

PANEL 1

Modern Studies in the Sphere of Natural Sciences

(DNU, Zoom)

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THE USE OF ANABOLIC STEROID DRUGS IN SPORTS AND EVERYDAY LIFE

The problem of steroids is extremely relevant in the modern world, as it is evidenced by the publications of the recent years. For example, in the Web of Science Core Collection database from the beginning of the year 2023 to March 9, 2023, 809 references were found, and during the year 2022, 10,509 records were found. Among them 1,851 publications are review articles. Statistics by fields of research for 2022-2023 are shown in Fig. 1.

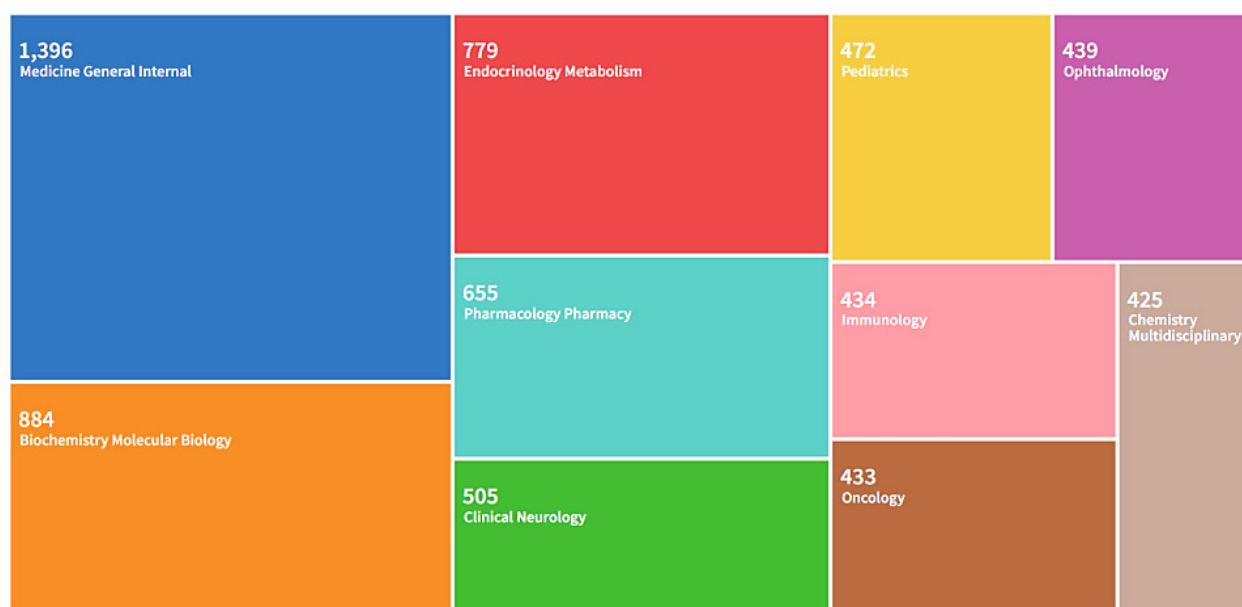


Fig. 1 – Statistics by fields of research for 2022-2023

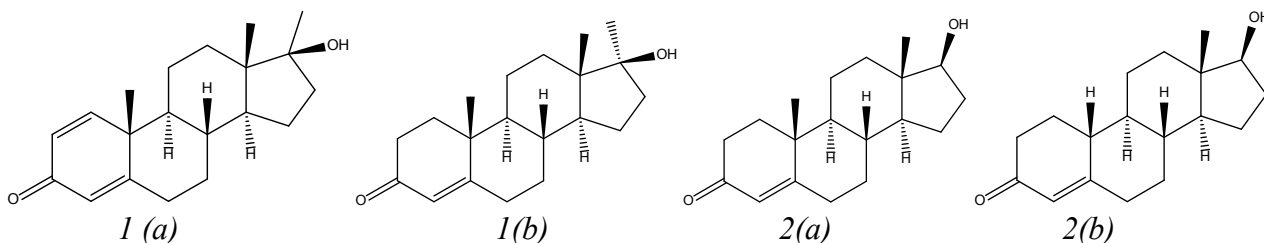
We were interested in the problem of anabolic steroids, which is also widely researched, in particular, in WOS during 2022-2023, 271 papers were devoted to

this problem, which presented research in such fields as analytical chemistry, pharmacology pharmacy, general and internal medicine, biochemical research methods, paying special attention to endocrinology metabolism, biochemistry and molecular biology, sports sciences.

