

GROWTH AND DEVELOPMENT SYMPOSIUM

Manipulation of Embryonic and Fetal Development: Relationships to Postnatal Growth

15 Environmental and genetic factors as source of variation in skeletal muscle fiber number. C. Rehfeldt*, I. Fiedler, L. Buenger, and R. Schadereit, *Research Institute for Biology of Farm Animals, Dummerstorf, Germany.*

Number of muscle fibers within skeletal muscle is of high importance for the growth capacity of the muscle and/or the predisposition of meat quality. To determine environmental and genetic influences on muscle fiber number, a series of studies were conducted on laboratory mice, rats, chickens, pigs and cattle. During normal postnatal life, increases in muscle fiber number (MFN) were found only shortly after birth in mice, rats and pigs. Thereafter, MFN remained unchanged under normal conditions of feeding and housing. Feed restriction in mice or rats during intense postnatal growth (40% of *ad lib* for 3 or 2 weeks, respectively) did not lower EDL (*M extensor digitorum longus*) fiber number. Stimulation of muscle growth by clenbuterol during postnatal growth in rats (EDL) or chicken (*M extensor hallucis longus*) was achieved by increases in muscle fiber size but not in number. Consistently, administration of porcine somatotropin (pST) to growing-finishing pigs did not alter *longissimus* muscle fiber number. On the other hand MFN in *rectus femoris* was significantly increased (by 12%) in mice after 3 weeks endurance exercise on a treadmill. Increased MFN also was obtained in response to long-term selection of mice for high body weight, or an index including body weight and endurance fitness, but not in genetic lines selected for high carcass protein accretion. Sex-related differences were associated with higher muscle fiber numbers in males in broiler chickens, cattle, rats, but not in pigs. In two sequential experiments, MFN in the *semitendinosus* was increased ($p < 0.05$) in newborn piglets when their mothers had been treated daily with 6 mg pST from day 10 to 24/27 of gestation. Results enable the suggestion that skeletal muscle fiber number is mainly determined by genetics and by environmental conditions during prenatal development.

Key Words: Skeletal muscle, Muscle fiber number