

Mouse Selection Studies

I. T. Omtvedt and R. R. Frahm

Project 1405 was initiated in 1969 to measure the direct and correlated response to selection for preweaning and postweaning rate of gain in mice. Growth rate is of considerable economic importance in all types of livestock and it is highly desirable in a breeding program to select animals at the earliest age possible. This project is designed to obtain information relative to the basic genetic relationship between early and late growth periods in mice which will provide a basis of application to other species.

Four different lines of breeding were crossed to form the foundation population from which six selected lines of 20 litters each (three lines selected on basis of individual weaning weight and three lines selected on basis of individual growth rate from three to six weeks of age) were formed. An additional 40 litters are maintained as a random mating control line for measuring genetic changes in the selection lines. Since the project is just in the first generation of selection, no results are available at this time.

Meats

The Desirability of Pork Products Processed Prior to Chilling

R. L. Henrickson, I. T. Omtvedt, and Robert Clary

High temperature curing of porcine muscle appears to have practical value for the meat industry. Data are available which support the view that muscle processed prior to chilling has a greater water-holding capacity than muscle processed post-chill. Total moisture, press fluid, and free fluids in the can all cause one to review rapid processing of meat with renewed vision. Pre-chilled processed muscle tended to take up the cure more rapidly and provided a more stable cured tissue as evident by nitrosopigment content. Shear force values indicated that pre-chilled canned muscle is not as tender as post-chilled muscle. This may be a practical advantage since canned ham is often over heated resulting in

poor texture. It is difficult at this time to predict the significance of tenderness in canned ham since it has not been possible to establish the desired tenderness level for this product. Studies concerned with the size and condition of the muscle fiber did not reveal great differences due to the processing treatment. However, there was some fiber variation between muscles.

The science of heat transfer has important applications to processing, storing, and transporting of commercial cuts of meat and meat products. The geometry index and prepared nomograph can be used to quickly calculate cooling time and temperatures. The forced convection equation can be used as a general expression for computing the heat transfer coefficient.

The Eating Quality of Beef as Influenced by Age and Muscle Difference

R. L. Henrickson, S. G. Reddy and W. A. Gillis

The beef carcass is composed of over 200 individual muscles. Muscles of the hindquarter are generally tender and used for steak. However, numerous other muscles, particularly in the frontquarter, may have utility as steak. A more efficient utilization of the beef carcass would be wise, particularly now as beef must meet competition from other protein sources.

Methods have been employed for the excision of individual muscles. Fiber size and variation in the degree of rigor have been investigated. Other factors evaluated were myofibril size, sarcomere length, collagen, elastin, and muco-proteins. These investigations provided the following:

1. Muscles and/or muscle systems can be more easily extracted from the warm carcass than from one chilled.
2. Muscles within a carcass are under varied levels of tension depending upon its location within the carcass and the chilling position.
3. Fiber diameter of muscles under 1000 gram tension were smaller than those with no tension.
4. No significant change was noted in muscles with additional levels of tension.

5. Both muscles studied exhibited less rigor fibers when the muscle was under 1000 gram tension than with no tension.

6. Muscles and muscle fibers varied in their response to rigor mortis.

In a study concerned with muscle size, individual muscle fibers were measured. The nuclei parameters and the area served by each nuclei suggests the need for more extensive work. The sartorius muscle possessed the least number of nuclei per 100 micron of fiber length. They ranged from 1.5 to 6.9 per 100 micron with a mean of 4.0. Muscles fibers of greater diameter generally possess more nuclei.

Intramuscular Variation in the Electrophoretic Characteristics of Bovine Muscle Proteins

J. J. Guenther

In this study a quantitative comparison of the electrophoretic patterns of proteins extracted from bovine longissimus dorsi, semitendinosus, and infraspinatus muscles was made. Samples were obtained from calves slaughtered at 8 and 14 months of age. A total of 50 half-sib hereford calves were tested. Muscle samples were extracted with 0.1M PO_4 buffer, pH 7.0, centrifuged and filtered. Aliquots of the filtrates were electrophoresed on polyacrylamide gels against a Tris-Glycine buffer, pH 8.4, in a Canalco Model 12 unit. Protein fractions obtained were quantitated via a specially modified photovolt Densitometer. Data were tabulated as a percentage of the total protein fractionated.

A total of 13 aniodic protein fractions were obtained. Uniform characteristics of certain of these fractions permitted the partitioning of the fractions in groups as follows: $A_{1-2-3-4}$; $B_{1-2-3-4-5-6}$; C_{1-2} ; D_1 ; in order of increased electronegativity. Statistical analysis revealed a highly significant muscle difference, $P < .005$, in each of the 13 protein fractions. For the longissimus dorsi, 70% of the total protein components occurred in the A_1 through B_1 fractions and 30% occurred in the B_2 - D_1 fractions. The semitendinosus and infraspinatus muscles had 63 and 50 percent, respectively, of the total protein components in the A_1 - B_1 fractions and 37 and 50 percent, respectively, in the B_2 - D_1 fractions.

Purification of Bovin G-Actin and the Formation of Its Polymer

J. J. Guenther

Experimental material consisted of bovine longissimus dorsi muscle from which the myofibrillar protein, Myosin, had been previously extracted. Following a series of washings of this minced muscle residue with NaHCO_3 , distilled water, and n-butanol an acetone-dried muscle powder was obtained. Aliquots of the dried muscle powder were extracted with 2×10^{-4} M ATP solution. The resulting extract, which contained crude G-Actin, was clarified via high speed centrifugation (spinco model L, No. 30 rotor, 10,000 rpm., 60 min.). The G-Actin was then transformed into its polymer, F-Actin, by adding 2M KCl. After a series of washes with the ATP solution, each followed by ultracentrifugation (30,000 rpm. for 3 hours), purification was effected. G-Actin was recovered by depolymerizing the purified F-Actin. This was accomplished by dialyzing the F-Actin against aqueous ATP solution.

Sedimentation patterns obtained on the G-Actin preparation showed a single, sharp peak, indicating purity and molecular homogeneity. Chromatographic separation on Bio-Rad P-100 gel also suggested purity of the G-Actin preparation. Electropherograms, obtained on polyacrylamide gels, showed the G- and F-Actin preparations to consist of 9 and 8 electronegative components, respectively. Electrophoretically, G-Actin differed from its polymer only in that it contained an additional highly mobile, anionic component.

Beef Feeding

Improving the Nutritive Value of Milo for Fattening Beef Cattle

D. G. Wagner

Although milo and corn have quite similar chemical compositions, milo has only about 85 percent the feeding value of corn for fattening beef cattle. The lower efficiency appears to be due in part to a lower availability of the carbohydrate fraction in milo. It has now been demon-