Effect of testosterone on muscle mass and muscle protein synthesis

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We have studied the effect of a pharmacological dose of testosterone enanthe (3 mg.kg-1.wk-1 for 12 wk) on muscle mass and total-body potassium and on whole-body and muscle protein synthesis in normal male subjects. Muscle mass estimated by creatinine excretion increased in all nine subjects (20% mean increase, P less than 0.02); total body potassium mass estimated by 40K counting increased in all subjects (12% mean increase, P less than 0.0001). In four subjects, a primed continuous infusion protocol with L-[1-13C]leucine was used to determine whole-body leucine flux and oxidation. Whole-body protein synthesis was estimated from nonoxidative flux. Muscle protein synthesis rate was determined by measuring [13C]leucine incorporation into muscle samples obtained by needle biopsy. Testosterone increased muscle protein synthesis in all subjects (27% mean increase, P less than 0.05). Leucine oxidation decreased slightly (17% mean decrease, P less than 0.01), but whole-body protein synthesis did not change significantly. Muscle morphometry showed no significant increase in muscle fiber diameter. These studies suggest that testosterone increases muscle mass by increasing muscle protein synthesis.