FLOW SHEETS OF PREPACKAGED FRESH MEAT

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This is to certify that the

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FLOW SHEETS OF PREPACKAGED FRESH MEAT

By

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INTRODUCTION

The self service type of merchandising was developed during the depression years of the 1930's. The primary reason behind this was to cut down the cost of labor in operating the store, as the customers served themselves instead of having a clerk assist them.

In the beginning, this type of merchandising was used only for dry groceries which had a long shelf life. After the development of ways to display such products as fruits and vegetables, this service was also extended into the fruit and vegetable departments with sucess. The development of the open refrigerator case enabled the markets to sell cold meat and dairy products on a self service basis.

Today we find that the trend is to merchandise all food products on a self service basis. It was not until 1942, however, according to Gilchrist (9), that fresh meat was offered for sale on a 100% self serve basis. Gilchrist (8) indicates that it was inaugurated in the Los Angeles area at the beginning of the last war (1941) when there was a shortage of labor. He also points out, that due to open-top refrigerator cases not being available, there was no immediate expansion of the self service type of meat merchandising. He estimated that by the summer of 1946, there were only twenty five retail meat departments on a self service basis. With the close of the war the open-top refrigerator case again became available, and many

merchants throughout the United States began to convert to 100% self service retailing of meats.

The growth in numbers of stores offering self service (28) says that as of April 1, 1948, there were 178 stores with 100% self service. The same day one year later there were 878 stores.

This rapid growth of self service meat merchandising is evidence that it is being received favorably by the public. There have been numerous surveys made to obtain consumer opinion on this new type of merchandising.

In a survey by the United States Department of Agriculture (29), 97 stores were surveyed. In this group of stores, 65 were chain stores and 32 were independent stores located in 80 cities in 27 states and the District of Columbia. Of the 97 stores, 67 reported that their customers had reacted enthusiastically to the establishment of a self service meat department. Twenty eight reported that their customers reacted with moderate enthusiasm, while only two stores stated that their self-service meat departments had not been well received.

The 97 stores reported 180 instances of favorable comment by consumers and 50 instances of unfavorable comment. The most frequently reported favorable comments were: (1) No waiting, by 46 stores; (2) better selection by 26 stores; (3) purchase to suit household budget, 18; (4) customers know what they are buying, 16; (5) may take

their time, 15; (6) purchase cheaper cuts without embarrassment, 15. The most common unfavorable comments were: (1) miss personal contact, 22; (2) prefer to see meat cut, 8.

A similar consumer opinion report by Kramer (15) showed that more than 70% of the customers answering the poll gave the following two reasons as being most important in buying prepackaged meat; (1) Weight and total price are given, 72%; (2) Can shop quicker, 70%.

In a poll of self-service patrons, DuPont (1) found that 87% of the respondents indicated a willingness to buy prepackaged fresh meat. Gilchrist (9) found in one case that 85% of the respondents were willing to buy prepackaged fresh meat while in a second survey 89% were willing to buy this type of meat.

DuPont (1) further shows the customers reaction to self-service prepackaged meats by the following survey:

New England Retailer

30 percent increase over old type service.

Mid-West Retailer

35 percent increase over old type service.

Mid-West Retailer

50 percent increase over old type service.

West Coast Retailer

60 percent increase over old type service.

The author has presented the results of these surveys

to point out the fact that prepackaged 100% self-service meat merchandising appears to be the method of the future for retailing meats.

If this type of merchandising is to be adopted, then there are problems to be investigated.

In preparing prepackaged fresh meat for the customer more handling of the meat is necessary. After the retail cut is made, each piece of meat with any bone dust on it must be handled by the operator to remove the bone dust to present a more attractive package. In addition, each unit of meat is handled when placed on trays and returned to the cooler for 15-30 minutes to bring out the optimum color of the meat. It is again handled in the packaging process. Equipment not ordinarily used in the old style of meat merchandising, such as trays, backing boards, etc., are used in preparing the product. Additional handling of the product and more equipment with which the product comes in contact undoubtedly increases the initial microbial count of the meat. In prepackaged fresh meat, more pieces of one particular retail cut of meat are made at one time than in the old type of meat merchandising and are displayed over a longer period of time.

With a probable higher intitial count on the meat and a longer time over which the meat is usually displayed the author divided this problem into two sections:

(1) To determine the number of bacteria found on the equipment and on the environmental surfaces where the meat

was packaged, and (2) To determine the microbial curve of the meat as displayed in cooperating commercial markets over a period of five days after being cut and packaged in those markets.

REVIEW OF LITERATURE

In reviewing the literature on prepackaged fresh meat it is evident that there has been little work done directly related to bacteriological aspects of the subject. In fact, prior to 1946, there were very few references of any kind dealing with self service meats. During 1947, interest began to develop, and since that time there have been many articles, reports and speeches on the subject. Most of these are of a popular vein and are, therefore, of little use for this investigation. Much of the review of literature which follows is not taken from articles on this subject but from articles which the author believes can be applied to it.

BACTERIOLOGICAL EXAMINATION OF MEAT

A review of the literature shows several different techniques used by investigators for the bacteriological examination of meat.

Weinzirl and Newton (30) placed the sample of meat to be tested into a sterile mortar and then added sterile sand. With the use of a sterile pestile this mixture was then ground until the sample of meat was thoroughly mascerated. A small amount of sterile saline was then added, followed by more grinding. This was continued until one hundred cubic centimeters of sterile saline had been added. Samples were then taken from this and pour plates were made using ordinary media. The plates were incubated at room temperature (20 deg. C.). After 48 hours, counts were made of the plates.

Bickert's method as cited by Tanner (25) was to keep away from the use of mortars for disintegrating the meat because of the danger of contamination. He suggested the use of a ball mill with quartz sand and a little physiological sodium chloride solution to give fluidity. Twenty grams of meat were ground with twenty grams of sterile quartz sand and eighty millileters of sterile physiological salt solution for one hour at 120 retations per minute. After the one hour period this was then brought to two hundred millileters with sterile salt solution and carefully mixed for another fifteen minutes. This was then

sampled and plates made using gelatin and agar for medium. Bickert placed very little confidence in results secured by plating and reached the conclusion that a new method for enumerating bacteria was needed.

Hoffstadt (13) used glass beads in a jar to secure an emulsion for plating. Twenty five grams of meat were placed into a glass quart jar. To the jar were added sterile glass beads and enough sterile water to make a one to twenty dilution. This was then shaken on a mechanical shaker for ten minutes. From this emulsion dilutions were made and plated using two percent beef infusion agar as media. The plates were incubated in duplicate at 37½ deg. C. The average counts of the plates, read after twenty four hours of incubation, were used as a basis to determine the number of bacteria present in the sample.

St. John's method as cited by Tanner (24) was the same as Hoffstadt's except that he did not use the mechanical shaker.

Garrard and Lockhead (7), working with hog carcasses used a still different method. These workers used a filter paper impression method of obtaining samples. Whatman #3 filter paper was cut into squares, 2 centimeters by 2 centimeters. The paper was then sterilized. Samples were taken by pressing a square of filter paper firmly against the meat tissue for twenty seconds with sterile forceps. The square was then dropped into a seven hundred and fifty

milliliter flask containing five hundred milliliters of physiological salt solution and seventy five grams of broken glass. The flasks were then shaken until the filter paper was disintegrated. Portions were taken from the flasks and plated with nutrient agar as the media. Plates were incubated at room temperature for 48 hours and counts made.

These workers used this method of obtaining their samples in preference to those involving scraping or cutting out measured areas, as it did not mutilate the tissue being tested.

Haines' method as reported by Tanner (25) gives the following procedure. He stated that since spoilage of tissues, apart from special cases of anaerobic processes, is due to growth on the surface of the meat, the best procedure is to make counts per unit of superficial tissue.

A sterile cork borer was pressed vertically into the tissues to a depth of one centimeter or more. This left a cylinder of tissue and from its top a disc about two millimeters thick was cut with a sterile scalpel. Microorganisms on the surface of the sample were brought into suspension by shaking vigorously with glass beads and sterile salt solution. This was then sampled, plated and counts made.

Haines also points out that when it is thought that the bacteria may have penetrated, a thicker disc of meat may be taken and ground, or disintegrated with a mechanical stirrer

and sterile sand. This may then be sampled, plated and counts taken after incubation.

Mallmann and Churchill (18) used a swab method of examining quarters of beef for their bacteriological counts. Four inch square areas on the surface of the meat were swabbed with a sterile moist cotton swab. The swab was then placed in sterile saline solution and then shaken. This was then sampled, plated, and incubated for counting.

These workers point out that this procedure undoubtedly fails to remove all the microorganisms but that it gives comparable results, is much simpler, and involves less labor and equipment than other methods.

TYPES OF ORGANISMS FOUND ON MEAT AND MEAT PRODUCTS

Mallmann and Zaikowski (19) isolated cultures from fresh and stored beef in a large packing plant. They found the cultures represented nine genera and 65 species as follows:

Genus	Number of Species
Micrococcus	22
Flavobacter	15
Bacillus	12
Achromobacter	9
Diplococcus	1
Gaffkya	1
Staphylococcus	1
Bacterium	3
Sarcina	1

It is evident from this work that the most common group of low temperature type bacteria are Micrococcus, Flavobacter, Bacillus and Achromobacter.

Moran (21) found that most of the bacteria found on meat kept at 5 deg. C. or below were Achromobacter and Pseudomonas.

Haines (11) found that the predomination bacteria on lean meat stored in the range 0-4 deg. C. were composed almost entirely of Achromobacter. He explains this by their more rapid growth at that temperature as compared with the growth of organisms having a higher optimum temperature.

Cary (5) working with sausage purchased on the Chicago market offers the following:

	Times Found
B. coli	30
Proteus vulgaris	11
Paracolon	9
B. fecalis	8
Yeasts	8
Streptococcus	5
Staph. aureus	2

Brewer (3) did not classify the bacteria he found on meats by genera but into groups as follows: (1) Colon; (2) Putrefactive; (3) Liquifiers; (4) Cocci; (5) Subtilus; (6) Molds.

He found the colon group to predominate.

Brewer concluded that the appearance of fresh meat could not be taken as an index to its bacterial content.

Jensen (14) working with lamb at 80% relative humidity and at 36 to 38 deg. F. found the usual nonpathogenic flora to be of the genera:

Pseudomonas

Achromobacter

Proteus

Micrococcus

BACTERIAL FLORA ON STORED LEAN MEAT

Haines (11) hung small pieces of lean beef (1-2 lbs.) in large glass jars at 0±0.1 deg. C. In the bottom of each jar he placed a shallow layer of water to maintain a saturated atmosphere. At intervals a nearly constant area was excised from each piece with a sterile cork borer, the area of which was approximately known, and the tissue cut off to a depth of 2-3 millimeters. This sample of meat was thoroughly shaken for 5 minutes with glass beads and 10 cubic centimeters of sterile saline. Suitable dilutions were then plated on nutrient agar. The plates were then incubated for 48 hours at 20 deg. C. and counted. He also made observations for the appearance of slime. Some typical counts are given on the following page.

From the table it will be seen that there is a relationship between the initial bacterial load carried by the meat and the time of appearance of slime.

TABLE I

ORGANISMS PER SQUARE CENTIMETER OF SURFACE*

Time in Days	Sample Number				
	1	2	3	4	5
0	40,000	17,300	2,700	270	43
4	875,000	35,000	5,600	3,000	200
8	56,000,000	6,500,000	980,000	26,000	59,000
11	1,650,000,000	70,000,000	-	-	595,000
15	20,000,000,000	2,000,000,000	11,300,000,000	12,100,000	45,000,000
Time of Appearance of Slime	8 days	10 days	11 days	16 days	18 days

* (11)

BACTERIA WITHIN MUSCLE TISSUE

Most of the early work done on the bacteriology of tissues of normal animals indicates that muscle tissues are sterile. Hauser, Neisser, Opitz, Messner, Amako, Wyssokowitsch, Thole, Hass, and Kuster as cited by Jensen (14) believed this.

Ford (6), Wolbach and Saiki (33), Reith (22), Boyer (2), Moran (20), Jensen (14), Spray (23), and Tanner (25) have reported a variety of microbes in the blood, viscera, and muscular tissues of healthy animals. Many other workers as cited by Jensen (14) also found microbes in the tissues of apparently normal animals.

Many theories have been advanced concerning the mode of entry of these bacteria. Jensen (14) lists 15 of these theories, advanced by investigators, which have been tested without finding many promising indications for the solution of the problem.

Jensen (14) and co-workers at Swift and Co. used seven prime hogs for an ante mortem-post mortem investigation to determine if muscles and marrows of normal hogs were infected. Extremely aseptic techniques were used throughout the experiment. The hogs were anaesthetized and disinfected thoroughly. Muscle tissue and marrow were removed aseptically from the hams to determine if bacteria were present. The hogs were then killed and dressed and then again using the same method samples of muscle, marrow, blood and bone

were taken. Results of ante mortem and post mortem show:*

TABLE II

Hog	1	2	3	4	5	6	7
Blood Before Slaughter	-	+	-	-	-	-	-
Blood After Slaughter	-	+	-	-	-	+	+
Tibia Marrow Before Slaughter	-	+	-	-	-	-	-
Tibia Marrow After Slaughter	-	+	+	-	+	+	+
Spongy Bone in Tibia Before Slaughter	-	+	-	-	-	-	-
Spongy Bone in Tibia After Slaughter	-	+	-	-	-	-	-
Muscle in Ham Before Slaughter	-	+	-	-	-	-	-
Muscle in Ham After Slaughter	-	+	+	+	-	+	+
Femur Marrow After Slaughter	-	+	+	-	-	+	-

* (14)

Jensen concluded that they believed their surgical technique accounted for the failure to find bacteria in the blood, marrow, and muscle of the living normal prime hog.

Reith (22) summarized his work on the bacteria found in the muscle tissue of apparently normal animals as follows:

1. Cultures of the muscular tissues of slaughtered hogs showed the presence of bacteria in 77% of the 216 samples used.
2. Cultures of the muscle tissue of healthy live hogs, rabbits, and guinea pigs showed the presence of bacteria in 83% of 108 samples.

3. Blood of healthy live hogs, rabbits and guinea pigs showed 84% of 38 samples contained bacteria.

Reith made the statement that he did not assume that bacteria live and multiply in healthy tissues. He believed that bacteria having invaded the general circulatory system are probably filtered out and destroyed. His results presented evidence that bacteria were present at the moment the samples were taken. It should be emphasized that, as compared with other foods, bacteria were apparently present in very small numbers within the tissue samples with some giving no growth.

Jensen (14) and coworkers conducted a series of studies to determine the source of contamination of muscle tissue, blood, and marrow of hog carcasses handled in a packing plant. Their conclusions were as follows:

1. When the hog is stuck and bleeding out, bacteria make their appearance in the blood, marrow, lungs, and muscle.
2. The stick knife contributes bacteria to the blood stream and bone marrow. The hog's skin is heavily contaminated with bacteria which infect the stick knife.
3. The presence of bacteria in the blood, muscle, and bone marrow of aseptically bled hogs points to agonal invasion, i.e., entrance during the dying period. Sterile sticking operations lessened the

load of bacteria in the heart's blood, bone marrow, and muscle of the hams, but other portals of entry of bacteria were apparent.

4. The heart of the exsanguinated hog continues to beat for several minutes after the animal appears lifeless. The hog should not be dropped into the scalding vat until the regulation holding period is passed.

5. Too large a stick hole is not desirable from the standpoint of subsequent contamination.

6. Elimination of the scalding vat and substituting continuous spray in steaming cabinets does not aid materially in reducing the bacteria in the carcass.

The author has pointed out these experiments to emphasize the fact that it is not his belief that the counts or organisms shown in this thesis represent only those found on the surface of the meat sampled. However, it is his belief that the number of bacteria found beneath the surface of the samples used is extremely small when comparing their numbers with those found on the surface of the samples.

NORMAL GROWTH CURVE OF ORGANISMS

Lane-Claypon (16) found the normal growth curve of bacteria was broken into four distinct phases.

Phase 1 - A period in which there is no increase in the number of bacteria present.

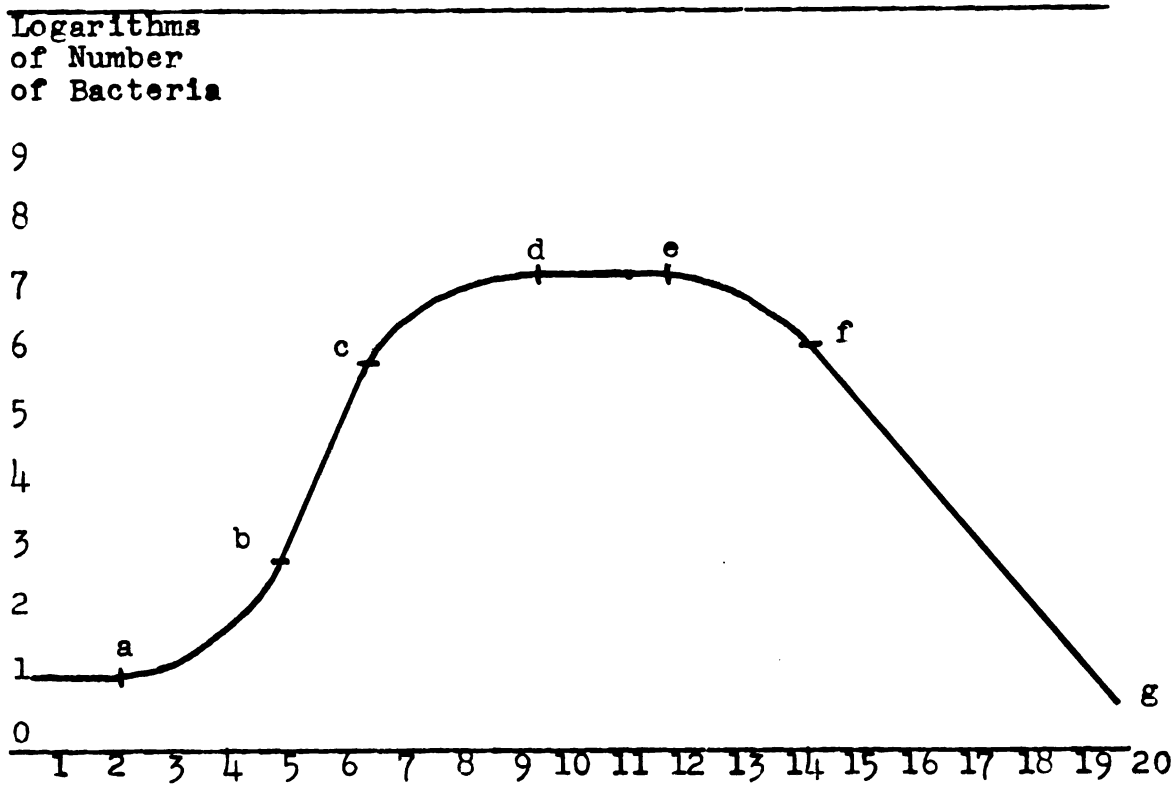
Phase 2 - After completion of phase 1 the bacteria commence to divide regularly. This is shown by the fact that the logarithms of the numbers plotted against time are found to fall on a straight line.

Phase 3 - The regular growth persists until a maximum has been reached after which the numbers remain more or less constant.

Phase 4 - After the numbers remain constant for a period of time they slowly decline.

Buchanan (4) found that the growth curve was in seven phases.

FIGURE I - NORMAL GROWTH CURVE OF ORGANISMS*



* (4)

1. Initial Phase - During this phase the number of bacteria remains constant, and the plot is a straight line parallel to the X axis indicated by 1-a.

2. Lag Phase or Positive Growth Acceleration Phase - During this phase the average rate of increase in numbers per organism increases with the time, giving rise to curve a-b. This increase in rate of growth per organism does not continue indefinitely but only to a certain point determined by the average minimal

generation time per organism under the condition of the test.

3. Logarithmic Growth Phase - During this phase the rate of increase per organism remains constant, in other words, the minimal average generation time is maintained throughout the period. This gives rise to the straight line b-c.

