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Human Endogenous Formaldehyde as an Anticancer Metabolite: Its Oxidation Downregulation May Be a Means of Improving Therapy

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Abstract

Malignant cells are characterized by an increased content of endogenous formaldehyde formed as a by-product of biosynthetic processes. Accumulation of formaldehyde in cancer cells is combined with activation of the processes of cellular formaldehyde clearance. These mechanisms include increased ALDH and suppressed ADH5/FDH activity, which oncologists consider poor and favorable prognostic markers, respectively. Here, the sources and regulation of formaldehyde metabolism in cancer cells are reviewed. The authors also analyze the participation of oncoproteins such as fibulins, FGFR1, HER2/neu, FBI-1, and MUC1-C in the control of genes related to formaldehyde metabolism, suggesting the existence of two mutually exclusive processes in cancer cells: 1) production and 2) oxidation and elimination of formaldehyde from the cell. The authors hypothesize that the study of the anticancer properties of disulfiram and alpha lipoic acid – which affect the balance of formaldehyde in the body – may serve as the basis of future anticancer therapy.

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