

## Growth- and breed-related changes of muscle bundle structure in cattle<sup>1</sup>

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The objective of this study was to investigate the changes in muscle fiber bundles of cattle of different breeds during growth. Different numbers of muscle fibers are surrounded by connective tissue to form bundles macroscopically visible as meat fibers or meat grain, a common meat quality trait. To determine the influence of breed and age on morphological characteristics of muscle fiber bundles, 4 cattle breeds with different growth impetus and muscularity were reared and slaughtered under experimental conditions. German Angus, a typical beef cattle; Galloway, a smaller beef type; Holstein Friesian, a dairy type; and double-muscling Belgian Blue, an extreme type for muscle growth, were used. Between 5 and 15 bulls of each breed were slaughtered at 2, 4, 6, 12, or 24 mo of age, and slices of semitendinosus muscle were removed. Muscle structure characteristics were determined by computerized image analysis. During growth, the muscle cross-sectional area enlarged ( $P < 0.001$ ) about 5-fold in double-muscling Belgian Blue bulls and about 4-fold in the other breeds. This was a result of the enlargement ( $P < 0.001$ ) of primary bundles and muscle fibers. The bundle size was similar ( $P \geq 0.15$ ) in bulls of German Angus and Galloway in all age groups and was doubled ( $P < 0.001$ ) in double-muscling Belgian Blue animals from 4 mo of age on. The Holstein Friesian bulls had the smallest ( $P < 0.001$ ) muscle fiber bundles at 24 mo of age. The number of muscle fibers per bundle and the number of bundles per muscle remained nearly constant ( $P > 0.05$ ) during growth. This supports the existing view that the structure of the muscle is already fixed in prenatal life. The double-muscling Belgian Blue bulls showed a more than 2.5-fold greater ( $P < 0.001$ ) number of muscle fibers per primary bundle compared with the other breeds investigated. The larger muscle fiber bundles led to a smaller amount of connective tissue per muscle area in double-muscling cattle. The coarser grain of meat in double-muscling Belgian Blue bulls and in older animals was not related to greater shear force values.

**Key Words:** breed • cattle • growth • meat quality • muscle fiber • primary bundle