Review Article ISSN 2639-944X

Journal of Medical - Clinical Research & Reviews

# The Role of Zinc in Cancer Patients Suffering From Diabetic Disease or Hyperglycaemia and the Impacts in the New Immunotherapy Protocols

**Pasquale Ruffolo[1]*, Osvaldo Acquaviva[2], Bruno Ruffolo[3], Marco Trifuoggi[4], Manuela Panunzio[5], Alessandra Paraggio[6] and Andrea Ruffolo[7]**

[1]*Specialist in Thoracic-Pulmonary Surgery, Specialist in Endocrine Surgery, Specialist in Oncological Surgery, Former Medical of the Naples Cancer Institute.*

[2]*Pharmacologist Expert in Nutraceuticals.*

[3]*Doctor of Medicine Center.*

[4]*Department of Chemical Sciences, University Federico II, Naples, Italy.*

[5]*Psychologist, Expert in Psychology of Environmental Damage.*

[6]*Prevention Technician in the Environment and in The Workplace.*

[7]*Labor Law and Health Law Attorney.*

***Correspondence:**

Pasquale Ruffolo, Specialist in Thoracic-Pulmonary Surgery, Specialist in Endocrine Surgery, Specialist in Oncological Surgery, Former Medical of the Naples Cancer Institute.

**Received:** 27 Jun 2023; **Accepted:** 02 Aug 2023; **Published:** 08 Aug 2023

**Citation:** Pasquale Ruffolo, Osvaldo Acquaviva, Bruno Ruffolo, et al. The Role of Zinc in Cancer Patients Suffering From Diabetic Disease or Hyperglycaemia and the Impacts in the New Immunotherapy Protocols. J Med - Clin Res & Rev. 2023; 7(8): 1-3.

## ABSTRACT

*Diabetes is a harmful metabolic disease (fasting hyperglycemia, intense thirst, mainly nocturnal diuresis, etc.) which afflicts millions of people worldwide and is correlated with environmental pollution and poor diet. The hyperglycemia of diabetic disease, supported by insulin resistance and hyperinsulinemia, is closely related to an increase in oncological, cardiovascular and chronic-degenerative diseases and to a worsening of any responses to therapeutic protocols. Our work proposes an insight into the lack of therapeutic response to immunotherapy and/or chemotherapy protocols in diabetic or hyperglycemic cancer patients. Lack of therapeutic response, in fact, occurs when a patient does not respond to a certain pathology because the body is unable to produce or activate specific lymphocytes and antibodies towards that disease. We argue that the lack of therapeutic response can be caused by deficiencies of trace elements such as Zinc, Copper, Manganese and Cobalt etc. Which help our body to improve its health condition and aggravated by toxic substances such as heavy metals, PCBs and other environmental pollutants. It therefore becomes essential to dose these substances in the various biological matrices (blood, hair, urine, modified tissues, etc.) and in the tumor to adequately deal with the neoplastic disease and reduce the possibility of a lack of therapeutic response.*

## Keywords

Hyperglycemia and hyperinsulinemia, Tumor diseases, Therapeutic response, Complications, Genomic modification, Genomic tests and genetic tests, Immune response, Nutritional supplementation, Trace elements, Zinc, Magnesium, Copper, Manganese, Cobalt, Heavy metals and dioxins.

## Introduction

Diabetes is a harmful metabolic disease (fasting hyperglycemia, intense thirst, predominantly nocturnal diuresis, clinically evidenced by the control of glycated hemoglobin, etc.) which afflicts millions of people in the world, today more frequently in youth, and is correlated with environmental pollution and poor diet.

As with other chronic inflammatory diseases, prevention through a healthy lifestyle that reduces inflammation itself is essential. It is amply demonstrated, in fact, that the excessive introduction of calories that we do not consume in our body, due to sedentary lifestyles, determines an incentive to the inflammatory process and therefore to a worsening of the clinical picture of the disease.