4. Phase of Negative Growth Acceleration - During this phase the rate of growth per organism decreases, that is, the average generation time is increased. The bacteria continue to increase in numbers, but less rapidly than during the logarithmic growth phase. Curve c-d.

5. Maximum Stationary Phase - During this period there is practically no increase in the numbers of bacteria. The plot gives a straight line d-e parallel to the X axis. The rate of increase per organism is zero and the average generation time infinity.

6. Phase of Accelerated Death - During this phase the number of bacteria are decreasing, slowly at first and with increasing rapidity, until the establishment of a logarithmic death rate. In the terminology used in the growth phases, the average "rate of death per organism" is increasing to a certain maximum. This gives

the curve e-f.

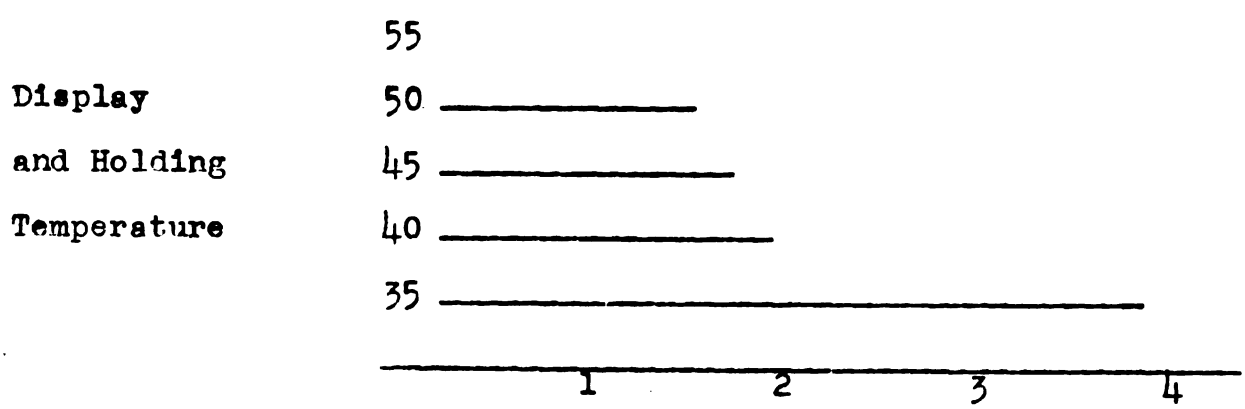
7. Logarithmic Death Phase - During this phase the "rate of death per organism" remains constant. The plot of the logarithms gives a straight line with a negative slope. This is represented by f-g.

EFFECT OF TEMPERATURE

The temperature at which the meat is held during prepackaging is very important especially when viewing this subject from the bacteriological point of view.

Hockman (12) makes the following statement: "The problem of proper refrigeration display fixture temperatures must be considered. Prepackaged meat has considerably more surface exposed than have wholesale cuts, and so care is required that proper temperature conditions are maintained. No real increase in salable life of packaged meats occur until temperatures below 40 deg. F. are applied. A temperature of 35 deg. F. seems to give good sales life and is not a great deal more difficult to maintain than the higher temperature."

Figure II - The Effect of Temperature on the Salable Life of Loin Steaks*



* (12)

According to Wiesman (31) (32), when possible, meat should be cut and packaged under refrigeration. This will help to retard the bacterial growth and keep the meat in a fresh condition for the maximum length of time.

Weisman (32) makes the following recommendation: "Proper handling of product during cutting, packaging, storage, shipment, and display is very necessary to insure protection of quality. All equipment including machinery, tables, floors, and walls must be kept in a clean and sanitary condition at all times. Bacterial development and subsequent product deterioration in meat products can be kept at a minimum by proper temperature control."

Wiesman (32) recommends the following temperatures during the course of operation:

1. Cutting and packaging Room Temperatures
   Minimum 40 deg. F. - Maximum 45 deg. F.
2. Holding Room Temperatures
   Minimum 34 deg. F. - Maximum 38 deg. F.
3. Retail Self-Service Case Temperatures
   Minimum 34 deg. F. - Maximum 40 deg. F.

If it is possible to control the temperatures very closely, a general classification according to proper holding temperatures follow as given by Wiesman (31).

1. Fresh Red Meats - 34-36 deg. F. (Lamb should be held at a lower temperature than beef or veal.)

2. Smoked Meats - 38-42 deg. F. (This class of products will keep at temperature up to 45 deg. F., but the lower temperature is recommended.)
3. Fresh Pork Sausage - 34 deg. F.
4. Frankfurters - 36 deg. F.
5. Luncheon Meats - 36 deg. F.
6. Dry and Semi Dry Sausage - 38-42 deg. F.

In most cases it is not possible to control the case temperature closely. The cases fluctuate from 4-8 deg. F. and also vary at different heights in the case. Wiesman (31) recommends that we should therefore set the temperature controls so that the low point of the cycle falls slightly above 32 deg. F.

Gowland (10) made some temperature studies of the stores in which this author's work was done. The first study was to check the temperatures of the display cases to determine the fluctuation at different times and to discover the variation of the temperature with the cases.

Each case was divided into five areas for checking the temperatures. On three trials he found the variation to be from 34.2 deg. F. to 39.2 deg. F. with an overall average of 36.3 deg. F.

Gowland found that the temperatures of the packaged meat in the cases varied 4 deg. F., from 38 deg. F. to 42 deg. F. He concluded that this variation was due to the location of the package in the case and to the amount of

handling of the package.

Gowland (10) also studied the temperature changes of the meat as it was processed through the cutting and wrapping operations. He found that the temperature of the meat rose as much as 10-12 deg. F. during the time required for these operations. He also noted that when there was a lag in the wrapping and weighing operations there was a rise up to 16 deg. F.

Jensen (14) makes some pertinent comments on the temperature of fresh meat and the activity of the microorganisms thereon. Quick chilling alters the bacteriological picture in the following manner: "When we hold a joint of fresh meat above 26.7 deg. C. (80 deg. F.) for three to four hours, mesophilic bacteria start their accelerated phase of growth, which enters into a logarithmic phase of multiplication, and then continues at a slower rate for at least eight hours at freezing temperatures. The bacteria may divide every 30 minutes, and with a high initial surface count the increase in numbers cannot be comprehended except as a mathematical concept. When the colder temperatures are reached (80 deg. F. down to 40 deg. F.), the mesophiles and psychrophiles may, by direct microscopic determinations, appear to divide every hour. If the bacteria continued to divide every hour, the descendents of an original cell would, in 48 hours, number 281,500,000,000 cells. Fortunately, bacteria of the many species encounter some unfavorable factors, so that their increase is not as great as theory permits."

Scott, as cited by Jensen (14), studied the growth rates of three species of Achromobacter and one species of Pseudomonas on beef muscle at eight different temperatures ranging from 30 to 86 deg. F. Similar studies were made for three asporogenous yeasts belonging to the genera Candida, Geotrichoides, and Mycotorula. He found that the Achromobacter, Candida, and Geotrichoides were psychrophilic, and that the Pseudomonas and Mycotorula strains studied must be regarded as mesophiles capable of growth at low temperatures. For microorganisms, the commonly accepted optimum temperature is that at which the maximum rate of growth occurs. Scott's results show that for Achromobacter and Geotrichoides yeasts, the maximum populations decrease at temperatures greater than 59 deg. F., while for Pseudomonas they show no tendency to decrease on beef muscle at 77 deg. F.

Richardsen and Scherubel, as cited by Jensen (14), observed that nonproteolytic microorganisms were able to develop on frozen meat, and to develop well on meat held at 32 deg. F. Bacteria penetrated one centimeter after 30 days on meat held at 2 to 4 deg. C. (35.6 to 39.2 deg. F.) The authors estimated that temperatures of -9 to -12 deg. C. (15.8 to 10.4 deg. F.) were required to check all microbial growth on stored beef.

EXPERIMENTAL PROCEDURE - PART 1

The object of part one was to determine the number of organisms found on the equipment and environmental surfaces on which the meat was cut and packaged.

Cutouts of different dimensions but equaling one square inch were made in a 3½ by 5 inch piece of sheet metal, as prescribed by Jensen (14), for use in the work. These were sterilized before each repeated use by wiping with alcohol and then flaming until dry.

During the time the cooperating markets were at work bacteriological examination of equipment and environmental surfaces were made. Samples were taken at 2:00 P. M. Trays, walls, saw blades, knives, scales, boning blocks, etc. were sampled. Using sterile cotton swabs, swabbings were taken by thoroughly rubbing the area exposed through the opening of the metal form. The swabs were then placed in dilution blanks containing a 99 cubic centimeter portion of sterile saline. These were then shaken until the cotton was well fluffed. Samples of the saline were removed and plated using T.G.E. agar as the media. Incubation was at room temperature, 20 deg. C., with counts made at the end of 48, 72, and 120 hours. The numbers of organisms counted represent organisms per square inch of surface sampled. The counts obtained after 120 hours of incubation are shown.

PART 2

The object of part two was to determine the microbial curve of prepackaged fresh meat as displayed in cooperating markets over a period of five days.

The meat used for this work in all cases except one was from animals killed in the Michigan State College meats laboratory. Beef, pork, and lamb were used. The animals were killed in the usual way and chilled at 33 deg. F. for at least forty eight hours in the meats laboratory cooler. Portions of the carcass (as shown on each individual graph) were taken to a local commercial market offering the pre-packaged style of meat merchandising. In the cooperating stores, under commercial market conditions using all their equipment, the portions of meat were broken down into retail cuts. All retail cuts used in this work were of the steak or chop variety. It was found that it was easier to sample this type of cut and that it took less equipment. The steak or chop was cut about three-quarters of an inch in thickness.

All portions of meat with bone in them were cut on a band saw. The bone dust was removed from these pieces by means of a piece of spring steel attached to a handle. Portions of meat not having bone in them were cut with a steak knife.

A piece of meat butcher paper was placed on a meat tray and then the retail cuts of meat were placed upon the paper. The cutting, scraping, and placing of the meat upon the tray

was done in the cutting and packaging room of the cooperating stores at a temperature which varied from 50-62 deg. F. The trays of meat were then taken into the stores' cooler for a period of from twenty to thirty minutes. The temperature of the coolers varied from 33-36 deg. F. From the start of the cutting operation until the meat was returned to the cooler required on the average twenty five to thirty minutes.

After this holding period, the meat was returned to the cutting and packaging room. At this point samples were taken from five or more pieces of the meat and designated as the immediate samples. The remaining pieces of meat were packaged to be displayed in the store display case over a period of five days. These cases were the same as those reported upon by Gowland (10).

The packaging materials used were 300 MSAT #80 cellophane and Rodeo backing boards. Depending upon size, the cut pieces of meat were placed upon the backing board, wrapped tightly with the cellophane, and sealed with a sealing iron. The author did all of the cutting and packaging so that no extra precautions were made in the process.

Each twenty four hours up to and including one hundred and twenty hours after the start of the trial another five or more pieces of meat were taken from the cooperating stores' display case and sampled.

The samples were taken by means of a sterile cork borer made to have an area of one square inch. The cellophane of the package was cut along the edges with a sterile knife.

The cellophane was then removed. Using the cork borer, a bore was taken from the pieces of meat aseptically, Each bore represented two square inches of exposed surface plus a volume of meat the thickness of the cut. The upper surface had been in contact with the cellophane and the lower surface in contact with the backing board. In determining the bacterial count for each sample of meat, the counts obtained were considered to be the counts of organisms found on the two square inch surface of the meat. In this investigation there was no way of segregating the surface organisms from those found within the meat. These, as shown be Mallmann (17), are negligible when working with such large numbers of bacteria as are found on meat.

A preliminary test was run on two different methods of getting the organisms on the meat into an emulsion for sampling. The first method was to use twenty five grams of glass beads in a bottle with sterile saline. The meat was placed in the bottle and then shaken vigorously one hundred times. This was then sampled, plated, and after a forty eight hour incubation period at room temperature, counted. The sedond method was by use of the Waring Blender. Ninety nine millliliters of sterile saline were placed into a sterile blender jar and then the sample added. The blender was then allowed to run until the sample was thoroughly broken up (three to four minutes). This was then sampled, plated, and counted after a forty eight hour incubation period as before. A comparison of the two methods showed a much higher count

secured with the Waring Blender. It was concluded that the author was unable to satisfactorily get the bacteria into an emulsion with the glass bead method so decided to use the Waring Blender method.

Due to glass Waring Blender jars having a steel blender assembly, autoclaving for sterilization was impossible as the jars would break unless taken apart. If they were taken apart it would be impossible to reassemble them without contamination. With this in mind the author tried a method of cold sterilization of the jars.

The jars were thoroughly washed after each use. A detergent sanitizer powder and tap water were placed in the jar. The blender was then allowed to run three to four minutes. This was then rinsed with tap water. After rinsing, a solution of two hundred parts per million of available chlorine was put in the jar and this was allowed to run for three to four minutes. This was thoroughly rinsed out with running tap water. Ninety nine milliliters of sterile saline solution was then placed in the jar. After allowing the blender to run for a minute this was then sampled, plated and counted before each sample was run. This count then showed the initial contamination of the jar. In some cases counts for a one to one hundred dilution ran from six to ten. In most cases the count obtained was below three, often the count was zero.

After a sample of the blender jar water was secured, a sample of meat taken aseptically was placed in the jar. This

was allowed to run three to four minutes until the sample was completely macerated. By means of sterile pipettes samples were taken from the jar and placed in sterile dilution blanks containing sterile saline. Pour plates were then made using T.G.E. agar as the media. These were allowed to stand at room temperature (20 deg. C.) for forty eight hours before counting. They were again counted after seventy two hours and after one hundred and twenty hours. These counts were recorded.

In analyzing the data obtained, the counts were converted to logarithms. The logarithms for the forty eight hour counts were added and then divided by the number of samples to obtain the geometric mean. The antilog of the geometric mean was determined and recorded. This was also done for the 72 and 120 hour counts.

Upon viewing the data one will find a great range of counts obtained. To present the data graphically the following method was used.

The graphs are based upon the antilogs of the geometric means for the seventy two hour counts of the samples for successive days. The antilog of the geometric mean obtained for the immediate samples seventy two hour count was divided into the seventy two hour count of successive days to obtain the amount of increase or decrease for that day. The increase or decrease was then graphed. A value of 1 was given the immediate 72 hour antilog of the geometric mean.

Example 1, Lamb Trial 1

	Antilog of Geometric Mean	Amount of Increase
Immediate Samples	948,000	1
24 Hour Samples	2,170,000	2.29
48 Hour Samples	3,210,000	3.39
72 Hour Samples	3,300,000	3.48
96 Hour Samples	6,440,000	6.79
120 Hour Samples	32,700,000	34.49

The antilogs of the geometric means for each successive day were divided by 948,000 with the resulting increase as shown. These points were then plotted against time to show the increase in number of the organisms.

To show the relative position of one trial with another the lowest antilog of the geometric mean for immediate samples of all trials was divided into the antilogs of the geometric means of immediate samples obtained for all other trials. To illustrate, an example follows:

Example 2

The lowest antilogarithm of the geometric mean for immediate samples obtained was 6,620 for Pork, Trial one. To find the relative position of Lamb, Trial one, 6,620 was divided into 948,000 (antilogarithm of geometric mean for immediate samples of Lamb, Trial one). The result was 143.20. Therefore the starting point for Lamb, Trial one is 143.20.

Data are shown in Appendix A.

The three trials of pork, beef, and lamb in store one were combined and shown graphically. The method used is shown in Appendix B. Similarly, the two trials of beef in store two were combined.

RESULTS OF STUDY

The results of part one of this study give a general indication of the condition of the environmental surfaces and equipment in the cooperating stores in which this study was made. The counts obtained after 120 hours of incubation time are shown in Table III. It should be noted that all surfaces sampled except those dealing directly with the cutting operation, were low in numbers of organisms. Knives, saws and the boning blocks used for cutting the meat were found to offer the greatest source of contamination to pre-packaged fresh meat. This was to be expected as this equipment comes in direct contact with the meat. The meat juices dry on the surfaces of the tools and offers an ideal media for bacterial growth. The two cooperating commercial stores in which this study was made would be classified as sanitary.

TABLE III - SWAB SAMPLES OF EQUIPMENT

	Store 1 Trial 1 Bact/Sq.Inch	Store 1 Trial 2 Bact/Sq.Inch	Store 2 Trial 1 Bact/Sq.Inch
Tray	300	740	880
Tray	100	2,960	690
Cutting Room Wall	130	480	380
Cutting Room Wall	50	400	330
Cutting Room Wall	200	210	310
Cooler Wall	200	180	110
Cooler Wall	100	640	670
Cooler Wall	260	220	1,170
Band Saw Blade	212,000		610
Cold Meat Saw Blade	2,100	1,290	361,000
Cold Meat Saw Platform	2,600	330	1,390
Steak Knife	970	1,080	32,100
Steak Knife		480	17,600
Packaging Table Top	1,100	410	1,850
Hand Saw Blade		8,800	1,380
Cleaver		84,000	1,990
Scale	620	1,170	390
Boning Block	7,190,000	12,400,000	6,400,000
Hamburger Shoot	2,800		80,000

Part two of the study discloses a wide range in numbers of organisms present on prepackaged fresh meat. The collection of representative quantitative samples of the microorganisms on the meat is extremely difficult, due to the variability of contamination. Considerable variations in bacterial counts must be expected.

Of the three meats used in the study, pork was found to have the lowest number of microorganisms. A study of the graphs, numbers IA, IB, and IC presented for the three trials of pork shows some inconsistency of the slope of the line when a comparison is made. This may be accounted for in several ways: 1. rise in display holding temperature during the display period, 2.. meat sampled may have been held toward the top of the display case thereby being at a higher temperature than meat held near the bottom, 3. veriation in initial contamination, 4. laboratory technique error. The inconsistencies are not the important point to consider. The important point is the general trend in the growth curves presented. The first two days of display time may be considered the Initial Phase, as described by Buchanan (4), during which time the number of organisms remains nearly constant. At the end of two days the curves indicate that the organisms have entered the Positive Growth Acceleration Phase (4). During this phase the average rate of increase in numbers per organism increases with time.

The pork used in this study appeared to be in a good salable condition even at the end of five days. This would indicate that the appearance of the meat is not an indication of its bacterial content as at the end of five days the microorganisms were well into the positive growth acceleration phase when high counts were found.

The three trials of pork were combined. The method used for combining the trials is shown in Appendix B. The combined curve is number ID. This curve eliminates the inconsistancies and presents a more accurate picture of the growth curve of microorganisms found on pork.

