Nuclear Spin Dependent Enzymatic Synthesis of ATP in Strong Magnetic Fields

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Synthesis of ATP (adenosine triphosphate – the main source of energy in all living organisms) has been proved to be ^{25}Mg nuclear spin dependent process *in vitro* and *in vivo* [1-4].

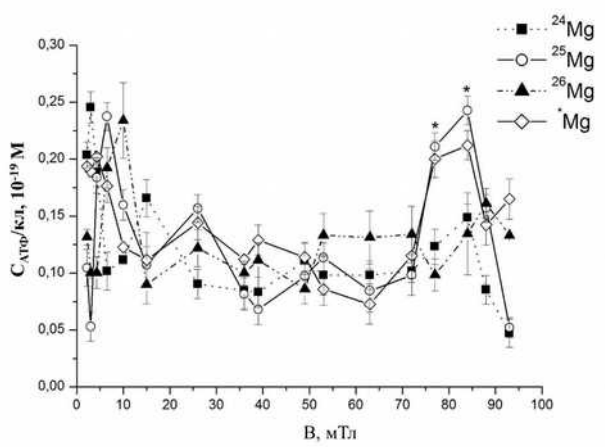

Fig. 1. Magnetic field dependences of intracellular ATP content in E. coli bacteria grown on M9 medium with magnesium isotopes ^{24}Mg, ^{25}Mg, ^{26}Mg and natural magnesium Mg. The data is given per cell. The range of magnetic fields is 0.8-98 mT.

Well known HFI mechanism of singlet-triplet conversion of ion-radical pairs is able to explain magnetic field dependencies of ATP synthesis in low magnetic fields, however, is not able to explain ones in strong magnetic fields B ~ 80 mT. To explain those effects a new model and a theory of S-T conversion for equivalent electron spins interacting with a nuclear spin was proposed. This S-T conversion was shown to be inevitably accompained by redistribution od charge density decreasing Coulomb repulsion of interacting particles. Theoretical results qualitatively coincide with the experimental ones for ATP production in bacterial cells *Escherichia coli*.

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