The hyperglycemia of diabetic disease, supported by insulin resistance and hyperinsulinemia, is closely related to an increase in oncological, cardiovascular and chronic-degenerative diseases and to a worsening of any responses to therapeutic protocols. All this is caused by the fact that insulin causes rapid cell proliferation, while the high number of sugars and lipids in the blood serves as metabolic fuel for the spread of the tumor or the inflammatory process. In cancer patients, the high insulin/glucose ratio in diabetics causes some cells to lose control of the regulatory genes of the DNA, starting a transformation mechanism as occurs in tumors of the gastrointestinal tract [1]. All this favors a high proliferation, migration and infiltration of tumor cells, which make the disease particularly aggressive [2].

Hyperglycemia in diabetic subjects, according to various scientific research, is considered a personal risk factor not so much in the formation phase of the disease, but in the therapeutic response phase. Recent studies, in fact, have shown that hyperglycemia is the cause not only of a delayed and reduced immune response but also of an increase in co-morbidity and mortality. The fundamental concept that our study proposes is the possible lack of therapeutic response to immunotherapy and/or chemotherapy protocols in diabetic or hyperglycemic patients. We argue that the lack of therapeutic response can be caused by deficiencies of trace elements such as Zinc, Copper, Manganese and Cobalt etc. Which help our body to improve its health condition and aggravated by toxic substances such as heavy metals, PCBs and other environmental pollutants.

According to this therapeutic model, therefore, it is essential in diabetic or hyperglycaemic patients suffering from oncological or chronic-degenerative diseases to carry out genomic tests directly on the neoplastic tissue and the dosage of heavy metals, dioxins, furans, PCBs, etc. analyzed "primarily" in the tumor and subsequently in the various biological matrices (blood, urine, hair, nails, breast milk, saliva, skin appendages, etc.), in addition to specific genetic tests. These tests allow us to understand the levels of harmful and useful substances, which affect hyperglycemia and consequently the resulting lack of therapeutic response [3].

Lack of therapeutic response, in fact, occurs when a patient's immune defenses do not respond to a certain disease because the body is unable to produce or activate lymphocytes and/or specific antibodies against that disease. This process is closely linked to trace element deficiencies such as zinc and to hyperglycemia and diabetes, aggravated by toxic substances such as heavy metals, PCBs and other environmental pollutants.

The heavy metals that have shown a direct correlation with the onset of diabetes are mainly four: arsenic, cadmium, mercury and nickel. These are contrasted by the beneficial action of some trace elements, such as Zinc, Copper, Selenium, Magnesium, Cobalt, Iron and Manganese and essential vitamins in the prevention and contrast of the harmful action of heavy metals and the diabetic disease itself [4]. Arsenic, which is easily introduced with the diet, being present in traces in various foods (rice, wheat, vegetables), because it is easily absorbed by the soil, mainly causes disorders of the nervous system, cardiovascular diseases, endocrine alterations and manages to modify some biological processes causing resistance to insulin. This process is expressed through an alteration of the transduction signal that affects the absorption of insulin-stimulated glucose in adipocytes and skeletal muscle cells, which leads to resistance of these tissues to insulin [5].

Cadmium inhibits insulin release and damages insulin receptors in tissues. This phenomenon is caused by the increase in lipid peroxidation, which causes a decrease in insulin release and a greater activation of gluconeogenic enzymes and an alteration of tissue insulin receptors. Mercury causes a loss of glucose in the urine (glycosuria) and oxidative stress and modifications of the DNA of kidney cells, astrocytes, lymphatic, epithelial and pancreatic cells such as the beta cells of the pancreas, responsible to produce insulin. Nickel in animal models determined the onset of hyperglycemia by increasing hepatic glycolysis and glucagon release, reducing the use of glucose at the peripheral level.

