

ISOTOPIC RESONANCE - THE FIRST DECADE

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Isotopic resonance (IsoRes) is a postulation that the rates of chemical and biological reactions are affected nonlinearly and non-canonically by the specific ratios between different stable isotopes. The average terrestrial isotopic compositions of the elements C, H, N and O happen to be close to the resonance values. The IsoRes hypothesis formulated in 2008 predicted that the terrestrial IsoRes affected all chemical and biochemical reactions on Earth and enhanced the chances of early life to either emerge or take root on our planet [1]. For the following decade, the existence of the IsoRes phenomenon in biology and biochemistry has been extensively tested experimentally and verified by at least two independent groups. Of the important IsoRes isotopic compositions, besides the terrestrial one, is the monoisotopic resonance as well as the resonances at around 350 ppm deuterium [2] and another one at 3.5% ^{15}N [3], with all other isotopic ratios being normal. The fact that both Mars and Venus seem to have no resonance, underlies the potential importance of the IsoRes phenomenon in space exploration and astrobiology [4].

REFERENCES:

1. Zubarev, R. A.; Artemenko, K. A.; Zubarev, A. R.; Mayrhofer, C.; Yang, H.; Fung, E. Y. M. Early life relict feature in peptide mass distribution, *Cent. Eur. J. Biol.* 2010, 5, 190-196.
2. Rodin, S.; Rebellato, P.; Lundin, A. Isotopic resonance at 370 ppm deuterium negatively affects kinetics of luciferin oxidation by luciferase, *Sci. Rep.* 2018: 16249.
3. Andriukonis, E.; Gorokhova, E. Kinetic ^{15}N -isotope effects on algal growth. *Sci Rep* 2017, 7: 44181.
4. Xie, X.; Zubarev, R. A. On the Effect of Planetary Stable Isotope Compositions on Growth and Survival of Terrestrial Organisms, *PLOS ONE*, 2017, 12: e0169296.