The importance of obtaining these growth curves may be pointed out in the following manner. The practice of commercial meat retailers is to use color and the general appearance of the meat as an indication of quality. So long as the appearance is satisfactory the product is left for sale. As has been pointed out, the pork appeared to be in a good salable condition at the end of five days display time, but the number of organisms found was high. Suppose a patron purchased a package of pork which had been displayed five days. Many people buy a large quantity of meat at one time to be used throughout the course of a week. If our imaginary patron held the package of meat in the home refrigerator five or six days in addition to the five days it had been held in the commercial store before using it, one can imagine the number of microorganisms it

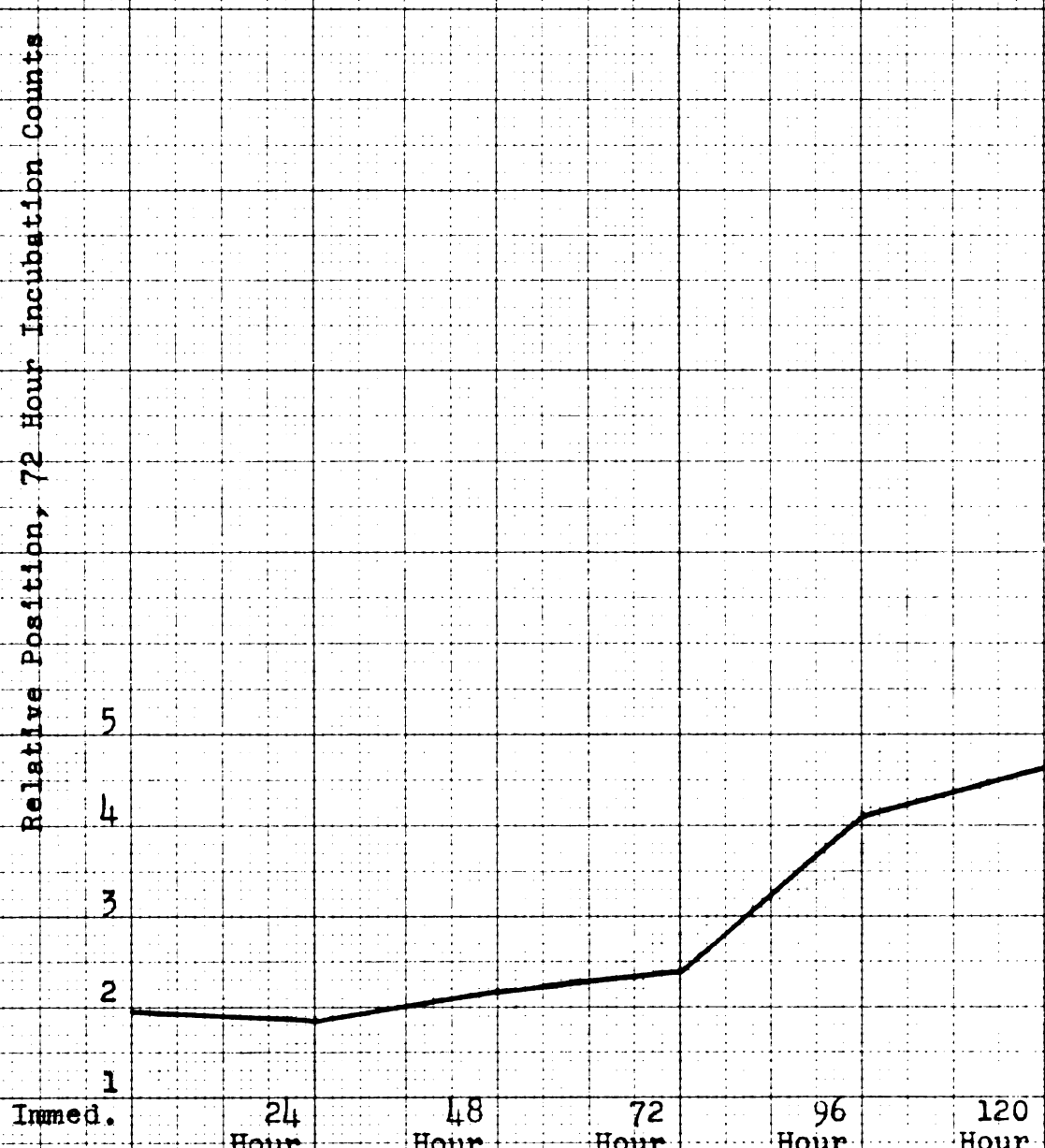
would contain. Haines (11) has shown that lean beef held at temperatures of 0±0.1 deg. C. increased from an initial count of 40,000 to 1,650,000,000 per square centimeter of surface area. He noted that slime appeared on this meat in eight days. Temperatures of home refrigerators are generally about 40 deg. F. or higher. The rate of increase in number of bacteria would be greater in the home refrigerator, at the higher temperature, than in the commercial market display case which is about 34 deg. F. Although there are extremely few cases of food poisoning due to organisms found on meat today, the quality of the meat would be very low after so long a holding time.

GRAPH IB - PORK, TRIAL 2

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 13,000
(Pork, Trial 2)

Display Period Points - $\frac{\text{actual count}}{13{,}000}$

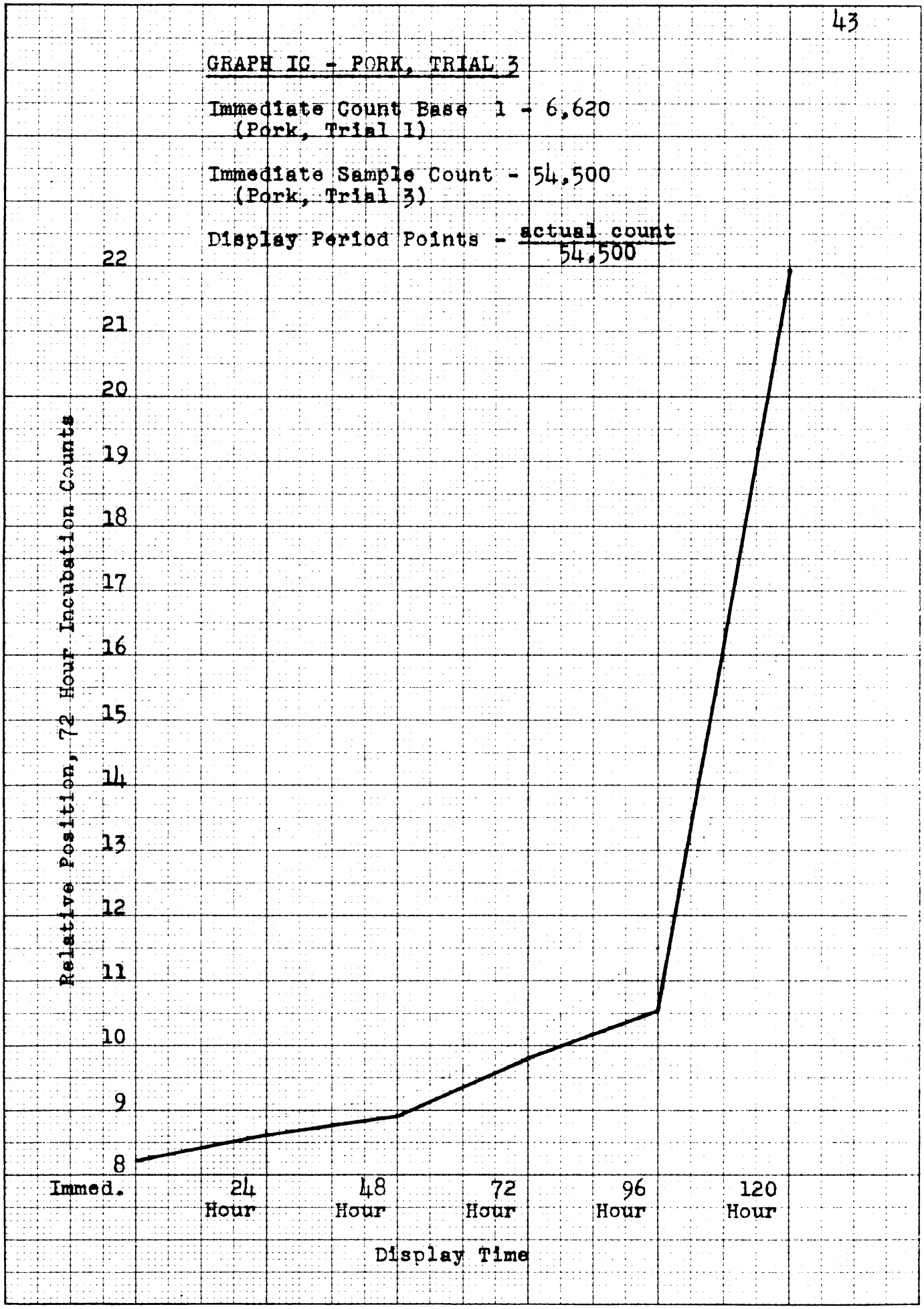


GRAPH IC - PORK, TRIAL 3

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 54,500
(Pork, Trial 3)

Display Period Points - $\frac{\text{actual count}}{54,500}$



GRAPH ID - PORK, COMBINED TRIALS 1, 2, and 3

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 16,800
(Combined Pork, Trials 1, 2, and 3)

Display Period Points - $\frac{\text{actual count}}{16,800}$

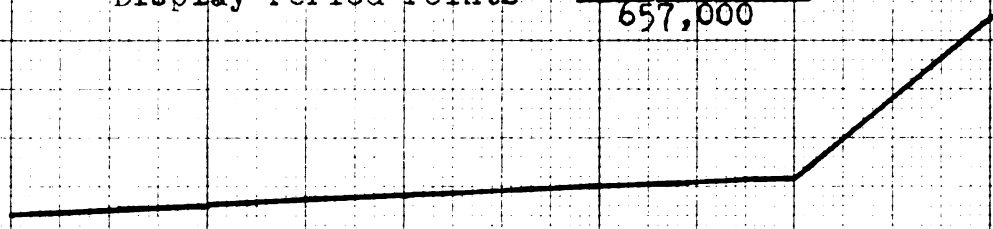
The beef used in this study would indicate essentially the same results as those found with pork. The initial counts obtained using beef were higher than those found on pork. The graphs number IIA, IIB and IIC show the results of three trials of beef in store one. The combined curve, number IID, for these three trials of beef indicates that it took three days of display time for the initial number of organisms to double in number. The fourth day's count indicates that the numbers had redoubled in 24 hours, while the count at the end of five days indicates that the numbers had increased nearly three times as much. The curves for the beef used in store two are shown in graphs number IIE and IIF. The combined curve, number IIG, for these trials is the same as that found for store one except that the starting point is much higher (36 compared with 180.74). The beef used for trial two of store one was held in the Michigan State College meat laboratory cooler for 18 days before use, thereby having a higher initial count. All other meat used in the study was cut and sampled seven to ten days after slaughter. The bacterial load of equipment in store two was higher than store one, probably resulting in a higher initial contamination of the meat prepackaged in store two. The appearance of beef after five days of display varied. Some of the individual retail cuts of beef were still in a salable condition while others were not.

GRAPH IIA - BEEF, TRIAL 1, STORE 1

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 657,000
(Beef, Trial 1)

Display Period Points - $\frac{\text{actual count}}{657,000}$

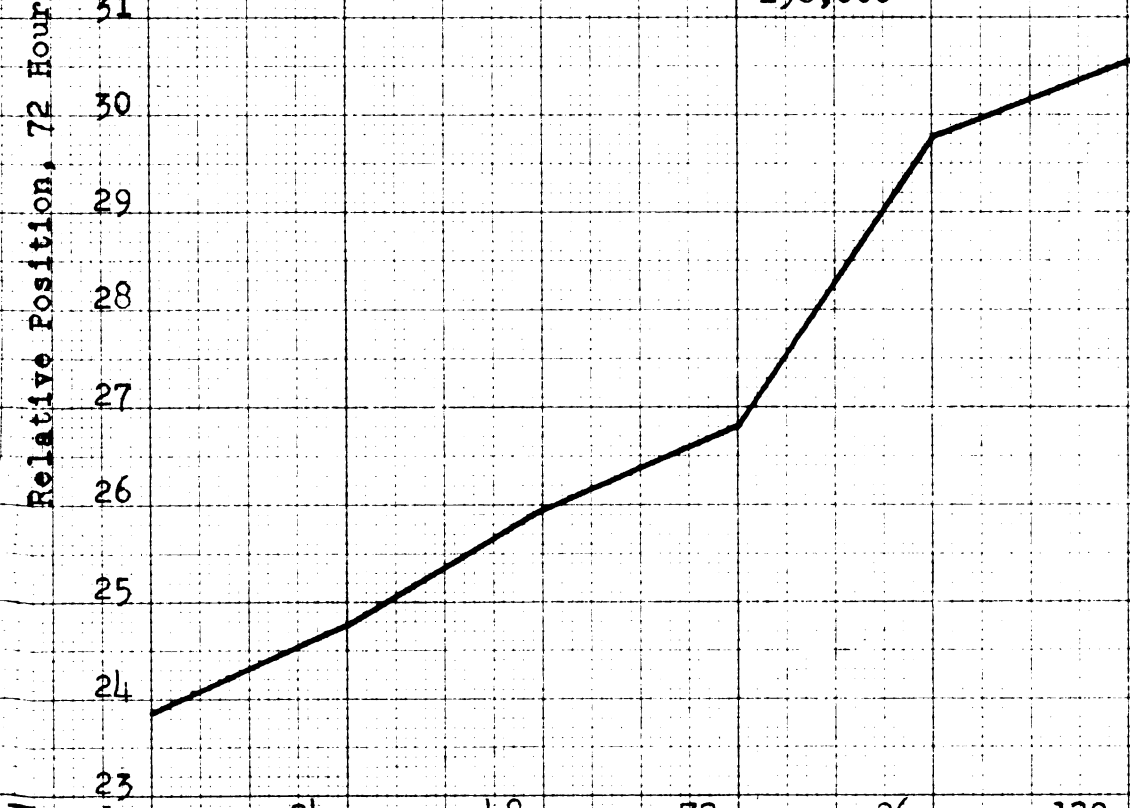


GRAPH IIB - BEEF, TRIAL 2, STORE 1

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 158,000
(Beef, Trial 2)

Display Period Points - $\frac{\text{actual count}}{158,000}$



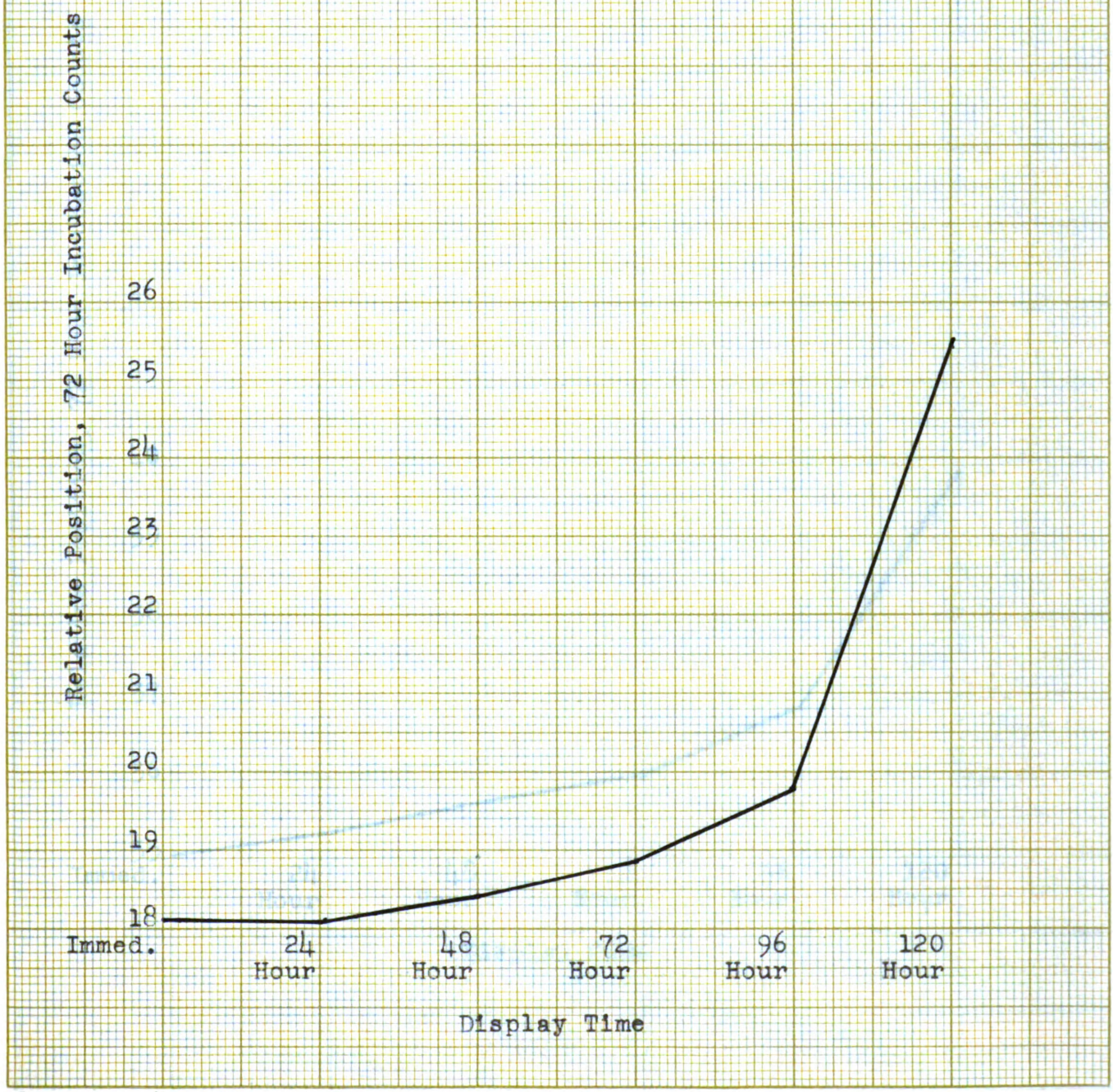

Relative Position, 72 Hour Incubation Counts

GRAPH IIC - BEEF, TRIAL 3, STORE 1

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 120,000
(Beef, Trial 3)

Display Period Points - $\frac{\text{actual count}}{120,000}$

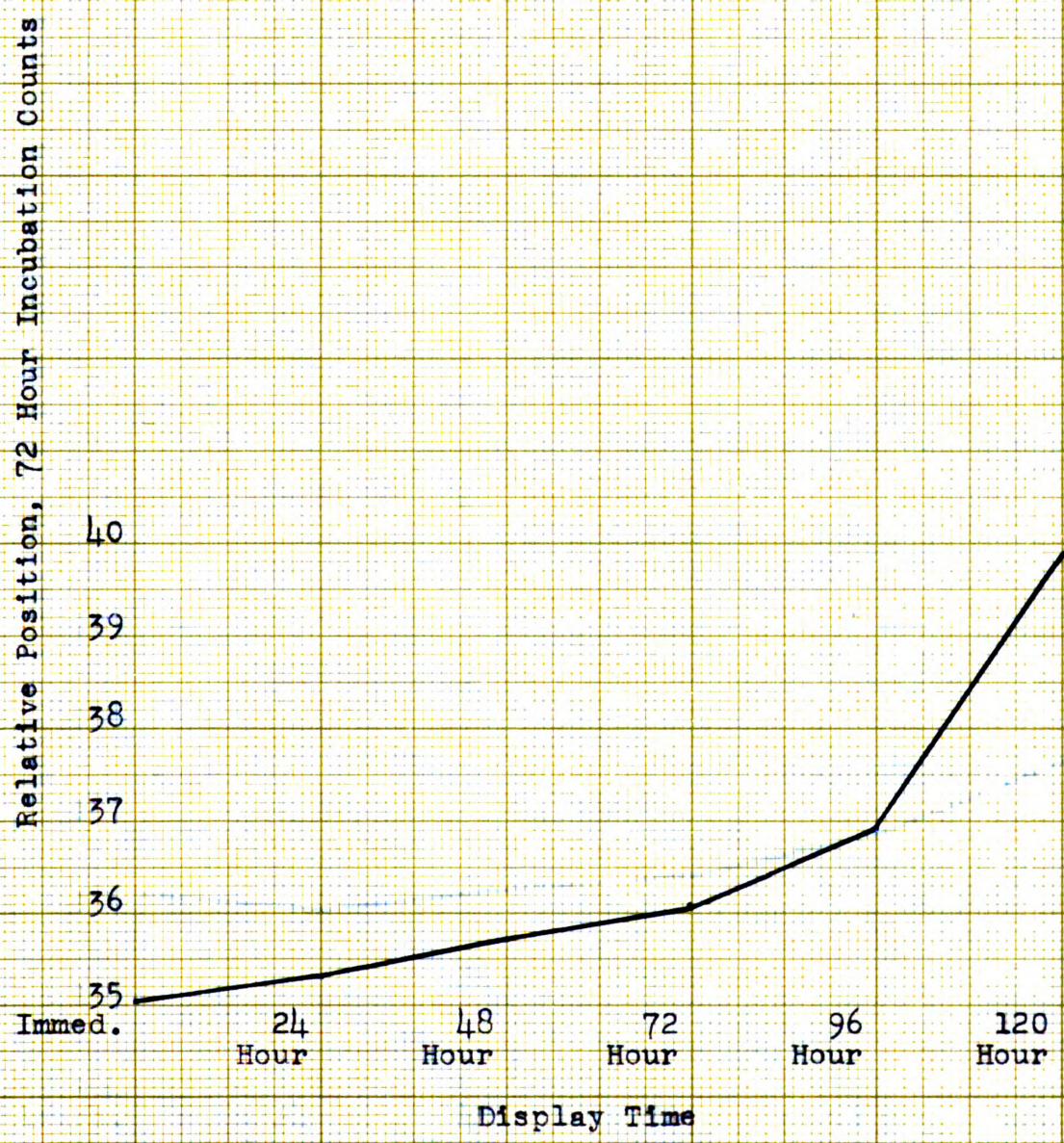


GRAPH IID - BEEF, COMBINED TRIALS 1, 2, and 3, STORE 1

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 232,000
(Combined Beef, Trials 1, 2, and 3)

