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Patented method-based evaluation of the toxicity of some uncoupling dinitrophenol-like compounds

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Although the dinitrophenols and related compounds are deeply poisonous, they are still used as pesticides, drugs or even weight loss agents. Today, DNP is used by bodybuilders, often illegally, to rapidly lose body fat before contests. Numerous pesticides act as uncoupling agents of oxidative phosphorylation at low concentrations, and inhibit the electron transport chains, probably before cytochrome C at higher concentrations. Dinitrophenol disrupts the H⁺ gradient reducing ATP synthesis. The permeability of mitochondrial membranes to protons is increased by the conversion failure from ADP to ATP. Under these conditions, much of our food that we eat could not use for ATP synthesis leads to weight loss. The difference between weight loss and death is only a small concentration change in dinitrophenol, making the drug dangerous. The level of toxicity of dinitrophenyl derivatives is closely related to inhibition of ATP production even in the presence of oxygen, which leads to alcohol formation in yeast and plant cells. Since the level of toxicity of dinitrophenyl derivatives depends on their property of uncoupling the respiration from ATP synthesis, we have recently patented a method to identify the uncoupling agents as well as to quantify the intensity of such activity by determining the ethanol produced in living cells of some biological materials. The simplest way to do that is to measure the ethanol liberated in presence of the uncoupling agents. We have colorimetrically determined alcohol by the reduction of the orange-colored potassium dichromate (K₂Cr₂O₇) to green colored salts of chromium (III), in the presence of sulfuric acid (H₂SO₄). A well-defined volume of sample is taken from the green colored solution, diluted with distilled water, and its absorbance measured in a spectrophotometer or colorimeter. The calibration curve is carried out with different concentrations of ethanol.

Biography

Marius Zaharia is a 2015 graduate of Alexandru Ioan Cuza University of Iasi, Department of Chemistry, and pursuing his doctoral study in Doctoral School "Chemistry and Life and Earth Sciences". Consequently, he is the Director of project *Grants for young researchers of UAIC* (Contract 21754/03.12.2015), project from Alexandru Ioan Cuza University of Iasi. He has published 8 papers and 4 papers accepted to be published in reputed journals and presented several research papers at various national and international conferences.

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