

P007 S-adenosylmethionine: Jack of all trades and master of everything?

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Restriction-modification (R-M) enzymes prove superb model systems to study DNA-protein interactions. The modification enzyme uses S-adenosylmethionine (SAM/AdoMet) as methyl donor to protect resident DNA against cognate restriction. Paul Modrich used his R-M experience to herald studies on methyl-directed strand-specific mismatch repair. Methylation is implicated in epigenetic modifications and imprinting, human disease and aging. SAM is the universal methyl donor for DNA, mRNA/tRNA/rRNA and proteins, dictating replicational, transcriptional and translational fidelity, topics of great interest in cancer research. Noreen Murray combined her R-M skills with lambda to establish how EcoKI, the R-M system of *E. coli* K-12, recognises 'Self'. EcoKI distinguishes unmethylated DNA from hemi-methylated DNA because SAM-binding alters the DNA contacts of the methylase. A decade later something reminiscent appears on the scene at the RNA level. Apparently, SAM riboswitches (RNAs that control certain mRNAs) regulate expression of multiple genes in a SAM-dependent manner, opening a new avenue into gene control. Finally, on a completely different track, SAM plays a crucial role in polyamine metabolism, thus establishing a link between SAM and viability and survival, hyper-trophic and neoplastic growth. This presentation aims to give an overview of these many diverse and amazing roles of this small metabolite.