

P007 Magnetic field effects in adenosylcobalamin-dependent enzymes

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Adenosylcobalamin (AdoCbl) is the active form of vitamin B₁₂, and acts as a unique source of radicals to a number of enzymes. The enzyme is activated by C—Co bond homolysis upon substrate binding, generating a singlet-born radical pair. Several magnetic field effect (MFE) studies have been conducted:

Viscosity-dependent MFEs in the photolysis of free AdoCbl;

Oxygen-dependent MFEs in the photolysis of AdoCbl-dependent ethanolamine ammonia lyase (EAL, class II) in the absence of substrate;

Failed reproduction of previous stopped-flow studies that reported field-induced changes in the thermal C—Co homolysis on substrate binding to EAL.

Together, these results suggest RP stabilization upon substrate binding in EAL, which has implications for the enormous catalytic power of AdoCbl-dependent enzymes.

The photolysis studies are being extended to the Glutamate Mutase (class I mutase) and D-ornithine-4,5-aminomutase (class III aminomutase) holoenzymes, to enable a direct comparison between all three AdoCbl-dependent enzyme classes.