

P056 S-adenosylmethionine and DNA damage: sophisticated agent of metabolism

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S-adenosylmethionine (SAM) is a sulfur-containing molecule at the heart of metabolism of all organisms. It is the well-known universal methyl donor for the methylation of DNA, RNA, lipids, histones, proteins such as Tp53, as well as many other small molecules including toxic compounds, with a concomitant major impact on DNA repair, chromatin (re)modelling, epigenetic modifications and imprinting. SAM plays vital roles in the methionine cycle, the polyamine and transsulfuration pathways, and the generation of the antioxidant glutathione, but also radical formation. So far 15 superfamilies of SAM-binding proteins have been identified, and, surprisingly, SAM also serves as an essential cofactor in specific recognition and cutting of DNA by nucleases such as EcoKI, and in FeS cluster-containing proteins. Finally, SAM also binds small RNAs leading to alternative RNA secondary structure formation and altered gene expression. Deregulation of SAM through folate or vitamin shortage and/or radical surplus via dietary insufficiency, alcohol abuse, arsenic poisoning, irradiation and/or other environmental or hereditary factors, impairs the DNA repair capacity and predisposes to diseases such as cancer, neuropathology, autoimmune disease, and also aging. This poster gives an overview of the many roles of this small metabolite and discusses the implications of deregulation of SAM to DNA damage and aging