Retraction

Retraction: Effect of Magnesium Oxide and Zinc Oxide Nanoparticles on Triiodothyronine Hormone (*IOP Conf. Ser.: Mater. Sci. Eng. 1145 012050*)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
Effect of Magnesium Oxide and Zinc Oxide Nanoparticles on Triiodothyronine Hormone

Taghried A. Salman¹, Tahseen Ali Ibrahim¹, Salma Abd Al-Radhia Abbas²
¹Department of Chemistry, College of Science, Al-Nahrain University, Baghdad-Iraq
²Department of Chemistry, College of Science, Al-Al-Mustansiriya University, Baghdad-Iraq
¹dr.tag_s@yahoo.com

Abstract. The nanoparticles of magnesium oxide and zinc oxide are diagnosed through several techniques, including the Atomic Force Microscope (AFM) and (XRD). Analyzing the structure of studied nanomaterials are useful to investigate their medical applications by applying them to the triiodothyronine hormone in the serum. The concentration effect of zinc and magnesium oxides nanoparticles on triiodothyronine hormone were investigated. Results obtained revealed that zinc oxide nanoparticles gave an inhibitory effect. The highest inhibition to triiodothyronine hormone in the serum was achieved when the ZnONPs concentration is 200 ppm. On the other hand, magnesium oxide nanoparticles have no inhibitory effect on hormone action.

Keywords: magnesium oxide nanoparticles, zinc oxide nanoparticles, Triiodothyronine hormone.

1. Introduction
Nanotechnology refer to the synthesis of nanoparticles of certain sizes or the formation and application of nanoscale devices. Nanotechnology no longer falls within the scope of science fiction only, but has become a reality that deserves great attention in all parts of the world, especially the developed countries, where it is now one of the most prominent trends and priorities of scientific research and serious developments and discoveries in this promising new field have helped increase investments for many laboratories commercially and scientifically [1]. Nanotechnology is a modern science that looks at the design of nanotubes and focuses on modifying the molecular and atomic structure of the substance so that it is new structures and at a low economic cost where the structure of molecules and atoms is restored to nanoscale sizes, so within a short period of time this technology was able to leap big scientific leaps in all fields of science, this is about its promising applications in the field of health and medicine [2].

Many researchers believe that the future of medicine is moving towards nanotechnology, as the devices and micro products in the human body work in many functions, including diagnosing and treating various diseases, especially incurable diseases, and studies and research indicate that in the field of medicine and health the benefits of nanotechnology Infinite, for example, that cancer research gives results on its presence in the body and the presence of good methods to develop methods of treatment and medical examinations. The use of nanotechnology in the field of pharmacy has a wide range, starting with the methods of producing the drug and ending with how it is given to the patient,
where it will be It is possible to link the nanoparticles to a base that can recognize the fingerprint of the pathogen's DNA, or link it to the harmful biomolecules and remove it from the body Figure 1, 2, 3. Nanomaterials have many functions, due to the advantage of surface area versus volume and also the size convergence between nanoparticles and biogelic molecules within the body, which helps them bind to biological cells, and take advantage for medical and pharmaceutical research, whether for the living body or the laboratory [3]. Many researches have also explained the importance of nanostructures in treating thyroid gland [4-5]. Thyroid hormones are synthesized in the thyroid gland. Thyroid hormone is transported in the bloodstream to be distributed throughout the body in a form associated with globulin and the ratio is about TBG (99.95%). Thyroid hormones affect many metabolic processes, increasing oxygen consumption.

Figure 1. the thyroid gland anatomic

They bind to specific receptors in cell nuclei and change the expression of certain genes[6-7].

Figure 2. structure of Thyroid Hormone

Triiodothyronine (T3) synthesized in the thyroid gland by iodination and coupling of two tyrosine molecules whilst attached to a complex protein called thyroglobulin controlled by TSH, convert Iodide to Iodine. Oxidation by the enzyme thyroperoxidase (Tpo) to (I or I°) The reaction requires hydrogen peroxide and convert to H2O[8]. After iodide oxidized the enzyme, thyroperoxidase (Tpo) and bound iodide oxidized with tyrosyl residues on thyroglobulin. This results in production of monoiodothyronine (MIT) and diiodothyronine (DIT) and (TPO) do coupling of two tyrosyl residues to for (T3) or (T4) The activity of thyroid hormone [9].
In hypothalamic, thyrotropin-releasing hormone (TRHs) synthesized by neurons in the hypothalamus. Its biological function stimulated to release thyrotropin (TSH). When this hormone is released into the bloodstream, its goal is to go to the thyroid gland to form and release thyroid hormones for the cells of the body, the body controls thyroid hormones by negative feedback as shown in figure 4, by controlling this pathway[11-17].

