Kadi, F. The effects of heavy resistance training and detraining on satellite cells in human skeletal muscles / F. Kadi, P. Schjerling, L.L. Andersen, N. Charifi, J.L. Madsen, L.R. Christensen, J.L. Andersen // J. Physiol., 2004.– Vol. 558.– №3, pp. 1005–1012.

Эффект силовой тренировки и прекращения тренировки на клетки-сателлиты в скелетных мышцах человека

ABSTRACT

Целью данного исследования было изучение изменения содержания клеток-сателлитов и количества миоядер после 30 и 90 дней тренировок с отягощениями и 3, 10, 30, 60 и 90 дней после прекращения тренировки. Биопсия была взята из латеральной широкой мышцы бедра 15 молодых людей (средний возраст: 24 года; диапазон: 20-32 лет). Клетки-сателлиты и миоядра изучали на сечениях мышечных волокон, окрашенных моноклональным антителом CD56 и контрастным окрашиванием гематоксилином Майера. Маркеры клеточного цикла CyclinD1 и уровень p21 иРНК определялся Northern blotting. Содержание клеток-сателлитов увеличилось на 19% (p = 0,02) в течение 30 дней и на 31% (p = 0,0003) в течение 90 дней тренировки. По сравнению с исходным уровнем до тренировки, количество клеток-сателлитов оставались значительно выше через 3, 10 и 60 дней после прекращения тренировки. К 90 дню прекращения тренировки оно достигло исходного уровня. Уровень двух маркеров клеточного цикла CyclinD1 и p21 мРНК, значительно вырос через 30 дней тренировки. На 90 день, p21 был еще повышенным, тогда как CyclinD1 вернулся к значениям до тренировки. В период прекращения тренировки, p21 и уровень CyclinD1 были близки к значениям до тренировки. Там не было никаких существенных изменений в количестве миоядер во время тренировки и периода прекращения тренировки. Площадь мышечного волокна, контролируемая одним миоядром, постепенно увеличивалась в течение всего периода тренировки и вернулась к исходному уровню в период прекращения тренировки. В заключение, эти результаты

демонстрируют высокую пластичность клеток-сателлитов в ответ на тренировку и прекращение тренировки и ясно показывают, что умеренные изменения в размере скелетных мышечных волокон могут быть достигнуты без добавления новых миоядер.

The aim of this study was to investigate the modulation of satellite cell content and myonuclear number following 30 and90 days of resistance training and 3, 10, 30, 60 and 90 days of detraining. Muscle biopsies were obtained from the vastus lateralis of 15 young men (mean age: 24 years; range: 20–32 years). Satellite cells and myonuclei were studied on muscle crosssections stained with a monoclonal antibody against CD56 and counterstained with Mayer's haematoxylin. Cell cyclemarkers CyclinD1 and p21 mRNA levels were determined by Northern blotting. Satellite cell content increased by 19% (P=0.02) at 30 days and by 31% (P=0.0003) at 90 days of training. Compared to pre-training values, the number of satellite cells remained significantly elevated at 3, 10 and 60 days but not at 90 days of detraining. The two cell cycle markers CyclinD1 and p21 mRNA significantly increased at 30 days of training. At 90 days of training, p21 was still elevated whereas CyclinD1 returned to pre-training values. In the detraining period, p21 and CyclinD1 levels were similar to the pre-training values. There were no significant alterations in the number of myonuclei following the training and the detraining periods. The fibre area controlled by each myonucleus gradually increased throughout the training period and returned to pre-training values during detraining. In conclusion, these results demonstrate the high plasticity of satellite cells in response to training and detraining stimuli and clearly show that moderate changes in the size of skeletal muscle fibres can be achieved without the addition of new myonuclei.

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