V. A MICROSCOPIC STUDY OF BEEF TISSUES

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Certain muscles taken from cattle in various stages of growth and in different degrees of finish were used in making a microscopic study of the relative area occupied by the muscle fibers and other tissue; the density of the sarcoplasm within the sarcolemma; comparative thickness of the saracolemma and the connective tissues as well as the exact location of the fat.

The specimens for this study were taken from five selected animals after being slaughtered. The cattle were; one 1½ year old Angus heifer, one short fed steer of about the same age as the heifer, one 2-year-old steer that had been grain fed all his life, and one old cow and a three-months-onld calf.

Six skeletal muscles from different parts of the carcass were selected for microscopic study. They were selected because it was thought that they would reveal the structural characteristics of the skeletal structure as a whole. Muscles which enter into a great deal of activity were chosen as well as muscles which were comparatively inactive. These features with the carcass characteristics were borne in mind as the muscular structure was studied and comparisons made.

The muscles chosen were adductor, biceps femoris, psoas major, longissmus dorsi, triceps brachii, and the common digital extensor.

The muscles were located and samples removed from each in the same location as nearly as could be reckoned. The samples of muscles which were about 5 mm. square were cut out and handled in such a way as to avoid disarrangement of the tissue structure. In collecting these samples, none of the deep fascia, tendons or aponeuroses were included within the section.

Two sets of slides were prepared from each muscle. One was to show the location and relative amounts of fats with other tissues, and the other set was to display among other things the relative area occupied by muscle fibers and other tissues as well as density of substance. The sections for the first were treated with Fleming's solution and cut in longitudinal sections and sections for the second were cut cross section with the fibers and stained in hematoxylin followed by eosin.

Two adjoining samples of each of the muscles were taken. One of them was placed in Fleming's Fluid while the other was dropped into formalin solution. The sections were finally blocked

in paralodion and the sectioning was done with a microtome. The cut sections measured 10 microns in thickness and were mounted on slides.

Comparison of Muscles in Each Individual

The microscopic study of the various muscles of each animal shows variations. The fat as mentioned here will refer only to intramuscular fat and the connective tissues mentioned is only that found within the muscle belly.

In the heifer there was no difference in the size of the fiber of the the fore quarter. There was no fat found in the sections from the fore shank and there was more in the shoulder than in the rib muscle. The loin had the smallest fiber and the greater intercellualar space. The fat was more equally distributed between the endomysium and the perimysium than any of the muscles. The largest fibers were in the round larger fat areas between the fiber and fasciculi of the biceps femoris.

The shoulder of the short fed steer had extensive fatty formation. There was plenty of fat in the perimysium but very little in the endomysium. The densest sarcoplasm was in the fore shank. The loin had the most uniform muscle fiber and the greatest intercellular space. There was more fat and it was more evenly distributed. The muscles of the round had fibers similar in size but varied in uniformity. The outside of the round contained more fat than the inside muscles.

In the prime steer was found more nearly ideal fat distribution. The two muscles of the round had fibers similar in size and uniformity. The adductor muscle had a little more evenly distributed fat but the biceps femoris contained the greatest amount of fat around the fasciculi. The loin had the greatest amount of space between fibers, the smallest fiber and the greatest amount of fat. The fat had become so prevalent as to cause fatty degeneration of the muscle cells. The longissmus dorsi was of a closer structure and had a larger fiber than was in the loin. It contained much less intramuscular fat. The fibers were denser in the shoulder but the perimysium was no thicker. The fat between the fasciculi was not as evenly distributed. The muscles of the shank had no larger fiber than the muscle of the shoulder but it was much denser and contained much less intramuscular fat.

The muscles of the cow were very dark and contained thick connective tissue. The sarcoplasm was all granular in appearance, some fibers having a denser sarcoplasm than others.

No intrafascicular, intercellular fat was found in any of the

sections and only a very small amount of interfascicular fat was found in some of the other sections. Some fat was seen in chain-like formation while in other places the fat cells were sparsely situated.

No fat was found in the digital extensor. The greatest amount of fat was found in the psoas major and the longissimus dorsi but it was not evenly distributed.

The digital extensior muscle had the largest fibers, more dense white fiborous tissue and less fat than any of the six muscles that were stained. The psoas major was the opposite. It had the smallest fiber, as much fat, and fat more evenly distributed. The psoas major also had a difference in the density of its sarcoplasm.

There was greater variation in the muscle fibers of the calf than in any of the other animals. The variation was in the size as well as the density of the celluar substances. These variations were very plainly brought out in one muscle. A peculiar thing about the muscles of the calf was the fact that osmic stain did not show the presence of fat cells in but two of the muscles.

The adiposity of the calf was not discussed in above paragraph because free fat did not bring out the quantity of stainable fat.