The aim of this research is to study the effect of nanoparticles of zinc oxide and magnesium oxide concentrations on the free Triiodothyronine hormone through laboratory experiments.

2. Materials and Methods

Sample Collection
In this study, thirty healthy people were chosen that their ages ranged between 9-60 years. Specimens were collected during the period from 1st Nov 2019 until the end of Feb 2020. 4-5 milliliter of venous blood samples were collected from each individual of healthy. Samples collected were putted in a clean and dry gel tube and left to clot at 37 °C for 20 min, then put it in the centrifuge device at 6000 RPM for 10 min. Serum are separated in a simple plastic tube and kept in the freezer till used for the further work.

**Biological Procedure**
Free Triiodothyronine hormone was assayd by two-step. Firstly, the anti-Thyroid stimulating hormone and secondly, the anti- free Triiodothyronine hormone. This experiment was done by adding 10 microns of serum to 10 micro liters of colloidal nanoparticles (ZnO or MgO) in concentrations of 0.25, 50, 100, 150, 175 and 200 ppm. After that, the relative optical units (RLUs) were measured by using Abbott device in order to compare the effect of nanoparticles on the Triiodothyronine hormone in the serum.

3. **Results and Discussions**
Zinc and magnesium oxides Nanoparticles were characterized by different analytical techniques such as AFM, XRD.

**Atomic Force Microscope (AFM)**

Figures 5 and 6, represent two dimension AFM images and the corresponding size distribution of MgO and ZnO nanoparticles. AFM results show that average diameter of MgONPs and ZnONPs are respectively 41.04 nm and 84.81 nm.

![AFM image and size distributions of MgONPs.](image-url)
Figure 6. AFM image and size distributions of ZnONPs

X-ray diffraction (XRD)

The diffraction peaks were identified for MgONPs were 41.9242, 61.3073 and 38.7352 deg, that represented respectively (220), (200) and (111) reflection planes as shown in figure 7. The observed peaks are indicative of cubic structure of MgO.12

Figure 7. X-ray diffraction of MgONPs

Figure 8 show diffraction peaks of ZnONPs that 36.2728, 31.7926 and 34.4377 deg, according to 2θ, there was the presence of more pronounced and distinct diffraction peaks in plane (100), (002) and (101) respectively, which refered to the hexagonal crystal structure of ZnONPs with space group.13
4. Statistical Studies

Tables 1 and 2 represent the statistical data obtained for healthy people as well as, the level of FT3 hormone. Results obtained revealed that the average age of healthy individuals is 27.53 as shown in table 1. Table 2 shows the mean value that is within the reference range in healthy serum (2-4.2) μg.

Table 1. Mean, SD, Rang and Median of age for Healthy people groups.

| Healthy people | Mean | SD  | Range | Median |
|----------------|------|-----|-------|--------|
|                | 27.53| 11.95| 49    | 26     |

Table 2. Mean and SD levels of FT3 in the sera of Healthy people groups.

| T3             | Mean | SD  |
|----------------|------|-----|
| Healthy people | 2.886| 0.581|

The Effect of MgO Nanoparticles on FT3

Table 3 and figure 9 represent the effect of MgONPs concentrations on the level of FT3. Data obtained revealed that MgO nanoparticles had no inhibitory effect on free T3 in sera.

Table 3. Effect of MgONPs Concentration on FT3 hormone.

| Concentration of MgONPs ppm | Concentration of FT3 μg/mL |
|-----------------------------|---------------------------|
| 0                           | 3.38                       |
| 25                          | 4.19                       |
Figure 9. Effect of MgONPs on FT3

Data obtained revealed that MgONPs stimulating the levels of FT3 hormone in the sera. There are several reasons for these results, among them the stimulation of increasing the sensitivity of the link between the hormone FT3 with an anti in the mechanism of measurement, which reflects to us the image of the increased strength of the hormone and its receptors with the body. Second reason is due to the small size of the nanoparticles, which made them to do the work of the substance in the T3 measurement mechanism. Nanoparticles increase the immune reaction or increase the chemical luminosity of the measurement process, where the highest rate of stimulation of the hormone at a concentration of 50 ppm of nanoparticles. Third reason may be attributed to the aggregation of nanoparticles due to their small size, as well as to the polarization force between the magnesium oxide molecules, which leads to the attraction of these particles by the electrostatic forces.