Accurate, simple and rapid determination of anabolic androgenic steroids (AAS) is increasingly appearing at the forefront of scientific and social interest, not only because this group of substances is abused by athletes to gain a competitive advantage, but also because the fact of their abuse is generally accepted [1]. People are always looking for the easiest ways to achieve their goals. AAS consumers are usually united by the desire for an ideal figure, confident behavior and a better social status. However, they often ignore the possible adverse consequences and the seriousness of their actions, and even if they know about them, they are willing to take risks. These include possible behavioral changes, anxiety, increased aggressiveness, hepatotoxicity, cardiotoxicity, abnormalities of the reproductive system etc. It is also worth noting that, on the other hand, AAS have therapeutic potential and cannot be easily replaced by other drugs in a number of conditions, such as wasting syndrome, severe burns, muscle and bone damage, anemia, and hereditary angioedema [1] The problem of the use of doping is gaining more and more scope [3], there is also the problem of the use of anabolic androgenic steroids by manufacturers as undeclared ingredients in dietary supplements. Chemical means that contribute to the growth of muscle mass and rapid recovery of the body are being improved, however, in contrast to this process, the methods of determining AAS in various objects are being upgraded as well. The development of fast, portable and sensitive methods for determining AAS has become the subject-matter of the majority of recent research.

Standard methods, commonly used for the determination of AAS, include liquid and gas chromatography combined with mass spectrometry. Currently the scientific focus has shifted to the development of new, tailored approaches leading to cost-effective, routine and portable methods for the determination of AAS in various matrices, such as biological fluids, food additives, meat, water or other environmental components [1]. Automated online methods of preparing dry blood

samples for screening and quantitative analysis of esters of anabolic steroids and methods of combined analysis are considered in modern studies [2, 5]. The authors [6] optimized the conditions of chromatography and mass spectrometry for the simultaneous detection of 93 anabolic steroids in solid and liquid food supplements.



*Fig. 2 – Common oral and injectable AAS:
1–17-alpha alkylated steroids (a – Methandrostenolon; b – Methyltestosteronum),
2–17-derivatives of beta-esters (a – Testosterone; b – Nandrolon)*

What are the positive effects of steroids on the body?

The positive effects include: anabolic (increase and strengthening of muscle tissue), anti-catabolic (quick recovery of the body due to a decrease in the proportion of lost protein), energetic (alleviation of fatigue due to energy accumulation, influx of strength and wine).

What are the negative effects of steroids on the body?

Anabolic steroids, according to Swedish studies [4], disrupt the action of the pituitary gland and thyroid gland, which is associated with the inhibition of the gonadal regulatory apparatus and the conversion of testosterone into estrogens (aromatization). This leads to hormonal disruptions and is accompanied by mental disorders (aggressiveness and irritability, a decrease in self-control), baldness, or, on the contrary, hairiness, obesity, a decrease in the tone of voice, and the appearance of acne. The use of AAS can cause such psychiatric symptoms as insomnia, anxiety and increased aggressiveness.

Also, anabolic steroids have a hepatotoxic effect, which can lead to the damage of kidneys and the appearance of gastrointestinal disorders.

Thus, anabolic steroid drugs should not be used by athletes, moreover – by people who are not professionals in sports. Only physical labor and strong will of a person can change his athletic performance for the better.

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PROACTIVE WAYS TO STRUGGLE WITH GLOBAL WARMING

As humanity uses more and more energy in its daily activities, it converts it from active forms to thermal ones, polluting the environment with heat and increasing the average global temperature [4]. Both active and passive measures are used to address the problem of global warming, but most often it is a matter of reducing energy consumption and switching to energy-saving technologies. Such options are reminiscent of the «technology of combating food shortages» by reducing its consumption. In essence, the problem is not to reduce the amount of energy consumed, but to maintain a constant temperature, which is possible in the balance of incoming energy and energy released into outer space [2, p. 426-428]. Therefore, as the supply of energy increases, it is necessary to consider options for its transmission into space. One solution is suggested by nature itself. In a calm atmosphere, heat is transferred by diffusion, and it takes a certain amount of time for