Many different repetition schemes can induce muscular hypertrophy. However, a moderate repetition scheme (approximately 8–10 repetitions per set) provides the greatest potential for muscular growth. Moderate repetitions allow for the use of reasonably heavy weights, a prerequisite for optimal stimulation of muscle fibers. If the weights used are too light to stimulate available fibers optimally, hypertrophy will be suboptimal. This approach excludes high-repetition schemes and leaves either moderate- or low-repetition schemes as the best alternatives for maximizing hypertrophy.

Moderate-repetition schemes have a major advantage over those that advocate low numbers of repetitions in that the glycolytic energy system is the primary source for fuel (low numbers of repetitions are fueled predominantly by the phosphocreatine system). The energy pathway is significant because of the way lactate is handled. Lactate is a by-product of glycolysis and produces several anabolic effects. It potentiates the release of growth hormone, which in turn acts as a mediator of insulin-like growth factor 1 (IGF-1). Local IGF-1 expression is one of the primary hypertrophic stimulators that act through a proliferation of satellite cells and increased muscle protein synthesis. Local IGF-1 acts in both an autocrine/paracrine and an endocrine mode. The autocrine/paracrine isoform is called mechano-growth factor and is activated only by mechanical stimuli. However, the endocrine isoform is similar to hepatic IGF-1 and therefore is mediated by growth hormone (gH). It is likely that gH significantly increases intramuscular IGF-1 levels and thereby increases muscle protein synthesis.

There is some evidence that gH has a more direct effect on muscle mass. In birds, gH elicits satellite cell proliferation in an IGF-independent manner. Because satellite cells are an essential component of the hypertrophic response, this proliferation is significant. In rats, gH induces substantial hypertrophy of type II lower limb fibers. Similar results have been obtained in dogs, with hypertrophy of both type I and type II fibers. Although a clear link between exercise-induced gH levels and hypertrophy has not been established, a link probably exists.

More importantly, training with moderate repetition helps to increase cellular hydration. The combination of a muscle pump and lactate formation causes a concentration gradient that pulls water into the muscle cell. Cell swelling may augment hypertrophy. Simply put, when a cell becomes hydrated, it perceives the increased volumization as a threat to its integrity and responds by growing larger. Cellular hydration may increase protein synthesis and decrease proteolysis; these processes combined are essential for muscular growth. Because fast-twitch fibers (those with the greatest potential for growth) contain a water transport protein called aquaporin 4, they appear to be the primary beneficiaries of this hydration effect. ▲

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