Display Period Points - $\frac{\text{actual count}}{232,000}$

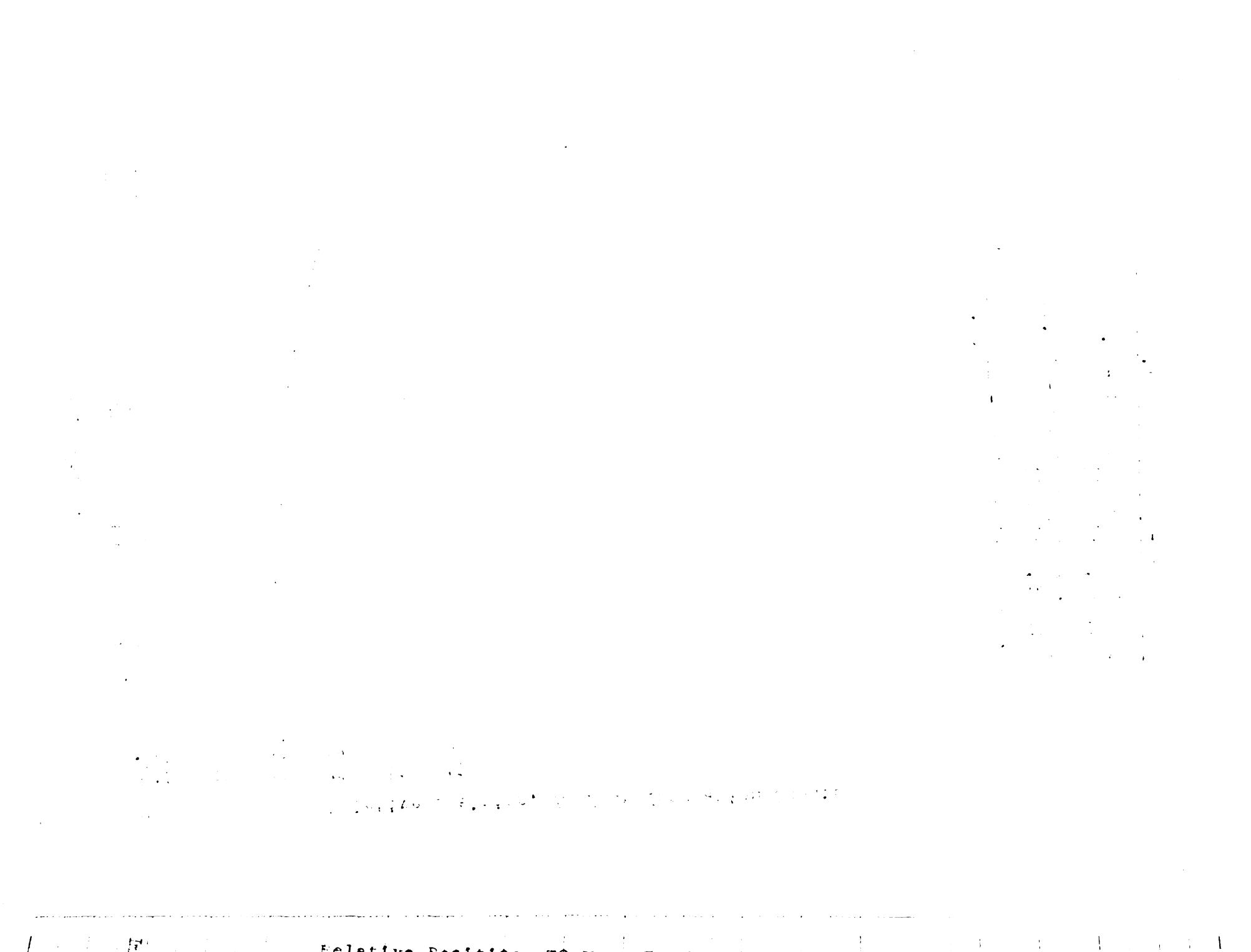


GRAPH IIE - BEEF, TRIAL 1, STORE 2

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 703,000
(Beef, Trial 1)

Display Period Points - $\frac{\text{actual count}}{703,000}$

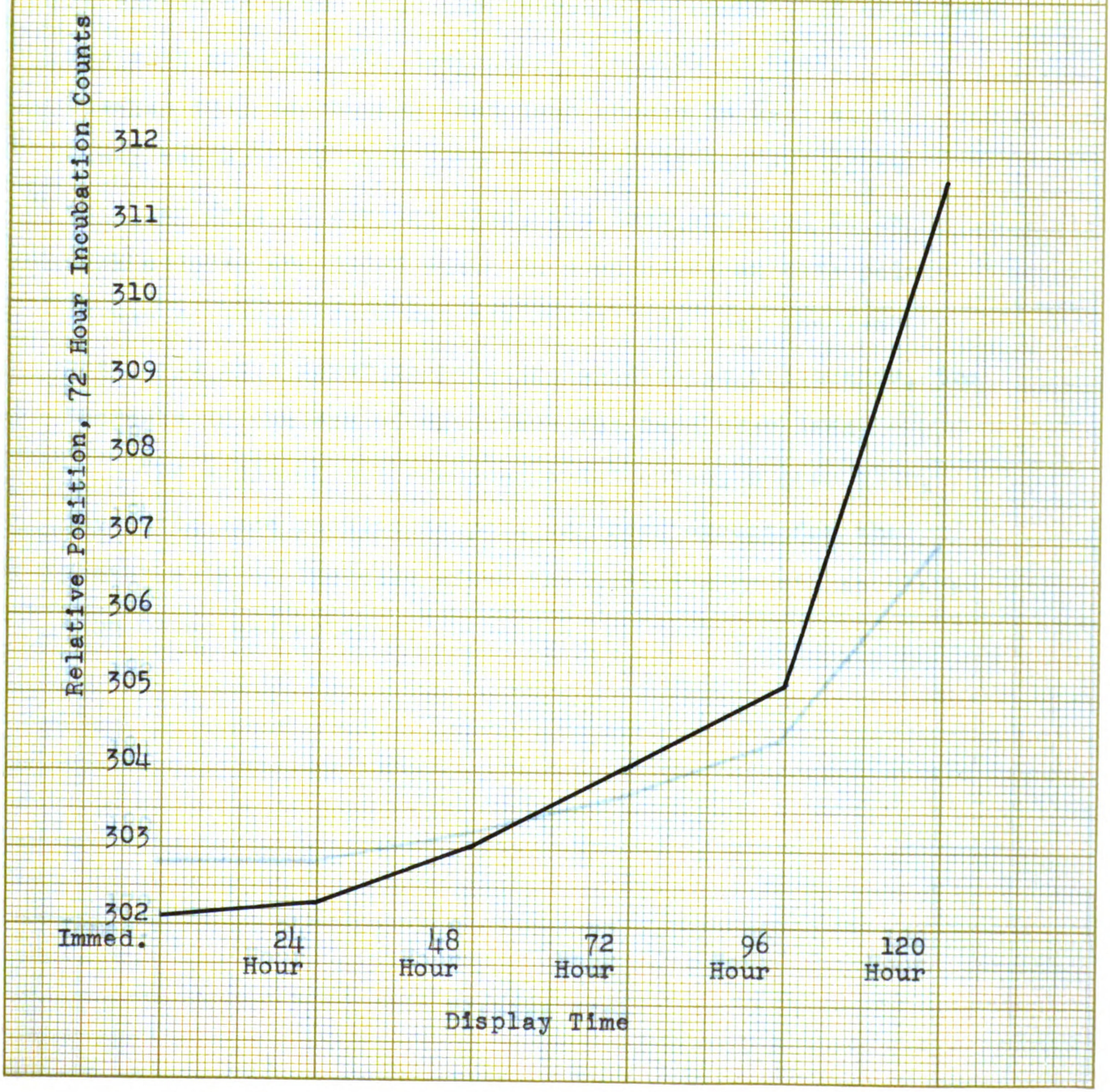


GRAPH IIF - BEEF, TRIAL 2, STORE 2

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 2,000,000
(Beef, Trial 2)

Display Period Points - $\frac{\text{actual count}}{2,000,000}$

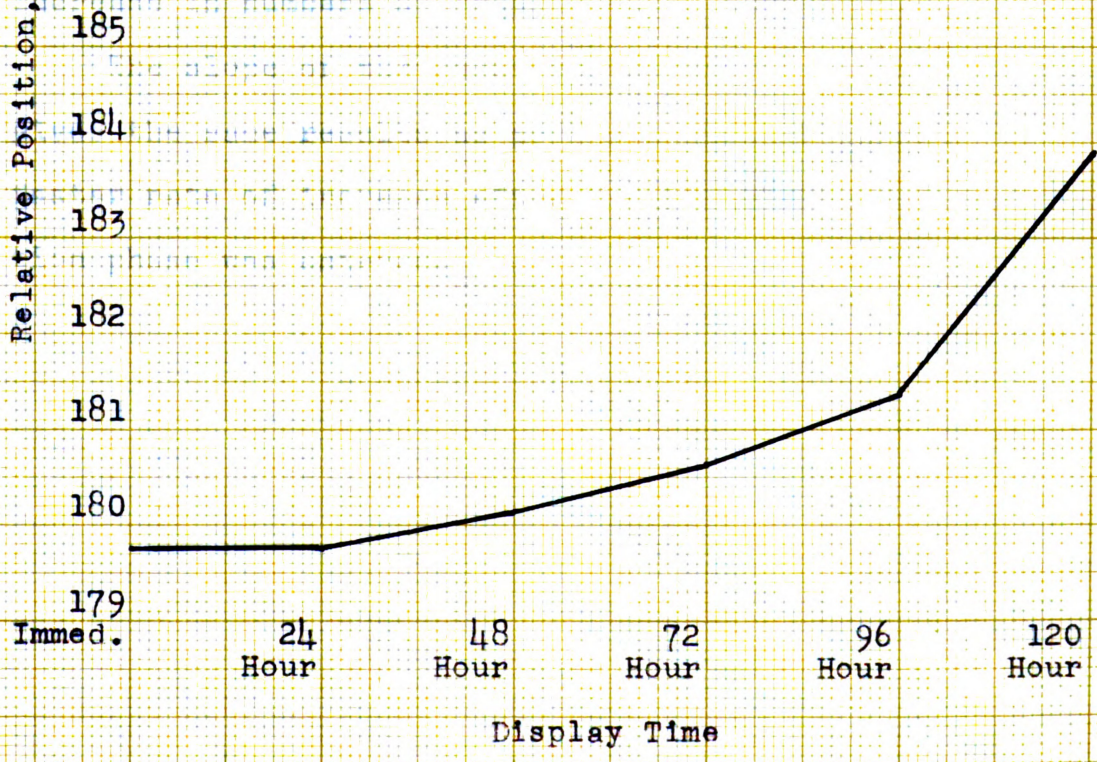


GRAPH IIG - BEEF, COMBINED TRIALS 1 and 2, STORE 2

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

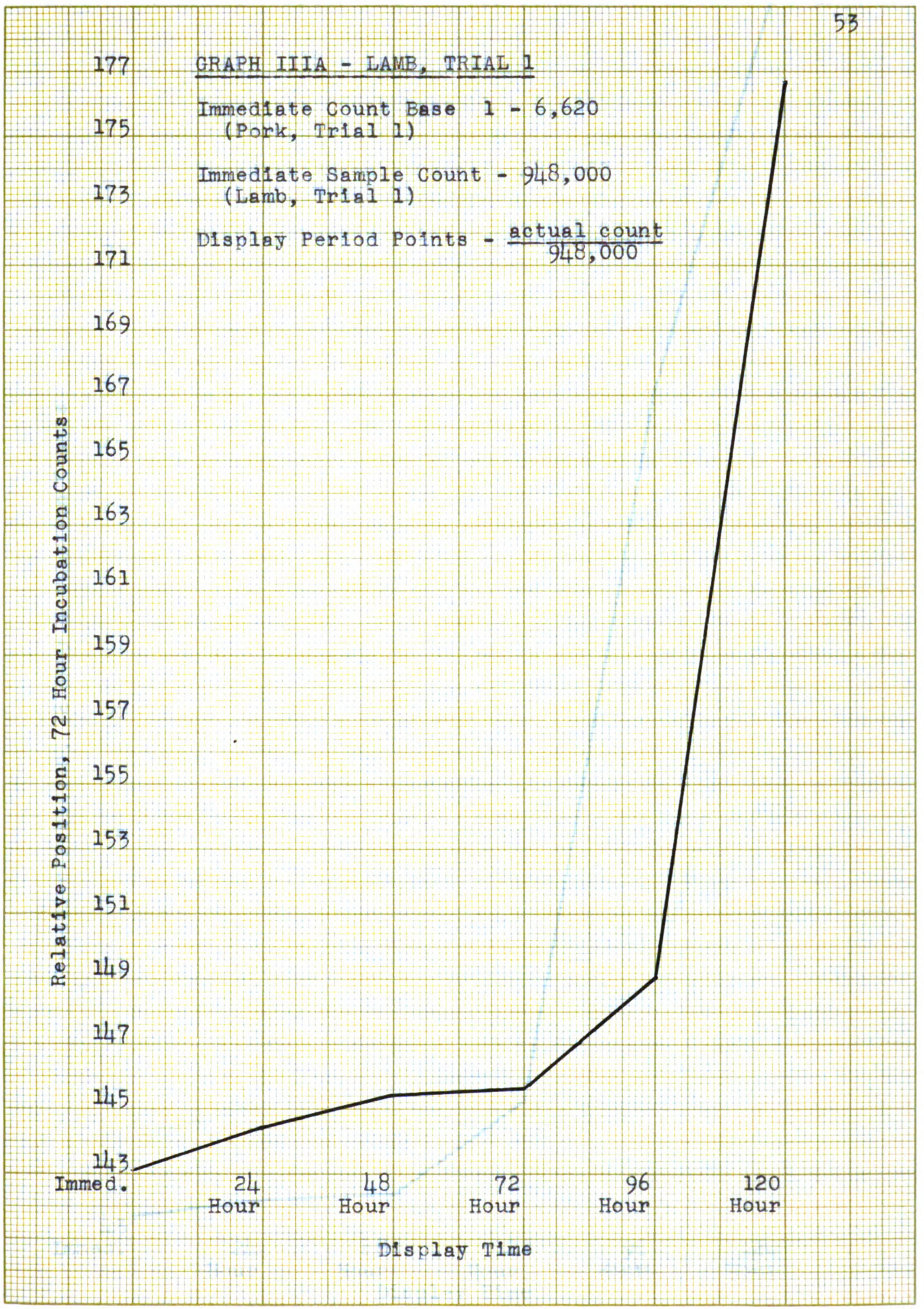
Immediate Sample Count - 1,190,000
(Combined Beef, Trials 1 and 2)

Display Period Points - $\frac{\text{actual count}}{1,190,000}$



The results obtained with lamb shows an initial phase during which time the number of organisms remains nearly constant. In two of the three trials with lamb this phase lasted three days while in the third trial this phase lasted but two days. The organisms then entered the positive growth acceleration phase. These curves are shown in graph numbers IIIA, IIIB, and IIIC. It should be noted that the increase in numbers of organisms was much greater with lamb than with pork or beef. Wiesman (31) recommends that lamb should be kept at a lower temperature than pork or beef. At the end of two or three days of display time, the lamb appeared to be dark colored and dried out. In most cases at this point it was no longer in a salable condition. Had the lamb been held at a lower temperature as Wiesman recommends, the increase in numbers of organisms may have been less.

The slope of the combined trial curve, number IIID, gives the same results as pork and beef except for the faster rate of increase after the positive growth accelaration phase was entered.

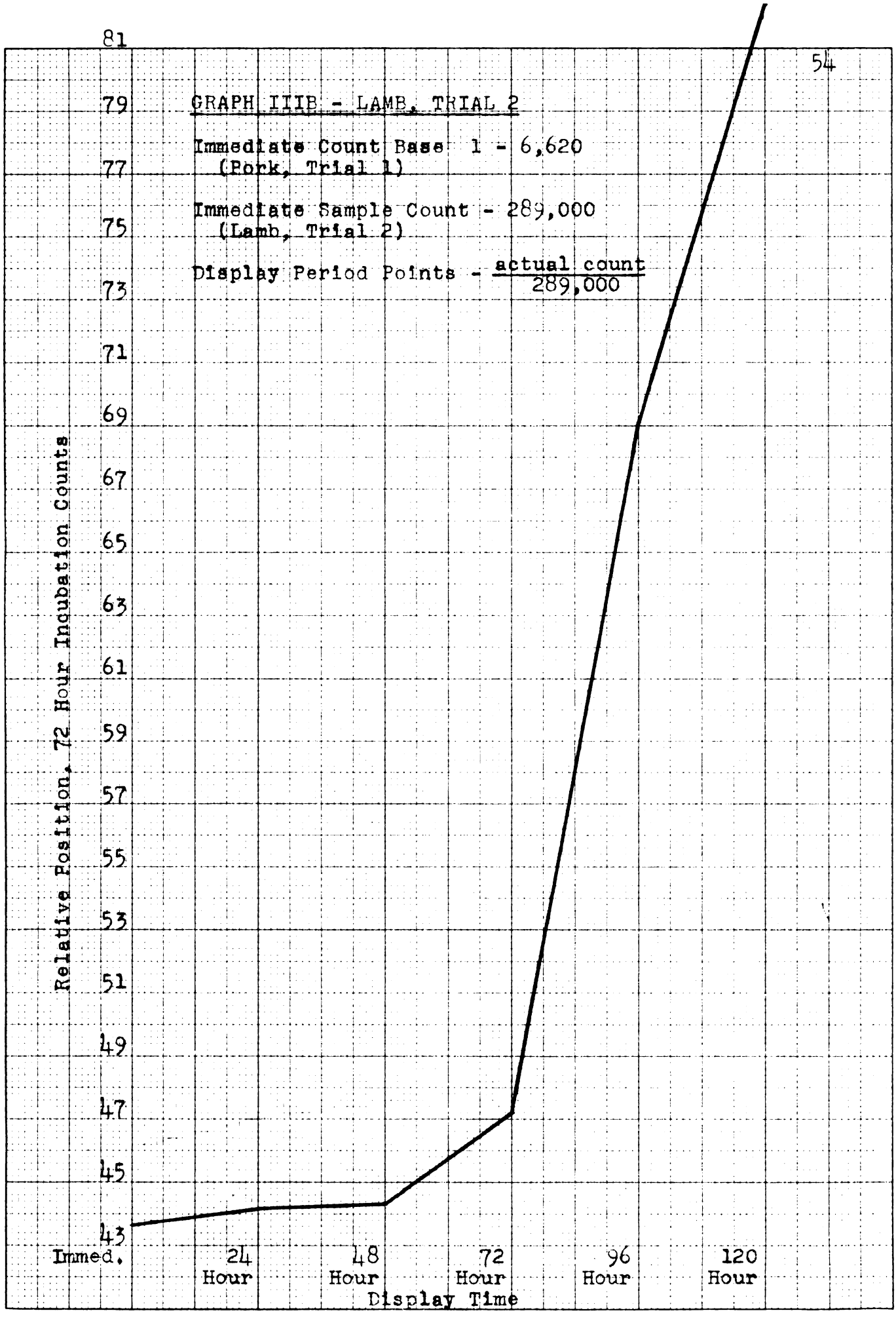

GRAPH IIIA - LAMB, TRIAL 1
Immediate Count Base 1 - 6,620
(Pork, Trial 1)
Immediate Sample Count - 948,000
(Lamb, Trial 1)
Display Period Points - actual count / 948,000
Relative Position, 72 Hour Incubation Counts
177
175
173
171
169
167
165
163
161
159
157
155
153
151
149
147
145
143
Immed.
24 Hour
48 Hour
72 Hour
96 Hour
120 Hour
Display Time

