Hydrogen Sulfide Olfactory Toxicity and Pharmacokinetics

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Hydrogen sulfide (H₂S) is an important air pollutant produced by a variety of anthropogenic and natural processes. In humans, inhalation of as little as 100 to 250 ppm H₂S for only a few minutes can result in incoordination, memory and motor dysfunction, and anosmia. In spite of the clear association between human H₂S exposure and olfactory dysfunction, surprisingly few studies have evaluated H₂S as a nasal toxicant. We recently reported that exposure of male rats to 30 or 80 ppm H₂S for 70 consecutive days was associated with sensory neuron loss and basal cell hyperplasia in the olfactory mucosa. To our knowledge, this is the first report of an olfactory lesion induced by subchronic exposure to relatively low levels of H₂S in an experimental animal. This observation has also been seen in F-344 and Sprague-Dawley rats and B6C3F1 mice exposed to up to 80 ppm H₂S for six-hr/day for 13 weeks (90 exposure days). Additional experiments were performed in 2001 to determine whether lesion development is related to site-specific tissue susceptibility, or differences in local tissue dose, or both. These experiments focus on the early pathogenesis of the lesion, the role of cytochrome oxidase in olfactory toxicity, and the use of a computational fluid dynamics (CFD) model for inhaled H₂S to evaluate regional delivery of H₂S within the rat nose.

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