

Glucokathexis

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Abstract

Glucokathexis is a clinical state characterized by low plasma glucose levels, in the presence of adequate glucose precursor stores. We conceive and construct this rubric to initiate interest and inspire insight into this field of metabolic medicine. We list various conditions that can cause true as well as pseudo-glucokathexis.

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Kathexis

The Greek word 'kathexis' has been used as a suffix in clinical conditions such as myelokathexis and lipokathexis. While myelokathexis is the retention of white blood cells in the bone marrow, leading to chronic severe leucopenia, lipokathexis describes a situation where excessive stores of fat are noted in the body even though circulating lipid levels are low.¹ The term 'reverse lipokathexis' denotes lipo-dystrophic syndromes where adipose dystrophy coexists with severe dyslipidaemia.

Cathexis has also been used in psychology, to highlight the concentration of mental energy on one particular person, idea or object, to an unhealthy degree.² Freud defined it as the libido's charge of energy, and as how the id utilized its energy.

Glucose and Kathexis

Glucose is an important determinant of, and contributor to, the homeostasis of the body. Glucose levels are regulated by myriad processes, most of which operate through insulin-dependent or incretin-dependent mechanisms.³ However, there are many other physiologic reactions which ensure maintenance of euglycaemia.

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Plasma glucose levels are usually concordant with the levels of precursor molecules such as glycogen and gluconeogenic substrates such as glycerol, lactate, pyruvate and specific amino acids. In certain situations, however, hypoglycaemia may occur in the face of adequate precursor molecule concentration. We term this as glucokathexis. Glucokathexis can be defined as a clinical state characterized by low plasma glucose levels, in the presence of adequate of glycogenolytic and/or gluconeogenic precursors.

True Glucokathexis

Certain inborn errors of metabolism do not allow conversion of glycogen, fatty acid, or sugars to glucose.³ This leads to a situation of glucokathexis, i.e., hypoglycaemia in spite of adequate precursor stores. Such diseases usually have a poor prognosis. At times, metabolic defects may occur due to poisoning of litchi or ackee fruit. These fruits, if taken by malnourished persons, can block glucogenic biochemical reactions, leading to

Table: Glucokathexis.

True Glucokathexis

- Inborn errors of metabolism
 - Glycogen storage diseases
 - Fatty acid oxidation defect
 - Galactosaemia
 - Hereditary fructose intolerance
- Acquired diseases
 - Litchi induced hypoglycaemia
 - Jamaican ackee fruit sickness
- Malignancies
 - Insulinoma
 - Nesidioblastosis
 - Mesenchymal tumours
 - Secreting IGF-2
- Immune disorders
 - Autoimmune hypoglycaemia
 - Type B insulin resistance syndrome

PSEUDO-GLUCOKATHEXIS

- Nutritional glucokathexis
 - Alcohol intake
 - High fibre diet
- Artefactual glucokathexis
 - Lack of antiglycolytic (e.g., fluoride) in collection tube
 - Haemolysed sample
 - Delayed processing

hypoglycaemia.⁴ These conditions, too, can be termed as glucokathexis.

Another group of diseases, such as insulinoma, nesidioblastosis and IGF-2 secreting tumours, are characterized by high requirements of glucose. The body, unable to meet the demands of endogenously secreted insulin or insulin-like factors, remains in a state of hypoglycaemia despite increasing adiposity.⁵

A similar situation is encountered in autoimmune hypoglycaemia may be associated with adequate body stores of glycogen and fat. Type B insulin resistance syndrome can present with a wide spectrum of glucose abnormalities, from severe hypoglycaemia to hyperglycaemia. In states of hypoglycaemia, it fits the definition of glucokathexis.

Pseudoglucokathexis

Two groups of conditions fit the rubric of pseudoglucokathexis. The first, nutritional glucokathexis, refers to calorie- rich foods and beverages, such as fibre and alcohol, which may lower glucose levels through lack of digestibility or interference in counter regulatory processes⁶. The second, artefactual glucokathexis, describes glucose values that are erroneously low due to pre-analytical or post-analytical errors.

Summary

We define and detail a novel term, glucokathexis, which describes hypoglycaemia in the face of adequate glucose precursor stores. This concept should spur insight and interest in the biochemistry, physiology and clinical science of glucose regulation.

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