

4. Conclusions

Due to the lack of data regarding toxicity of the mixture of jet fuels, hydrazines, trichloroethylene, arsenic, and strontium-90, a component-based approach is recommended to assess potential public health effects associated with exposure to this mixture. Because of the extensive overlap of toxic endpoints for the five components of this mixture, the specific recommendation for this mixture is to assume additivity among the mixture components. BINWOE analysis of the joint toxic action of the component pairs was indeterminate for most pairs due to scarcity of data available regarding joint toxic action of the component pairs, and insufficient understanding of toxic and pharmacokinetic mechanisms of the individual substances, but did support the assumption of additivity for depression of the central nervous system from exposure to jet fuels and trichloroethylene. Greater-than-additive effects were predicted for the effect of strontium-90 on general arsenic toxicity, due to inhibition of arsenic metabolic detoxification by strontium.

The hazard index approach is recommended as an additive component-based method for assessing possible health hazards from noncancer effects for mixtures of jet fuels, hydrazines, trichloroethylene, arsenic, and strontium-90. The hazard index approach allows for summing across routes of exposure to account for multiple pathways of exposure, which may be important for this mixture. For oral exposure, the lack of health guidance values is problematic and leaves only arsenic and trichloroethylene contributing to the hazard index for oral exposure to the mixture. Because these chemicals affect many of the same sensitive endpoints (neurological, renal, and immunological targets), it is recommended to calculate hazard indexes for oral exposure using both chemicals. For inhalation exposure, intermediate MRLs are available for all three chemicals for which this route is expected to potentially contribute to exposure to offsite receptors at rocket launch sites: jet fuels and hydrazines based on liver effects and trichloroethylene based on neurological effects. Because the central nervous system and the liver are sensitive targets for all three chemicals, it is recommended that inhalation hazard indexes be calculated using all three chemicals together. Application of the TTD modification of the hazard index method is not justified by the existing data set.

For cancer effects, the cancer risk for each substance (calculated from the lifetime average daily intake and the potency factor) is summed to provide an estimate of risk due to the whole mixture. Risk can be summed across routes to account for multiple pathways of exposure.