LETTER TO EDITOR

A Nuclear – Magnetic Insight Towards the Cytostatic Potential of Medicinal Plant Extracts: Reply to Al-Whibi, et al. Biomedica, 2019, 35 (4): 203 – 209.

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ABSTRACT

Cytostatic activities of water and organic extracts prepared from medicinal higher plants including *Ducrosia anethifolia* should be analyzed by taking into account the "hidden" magnetic isotope effects of stable metal isotopes (^{25}Mg, ^{43}Ca, ^{67}Zn …) pre-(bio) fractionated in the plant tissues. A multi-collector inductively coupled plasma mass spectrometry (MC – ICPMS) might be successfully employed to reveal and detail this specific peculiarity for further pharmacological applications.

KEYWORDS: Medicinal plants, Cytostatic effects, Stable metal isotopes, Acute myeloid leukemia cells.

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Dear Editor,

Let us reply to one of the most recent publications on anti-cancer properties of higher plant extracts appeared in *Biomedica.*[1] This attention catching study deals with, particularly, a MTT-measured cytotoxicity of *Ducrosia anethifolia* water extracts tested in several cancer cell lines including the HL60 acute myeloid leukemia (AML) strain.

Noteworthy, no data on HL60 viability (plant extract promoted cytotoxicity) presented. The only anti-cancer effects shown were clearly illustrated by Figures 6 and 7.[1]These data describes K562 and MCF7 cytotoxicity patterns although AML HL60 cells were also listed in the Abstract and Methods. Therefore, the HL60 related conclusion lacks an appropriate experimental proof.

Obviously, the Agilent 5975C mass spectrometer used[1] operates on the basis of a field ionization – field desorption mode which means that the *tetradecenol* related ionized molecular fragments might be "masked" by at least several plant – extractable aliphatic compounds.[2] This requires to employ a *tetradecenol* internal standard and it is unclear whether or not that has been employed.

The Discussion[1] is mainly focusing over the *tetradecenol* derivatives with no consideration of any other biologically active compounds known for their massive co-extractability in a course of the plant tissue treatment. Thus, the fractionation of bivalent metal stable isotopes "performed" by higher plants[2,3] may lead to a significant enrichment of biomass with the nuclear spin possessing (paramagnetic) isotopes like $^{25}Mg^{2+}$, $^{43}Ca^{2+}$ and $^{67}Zn^{2+}$.[2-5] This alone is capable to launch a so called *magnetic isotope effects*, that is the ion-radical path of an extremely powerful modulation

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of metal-dependent enzymatic catalysis in cancer cells including the HL60 ones.[5,7,8]

We have to outline that $^{25}Mg^{2+}$ ions, for instance, are certainly the water soluble pool compounds with the sharp cytostatic properties due to their suppressive *magnetic isotope effect* (MIE) on Mg^{2+}-dependent DNA Polymerase Beta, a key enzyme for DNA repair in malignancies.[6-8] Therefore, it might be some marked contribution of this MIE to the anti-cancer activity of a crude extract prepared from medicinal plant tissue owing to a so called "hidden" *magnetic isotope effect*.

A multi-collector inductively coupled plasma mass spectrometry (MC-ICPMS) is a perfect tool for both low molecular weight organic compounds and the stable bivalent metal isotopes discriminative measurements[2,7] as compared to a routine GC-MS (FIFD) technique employed in Al-Whibi publication.[1]

In our opinion, this should be placed into the context of anti- cancer activities manifested by the crude medicinal plant extracts.

REFERENCES

1. Al-Whibi M, Moubayed NMS, Zahrani H, Mashhour A. Antibacterial and cytostatic activities of *Ducrosia anethifolia*: A potential biomedicine against selected human pathogens and cancer cell lines. Biomedica. 2019; 35 (4): 303-209.
2. Von Blankenburg F, Von Wiren N, Guelke M, Weiss DJ, Bullen TD, et al. Fractionation of metal stable isotopes by higher plants. Elements. 2009; 5 (6): 375-80.
3. Melkikh AV, Bokunyaeva AO. A model of isotope separation in plants. Acta Biotheoretica. 2017; 65 (1): 43-57.
4. Buchachenko AL. *Magnetic isotope effect in Chemistry and Biochemistry.* Nova Science Publishers, 2009; Inc.: New York.
5. Buchachenko AL. *Magneto – Biology and Medicine.* Nova Biomedical Publishers, 2015; Inc.: New York.
6. Ermakov KV, Bukhvostov AA, Dvornikov AS, Kurapov PB, Kuznetsov DA. Retinoblastoma: magnetic isotope effects might make a difference in the current anti-cancer research strategy. Acta Medica (Hradec Kralove, Czech Republic). 2017; 60 (2): 93-6.
7. Kuznetsov DA, Buchachenko AL. Nuclear magnetic ions of magnesium, calcium and zinc as a powerful and universal means for killing cancer cells. Russ J Phys Chem B. 2018; 12 (4): 690-4.
8. Buchachenko AL, Bukhvostov AA, Ermakov KV, Kuznetsov DA. Nuclear spin selectivity in enzymatic catalysis: A caution for applied biophysics. Arch Biochem Biophys. 2019; 667 (1): 30-5.

Author's Contribution

AAB ; KVE ; DAK: All authors critically revised the manuscript for important intellectual contents and approved the final version.

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