The key characteristics (KCs) of human carcinogens were recently introduced as the basis of a uniform approach for searching, organizing, and evaluating mechanistic evidence to support cancer hazard identification (PMID: 30521319). The KCs comprise the properties of known human carcinogens, including their ability to, be genotoxic; be immunosuppressive; or modulate receptor-mediated effects (PMID: 2660562). Established human carcinogens commonly exhibit one or more of these characteristics, and therefore, data on these characteristics can provide independent evidence of carcinogenicity when human data are lacking (PMID: 29562322). Such data can also help in interpreting the relevance and importance of findings of cancer in animals and in humans. In its 2017 report on ‘Using 21st Century Science to Improve Risk-Related Evaluations’, the NRC opined that the KCs approach ‘avoids a narrow focus on specific pathways and hypotheses and provides for a broad, holistic consideration of the mechanistic evidence.’ They further suggested that key characteristics be developed for other endpoints, such as endocrine disruption and reproductive toxicity. These have recently been published (PMID: 31719706; 31322437; 31199676) and KCs for hepatotoxin, immuno-, neuro- and cardiovascular toxicants are in the final stages of development. We have also recently published the findings of two expert committees who described approaches to studying carcinogenicity of chemical mixtures using the KCs (PMID: 33784186) and identified biomarkers that can be used to measure the KCs of carcinogens in humans, animals and cell culture (PMID: 32152214). A uniform approach to applying these biomarkers in occupational studies of different epidemiologic design needs to be developed so that the most relevant biomarkers of each KC are measured in exposed human populations, thereby improving hazard identification and risk assessment.

**Conclusion**

There is strong mechanistic evidence in humans for inflammatory and metabolic changes that promote carcinogenicity of welding fumes in humans.