

Steroids as hormones, drugs, contraceptives and doping

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Steroids are cyclic hydrocarbons with a typical sterane (cyclopentanoperhydrophenanthrene) skeleton. They belong to “ancient structures”, used in the nature in both plant and animal kingdom. Only in higher organisms they function also as hormones. Their main classes are glucocorticoids, mineralocorticoids, male and female sex hormones and biologically active metabolites of vitamin D. Their biosynthesis proceeds in mitochondria and their common precursor is cholesterol. The main sites of their formation are adrenocortex (corticoids), male and female gonads (sex hormones) but steroid hormones are formed and metabolised in a number of other organs and cells, of which the most remarkable are brain structures and gastrointestinal tract. Biologically active metabolites of vitamin D are formed by light exposure from endogenous dehydrocholesterol or ergosterol from food. Their major effects consist in regulation of metabolism, first of all glycoregulation, maintaining mineral homeostasis and driving of somatosexual development and reproduction. As regulators of physiological processes they act on the level of gene expression (genomic effects). Since the end of World War 2, they are broadly utilized in treatment: glucocorticoids for their immunomodulatory and immunosuppressive, antiinflammatory and antiallergic properties, androgens and estrogens for treatment of reproduction disorders. Let us mention here also the beneficial effects of vitamin D supplementation in the light of COVID-19 pandemic. The introduction of progestins and estrogens caused a revolution in a female contraception. At present there exist hundreds synthetic steroids and derivatives, analogues of natural hormones, differing in their chemical structure, persistence in the organism, metabolism and manifold effects, for which they are utilized in various areas of medicine. Roughly since sixties (Olympic games in Tokio, 1964), the analogues of sex steroids, androgens and estrogens have been abused as banned supporting means (doping) in the top-level sport, especially in strength disciplines. The fight against doping belongs to a permanent challenge for physicians and analysts.