Abstract Sifter: A literature informatics tool for chemical safety assessments

Nancy C. Baker[1] and Thomas Knudsen[2]

[1] Leidos, RTP, NC; [2] NCCT, EPA, RTP, NC

www.epa.gov

Nancy C. Baker | baker.nancy@epa.gov | 0000-0002-8351-9435

Introduction

Identifying environmental chemicals that adversely affect human health or the environment requires assembling information from a wide variety of sources, including the millions of articles in the biomedical literature. Literature informatics approaches can help researchers make use of this literature in more effective ways. We have developed a freely available Excel-based tool called the Abstract Sifter to retrieve and triage articles and to visualize the literature landscape for a set of chemicals.

The tool is supplied with queries that facilitate exploration of mechanistic information by using the language of adverse outcome pathways (AOPs) and Key Characteristics of Carcinogens[2].

Defining mechanisms through PubMed queries

Toxicity type queries

Genetox	(dna/drug effects OR DNA Damage OR chromosome aberrations OR genotoxicity OR micronucleus OR DNA Repair OR mutagenicity te
Cancer	neoplasms or cancer
ReproTox	(reproduction AND (toxicity OR abnormal OR adverse effects))
NeuroTox	(neurotoxicity OR (Nervous system diseases and chemically induced) OR ((neurons OR brain OR behavior) AND drug effects)
DevTox	(toxicity OR congenital abnormalities OR Prenatal Exposure Delayed Effects) AND (fetus OR embryo OR embryonic development)
Skin sensitization	("allergic" AND "contact" And dermatitis) OR Dermatitis, Allergic Contact[mh]

AOP queries

aop43	1mie	(Vascular Endothelial Growth Factor Receptor-2 OR Vascular Endothelial Growth Factc
aop43	2ke	((angiogenesis OR vasculogenesis) AND (reduce OR inhibit)) OR (Neovascularization, I
aop43	3ke	endothelium OR endothelial AND (damage OR impair OR impairment)
aop44	4ke	Blood circulation AND (drug effects AND toxicity)
aop43	5ao1	birth defects OR Congenital Abnormalities
aop43	6ao2	(bone OR bone development OR calcification OR osteogenesis OR limb bud/drug effe

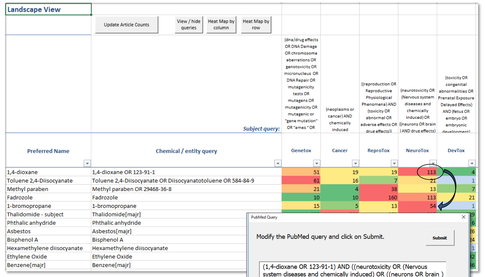
Aopwiki.org

Key Characteristics of Carcinogens queries

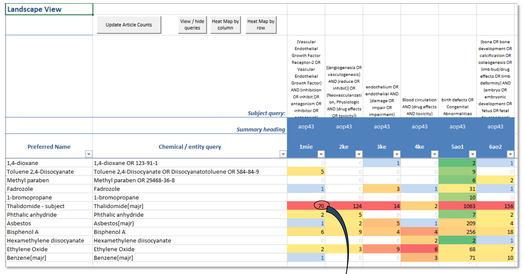
KCC1	Adducts	protein Adducts OR dna adducts OR epoxides OR quinones OR aldehydes
KCC2	DNA	(dna/drug effects OR DNA Damage OR chromosome aberrations OR genotoxicity OR micronucleus OR mutagenicity tests OR mutagens OR mut
KCC3	DNA break/rep	(topoisomerase OR DNA Repair/drug effects OR double-strand break repair)
KCC4	Epigenetics	(DNA methylation OR histone modification OR Histone Code OR Chromatin Assembly and Disassembly OR microRNAs OR Epigenesis, Genetic)
KCC5	Oxidative stres	(oxidative stress OR reactive oxygen species OR mitochondria/drug effects)
KCC6	Inflammation	(inflammation OR macrophages)
KCC7	Immunosuppre	(immunosuppressive OR immune system dysfunction)
KCC8	Receptors	receptors AND (antagonism OR agonism OR drug effects)
KCC9	Cell immortaliz	(cell immortalization OR cell division OR hayflick limit OR Aging/genetics OR Cellular Senescence)
KCC10	Proliferation	(cell proliferation OR cell death OR apoptosis OR Neovascularization, Pathologic)
Cancer	Cancer	(cancer OR neoplasms OR precancerous OR carcinogen OR carcinoma) AND (toxicity OR poisoning OR adverse effects)

