
E98 Anabolic Androgenic Steroids Abuse: New Molecular Biomarkers

Francesco Sessa, MS, Department of Forensic Pathology, University of Foggia, Foggia 71100, ITALY; Monica Salerno, MD, PhD, Department of Forensic Pathology, Foggia 71121, ITALY; Pietrantonio Ricci, MD, PhD, Department of Clinical and Experimental Medicine, Foggia 71100, ITALY; Cristoforo Pomara, MD, PhD, Catania, ITALY*

Learning Overview: After attending this presentation, attendees will have a better understanding of Anabolic Androgenic Steroids (AASs) assumptions, side effects, organ damages, and MicroRNAs (miRNAs) dysregulation. The first results obtained on this research hypothesis will be presented.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by providing a systematic review and meta-analysis on the miRNA dysregulation linked to the adverse effects of AASs use/abuse. This review also aims to suggest a new study hypothesis on the role of miRNAs as new molecular biomarkers of AASs use/abuse.

Currently, even if AASs abuse is clearly associated with a wide spectrum of side effects, frequently adolescents and athletes use a large group of synthetic derivatives of testosterone, both for aesthetic uses and for improving performances.

Nandrolone, testosterone, stanozolol, methandienone, and methenolone are the most frequently abused androgens and account for a major fraction of androgen abuse. One common factor between detecting each of these performance-enhancing drugs is that the traditional methods of drug testing were taken at a single point in time. An enhanced method of detection has been required to counter the increasingly sophisticated doping regimens and the ongoing development of new substances. For these reasons, the identification of new molecular biomarkers remains an ambitious target for the scientific community.

In the past few years, the development of microRNA (miRNA) technologies has become an essential part of research projects. Their role as potential molecular biomarkers is frequently investigated by the scientific community. The principal application of miRNA dosage is the characterization of cancer; moreover, miRNAs are frequently investigated as prognostic biomarkers, evaluating the disease evolution. More evidence suggests that miRNAs are deregulated in viral infections, nervous system disorders, cardiovascular disorders, muscular disorders, diabetes, and other diseases.

The research hypothesis of this presentation is a direct implication among drugs assumption, side effects, organ damages, and miRNAs dysregulation, with the goal of finding a direct link between AASs use/abuse and miRNA dysregulation. Moreover, with this proposal, the results obtained with the experimental model used will be presented.

Databases from 2000 to June 2017, including Medline®, Cochrane Central, Scopus®, Web of Science, Science Direct®, EMBASE, and Google® Scholar, were searched using the following keywords: miRNA, anabolic androgenic steroid, side/adverse effects, organs and systems (Cardiovascular system, reproductive system, central nervous system, liver, kidney, and skin). The main keywords were individually searched in association to each of the others.

Due to reviewing and analyzing each adverse effect caused by AASs use/abuse, a selection of miRNA signatures was performed. For example, a pivotal role on the activity of the cardiovascular system was played by myo-miRNAs; the up/under-expression could be important to generate adverse effects after AASs assumption. Following the research proposal, the dysregulation of the expression profiles of these miRNAs could suggest a direct action on tissues. Moreover, the same miRNAs could become the signatures of AASs abuse. Due to Real-Time Polymerase Chain Reaction (RT-PCR) technique, the miRNAs expression levels were evaluated on autopsy samples of young male deaths with toxicological positive tests for anabolic agents.

In conclusion, the identification of new tools for AASs use/abuse represents an important challenge for the scientific community. In the past few years, several studies highlighted the role of miRNAs as a highly accurate diagnostic tool. Moreover, miRNAs in serum are stable at room temperature and are resistant to freeze-thaw cycles; these characteristics highlight the important role of miRNAs in the future as new tools for the anti-doping war.

Knowledge regarding miRNA in human diseases related to AASs use/abuse may eventually lead to serum or tissue biomarkers with anti-doping utility. In this regard, there are major challenges, such as the need for careful validation of diagnostic miRNA candidates in well-annotated toxicological studies. The rapid progress in anti-doping technologies using miRNA-based strategies for discovered the drugs of abuse, such as AASs use/abuse, allow optimism for new approach definitions based on existing and emerging knowledge.

Anabolic Androgenic Steroids (AAS), miRNA, Adverse Effect