QUANTIFICATION OF IODIDE IN PHYSIOLOGICAL CONDITIONS WITH APPLICATION IN URINE ANALYSIS

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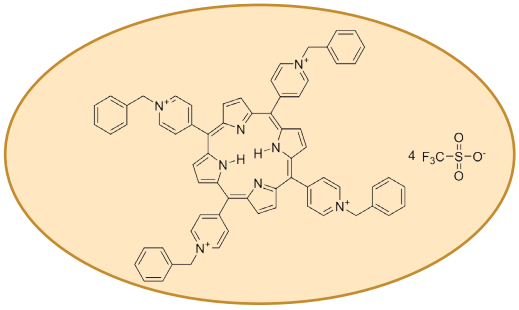
Abstract

This invention describes a novel fast methodology for synthesizing and using a fluorescent porphyrin salt to detect and quantify iodide in physiological conditions with high sensitivity, selectivity and speed. Its application lies mainly in the diagnosis of metabolic diseases, but it can be extended to other fields.



Porin salt (sensor)

Background

Iodine is an element that we can naturally find on the surface of the earth and its iodide or iodine form enters in the metabolic cycle of most of the flora and fauna, as well as in mammals.

The content of this element in vegetables is very variable, since it depends on the amount of iodine that has the soil and the water with which they were cultivated.

There are foods that have a greater concentration, since they absorb the iodine of the sea, such as: fish, seafood, molluscs, crustaceans, seaweed. Milk and its derivatives also have this element, as well as meats and fruits, although in smaller quantity

On the other hand, iodine is an essential nutrient for humans. It is a building material for thyroid hormones that are essential for growth, nervous system and metabolism. The lack of this element in the body, can cause disorders, such as: abortion, congenital anomalies, mental retardation, low birth weight, thyroid deficiency manifested as lack of energy, muscle damage, speech and auditory defects (cretinism), goiter, among many others.

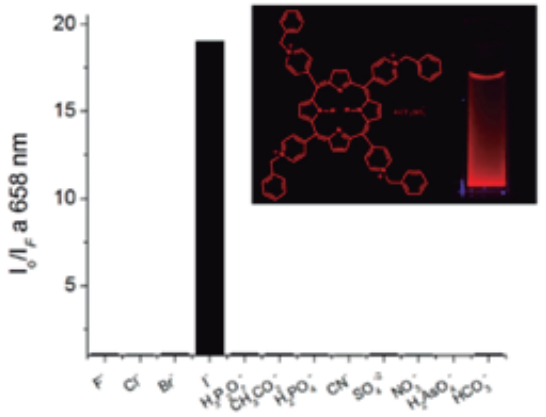
In foods, as in the human body, iodine is in aqueous medium. For example, in urine, more than 90% of the total iodine is found as iodide, which is a biochemical indicator for the diagnosis and treatment of diseases caused by iodine deficiency.

The present development is a methodology with rapid and selective iodine detection capability that achieves its quantification at extremely low concentration limits (submicromolar) and without extensive sample preparation protocols.

Stage of research

The research group has achieved the synthesis and characterization by NMR spectra of porin salt, used as a sensor for I-. This methodology is already implemented for the detection and quantification of iodine in human urine samples with high selectivity, demonstrating its real application. In the case of the detection and quantification of the iodide ion, measurements can also be made on other types of aqueous samples without long treatment.

Changes in fluorescence emission at 658nm



Applications

- **Clinical applications:** The importance of substances such as iodine in daily life, such as in the control of metabolic disease disorders, its detection of contaminating traces, as well as the quantification of these in the area of drug manufacture, is relevant and a subject pending in the clinic, medicine and modern chemistry.
- **Pharmaceutical & Chemical industry:** Iodine is mostly used in pharmaceuticals (27%), at least 60% of which are disinfectants. Iodine is also used in contrast agents (25%) and the chemical catalysis industry (17%).
- **Food and electronic industry:** On a smaller scale, but still of importance, the food and electronics industry also require this valuable element..

Advantages

Due to the essential role that iodine plays in the function of the thyroid gland, its detection and quantification is frequently performed to examine relevant clinical disorders.

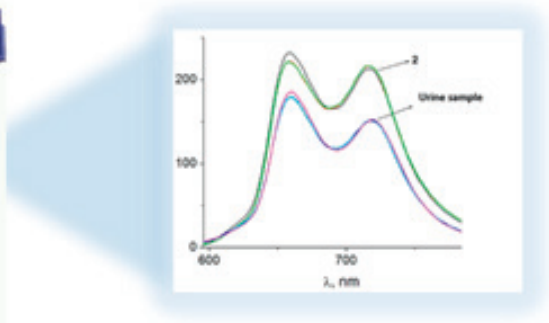
Therefore, the development of this low-cost, non-invasive, easy-to-implement analytical technique for selective iodine detection and quantification in both water and physiological conditions is very significant.

Compared with other methodologies for the detection and quantification of micronutrients and ions such as fluorides, chlorides and phosphates, the high selectivity of this innovative iodine method, in its iodide form, allows its easy and direct application in the medical clinic as well as in analytical chemistry, food, pharmacy, industrial and environmental chemical processes.

For example, the present methodology has a high selectivity in the detection and quantification of iodine in urine, which gives it the advantage of making measurements of iodide in other types of aqueous samples without a long treatment of the sample.

To summarize, this methodology:

- It's cheap
- Not invasive
- Easy to implement
- Has high selectivity
- Does not requires long treatment of the sample



The annual production of iodine is led by Chile with 60% and Japan with 35%, producing most of the iodine worldwide.

That is why having a method of detection and quantification, both reliable and highly selective is of relevance in the medical, diagnostic, industrial and general areas and chemical-environmental determinations.