**PROJECT REVIEW**

## *"Implications of RNA-seq in the detection of anabolic steroid use and harnessing of the molecular mechanism of muscle memory"*

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The variable effects of anabolic androgenic steroids (AAS) on increasing skeletal muscle mass and strength has been well documented, as is the misuse of AAS in sport. Recent evidence suggest either a long- or short-term exposure to AAS might have a sustained effect on muscle morphological changes, for example, with increased muscle mass, capillary per fibre, muscle fibre size and myonuclei density, leading to improved performance. A positive correlation between the number of myonuclei and training response following exposure to AAS in a mouse model seems to suggest a link between the formation of extra myonuclei and the extent of "muscle memory"; an idea that requires further investigation in humans.

Strength training can also increase the number of nuclei in muscle fibres. Adaptations in muscle mass by strength training are significantly enhanced in previously trained individuals despite a prolonged detraining period. Given the persistence of muscle nuclei, the use of AAS combined with training will have a greater impact on muscle hypertrophy than either training or steroid use alone. To detect the long-term effect of AAS and training (even after drugs are no longer detectable in the human system), abnormal changes in skeletal muscle morphology illustrated by specific gene markers in response to the stimuli exist and will allow these molecular signals to be picked up by modern gene screening methods. In the proposed project, gene expression profiling of skeletal muscle in response to AAS exposure will be carried out using total RNA-seq. The molecular, histological and training response markers will be integrated for the detection of short- and long-term effects of AAS and will be incorporated into the steroid module of the Athlete Biological Passport for improved validity and reliability.