GRAPH IIIB - LAMB, TRIAL 2

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 289,000
(Lamb, Trial 2)

Display Period Points - $\frac{\text{actual count}}{289,000}$

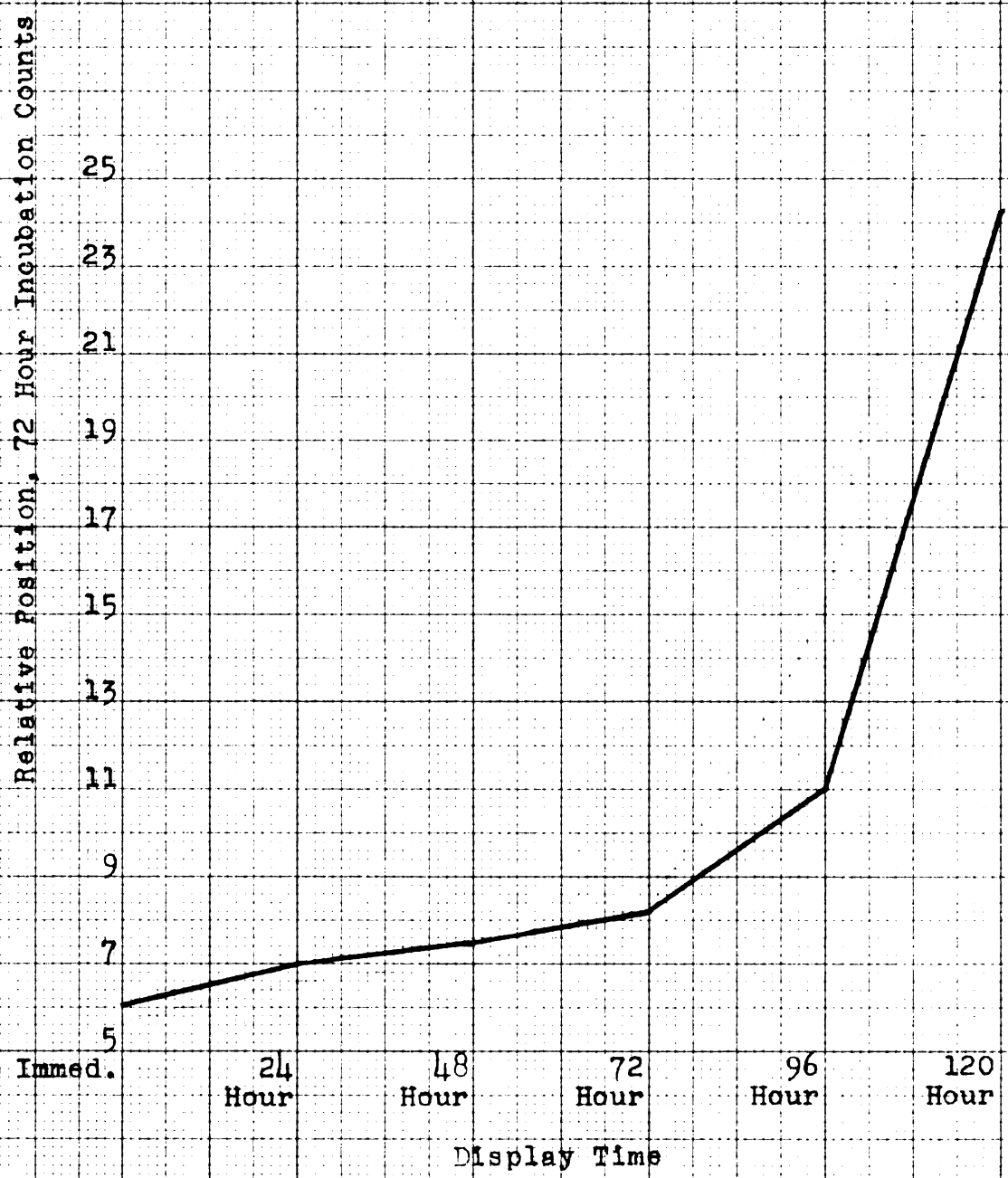


GRAPH IIIC - LAMB, TRIAL 3

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 40,500
(Lamb, Trial 3)

Display Period Points - $\frac{\text{actual count}}{40,500}$



GRAPH IIID - LAMB, COMBINED TRIALS 1, 2, and 3

Immediate Count Base 1 - 6,620
(Pork, Trial 1)

Immediate Sample Count - 223,000
(Combined Lamb, Trials 1, 2, and 3)

Display Period Points - $\frac{\text{actual count}}{223,000}$

CONCLUSIONS

1. That equipment concerned directly with the cutting operation offers the greatest source of contamination for prepackaged fresh meat in the retail store.
2. During the first three days of display time, the increase in numbers of organisms on pre-packaged fresh meat is small.
3. After three days of display time the number of microorganisms found on prepackaged fresh meat is greatly increased.
4. Prepackaged fresh meat should not be displayed longer than three days even under ideal conditions. If displayed three days it should be consumed immediately to prevent further loss in quality.

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APPENDIX

Pork, Loin - Trial 1
Store 1

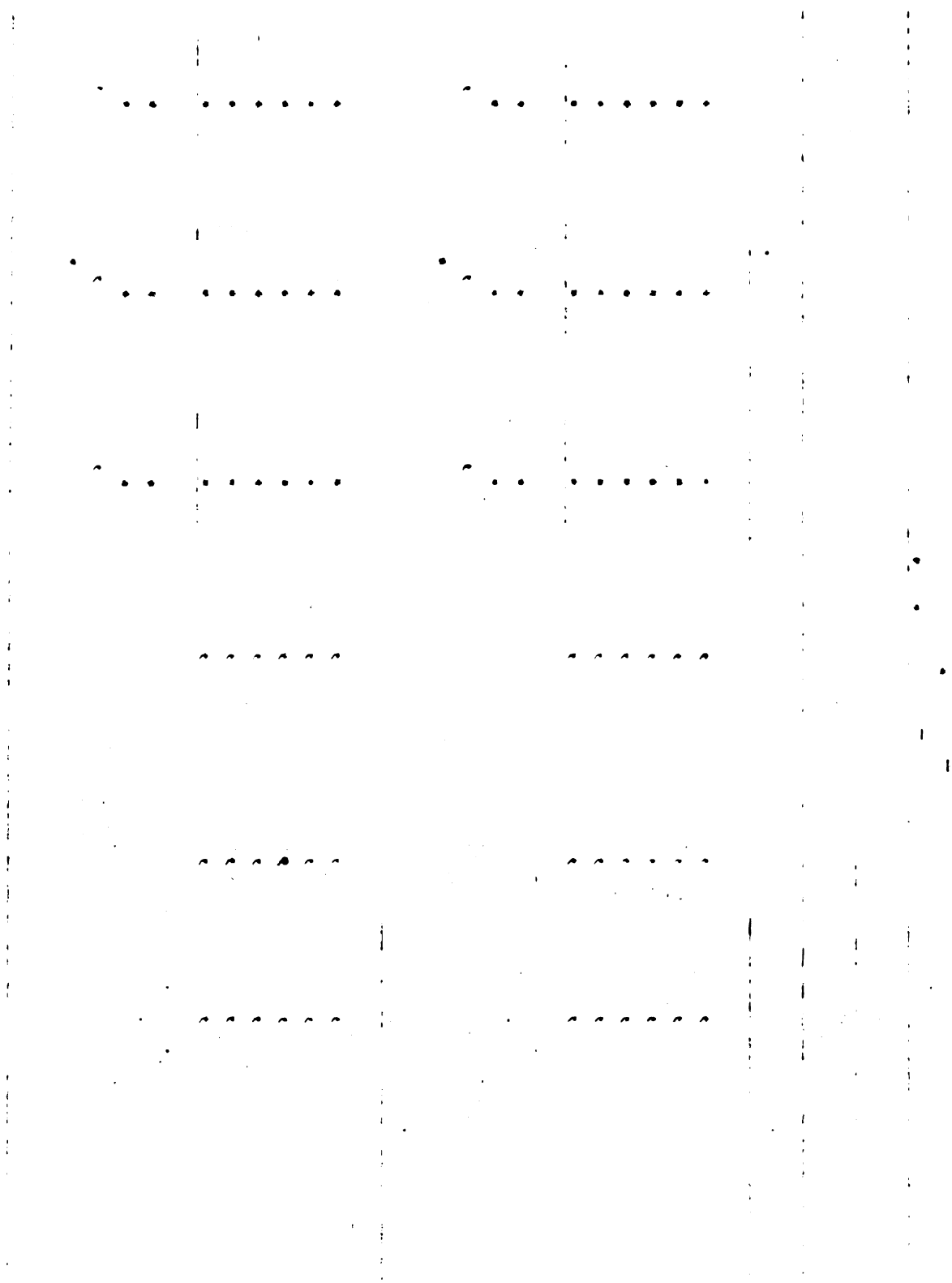
Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	2,400	5,100	6,700	3.3802	3.7076	3.8261
2	4,000	6,300	6,700	3.6021	3.7993	3.8261
3	1,700	3,300	5,300	3.2304	3.5185	3.7243
4	6,100	6,900	7,400	3.7853	3.8388	3.8692
5	2,300	6,700	7,200	3.3617	3.8261	3.8573
6	2,900	4,800	5,900	3.4624	3.6812	3.7709
7	3,900	7,000	7,800	3.5911	3.8451	3.8921
8	12,000	14,000	13,000	4.0792	4.1461	4.1139
9	3,700	6,300	7,100	3.5682	3.7993	3.8513
10	8,000	11,200	12,100	3.9031	4.0492	4.0828
	Logarithmic Total			35.9637	38.2112	38.8140
	Geometric Mean			3.5964	3.8211	3.8814
	Antilog of Geometric Mean			3,950	6,620	7,610
	Amount of 72 Hour Increase				1	
24 Hour Display Samples						
1	12,900	16,300	19,800	4.1106	4.2122	4.2967
2	14,000	21,000	22,000	4.1461	4.3222	4.3424
3	7,500	11,300	10,000	3.8751	4.0531	4.0000
4	8,400	10,600	11,200	3.9243	4.0253	4.0492
5	7,600	12,100	13,200	3.8808	4.0828	4.1206
6	11,600	14,200	15,600	4.0645	4.1523	4.1931
7	7,100	12,200	13,100	3.8513	4.0864	4.1173
8	7,400	11,600	12,100	3.8692	4.0645	4.0828
	Logarithmic Total			31.7219	32.9988	33.2021
	Geometric Mean			3.9654	4.1249	4.1503
	Antilog of Geometric Mean			9,230	13,300	14,100
	Amount of 72 Hour Increase				2.01	

Pork, Loin - Trial 1
Store 1

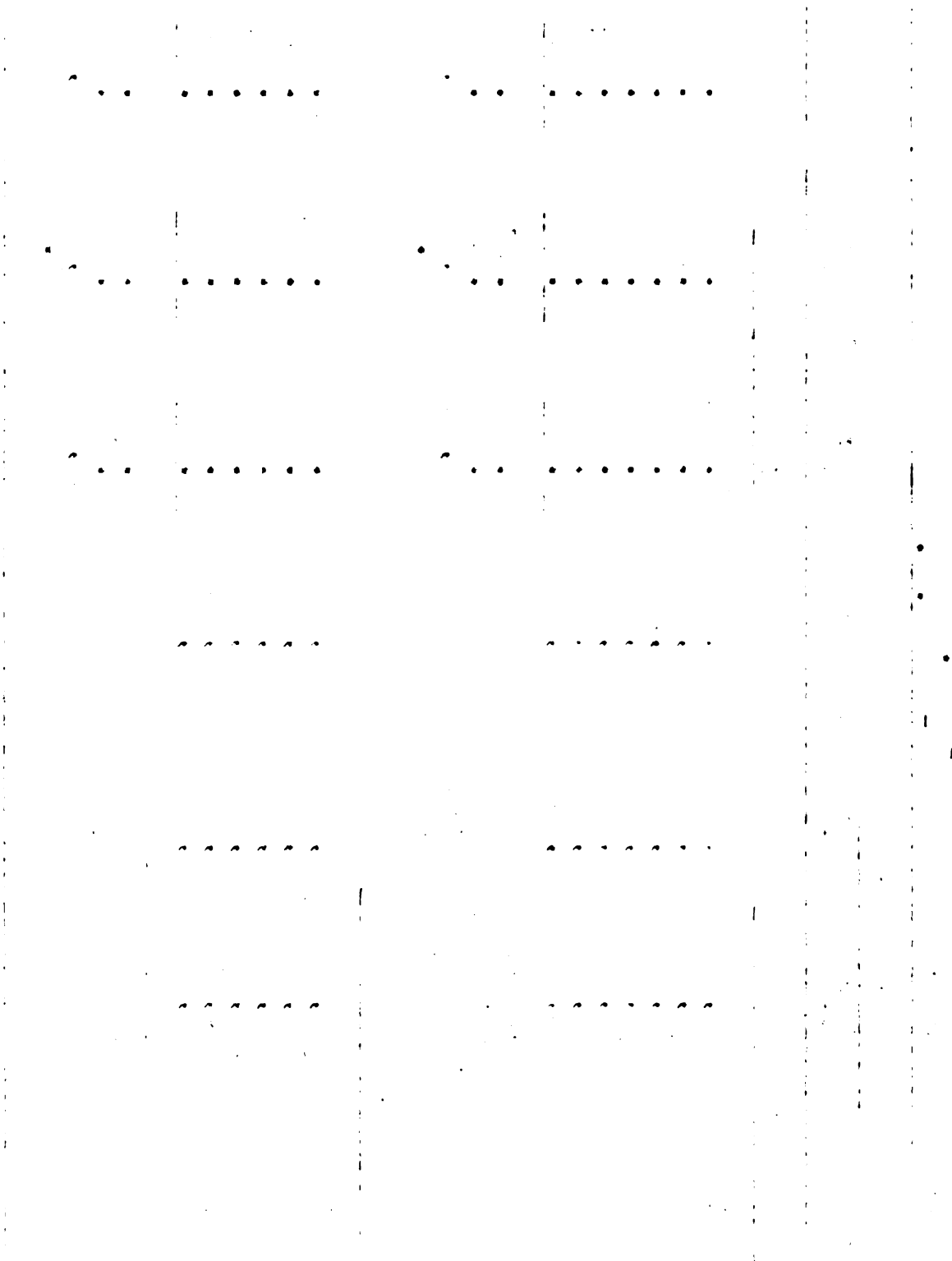
Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods: 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	19,000	20,000	22,000	4.2788	4.3010	4.3424
2	17,300	23,300	24,500	4.2380	4.3674	4.3892
3	15,100	16,100	17,600	4.1790	4.2068	4.2455
4	10,600	12,200	13,300	4.0253	4.0864	4.1239
5	13,400	15,000	15,300	4.1271	4.1761	4.1847
6	8,800	9,000	9,400	3.9445	3.9542	3.9731
	Logarithmic Total			24.7927	25.0919	25.2588
	Geometric Mean			4.1321	4.1819	4.2098
	Antilog of Geometric Mean			13,600	15,200	16,200
	Amount of 72 Hour Increase				2.30	
72 Hour Display Samples						
1	11,600	12,400	12,600	4.0645	4.0934	4.1004
2	20,000	40,000	30,000	4.3010	4.6021	4.4771
3	12,600	40,000	50,000	4.1004	4.6021	4.6990
4	20,000	30,000	40,000	4.3010	4.4771	4.6021
5	110,000	140,000	170,000	5.0414	5.1461	5.2304
6	13,000	13,500	14,600	4.1139	4.1303	4.1644
	Logarithmic Total			25.9222	27.0511	27.2734
	Geometric Mean			4.3204	4.5085	4.5456
	Antilog of Geometric Mean			20,900	32,200	35,100
	Amount of 72 Hour Increase				4.86	



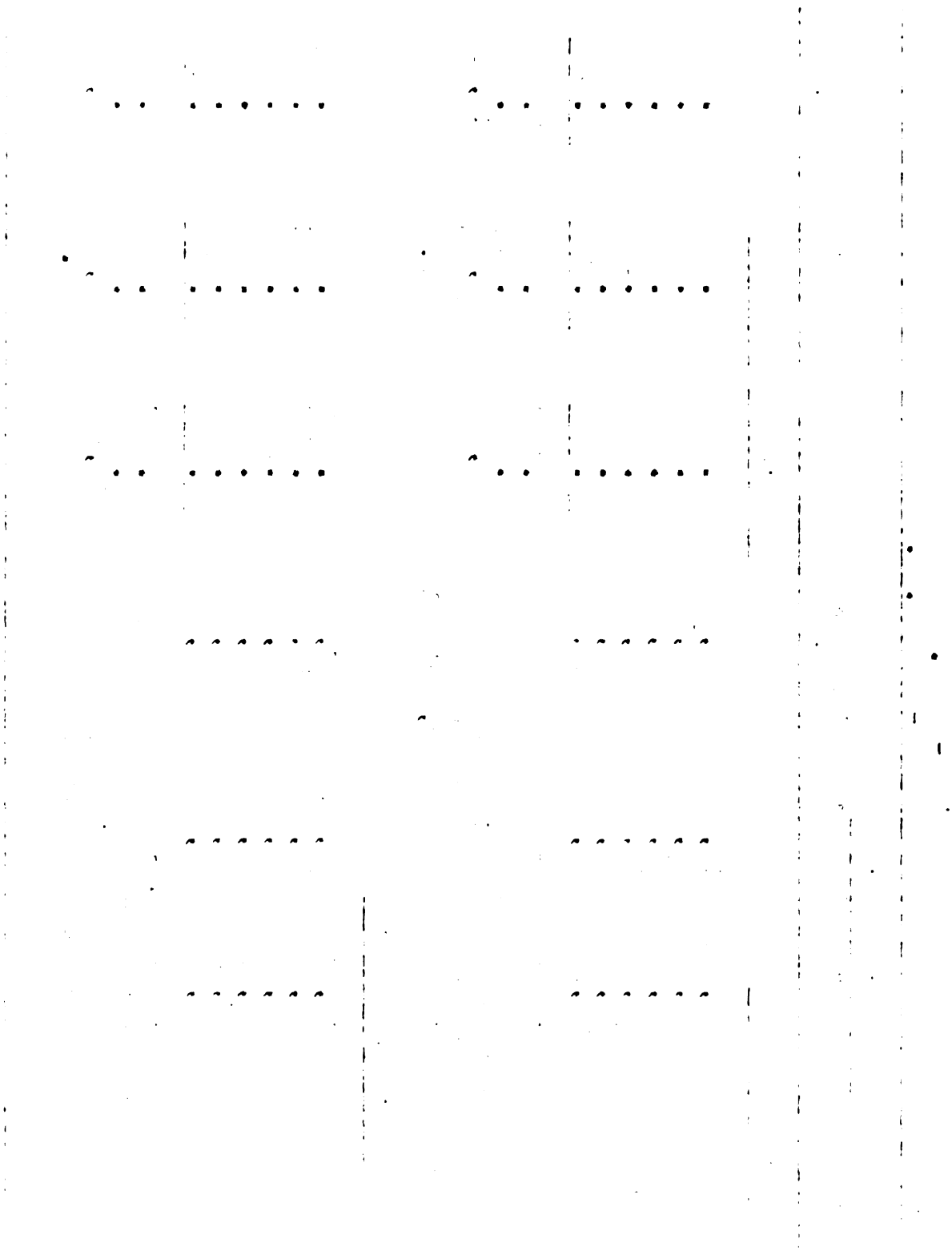
Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				**Logarithms of Numbers**		
1	70,000	110,000	130,000	4.8451	5.0414	5.1139
2	140,000	150,000	180,000	5.1461	5.1761	5.2553
3	19,600	20,900	24,100	4.2923	4.3201	4.3820
4	19,700	20,300	21,900	4.2945	4.3075	4.3404
5	20,200	22,100	25,300	4.3054	4.3444	4.4031
6	40,000	60,000	80,000	4.6021	4.7782	4.9031
7	21,600	22,900	26,400	4.3345	4.3598	4.4216
	Logarithmic Total			31.8202	32.3275	32.8204
	Geometric Mean			4.5457	4.6182	4.6886
	Antilog of Geometric Mean			35,100	41,500	48,800
	Amount of 72 Hour Increase				6.27	
120 Hour Display Samples						
1	50,000	50,000	50,000	4.6990	4.6990	4.6990
2	120,000	160,000	230,000	5.0792	5.2041	5.3617
3	90,000	110,000	134,000	4.9542	5.0414	5.1271
4	120,000	140,000	160,000	5.0792	5.1461	5.2041
5	60,000	100,000	120,000	4.7782	5.0000	5.0792
6	20,000	40,000	60,000	4.3010	4.6021	4.7782
	Logarithmic Total			28.8908	29.6927	30.2493
	Geometric Mean			4.8151	4.9488	5.0415
	Antilog of Geometric Mean			65,300	88,900	110,000
	Amount of 72 Hour Increase				13.43	



Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 58 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	8,700	14,800	23,600	3.9395	4.1703	4.3729
2	5,100	7,400	9,100	3.7076	3.8692	3.9590
3	17,000	21,700	22,100	4.2304	4.3365	4.3444
4	8,900	13,600	16,700	3.9494	4.1335	4.2227
5	15,400	17,600	25,400	4.1875	4.2455	4.4048
6	6,100	8,600	10,700	3.7853	3.9345	4.0294
	Logarithmic Total			23.7997	24.6895	25.3332
	Geometric Mean			3.9666	4.1149	4.2222
	Antilog of Geometric Mean			9,260	13,000	16,700
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				1.96	
24 Hour Display Samples						
1	16,400	21,400	27,600	4.2148	4.3304	4.4409
2	9,500	11,300	12,100	3.9777	4.0531	4.0828
3	12,200	12,900	14,300	4.0864	4.1106	4.1553
4	8,600	9,400	9,800	3.9345	3.9731	3.9912
5	7,700	8,400	9,300	3.8865	3.9243	3.9685
6	9,200	11,800	13,000	3.9638	4.0719	4.1139
	Logarithmic Total			24.0637	24.4634	24.7526
	Geometric Mean			4.0106	4.0739	4.1254
	Antilog of Geometric Mean			10,300	11,900	13,300
	Amount of 72 Hour Increase				.92	

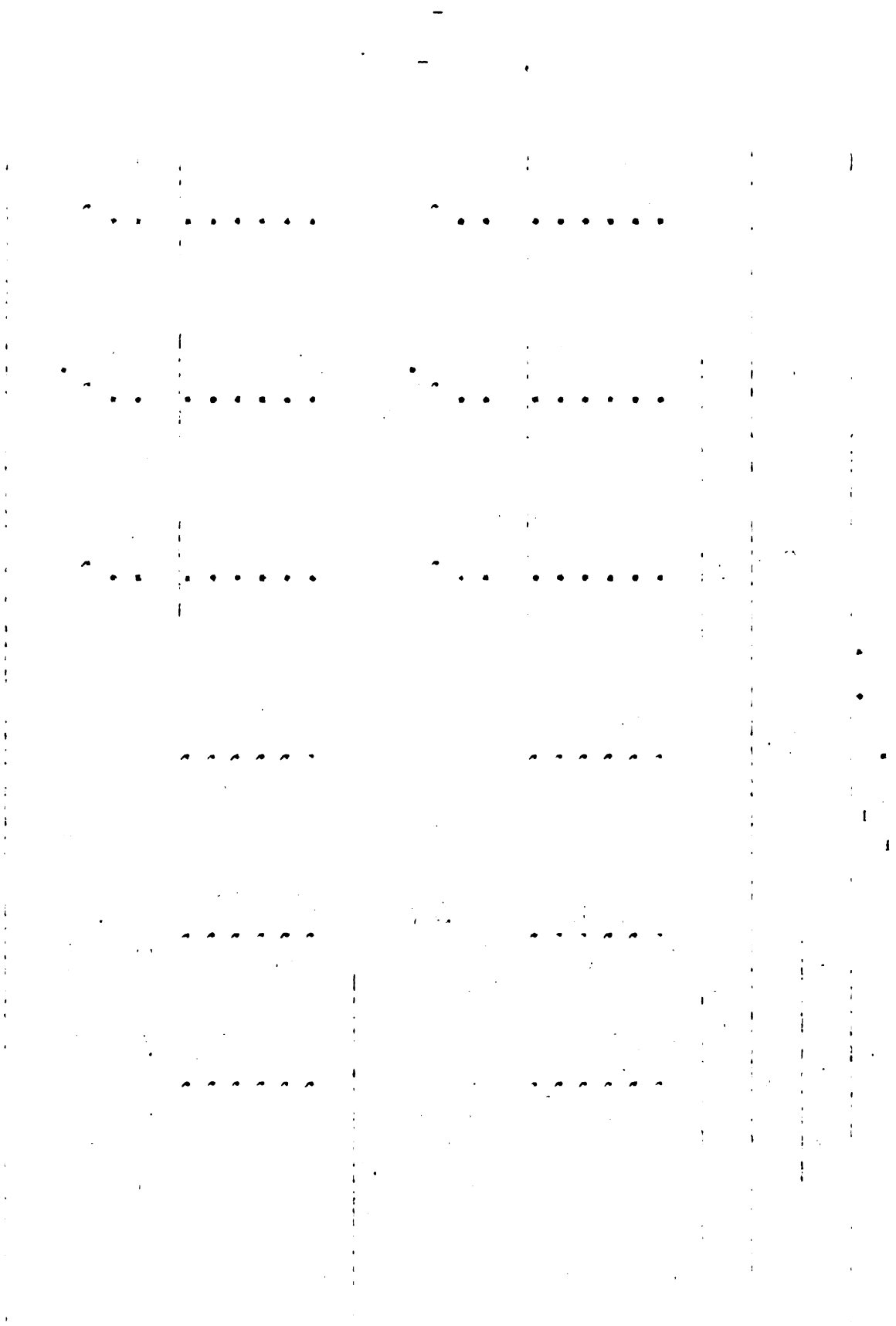


Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 58 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	12,300	13,300	14,100	4.0899	4.1239	4.1492
2	21,900	23,600	23,800	4.3404	4.3729	4.3766
3	15,600	16,700	18,900	4.1931	4.2227	4.2765
4	10,800	13,200	13,900	4.0334	4.1206	4.1430
5	18,200	18,900	21,700	4.2601	4.2765	4.3365
6	12,100	12,400	13,400	4.0828	4.0934	4.1271
	Logarithmic Total			24.9997	25.2100	25.4089
	Geometric Mean			4.1666	4.2017	4.2348
	Antilog of Geometric Mean			14,700	15,900	17,200
	Amount of 72 Hour Increase				1.22	
72 Hour Display Samples						
1	14,900	15,400	16,100	4.1732	4.1875	4.2068
2	11,700	14,200	16,400	4.0682	4.1523	4.2148
3	38,200	66,000	75,000	4.5821	4.8195	4.8751
4	14,800	15,200	15,900	4.1703	4.1818	4.2014
5	10,900	11,100	12,100	4.0374	4.0453	4.0828
6	16,400	17,700	28,000	4.2148	4.2480	4.4472
	Logarithmic Total			25.2460	25.6344	26.0281
	Geometric Mean			4.2077	4.2724	4.3380
	Antilog of Geometric Mean			16,100	18,700	21,800
	Amount of 72 Hour Increase				1.44	

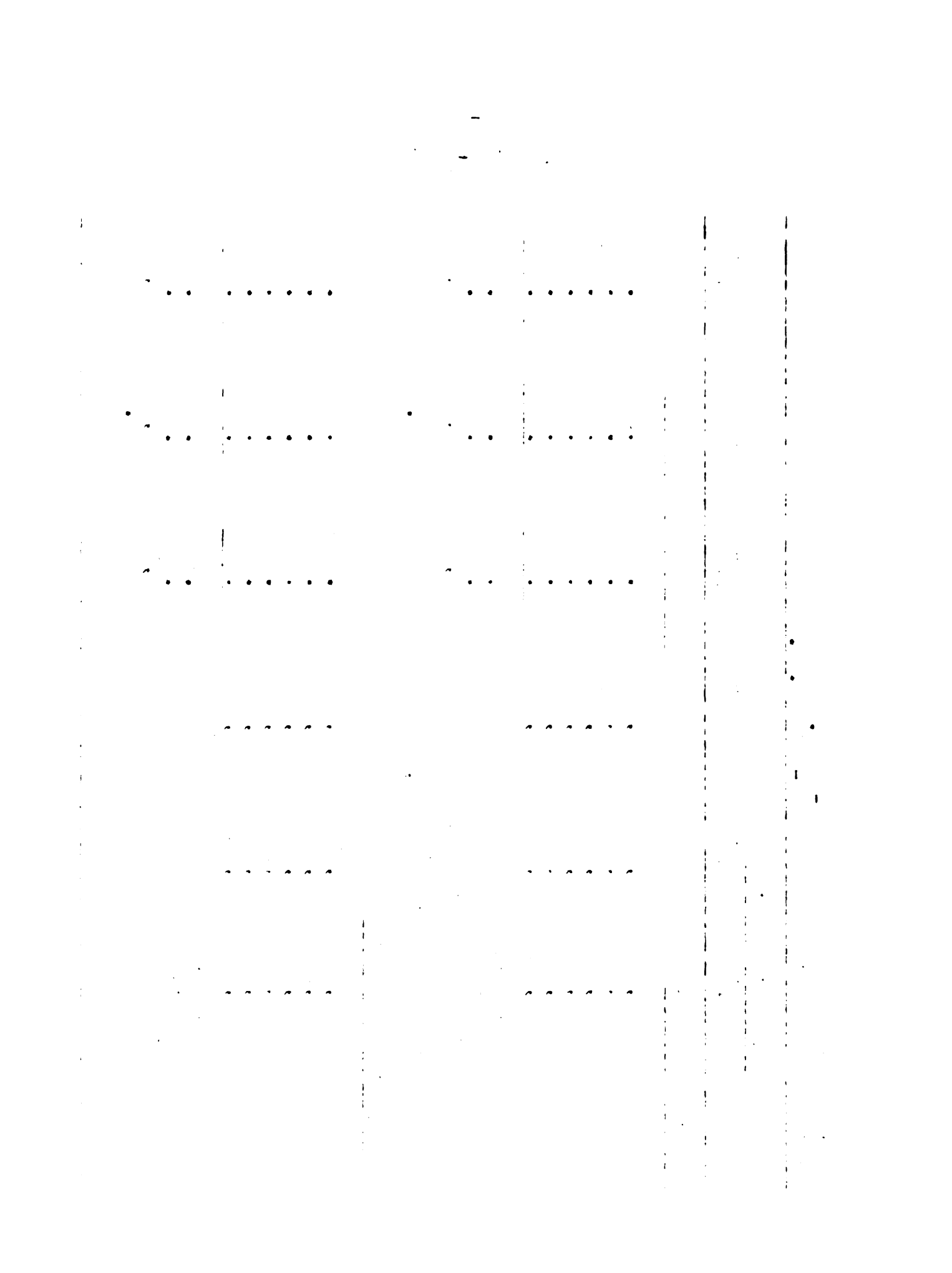
Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 58 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	49,000	51,000	62,000	4.6902	4.7076	4.7924
2	49,000	53,000	59,000	4.6902	4.7243	4.7709
3	27,100	28,300	49,000	4.4330	4.4518	4.6902
4	24,700	26,100	39,000	4.3927	4.4166	4.5911
5	44,000	45,000	49,000	4.6532	4.6532	4.6902
6	47,000	51,000	56,000	4.6721	4.7076	4.7482
	Logarithmic Total			27.5217	27.6611	28.2830
	Geometric Mean			4.5869	4.6102	4.7138
	Antilog of Geometric Mean			38,600	40,800	51,800
	Amount of 72 Hour Increase				3.14	
120 Hour Display Samples						
1	291,000	302,000	290,000	5.4639	5.4800	5.4624
2	92,000	98,000	104,000	4.9638	4.9912	5.0170
3	22,600	23,600	30,000	4.3541	4.3729	4.4771
4	25,600	26,100	28,600	4.4082	4.4166	4.4564
5	13,700	14,700	16,900	4.1367	4.1673	4.2279
6	42,000	45,000	49,000	4.6232	4.6532	4.6902
	Logarithmic Total			27.9499	28.0812	28.3310
	Geometric Mean			4.6583	4.6802	4.7218
	Antilog of Geometric Mean			45,500	47,900	52,700
	Amount of 72 Hour Increase				3.68	



Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	42,000	44,000	52,000	4.6232	4.6435	4.7160
2	16,100	17,200	18,100	4.2068	4.2355	4.2577
3	27,000	29,000	32,000	4.4314	4.4624	4.5051
4	44,000	47,000	52,000	4.6435	4.6721	4.7160
5	192,000	200,000	212,000	4.2833	5.3010	5.3263
6	122,000	127,000	139,000	5.0864	5.1038	5.1430
	Logarithmic Total			28.2746	28.4183	28.6641
	Geometric Mean			4.7124	4.7364	4.7774
	Antilog of Geometric Mean			51,600	54,500	59,900
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				8.23	
24 Hour Display Samples						
1	35,000	38,000	43,000	4.5441	4.5798	4.6335
2	52,000	55,000	61,000	4.7160	4.7404	4.7853
3	92,000	94,000	99,000	4.9638	4.9731	4.9956
4	91,000	94,000	97,000	4.9590	4.9731	4.9868
5	240,000	244,000	256,000	5.3802	5.3874	5.4082
6	49,000	51,000	57,000	4.6902	4.7076	4.7559
	Logarithmic Total			29.2533	29.3614	29.5653
	Geometric Mean			4.8756	4.8936	4.9276
	Antilog of Geometric Mean			75,100	78,300	84,700
	Amount of 72 Hour Increase				1.44	



Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples						
1	105,000	108,000	117,000	5.0212	5.0334	5.0682
2	111,000	115,000	121,000	5.0453	5.0607	5.0828
3	74,000	79,000	84,000	4.8692	4.8976	4.9243
4	110,000	114,000	117,000	5.0414	5.0569	5.0682
5	50,000	54,000	63,000	4.6990	4.7324	4.7993
6	92,000	95,000	107,000	4.9638	4.9777	5.0294
	Logarithmic Total			29.6399	29.7587	29.9772
	Geometric Mean			4.9400	4.9598	4.9962
	Antilog of Geometric Mean			87,100	91,200	99,100
	Amount of 72 Hour Increase				1.67	
72 Hour Display Samples						
1	211,000	224,000	239,000	5.3243	5.3502	5.3784
2	120,000	123,000	129,000	5.0792	5.0899	5.1106
3	132,000	135,000	139,000	5.1206	5.1303	5.1430
4	102,000	107,000	116,000	5.0086	5.0294	5.0645
5	139,000	143,000	149,000	5.1430	5.1553	5.1732
6	125,000	134,000	137,000	5.0969	5.1271	5.1367
	Logarithmic Total			30.7726	30.8822	31.0064
	Geometric Mean			5.1288	5.1470	5.1677
	Antilog of Geometric Mean			134,000	140,000	147,000
	Amount of 72 Hour Increase				2.57	

Holding Period Before Packaging - None.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				**Logarithms of Numbers**		
1	97,000	102,000	109,000	4.9868	5.0086	5.0374
2	117,000	120,000	126,000	5.0682	5.0792	5.1004
3	440,000	470,000	510,000	5.6435	5.6721	5.7076
4	296,000	300,000	320,000	5.4713	5.4771	5.5051
5	137,000	141,000	146,000	5.1367	5.1492	5.1644
6	143,000	147,000	152,000	5.1553	5.1673	5.1818
	Logarithmic Total			31.4618	31.5535	31.6967
	Geometric Mean			5.2436	5.2589	5.2828
	Antilog of Geometric Mean			175,000	182,000	192,000
	Amount of 72 Hour Increase				3.34	
120 Hour Display Samples						
1	510,000	560,000	590,000	5.7076	5.7482	5.7709
2	550,000	660,000	690,000	5.7404	5.8195	5.8388
3	970,000	1,340,000	1,420,000	5.9868	6.1271	6.1523
4	410,000	430,000	470,000	5.6128	5.6335	5.6721
5	241,000	440,000	460,000	5.3820	5.6435	5.6628
6	2,150,000	2,820,000	2,920,000	6.3324	6.4502	6.4654
	Logarithmic Total			34.7620	35.4220	35.5623
	Geometric Mean			5.7937	5.9037	5.9271
	Antilog of Geometric Mean			622,000	801,000	845,000
	Amount of 72 Hour Increase				14.70	

Beef, Sirloin Tip - Trial 1
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	241,000	288,000	310,000	5.3820	5.4594	5.4914
2	890,000	1,000,000	1,230,000	5.9494	6.0000	6.0899
3	142,000	217,000	650,000	5.1523	5.3365	5.8129
4	920,000	1,140,000	1,620,000	5.9638	6.0569	6.2095
5	710,000	840,000	1,110,000	5.8513	5.9243	6.0453
6	1,160,000	1,340,000	1,520,000	6.0645	6.1271	6.1818
	Logarithmic Total			34.3633	34.9042	35.8308
	Geometric Mean			5.7272	5.8174	5.9718
	Antilog of Geometric Mean			534,000	657,000	937,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				99.24	
24 Hour Display Samples						
1	780,000	900,000	990,000	5.8921	5.9542	5.9956
2	296,000	310,000	390,000	5.4713	5.4914	5.5911
3	265,000	297,000	440,000	5.4232	5.4728	5.6435
4	610,000	760,000	920,000	5.7853	5.8808	5.9638
5	590,000	650,000	790,000	5.7709	5.8129	5.8976
6	2,660,000	2,870,000	3,290,000	6.4249	6.4579	6.5172
	Logarithmic Total			34.7677	35.0700	35.6088
	Geometric Mean			5.7946	5.8450	5.9348
	Antilog of Geometric Mean			623,000	700,000	861,000
	Amount of 72 Hour Increase				1.07	

Beef, Sirloin Tip - Trial 1
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	230,000	250,000	310,000	5.3617	5.3979	5.4914
2	810,000	860,000	940,000	5.9085	5.9345	5.9731
3	900,000	960,000	1,030,000	5.9542	5.9823	6.0128
4	710,000	750,000	830,000	5.8513	5.8751	5.9191
5	1,650,000	1,760,000	1,810,000	6.2175	6.2455	6.2577
6	720,000	770,000	890,000	5.8573	5.8865	5.9494
	Logarithmic Total			35.1505	35.3218	35.6035
	Geometric Mean			5.8584	5.8869	5.9339
	Antilog of Geometric Mean			722,000	771,000	859,000
	Amount of 72 Hour Increase				1.17	
72 Hour Display Samples						
1	290,000	360,000	430,000	5.4624	5.5563	5.6335
2	920,000	1,000,000	1,160,000	5.9638	6.0000	6.0645
3	870,000	960,000	1,040,000	5.9395	5.9823	6.0170
4	570,000	660,000	890,000	5.7076	5.8195	5.9494
5	2,040,000	2,460,000	5,300,000	6.3096	6.3909	6.7243
6	520,000	580,000	610,000	5.7160	5.7634	5.7853
	Logarithmic Total			35.0989	35.5124	36.1740
	Geometric Mean			5.8498	5.9187	6.0290
	Antilog of Geometric Mean			708,000	829,000	1,070,000
	Amount of 72 Hour Increase				1.26	