Other highly harmful substances are those of chemical synthesis present in pesticides, in petroleum, coal and methane derivatives and in industrial waste which, discharged into the environment, cause a toxic action which can have an endocrine interference which can give rise diabetes, obesity, cardiovascular disease, neuroendocrine disorders, childhood sexual disorders, infertility.

## Conclusion

In conclusion, environmental pollution is, according to several studies, closely linked to the onset of diabetes and hyperglycemia. It has been seen that in countries where the levels of environmental pollutants such as PM10, VOCs and NOx are high, the number of children who develop type 1 diabetes is growing, also anticipating its onset, demonstrating that the damage acts as soon as the baby is still in the womb. This should make us reflect on the fact that this pathological condition could be limited by prevention and by the reduced exposure of pregnant women and children to certain pollutants [6,7].

An important role is also played by therapeutic integration in the

absence of trace elements useful for cellular metabolism, especially for defense mechanisms, such as Copper, Zinc, Selenium, Magnesium, Cobalt, Iron and Manganese and essential vitamins to improve modify the lack of therapeutic response. The lack of trace elements could be seen as a possible "predisposition" to the lack of response to immunological therapies and therefore to a greater risk of aggravation of the disease due to lack of therapeutic response both immunological and chemotherapy. It is reported in the literature that the lack of selenium, zinc, copper, magnesium, manganese, iron and cobalt can be correlated to possible states of immunodeficiency [8,9].

It is reported in the literature, in fact, that in cases in which there have been no or reduced therapeutic responses of the cancer patient, these have been related to the lack of activation of certain genes related to the immune system, which are not activated. Their non-activation could be referred to low concentrations (or values) especially of Copper and Zinc, but also of Selenium, Cobalt, Manganese and Iron. For example, Zinc participates through the Zinc Finger Protein, in the DNA repair processes and therefore in the recovery of the immune defenses [10]. Indeed, the altered dosage of these trace elements in different organs and systems finds some correspondence in the possible organ-specific complications, giving us the possibility of predicting in which patients a rapid evolution could arise and with different complications of the disease with an individual-specificity and organ-specificity and in which patients a paucisymptomatic form.

According to what is expressed in our work, we believe that it is essential in a diabetic and hyperglycemic patient being treated with immunotherapy and/or chemotherapy to dose the elements mentioned above, both useful for the immune response and those that aggravate the pathological condition, in the tumor and in the various biological matrices.

## References


1. Flavia Orazzo LN. Air pollution aeroallergens and emergency room visits for acute respiratory disease and gastroenteric disorders among young children in six Italian cities. Environ Health Perspect. 2009; 117: 1780-1785.
2. Emily Jane Gallagher DL. The proliferating role of insulin and insulin-like growth factors in cancer. Trend Endocrinl Metab. 2010; 21: 610-618.
3. Pasquale Ruffolo OA. The new therapies from histological model to the mutational model. Global Journal of Medicine Research. 2023; 23.
4. https://www.caimgroup.it/metalli/
5. Tahereh Farkhondeh SSN. The role of arsenic in obesity and diabetes. J Cell Physiol. 2019; 234: 12516-12529.
6. Agostino Di Ciaula PP. Relationships between emissions of toxic airborne molecules and type 1 diabetes incidence in Children an ecologic study. World Journal of Diabetes. 2021; 12: 673-684.
7. Di Ciaula A. Type 1 diabetes in paediatric age in Apulia Italy incidence and associations with outdoor air polluntants. Diabetes Research and clinical practice. 2016; 3: 36-43.
8. Pasquale Ruffolo MT. Selenium, Zinc and Copper can their deficiency facilitate complications COVID-19 and Omicron Pandemic. American Journal of Internal Medicine. 2022; 10: 51-55.
9. Joseph C Avery PR. Selenium Selenoproteins and Immunity. Nutrients. 2018; 10: 1203.
10. Inga Wessels MM. Zinc as a Gatekeeper of Immune Function. Nutrients. 2017; 9: 1286.