AJMB
Avicenna Journal of Medical Biochemistry
Avicenna J Med Biochem, 2022; 10(1):82-83. doi:10.34172/ajmb.2022.11
http://ajmb.umsha.ac.ir

Letter to the Editor

Increasing the Testosterone Secretion From the Adrenal Glands in Male Transgenders Using Magnetic Nanoparticles

Yara Elahi[1], Ramin Mazaheri Nezhad Fard[2,3*]

[1]Department of Genetics, Faculty of Life Sciences, Islamic Azad University, Tehran North Branch, Tehran, Iran
[2]Department of Pathobiology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[3]Food Microbiology Research Center, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

***Corresponding author:** Ramin Mazaheri Nezhad Fard, Associate Professor of Medical Bacteriology, Senior Fellow in Microbial Genetics; Department of Pathobiology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran. Tel: +98-21-42933208, Email: raminmazaheri@gmail.com

Received: 14 Dec. 2021 **Revised:** 5 Feb. 2022 **Accepted:** 6 Feb. 2022 **ePublished:** 25 June 2022

Please cite this article as follows: Elahi Y, Mazaheri Nezhad Fard R. Increasing the testosterone secretion from the adrenal glands in male transgenders using magnetic nanoparticles. Avicenna J Med Biochem. 2022; 10(1):82-83. doi:10.34172/ajmb.2022.11

Dear Editor,

Testosterone is an essential male sex hormone that is responsible for the development of male fertility and male characteristics such as deep voice, facial hair growth, and increased muscle mass. This hormone is produced and secreted in small quantities in women. In addition to genitals in men and women, adrenal glands secrete small quantities of testosterone. Male transgenders always need prescribed testosterone to maintain their health and develop muscles. Magnetic nanoparticles (MNPs) are a group of nanoparticles that can be monitored using magnetic fields. These particles are usually composed of two various components, a magnetic substance such as iron, nickel, and cobalt and a functional chemical component. Based on recent studies on MNPs and their use as stimulants for the production of essential hormones from adrenal glands, nanoparticles can be used to produce and secrete desired quantities of testosterone at regular intervals in the body of these people.

Testosterone is an essential hormone for the growth and sexual functions of men. This hormone is secreted from testicles in men and ovaries in women. Furthermore, humans have two adrenal glands located above the kidneys with an average weight of 4–5 g in adults, which secrete low concentrations of testosterone in the two sexes. The adrenal glands in women produce nearly 25% or 50–75 µg of testosterone per day (1). Since the uterus and ovaries in male transgenders are removed during surgeries, testosterone production and secretion decrease. To prevent menopausal complications and to develop male characteristics, male transgenders must receive certain concentrations of testosterone at regular intervals. For this purpose, testosterone enanthate is often administered through intramuscular injections every 2–3 weeks depending on the individual condition. Zona reticularis (innermost layer of the adrenal cortex) produces androgens and plays role in the development of secondary sexual characteristics. Dehydroepiandrosterone is the primary androgen produced in the zona reticularis and it is a precursor for the synthesis of other hormones such as testosterone (2). MNPs or nanomaterials with magnetic properties have wide uses in several fields such as biology, medicine, and engineering. Recently, MNPs have been popular in medicine (3). Due to the various uses of MNPs in medicine and drug delivery to specific organs at precise times in specific locations of the body (4), MNPs have been suggested to increase the secretion of adrenaline and cortisol from the adrenal glands using magnetothermal stimulation to modulate the function of cells without artificially introducing genes, as recently shown by a study at the Massachusetts Institute of Technology (MIT), USA. Based on this study, MNPs were injected directly into rat adrenal glands and accumulated in the organs for at least six months (5). In previous studies, researchers have used ion channels that control the flow of calcium into adrenal cells. These ion channels have been activated by heat. When calcium flows into the adrenal cells through the open channels, cells begin to release the hormones. In this method, MNPs can be injected into the adrenal glands. When these nanoparticles are exposed to a weak magnetic field, they slightly heat up and activate heat-responsive channels, resulting in hormone secretion (4,5). Because adrenaline, cortisol, and testosterone are secreted by the medulla of the adrenal glands and scientists have already been able to increase secretion of adrenaline and cortisol using MNPs, these MNPs possibly can

increase testosterone secretion from this region using the highlighted method. Further studies should be conducted to investigate the possible uses of MNPs for the secretion of necessary concentrations of testosterone in the body, which can not only meet one of the biggest challenges of male transgenders but also solve the problem of testosterone deficiency in straight people. In conclusion, MNPs have been shown to have the ability to stimulate the natural secretion of the essential hormones from the adrenal glands; therefore, stimulation of testosterone secretion from these glands is hypothesized using MNPs. This can solve the problem of hormones received in transgenders as well as other people with hormone deficiencies.

Conflict of Interests

None.

Ethical Issues

Not applicable.

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