-32.0 lbs	3	Club Steaks	2.3	Rib-16.5 lbs	3	Roasts	14.6
	7	T-Bone	7.1			Bone	1.9
	3	Porterhouse	4.2	Plate-23 lbs	3	Short Rib	11.9
	7	Sirloin	15.8			Ground Beef	9.8
		Bone Rem'ed	2.0			Bone	1.2
Flank-12.3 lbs		Fat	6.5	Shank-8 lbs	3	Soup Bones	6.5
		Lean Trim	5.8			Waste	1.1
Rump-11.0 lbs	2	Rolled R'sts	8.1			Ground Beef	.3
		Bone	2.7	Chuck-58.5 lbs	3	Inside C'ck Roll	15.11
Round-38.5 lbs	6	Inside R.	9.2		3	O'tside C'ck Roll	9.8
	6	Outside R.	9.1		2	Swiss Steaks	5.0
	4	Tip	5.5			Ground Beef	7.9
	1	Heel	6.2			Bone	11.8
		Trim	1.9			Fat Trim	2.5
		Bone	6.6				
Kidney Knob			7.3				

	Pounds	Percent	Pounds	Percent
Steak	53.2	52.1	5.0	4.3
Roasts and Pot Roasts	14.3	14.0	57.0	49.0
Ground Beef	7.7	7.5	25.5	22.0
Soup Bone			6.5	5.5
Bones Removed	11.3	11.0	17.9	15.5
Fat Trim	13.8	13.5	2.5	1.8
Cutting Loss	1.7	1.6	2.4	2.1

Total Meat to Locker

Steak	58.2 Lbs.	27.0 Percent of Side
Roasts and Pot Roasts	71.3 Lbs.	33.0 Percent of Side
Ground Beef	33.4 Lbs.	15.5 Percent of Side
Soup Bone	6.5 Lbs.	3.9 Percent of Side
Grand Total	169.4 Lbs.	78.5 Percent of Side
Fat Trimmings	15.9 Lbs.	7.3 Percent of Side
Bone Removed	29.2 Lbs.	13.5 Percent of Side

SUGGESTED BREAK-DOWN OF LAMB CARCASS

January 1, 1949

Live Wt. 95 Lbs.—Dressed Wt. 49 Lbs.—Dressing Percent 52. Grade—U. S. Good

Cut	No pieces	Trimmed Wt. Lbs.	Dr. Wt. Percent	Disposition of Cut
Leg—Am. Style	2	4.5	18.4	Roast
Leg end roll	1	4.25	8.7	Roast or chops
Loin roll	1	3.8	7.8	Roast or chops
Rib chops	16	3.8	7.8	Broiled chops
Shoulder Roll	2	4.2	17.1	Roast
Shanks	2	1.9	3.9	Braised
Riblets		1.9	3.9	Stew
Ground lamb		5.25	10.7	Broil lamburgers
Total wt. to Locker		38.3	78.3	
Bones Removed.		7.25	14.8	
Fat Trim		2.00	4.1	
Waste		1.4	2.8	
Total		48.95	100.	

Normal Expectancy—Dressing percent—50% to 52%; Meat to locker, 78% to 80%. Bone removed, 7.5%; Fat trim, 4% to 5%, (depending upon degree of finish). Leg end roll and Loin roll may cut into chops for broiling, just before cooking. Bones may be used for soup stock.

SUGGESTED BREAK DOWN OF HOG CARCASS

January 1. 1949

Live Wt., 245 Lbs.—Dressed Wt., 184 Lbs.—Dressing Percent, 75.

Cut	Trimmed Wt.	Live wt. Percent	Dr. Wt. Percent	Disposition of Cut
Hams	33.6	13.7	18.2	Fresh or cured
Picnics	15.7	6.4	8.5	Fresh or cured
Bellies	30.8	12.2	16.6	Cured
Bacon Squares	5.9	2.4	3.2	Cured
Total Cured	86.0	34.7	46.5	
Boston Butts	10.4	4.2	5.7	Roasts or chops
Loins	24.9	10.0	13.5	Roasts or chops
Spare Ribs	4.5	1.8	2.4	braised
Sausage Trimmi'gs	7.3	3.1	4.0	
Neck Bone	3.1	1.3	1.7	Seasoning
Pigs Feet	4.4	1.7	2.4	Fresh or pickled
Total Fresh Meat.	44.6	22.1	29.7	
Fat Back	19.5	8.0	10.6	Rendered
Clear Plate	6.2	2.5	3.4	Rendered
Leaf Lard	6.2	2.5	3.4	Rendered
Fat Trimmings	8.1	3.3	4.4	Rendered
Total Fat for Lard	40.0	16.3	21.8	
Rendered Lard	30.0	12.3	16.3	

Normal Expectancy—55 pounds fresh meat and 15 pounds lard for each 100 pounds live weight. Of the 55 pounds fresh meat two-thirds is usually cured, leaving only 18 pounds of fresh meat per 100 pounds live weight, or only about 6 and 8 packages of fresh meat per 100 pounds of live hog.