Beef, Sirloin Tip - Trial 1
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				**Logarithms of Numbers**		
1	5,300,000	6,000,000	8,100,000	6.7243	6.7782	6.9085
2	1,080,000	1,160,000	1,320,000	6.0334	6.0645	6.1206
3	610,000	710,000	740,000	5.7853	5.8513	5.8692
4	370,000	470,000	660,000	5.5682	5.6721	5.8995
5	320,000	410,000	460,000	5.5051	5.6128	5.6628
6	510,000	580,000	730,000	5.7076	5.7634	5.8633
	Logarithmic Total			35.3239	35.7423	36.2439
	Geometric Mean			5.8873	5.9571	6.0406
	Antilog of Geometric Mean			771,000	906,000	1,100,000
	Amount of 72 Hour Increase				1.38	
120 Hour Display Samples						
1	2,570,000	3,600,000	3,900,000	6.4099	6.5563	6.5911
2	1,490,000	2,300,000	2,600,000	6.1732	6.3617	6.4150
3	1,410,000	1,730,000	2,100,000	6.1493	6.2380	6.3222
4	2,430,000	3,400,000	3,700,000	6.3674	6.5315	6.5682
5	1,220,000	1,300,000	1,700,000	6.0864	6.1139	6.2304
6	810,000	970,000	1,060,000	5.9085	5.9868	6.0253
	Logarithmic Total			37.0946	37.7882	38.1522
	Geometric Mean			6.1824	6.2980	6.3587
	Antilog of Geometric Mean			1,520,000	1,990,000	2,280,000
	Amount of 72 Hour Increase				3.03	

Beef, Rib of Beef - Trial 2
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				Logarithms of Numbers		
1	133,000	152,000	163,000	5.1239	5.1818	5.2122
2	105,000	113,000	124,000	5.0212	5.0531	5.0934
3	122,000	135,000	140,000	5.0864	5.1303	5.1461
4	280,000	310,000	330,000	5.4472	5.4914	5.5185
5	118,000	127,000	139,000	5.0719	5.1038	5.1430
6	146,000	168,000	179,000	5.1644	5.2253	5.2529
	Logarithmic Total			30.9150	31.1857	31.3661
	Geometric Mean			5.1525	5.1976	5.2277
	Antilog of Geometric Mean			142,000	158,000	169,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				23.87	
24 Hour Display Samples						
1	174,000	196,000	213,000	5.2405	5.2923	5.3284
2	291,000	380,000	430,000	5.4639	5.5798	5.6335
3	223,000	256,000	410,000	5.3483	5.4082	5.6128
4	246,000	290,000	360,000	5.3909	5.4624	5.5563
5	277,000	370,000	410,000	5.4425	5.5682	5.6128
6	268,000	390,000	520,000	5.4281	5.5911	5.7160
	Logarithmic Total			32.3142	32.9020	33.4598
	Geometric Mean			5.3857	5.4837	5.5766
	Antilog of Geometric Mean			243,000	305,000	377,000
	Amount of 72 Hour Increase				1.93	

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				Logarithms of Numbers		
1	390,000	410,000	560,000	5.5911	5.6128	5.7482
2	630,000	710,000	890,000	5.7993	5.8513	5.9494
3	640,000	770,000	870,000	5.8062	5.8865	5.9395
4	430,000	450,000	530,000	5.6335	5.6532	5.7243
5	220,000	260,000	330,000	5.3424	5.4150	5.5185
6	480,000	530,000	610,000	5.6812	5.7243	5.7853
	Logarithmic Total			33.8537	34.1431	34.6652
	Geometric Mean			5.6423	5.6905	5.7775
	Antilog of Geometric Mean			439,000	490,000	599,000
	Amount of 72 Hour Increase				3.10	
72 Hour Display Samples						
1	450,000	560,000	570,000	5.6532	5.7482	5.7559
2	760,000	810,000	970,000	5.8808	5.9085	5.9868
3	1,050,000	1,140,000	1,290,000	6.0212	6.0569	6.1106
4	640,000	660,000	810,000	5.8062	5.8195	5.9085
5	490,000	520,000	590,000	5.6902	5.7160	5.7709
6	290,000	330,000	370,000	5.4624	5.5185	5.5682
	Logarithmic Total			34.5140	34.7676	35.1009
	Geometric Mean			5.7523	5.7946	5.8501
	Antilog of Geometric Mean			565,000	623,000	708,000
	Amount of 72 Hour Increase				3.94	

Holding Period before Packaging - 20 minutes - 33 deg. F.
Cutting and Packaging Temperature - 54 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				**Logarithms of Numbers**		
1	2,960,000	4,100,000	6,100,000	6.4713	6.6128	6.7853
2	2,190,000	2,410,000	3,700,000	6.3404	6.3820	6.5682
3	830,000	870,000	1,040,000	5.9191	5.9395	6.0170
4	330,000	370,000	490,000	5.5185	5.5682	5.6902
5	540,000	610,000	740,000	5.7324	5.7853	5.8692
6	810,000	860,000	970,000	5.9085	5.9345	5.9868
	Logarithmic Total			35.8902	36.2223	36.9267
	Geometric Mean			5.9817	6.0370	6.1544
	Antilog of Geometric Mean			959,000	1,090,000	1,430,000
	Amount of 72 Hour Increase				6.90	
120 Hour Display Samples						
1	590,000	630,000	660,000	5.7709	5.7993	5.8195
2	1,370,000	1,460,000	1,540,000	6.1367	6.1644	6.1875
3	2,660,000	3,180,000	3,290,000	6.4249	6.5024	6.5172
4	1,120,000	1,160,000	1,230,000	6.0492	6.0645	6.0899
5	810,000	840,000	870,000	5.9085	5.9243	5.9395
6	1,030,000	1,160,000	1,230,000	5.0128	6.0645	6.0899
	Logarithmic Total			36.3030	36.5194	36.6435
	Geometric Mean			6.0505	6.0866	6.1072
	Antilog of Geometric Mean			1,130,000	1,220,000	1,280,000
	Amount of 72 Hour Increase				7.72	

Holding Period Before Packaging - 25 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	369,000	410,000	460,000	5.5670	5.6128	5.6628
2	69,000	76,000	80,000	4.8388	4.8808	4.9031
3	184,000	189,000	196,000	5.2648	5.2765	5.2923
4	81,000	87,000	105,000	4.9085	4.9395	5.0212
5	98,000	105,000	114,000	4.9912	5.0212	5.0569
6	47,000	55,000	61,000	5.6721	4.7404	4.7853
	Logarithmic Total			30.2424	30.4712	30.7216
	Geometric Mean			5.0404	5.0785	5.1203
	Antilog of Geometric Mean			110,000	120,000	132,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				18.13	
24 Hour Display Samples						
1	71,000	74,000	78,000	4.8513	4.8692	4.8921
2	131,000	136,000	144,000	5.1173	5.1335	5.1584
3	189,000	192,000	199,000	5.2765	5.2833	5.2989
4	171,000	173,000	177,000	5.2330	5.2380	5.2480
5	121,000	124,000	129,000	5.0828	5.0934	5.1106
6	66,000	73,000	85,000	4.8195	4.8633	4.9294
	Logarithmic Total			30.3804	30.4807	30.6374
	Geometric Mean			5.0634	5.0801	5.1062
	Antilog of Geometric Mean			116,000	120,000	128,000
	Amount of 72 Hour Increase				1	

Beef, Sirloin Tip - Trial 3
Store 1

Holding Period Before Packaging - 25 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				Logarithms of Numbers		
1	151,000	155,000	157,000	5.1790	5.1903	5.1959
2	146,000	151,000	154,000	5.1644	5.1790	5.1875
3	181,000	187,000	189,000	5.2577	5.2718	5.2765
4	71,000	78,000	81,000	4.8513	4.8921	4.9085
5	248,000	254,000	259,000	5.3945	5.4048	5.4133
6	136,000	143,000	151,000	5.1335	5.1553	5.1790
	Logarithmic Total			30.9804	31.0933	31.1607
	Geometric Mean			5.1634	5.1822	5.1935
	Antilog of Geometric Mean			146,000	152,000	156,000
	Amount of 72 Hour Increase				1.27	
72 Hour Display Samples						
1	98,000	103,000	109,000	4.9912	5.0128	5.0374
2	181,000	183,000	187,000	5.2577	5.2625	5.2718
3	339,000	350,000	370,000	5.5302	5.5441	5.5682
4	343,000	470,000	490,000	5.5353	5.6721	5.6902
5	195,000	198,000	203,000	5.2900	5.2967	5.3075
6	132,000	136,000	142,000	5.1206	5.1335	5.1523
	Logarithmic Total			31.7250	31.9217	32.0274
	Geometric Mean			5.2875	5.3203	5.3379
	Antilog of Geometric Mean			194,000	209,000	218,000
	Amount of 72 Hour Increase				1.74	

Holding Period Before Packaging - 25 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	270,000	290,000	350,000	5.4314	5.4624	5.5441
2	210,000	230,000	260,000	5.3222	5.3617	5.4150
3	320,000	340,000	370,000	5.5051	5.5315	5.5682
4	260,000	290,000	340,000	5.4150	5.4624	5.5315
5	410,000	430,000	470,000	5.6128	5.6335	5.6721
6	360,000	380,000	440,000	5.5563	5.5798	5.6435
Logarithmic Total				32.8428	33.0313	33.3744
Geometric Mean				5.4738	5.5052	5.5624
Antilog of Geometric Mean				298,000	320,000	365,000
Amount of 72 Hour Increase					2.67	
120 Hour Display Samples						
1	1,210,000	1,230,000	1,270,000	6.0828	6.0899	6.1038
2	910,000	940,000	990,000	5.9590	5.9731	5.9956
3	820,000	840,000	870,000	5.9138	5.9243	5.9395
4	770,000	810,000	870,000	5.8865	5.9085	5.9395
5	1,130,000	1,170,000	1,230,000	6.0531	6.0682	6.0899
6	1,070,000	1,110,000	1,130,000	6.0294	6.0453	6.0531
Logarithmic Total				35.9246	36.0093	36.1214
Geometric Mean				5.9874	6.0016	6.0202
Antilog of Geometric Mean				971,000	1,000,000	1,050,000
Amount of 72 Hour Increase					8.33	

Beef, Sirloin Tip - Trial 1
Store 2

Holding Period Before Packaging - 30 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 60 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	1,660,000	1,960,000	2,120,000	6.2201	6.2923	6.3263
2	750,000	780,000	790,000	5.8751	5.8921	5.8976
3	1,940,000	2,160,000	2,190,000	6.2878	6.3345	6.3404
4	285,000	300,000	380,000	5.4548	5.4771	5.5798
5	288,000	320,000	380,000	5.4594	5.5051	5.5798
6	250,000	380,000	470,000	5.3979	5.5798	5.6721
	Logarithmic Total			34.6951	35.0809	35.3960
	Geometric Mean			5.7825	5.8468	5.8993
	Antilog of Geometric Mean			606,000	703,000	793,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				106,20	
24 Hour Display Samples						
1	213,000	228,000	236,000	5.3284	5.3579	5.3729
2	310,000	370,000	390,000	5.4914	5.5682	5.5911
3	230,000	310,000	350,000	5.3617	5.4914	5.5441
4	1,410,000	1,490,000	1,520,000	6.1492	6.1732	6.1818
5	510,000	690,000	780,000	5.7076	5.8388	5.8921
6	1,460,000	1,500,000	1,530,000	6.1644	6.1761	6.1847
	Logarithmic Total			34.2027	34.6056	34.7667
	Geometric Mean			5.7005	5.7676	5.7945
	Antilog of Geometric Mean			502,000	586,000	623,000
	Amount of 72 Hour Increase				.83	

Holding Period Before Packaging - 30 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 60 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	910,000	960,000	970,000	5.9590	5.9823	5.9868
2	330,000	380,000	390,000	5.5185	5.5798	5.5911
3	1,760,000	1,860,000	1,900,000	6.2455	6.2695	6.2788
4	370,000	380,000	390,000	5.5682	5.5798	5.5911
5	630,000	690,000	760,000	5.7993	5.8388	5.8808
6	860,000	930,000	980,000	5.9345	5.9685	5.9912
	Logarithmic Total			35.0250	35.2187	35.3198
	Geometric Mean			5.8375	5.8698	5.8866
	Antilog of Geometric Mean			688,000	741,000	770,000
	Amount of 72 Hour Increase				1.05	
72 Hour Display Samples						
1	190,000	220,000	240,000	5.2788	5.3424	5.3802
2	850,000	920,000	1,060,000	5.9294	5.9638	6.0253
3	1,720,000	1,750,000	1,830,000	6.2355	6.2430	6.2625
4	870,000	910,000	970,000	5.9395	5.9590	5.9868
5	1,030,000	1,040,000	1,240,000	6.0128	6.0170	6.0934
6	1,140,000	1,170,000	1,210,000	6.0569	6.0682	6.0828
	Logarithmic Total			35.4529	35.5934	35.8310
	Geometric Mean			5.9088	5.9322	5.9718
	Antilog of Geometric Mean			811,000	855,000	937,000
	Amount of 72 Hour Increase				1.22	

Holding Period Before Packaging - 30 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 60 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				**Logarithms of Numbers**		
1	960,000	1,070,000	1,110,000	5.9823	6.0294	6.0453
2	1,660,000	1,790,000	1,870,000	6.2201	6.2529	6.2718
3	1,830,000	1,890,000	1,940,000	6.2625	6.2765	6.2878
4	2,350,000	2,410,000	2,440,000	6.3711	6.3820	6.3874
5	440,000	510,000	550,000	5.6435	5.7076	5.7404
6	560,000	620,000	670,000	5.7482	5.7924	5.8261
	Logarithmic Total			36.2277	36.4408	36.5588
	Geometric Mean			6.0380	6.0735	6.0931
	Antilog of Geometric Mean			1,090,000	1,190,000	1,240,000
	Amount of 72 Hour Increase				1.70	
120 Hour Display Samples						
1	2,660,000	2,720,000	2,750,000	6.4249	6.4346	6.4393
2	970,000	1,000,000	1,040,000	5.9868	6.0000	6.0170
3	1,600,000	1,660,000	1,710,000	6.2041	6.2201	6.2330
4	1,490,000	1,520,000	1,540,000	6.1732	6.1818	6.1875
5	1,820,000	2,090,000	2,180,000	6.2601	6.3201	6.3385
6	1,910,000	1,970,000	2,030,000	6.2810	6.2945	6.3075
	Logarithmic Total			37.3301	37.4511	37.5228
	Geometric Mean			6.2217	6.2419	6.2538
	Antilog of Geometric Mean			1,670,000	1,750,000	1,790,000
	Amount of 72 Hour Increase				2.49	

Beef, Sirloin Tip - Trial 2
Store 2

Holding Period Before Packaging - 25 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	930,000	1,050,000	1,120,000	5.9685	6.0212	6.0492
2	880,000	910,000	1,020,000	5.9445	5.9590	6.0086
3	13,300,000	16,100,000	19,000,000	7.1239	7.2068	7.2788
4	3,800,000	3,800,000	4,200,000	6.5798	6.5798	6.6232
5	520,000	550,000	590,000	5.7160	5.7404	5.7709
	Logarithmic Total			31.3327	31.5072	31.7307
	Geometric Mean			6.2665	6.3014	6.3461
	Antilog of Geometric Mean			1,850,000	2,000,000	2,220,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				302.11	
24 Hour Display Samples						
1	1,780,000	1,810,000	1,920,000	6.2504	6.2577	6.2833
2	2,400,000	2,480,000	2,670,000	6.3802	6.3945	6.4265
3	1,860,000	1,970,000	2,010,000	6.2695	6.2945	6.3032
4	4,100,000	4,700,000	4,900,000	6.6128	6.6721	6.6902
5	1,940,000	2,080,000	2,990,000	6.2878	6.3181	6.4757
	Logarithmic Total			31.8007	31.9369	32.1789
	Geometric Mean			6.3601	6.3874	6.4358
	Antilog of Geometric Mean			2,290,000	2,440,000	2,730,000
	Amount of 72 Hour Increase				1.22	

Beef, Sirloin Tip - Trial 2
Store 2

Holding Period Before Packaging - 25 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	7,500,000	7,900,000	8,700,000	6.8751	6.8976	6.9395
2	2,730,000	2,860,000	2,940,000	6.4362	6.4564	6.4683
3	9,000,000	9,400,000	9,800,000	6.9542	6.9731	6.9912
4	2,520,000	2,630,000	2,730,000	6.4014	6.4200	6.4362
5	1,340,000	1,470,000	1,580,000	6.1271	6.1673	6.1987
	Logarithmic Total			32.7940	32.9144	33.0339
	Geometric Mean			6.5588	6.5829	6.6068
	Antilog of Geometric Mean			3,620,000	3,830,000	4,040,000
	Amount of 72 Hour Increase				1.92	
72 Hour Display Samples						
1	240,000	2,420,000	2,510,000	6.3802	6.3838	6.3997
2	5,100,000	5,400,000	5,400,000	6.7076	6.7324	6.7324
3	4,300,000	6,600,000	7,400,000	6.7993	6.8195	6.8694
4	5,300,000	5,400,000	5,900,000	6.7243	6.7324	6.7709
5	16,700,000	17,200,000	18,800,000	7.2227	7.2355	7.2742
	Logarithmic Total			33.8341	33.9036	34.0466
	Geometric Mean			6.7668	6.7807	6.8093
	Antilog of Geometric Mean			5,850,000	6,040,000	6,450,000
	Amount of 72 Hour Increase				3.02	

Holding Period Before Packaging - 25 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	6,100,000	6,700,000	7,400,000	6.7853	6.8261	6.8692
2	5,800,000	6,300,000	6,500,000	6.7634	6.7993	6.8129
3	8,700,000	8,700,000	9,300,000	6.9395	6.9395	6.9685
4	7,900,000	8,000,000	8,100,000	6.8976	6.9031	6.9085
5	11,500,000	12,100,000	12,400,000	7.0607	7.0828	7.0934
	Logarithmic Total			34.4365	34.5508	34.6525
	Geometric Mean			6.8873	6.9102	6.9305
	Antilog of Geometric Mean			7,710,000	8,130,000	8,520,000
	Amount of 72 Hour Increase				4.07	
120 Hour Display Samples						
1	13,000,000	14,600,000	16,800,000	7.1139	7.1644	7.2253
2	9,600,000	10,600,000	12,600,000	6.9823	7.0253	7.1004
3	24,000,000	25,000,000	28,000,000	7.3802	7.3979	7.4472
4	33,000,000	39,000,000	41,000,000	7.5185	7.5911	7.6128
5	27,200,000	27,900,000	29,700,000	7.4346	7.4456	7.4728
	Logarithmic Total			36.4295	36.6243	36.8585
	Geometric Mean			7.2859	7.3249	7.3717
	Antilog of Geometric Mean			19,300,000	21,100,000	23,500,000
	Amount of 72 Hour Increase				10.55	

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	980,000	1,080,000	1,270,000	5.9912	6.0334	6.1038
2	480,000	570,000	670,000	5.6812	5.7559	5.8261
3	530,000	630,000	760,000	5.7243	5.7993	5.8808
4	570,000	640,000	790,000	5.7559	5.8062	5.8976
5	278,000	350,000	430,000	5.4440	5.5441	5.6335
6	7,100,000	8,000,000	9,500,000	6.8513	6.9031	6.9777
	Logarithmic Total			35.4479	35.8420	36.3195
	Geometric Mean			5.9079	5.9770	6.0533
	Antilog of Geometric Mean			809,000	948,000	1,130,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				143.20	
24 Hour Display Samples						
1	640,000	730,000	900,000	5.8062	5.8633	5.9542
2	1,100,000	1,270,000	1,390,000	6.0414	6.1038	6.1430
3	880,000	1,060,000	1,240,000	5.9445	6.0253	6.0934
4	6,700,000	7,800,000	8,400,000	6.8261	6.8921	6.9243
5	18,900,000	21,700,000	23,100,000	7.2765	7.3365	7.3636
6	580,000	630,000	710,000	5.7634	5.7993	5.8513
	Logarithmic Total			37.6581	38.0203	38.3298
	Geometric Mean			6.2763	6.3367	6.3883
	Antilog of Geometric Mean			1,890,000	2,170,000	2,440,000
	Amount of 72 Hour Increase				2.29	