The effect of ZnO nanoparticles on FT3

Table 4 and figure 10 show that ZnO nanoparticles had an inhibitory effect on free FT3 hormone in sera.

Table 4. Effect of ZnONPs Concentration on FT3 hormone.

| Concentration of ZnONPs ppm | Concentration of FT3 μg/mL |
|-----------------------------|---------------------------|
| 0                           | 4.00                      |
| 25                          | 3.97                      |
| 50                          | 3.95                      |
| 100                         | 3.90                      |
| 150                         | 3.70                      |
| 175                         | 3.50                      |
| 200                         | 3.45                      |
The effects of ZnO NPs on the levels of T3 in the sera were investigated. An inhibition effect of 13.75% in serum was obtained as shown in figure 11. The highest inhibition to sera free T3 was achieved when the ZnONPs concentration is 200 ppm. This inhibition may be attributed to the hydrogen bonds or electrostatic forces between hormone molecules and Nanoparticles.

5. Conclusion

Nanoparticles, whether zinc or magnesium oxides, have a different effect on the free T3 hormone. Laboratory results revealed that increasing ZnONPs concentration leads to increase the inhibition of FT3 hormone level, indicating a distinct evidence for use as a pharmacological value. On the other hand, increasing the concentration of MgONPs leads to stimulating the levels of FT3 hormone in the sera.

Acknowledgment
The authors express their sincere gratitude to the Chemistry Department, College of Science, Al-Nahrain University for helped in completing this scientific research.

References

[1] Barbesino, G. & Tomer, Y. Clinical utility of TSH receptor antibodies. J. Clin. Endocrinol. Metab. 98, 2247–2255 (2013).
[2] Bradley, J. & Gurnell, M. Clinical medicine.
[3] Chatterjea, M. N. & Shinde, R. Textbook of medical biochemistry. (Wife Goes On, 2011).
[4] Coombs, R. R. Nanotechnology in Medicine and the Biosciences. (Gordon and Breach, 1996).
[5] Duprez, L. et al. TSH receptor mutations and thyroid disease. Trends Endocrinol. Metab. 9, 133–140 (1998).
[6] Estrada, J. M., Soldin, D., Buckey, T. M., Burman, K. D. & Soldin, O. P. Thyrotropin isoforms: implications for thyrotropin analysis and clinical practice. Thyroid 24, 411–423 (2014).
[7] Haldorai, A. Ramu, and S. Murugan, Social Aware Cognitive Radio Networks, Social Network Analytics for Contemporary Business Organizations, pp. 188–202. doi:10.4018/978-1-5225-5097-6.ch010
[8] R. Arulmurugan and H. Anandakumar, Region-based seed point cell segmentation and detection for biomedical image analysis, International Journal of Biomedical Engineering and Technology, vol. 27, no. 4, p. 273, 2018.
[9] Hedayati, A., Kolangi, H., Jahanbakhshi, A. & Shaluei, F. Evaluation of silver nanoparticles ecotoxicity in silver carp (Hypophthalmicthys molitrix) and goldfish (Carassius auratus). Bulg. J. Vet. Med 15, 172 (2012).
[10] Hiromatsu, Y., Satoh, H. & Amino, N. Hashimoto’s thyroiditis: history and future outlook. Horm. 12, 12–18 (2013).
[11] Jassim, A. M. N. & Al-Kazaz, F. F. M. Biochemical study for gold and silver nanoparticles on thyroid hormone levels in saliva of patients with chronic renal failure. Eur. J. Chem. 4, 353–359 (2013).
[12] Magner, J. Historical Note: Many Steps Led to the Discovery of Thyroid-Stimulating Hormone. Eur. Thyroid J. 3, 95–100 (2014).
[13] Notes, L. Clinical biochemistry.
[14] Porter, R. S. & Kaplan, J. L. The Merck manual of diagnosis and therapy. (Merck Sharp & Dohme Corp., 2011).
[15] Puri, D. Textbook of Medical Biochemistry E-BK. (Elsevier Health Sciences, 2018).
[16] Singh, A., Jain, D., Upadhyay, M. K., Khandelwal, N. & Verma, H. N. Green synthesis of silver nanoparticles using Argemone mexicana leaf extract and evaluation of their antimicrobial activities. Dig J Nanomater Bios 5, 483–489 (2010).
[17] STANBURY, J. B., Kassenaar, A. A. H., Meijer, J. W. A. & Terpstra, J. The occurrence of mono- and di-iodotyrosine in the blood of a patient with congenital goiter. J. Clin. Endocrinol. Metab. 15, 1216–1227 (1955).