

## 4. Conclusions

There are no studies available that directly characterize health hazards and dose-response relationships for exposures to mixtures of 1,1,1-trichloroethane, 1,1-dichloroethane, trichloroethylene, and tetrachloroethylene. Each of the chemicals can produce neurological impairment via parent compound-induced physical and chemical changes in neuronal membranes and cause non-carcinogenic and carcinogenic responses (via reactive metabolites) in the liver and kidneys of animals. No studies were located that directly examined joint toxic actions of these chemicals on the nervous system, but additive joint toxic action is plausible. Limited studies of joint toxic action of ternary and binary mixtures of these chemicals on the liver and kidney provide no evidence of greater-than-additive joint toxic actions. Additive joint toxic action on the liver and kidney is plausible for binary combinations of each of the components, with the exception of limited evidence that tetrachloroethylene may inhibit the toxic action of trichloroethylene on the liver and kidney (Goldsworthy and Popp 1987; Seiji et al. 1989). A component-based hazard index approach that assumes additive joint toxic action and uses ATSDR MRLs based on neurological impairment is recommended for exposure-based assessments of possible health hazards from exposure to mixtures of 1,1,1-trichloroethane, 1,1-dichloroethane, trichloroethylene, and tetrachloroethylene. There is no evidence to indicate that greater-than-additive interactions would cause liver and kidney effects to occur at exposure levels lower than those influencing the nervous system.