Molybdenum Complexes as Catalytic Cyanide Antagonists: Bicompatibility, Intracellular Distribution and Mechanism.

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Cyanide detoxification *in vivo* is most often accomplished with Co(II) based chelators such as [Co(EDTA)] or Hydroxocobalamin [1]. Enzyme catalyzed conversion of cyanide to thiocyanate by the metal-free rhodanase enzyme is well documented [2]. A few examples are known of cyanide forming thiocyanate when reacting with sulfur bound to molybdenum enzymes [3, 4]. A few examples are known of cyanide forming thiocyanate in a reaction of molybdenum complexes with cyanide [5, 6]. The reactivity of a sulfur abstraction reaction by cyanide with Mo-disulfide moiety to form thiocyanate was studied and expanded to catalytic conditions [7]. High conversion of cyanide to thiocyanate was achieved in a time period of 20 minutes. Catalytic cycle is proposed where initial step requires a sulfur abstraction reaction. Cytotoxicity of a series of complexes was studied as well as *in vivo* toxicity via a dose escalation study [8]. A preliminary pharmacokinetic profile of a selected compound was obtained using ICP-OES, and survival studied at lethal HCN dose in a mouse model [9].

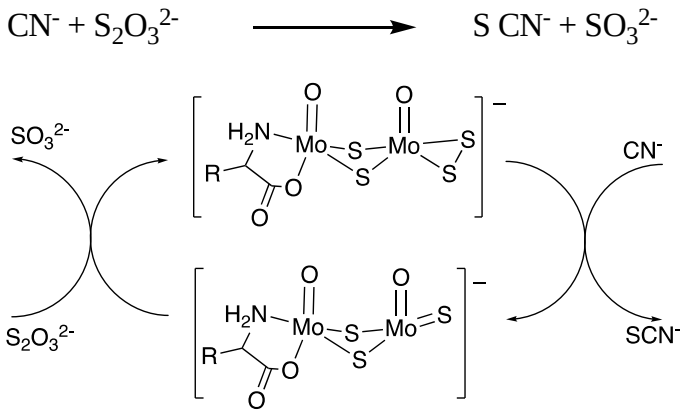

Figure: Reaction of cyanide and thiosulfate catalyzed by $[(RC_2O_2NH2)Mo_2O_2(\mu\text{-}S)_2(S_2)]^-$.

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[1] S. G. Suman, J. M. Gretarsdottir, *Met Ions Life Sci*. **2019**, 359.
[2] K. R. Leininger, J. Westley, *J. Biol. Chem*., **1967**, *243*, 1892.
[3] R. Hille, Arch. Biochem. Biophys., **2005,** *433*, 107.
[4] J. H. Enemark, C. G. Young, **1993**, A. G. Sykes (ed) Adv. Inorg. Chem. Academic Press, pp. 1-88
[5] P. D. Smith, D. A. Slizys, G. N. George, C. G. Young, *J. Am. Chem. Soc*., **2000**, *122*, 2946.
[6] S. G. Suman, J. M. Gretarsdottir, P. E. Penwell, J. P. Gunnarsson, S. Frostason, S. Jonsdottir, K. K. Damodaran, A. Hirschon, *Inorg. Chem*., **2020**, 59, 7644.
[7] J. M. Gretarsdottir, S. Jonsdottir, W. Lewis, T. W. Hambley and S. G. Suman, Inorg. Chem. 2020, 59, 18190.
[8] J. M. Gretarsdottir, S. Bobersky, N. Metzler-Nolte, S. G. Suman, *J. Inorg. Biochem*. **2016**, *160*, 166.

[9] L. A. Hancock (2019) *In vivo* Analyses of a $Mo_2O_2S_2$-Based metallodrug, *University of Iceland*.