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	620,000	680,000	750,000	5.7924	5.8325	5.8751
2	1,450,000	1,560,000	1,610,000	6.1614	6.1931	6.2068
3	2,900,000	3,300,000	3,700,000	6.4624	6.5185	6.5682
4	220,000	310,000	430,000	5.3424	5.4914	5.6335
5	34,000,000	39,000,000	41,000,000	7.5315	7.5911	7.6128
6	23,000,000	26,000,000	33,000,000	7.3617	7.4150	7.5185
	Logarithmic Total			38.6514	39.0416	39.4149
	Geometric Mean			6.4419	6.5069	6.5691
	Antilog of Geometric Mean			2,770,000	3,210,000	3,710,000
	Amount of 72 Hour Increase				3.39	
72 Hour Display Samples						
1	4,300,000	5,100,000	5,700,000	6.6335	6.7076	6.7559
2	5,900,000	6,700,000	7,400,000	6.7709	6.8261	6.8692
3	3,200,000	3,700,000	4,200,000	6.5051	6.5682	6.6232
4	4,900,000	5,600,000	6,500,000	6.6902	6.7482	6.8129
5	2,110,000	2,460,000	2,630,000	6.3243	6.3909	6.4200
6	670,000	740,000	810,000	5.8261	5.8692	5.9085
	Logarithmic Total			38.7501	39.1102	39.3897
	Geometric Mean			6.4583	6.5184	6.5649
	Antilog of Geometric Mean			2,870,000	3,300,000	3,670,000
	Amount of 72 Hour Increase				3.48	

Lamb, Loin - Trial 1
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 57 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	8,100,000	9,300,000	10,900,000	6.9085	6.9685	7.0374
2	4,200,000	4,600,000	5,100,000	6.6232	6.6628	6.7076
3	1,590,000	1,710,000	1,970,000	6.2014	6.2330	6.2945
4	7,000,000	33,000,000	36,000,000	6.8451	7.5185	7.5563
5	3,800,000	4,300,000	4,500,000	6.5798	6.6335	6.6532
6	6,400,000	6,900,000	7,300,000	6.8062	6.8388	6.8633
	Logarithmic Total			39.9642	40.8551	41.1123
	Geometric Mean			6.6607	6.8092	6.8520
	Antilog of Geometric Mean			4,580,000	6,440,000	7,110,000
	Amount of 72 Hour Increase				6.79	
120 Hour Display Samples						
1	7,800,000	9,300,000	10,700,000	6.8921	6.9685	7.0294
2	11,000,000	14,700,000	15,400,000	7.0414	7.1673	7.1875
3	23,100,000	25,400,000	27,300,000	7.3636	7.4048	7.4362
4	129,000,000	162,000,000	179,000,000	8.1106	8.2095	8.2529
5	88,000,000	108,000,000	136,000,000	7.9445	8.0334	8.1335
6	13,600,000	15,300,000	17,200,000	7.2041	7.3010	7.3222
	Logarithmic Total			44.5563	45.0845	45.3617
	Geometric Mean			7.4260	7.5141	7.5603
	Antilog of Geometric Mean			26,600,000	32,700,000	36,300,000
	Amount of 72 Hour Increase				34.49	

Lamb, Loin - Trial 2
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 61 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				Logarithms of Numbers		
1	39,000	49,000	57,000	4.5911	4.6902	4.7559
2	1,140,000	1,340,000	1,490,000	6.0569	6.1271	6.1732
3	30,000	42,000	44,000	4.4771	4.6232	4.6435
4	1,160,000	1,420,000	1,670,000	6.0645	6.1523	6.2227
5	89,000	114,000	141,000	4.9494	5.0569	5.1492
6	1,050,000	1,300,000	1,390,000	6.0212	6.1139	6.1430
	Logarithmic Total			32.1602	32.7636	33.0875
	Geometric Mean			5.3600	5.4606	5.5145
	Antilog of Geometric Mean			229,000	289,000	327,000
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				43.65	
24 Hour Samples						
1	274,000	290,000	310,000	5.4378	5.4624	5.4914
2	155,000	159,000	173,000	5.1903	5.2014	5.2380
3	176,000	182,000	198,000	5.2455	5.2601	5.2967
4	1,020,000	1,090,000	1,160,000	6.0086	6.0374	6.0645
5	970,000	990,000	1,080,000	5.9868	5.9956	6.0334
6	930,000	980,000	1,040,000	5.9685	5.9912	6.0170
	Logarithmic Total			33.8375	33.9481	34.1410
	Geometric Mean			5.6395	5.6580	5.6901
	Antilog of Geometric Mean			436,000	455,000	490,000
	Relative Position to Pork, Trial 1				1.57	

Lamb, Loin - Trial 2
Store 1

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 61 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				**Logarithms of Numbers**		
1	370,000	390,000	410,000	5.5682	5.5911	5.6128
2	860,000	940,000	1,040,000	5.9345	5.9731	6.0170
3	450,000	490,000	520,000	5.6532	5.6902	5.7160
4	1,040,000	1,120,000	1,290,000	6.0170	6.0492	6.1106
5	197,000	219,000	226,000	5.2945	5.3404	5.3541
6	270,000	300,000	320,000	5.4314	5.4771	5.5051
	Logarithmic Total			33.8988	34.1211	34.3156
	Geometric Mean			5.6498	5.6868	5.7192
	Antilog of Geometric Mean			447,000	486,000	524,000
	Amount of 72 Hour Increase				1.68	
72 Hour Display Samples						
1	2,680,000	2,700,000	3,000,000	6.4281	6.4314	6.4771
2	1,220,000	1,310,000	1,450,000	6.0864	6.1173	6.1614
3	1,100,000	1,180,000	1,210,000	6.0414	6.0719	6.0828
4	360,000	410,000	430,000	5.5563	5.6128	5.6335
5	2,960,000	4,300,000	5,600,000	6.4713	6.6335	6.7482
6	600,000	690,000	790,000	5.7782	5.8388	5.8976
	Logarithmic Total			36.3617	36.7057	37.0006
	Geometric Mean			6.0603	6.1176	6.1667
	Antilog of Geometric Mean			1,150,000	1,310,000	1,470,000
	Amount of 72 Hour Increase				4.53	

Holding Period Before Packaging - 20 Minutes - 33 deg. F.
Cutting and Packaging Temperature - 61 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	4,700,000	5,300,000	6,200,000	6.6721	6.7243	6.7924
2	10,600,000	11,300,000	11,800,000	7.0253	7.0531	7.0719
3	7,600,000	10,300,000	11,000,000	6.8808	7.0128	7.0414
4	9,700,000	10,100,000	10,600,000	6.9868	7.0043	7.0253
5	1,410,000	1,520,000	1,590,000	6.1492	6.1818	6.2014
6	17,100,000	21,300,000	22,800,000	7.2330	7.3284	7.3579
	Logarithmic Total			40.9472	41.3047	41.4903
	Geometric Mean			6.8245	6.8841	6.9150
	Antilog of Geometric Mean			6,680,000	7,660,000	8,220,000
	Amount of 72 Hour Increase				26.50	
120 Hour Display Samples						
1	14,900,000	15,400,000	15,800,000	7.1732	7.1875	7.1987
2	6,300,000	6,800,000	7,200,000	6.7993	6.8325	6.8573
3	11,100,000	11,700,000	12,900,000	7.0453	7.0682	7.1106
4	6,300,000	6,500,000	6,900,000	6.7993	6.8129	6.8388
5	9,700,000	10,900,000	11,400,000	6.9868	7.0374	7.0569
6	22,100,000	27,600,000	29,700,000	7.3444	7.4409	7.4728
	Logarithmic Total			42.1483	42.3794	42.5351
	Geometric Mean			7.0247	7.0632	7.0891
	Antilog of Geometric Mean			10,600,000	11,600,000	12,300,000
	Amount of 72 Hour Increase				40.14	

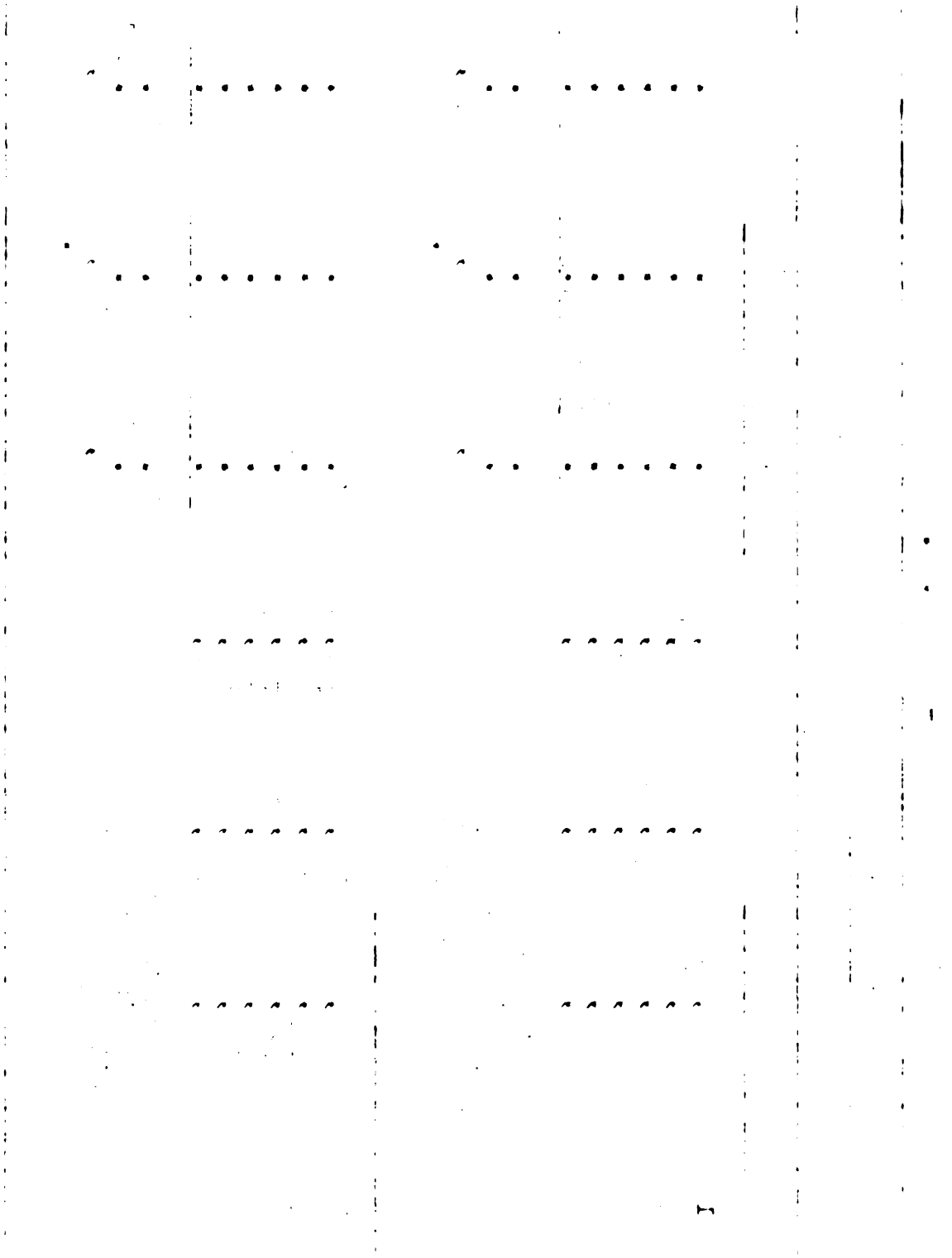
Holding Period Before Packaging - 20 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
Immediate Samples				**Logarithms of Numbers**		
1	27,000	36,000	41,000	4.4314	4.5563	4.6128
2	56,000	67,000	71,000	4.7482	4.8261	4.8513
3	31,000	40,000	46,000	4.4914	4.6021	4.6628
4	25,000	30,000	35,000	4.3979	4.4771	4.5441
5	33,000	37,000	45,000	4.5185	4.5682	4.6532
6	35,000	41,000	47,000	4.5441	4.6128	4.6721
	Logarithmic Total			27.1315	27.6426	27.9963
	Geometric Mean			4.5219	4.6071	4.6661
	Antilog of Geometric Mean			33,300	40,500	46,400
	Amount of 72 Hour Increase				1	
	Relative Position to Pork, Trial 1				6.12	
24 Hour Display Samples						
1	98,000	102,000	119,000	4.9912	5.0086	5.0755
2	63,000	67,000	74,000	4.7993	4.8261	4.8692
3	78,000	81,000	94,000	4.8921	4.9085	4.9731
4	31,000	38,000	42,000	4.4914	4.5798	4.6232
5	110,000	119,000	131,000	5.0414	5.0755	5.1173
6	60,000	70,000	115,000	4.7782	4.8451	5.0607
	Logarithmic Total			28.9936	29.2436	29.7190
	Geometric Mean			4.8323	4.8739	4.9532
	Antilog of Geometric Mean			68,000	74,800	89,800
	Amount of 72 Hour Increase				1.85	

Lamb, Loin - Trial 3
Store 1

Holding Period Before Packaging - 20 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
48 Hour Display Samples				Logarithms of Numbers		
1	245,000	270,000	284,000	5.3892	5.4314	5.4533
2	110,000	113,000	118,000	5.0414	5.0531	5.0719
3	49,000	50,000	54,000	4.6902	4.6990	4.7324
4	71,000	75,000	81,000	4.8513	4.8751	4.9085
5	67,000	69,000	73,000	4.8261	4.8388	4.8633
6	87,000	89,000	93,000	4.9395	4.9494	4.9685
	Logarithmic Total			29.7377	29.8468	29.9979
	Geometric Mean			4.9563	4.9745	4.9996
	Antilog of Geometric Mean			90,500	94,300	99,900
	Amount of 72 Hour Increase				2.33	
72 Hour Display Samples						
1	106,000	109,000	116,000	5.0253	5.0374	5.0645
2	126,000	136,000	147,000	5.1004	5.1335	5.1673
3	133,000	138,000	153,000	5.1239	5.1399	5.1847
4	111,000	119,000	124,000	5.0453	5.0755	5.0934
5	138,000	146,000	156,000	5.1399	5.1644	5.1931
6	96,000	107,000	110,000	4.9823	5.0294	5.0414
	Logarithmic Total			30.4171	30.5801	30.7444
	Geometric Mean			5.0615	5.0967	5.1241
	Antilog of Geometric Mean			117,000	125,000	133,000
	Amount of 72 Hour Increase				3.09	



Holding Period Before Packaging - 20 Minutes - 34 deg. F.
Cutting and Packaging Temperature - 55 deg. F.

Package Number	Incubation Periods 48 Hour Count	72 Hour Count	120 Hour Count	48 Hour Count	72 Hour Count	120 Hour Count
96 Hour Display Samples				Logarithms of Numbers		
1	220,000	260,000	340,000	5.3424	5.4150	5.5315
2	290,000	320,000	360,000	5.4624	5.5051	5.5563
3	240,000	280,000	350,000	5.3802	5.4472	5.5441
4	170,000	180,000	220,000	5.2304	5.2553	5.3424
5	150,000	170,000	200,000	5.1761	5.2304	5.3010
6	220,000	260,000	360,000	5.3424	5.4150	5.5560
	Logarithmic Total			31.9339	32.2680	32.7816
	Geometric Mean			5.3223	5.3780	5.4636
	Antilog of Geometric Mean			210,000	239,000	291,000
	Amount of 72 Hour Increase				5.90	
120 Hour Display Samples						
1	520,000	840,000	930,000	5.7160	5.9243	5.9685
2	450,000	840,000	910,000	5.6532	5.9243	5.9590
3	710,000	750,000	810,000	5.8513	5.8751	5.9085
4	480,000	590,000	640,000	5.6812	5.7709	5.8062
5	670,000	710,000	780,000	5.8261	5.8513	5.8921
6	900,000	980,000	1,020,000	5.9542	5.9912	6.0086
	Logarithmic Total			34.6820	35.3371	35.5429
	Geometric Mean			5.7803	5.8895	5.9238
	Antilog of Geometric Mean			603,000	775,000	839,000
	Amount of 72 Hour Increase				19.14	

APPENDIX B

Combined Pork - Trials 1, 2 and 3
Store 1

	Immediate Samples	24 Hour Display Samples	48 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	3.8211	4.1249	4.1819
72 Hour Count Geometric Mean, Trial 2	4.1149	4.0739	4.2017
72 Hour Count Geometric Mean, Trial 3	4.7364	4.8936	4.9598
Total of Geometric Means	12.6723	13.0924	13.3434
Mean of Geometric Means	4.2241	4.3641	4.4478
Antilog of Mean of Geometric Means	16,800	23,100	28,000
Relative Increase	1	1.38	1.67
Relative Position to Pork, Trial 1	2.54		

	72 Hour Display Samples	96 Hour Display Samples	120 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	4.5085	4.6182	5.9488
72 Hour Count Geometric Mean, Trial 2	4.2724	4.6102	4.6802
72 Hour Count Geometric Mean, Trial 3	5.1470	5.2589	5.9037
Total of Geometric Means	13.9279	14.4873	15.5327
Mean of Geometric Means	4.6426	4.8291	5.1776
Antilog of Mean of Geometric Means	43,900	67,500	151,000
Relative Increase	2.61	4.02	8.99

APPENDIX B - Continued

Combined Beef - Trials 1, 2 and 3
Store 1

	Immediate Samples	24 Hour Display Samples	48 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	5.8174	5.8450	5.8869
72 Hour Count Geometric Mean, Trial 2	5.1976	5.4837	5.6905
72 Hour Count Geometric Mean, Trial 3	5.0785	5.0801	5.1822
Total of Geometric Means	16.0935	16.4088	16.7596
Mean of Geometric Means	5.3645	5.4696	5.5865
Antilog of Mean of Geometric Means	232,000	295,000	386,000
Relative Increase	1	1.27	1.66
Relative Position to Pork, Trial 1	35.04		

	72 Hour Display Samples	96 Hour Display Samples	120 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	5.9187	5.9571	6.2980
72 Hour Count Geometric Mean, Trial 2	5.7946	6.0370	6.0866
72 Hour Count Geometric Mean, Trial 3	5.3203	5.5052	6.0016
Total of Geometric Means	17.0336	17.4993	18.3862
Mean of Geometric Means	5.6779	5.8331	6.1287
Antilog of Mean of Geometric Means	476,000	681,000	1,350,000
Relative Increase	2.05	2.94	5.82

APPENDIX B - Continued

Combined Beef - Trials 1 and 2
Store 2

	Immediate Samples	24 Hour Display Samples	48 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	6.3014	6.3874	6.5829
72 Hour Count Geometric Mean, Trial 2	5.8468	5.7676	5.8698
Total of Geometric Means	12.1482	12.1550	12.4527
Mean of Geometric Means	6.0741	6.0775	6.2264
Antilog of Mean of Geometric Means	1,190,000	1,200,000	1,680,000
Relative Increase	1	1.01	1.41
Relative Position to Pork, Trial 1	179.76		

	72 Hour Display Samples	96 Hour Display Samples	120 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	6.7807	6.9102	7.3249
72 Hour Count Geometric Mean, Trial 2	5.9322	6.0735	6.2419
Total of Geometric Means	12.7129	12.9837	13.5668
Mean of Geometric Means	6.3565	6.4919	6.7834
Antilog of Mean of Geometric Means	2,270,000	3,100,000	6,070,000
Relative Increase	1.91	2.61	5.10

APPENDIX B - Continued

Combined Lamb - Trials 1, 2 and 3
Store 1

	Immediate Samples	24 Hour Display Samples	48 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	5.9770	6.3367	6.5069
72 Hour Count Geometric Mean, Trial 2	5.4606	5.6580	5.6868
72 Hour Count Geometric Mean, Trial 3	4.6071	4.8739	4.9745
Total of Geometric Means	16.0447	16.8686	17.1682
Mean of Geometric Means	5.3482	5.6229	5.7227
Antilog of Mean of Geometric Means	223,000	420,000	528,000
Relative Increase	1	1.88	2.37
Relative Position to Pork, Trial 1	33.69		

	72 Hour Display Samples	96 Hour Display Samples	120 Hour Display Samples
72 Hour Count Geometric Mean, Trial 1	6.5184	6.8092	7.5141
72 Hour Count Geometric Mean, Trial 2	6.1176	6.8841	7.0632
72 Hour Count Geometric Mean, Trial 3	5.0967	5.3780	5.8895
Total of Geometric Means	17.7327	19.0713	20.4668
Mean of Geometric Means	5.9109	6.3571	6.8223
Antilog of Mean of Geometric Means	813,000	2,280,000	6,640,000
Relative Increase	3.65	10.22	29.78