

A text-mining approach for chemical risk assessment and cancer research

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The identification and understanding of chemicals' "mode of action" (MOA) can both improve cancer risk assessment and reduce uncertainties. The term MOA is defined as a sequence of key events, starting with the interaction of an agent with a cell, proceeding through cellular changes ultimately resulting in cancer formation.

We are developing a computerized text-mining tool, CRAB, for cancer research and risk assessment. The tool is based on the current understanding of the MOA and mechanisms relevant for cancer development. It can automatically analyze scientific data on chemicals of interest and classifies the literature according to the type, amount and strength of the evidence it provides for risk assessment. Chemical-specific toxicological literature profiles are generated by the tool.

Several areas where cancer risk assessment and research could be further developed with the aid of text-mining have been recognized, e.g. identification of gender-specific mechanisms for carcinogens and defining critical signaling pathways for cancer development. Another important application is to identify chemicals that share the same MOA that can cause additivity or interactions in the context of mixed exposure.

The tool provides both a qualitative and quantitative overview of existing scientific data. In addition, it can help to find patterns and common links between chemicals and help in generating new scientific hypotheses that can be tested experimentally.

We present an overview of the development of the tool and give several examples of applications that could be useful for toxicologists, risk assessors and researchers interested in understanding the mechanisms leading to chemical carcinogenesis.