

CREOSOTE SITES

by

Richard A Parent, PhD, DABT, FATS, RAC, ERT
Consulting Toxicologist

Most creosote mixtures that are used today are byproducts of the petroleum industry or coal gasification processes. They are mixtures of several hundreds of chemicals mostly polynuclear aromatic hydrocarbons (PAHs) but contain a host of other chemicals including complex heterocyclic compounds. Many of the components of creosote are known to be carcinogenic and are capable of producing a myriad of health effects in addition to cancer. Wood treatment plants use creosote to stabilize wood so that it will not decompose as readily in the environment. Typical applications include railroad ties and telephone poles, among others.

Wood treatment plants, or “creosote sites” employ these complex mixtures called creosote, but to further complicate matters, they have also used pentachlorophenol (PCP) and arsenic compounds to preserve wood. Thus, in approaching the evaluation of a creosote site, one must be aware of more than the PAHs which are the main component of the creosotes. PCP in the environment is converted to a polychlorinated dioxin which is extremely persistent in the environment and is stored for up to 20 years in fatty tissue in man and animals. If one measures the blood of those exposed to creosote sites, one can usually find octachloro-p-dioxin as the major contaminant of blood serum. The pattern of dioxins/dibenzofurans found at creosote sites, is unique and quite distinguishable from the dioxins normally found in food and other nutrients. This chemical thus serves as a good biomarker for exposure to past and current creosote sites.

Another chemical of concern near creosote sites is arsenic. Arsenic is a carcinogen but does not behave in the same manner as those chemicals mentioned above. Arsenic concentrates in hair, fingernails and toenails and can be quantified in those tissues. Although this biomarker does not have the persistence of the dioxin mentioned above, it does demonstrate ongoing exposure in drinking water, airborne particulates or dust in the home. If an area is contaminated with arsenic, it can find its way into the home and this results in a continuing exposure situation. The PAHs and dioxins can also accumulate in the home resulting in on-going exposures..

One approach to evaluating a potential exposure situation is to conduct a “pilot study” to determine if there is any widespread contamination and if any health effects are obviously related to the contamination. Obviously, environmental sampling of a limited number of residences and sources of distribution of contaminants such as ditches would be appropriate. Careful selection of a limited number of sampling sites both indoors and out-of-doors will insure an efficient evaluation of the situation.

Similarly, evaluation of the health of those thought to have been exposed to creosote, dioxins or arsenic should also be investigated. In addition, blood analysis for standard clinical parameters and for dioxins would provide definitive proof of exposure to chemicals emanating from a given creosote site. Our approach is to request that each patient fill out a medical questionnaire which

not only asked health-related questions but also family health and social habits. We then ask a selected number of patients to donate blood samples for analysis for clinical parameters including CBC and metabolic panels. We also ask for sufficient blood to determine the concentrations of dioxins and PAHs in their blood. While it would be ideal to have an unexposed control group for comparison, the Centers for Disease Control has reported normal values for many of the components that we seek to evaluate. Comparisons can be made to determine if indeed the patient has an elevated level of chemicals in their blood. In addition, if arsenic is found to be a component of the chemical mixture found at the site, then we will take samples of hair, fingernails and toenails for arsenic analysis. Again, we will compare them to normal values published in the literature.

Should we find elevated levels of dioxins, PAHs or arsenic in the suspect exposed population, then further medical evaluations may be appropriate and further testing on a larger group representing those exposed, will be recommended. Dr. Richard Parent, of Consultox Limited has been involved in several environmental sites including creosote sites and has designed and implemented programs involving as many as 1000 patients.