Landscape view for three sample mechanistic reviews

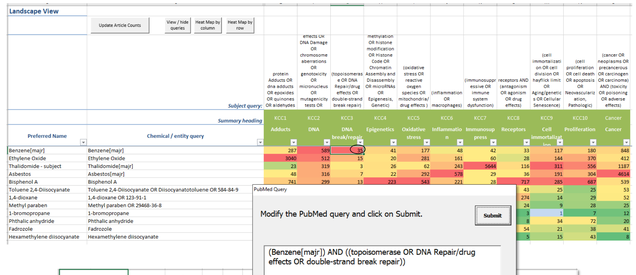
Toxicity Types



AOP 43: Vascular disruption



Key Characteristics of Carcinogens



Landscape Overview

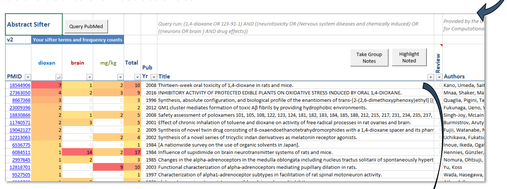
The Landscape sheet lets the scientist build an overview of a literature domain by entering entity and subject matter queries.

The numbers are article counts retrieved by the app... Double-clicking on the article count retrieves the citations and sends them to the Main sheet.

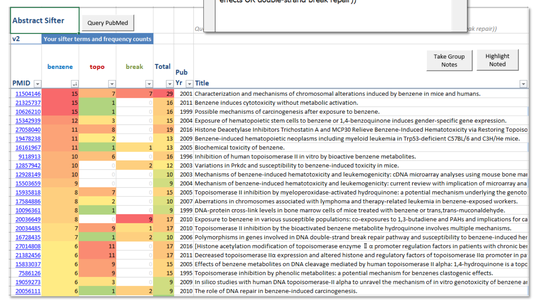
To sift, enter terms or characters of interest here and let the Abstract Sifter count occurrences of the terms in the title and abstract. Then sort. Double-clicking on a row sends the user to the Abstract sheet.

Retrieve and sift the citations

The Main sheet is where the user can browse and use the novel *sifting* technology to find relevant articles.



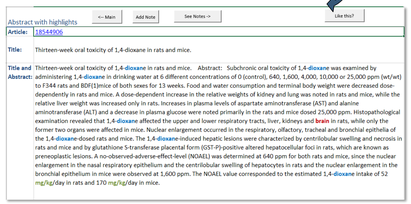
Notes can be taken and noted articles highlighted.



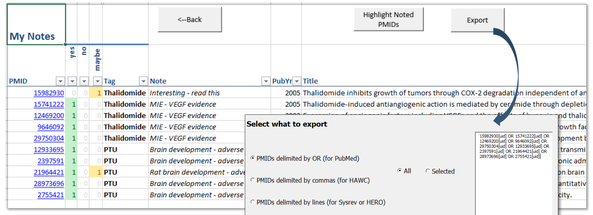
What other things can you do?

Look here to see other useful and fun capabilities.

Here's the Abstract sheet with the sifter terms colorized for easy reading.



Citations on the Notes sheet can be exported to other software.



Summary

The Abstract Sifter is a free, flexible literature retrieval tool that provides an overview of a complex literature landscape and the capability of focusing on mechanisms of toxicity. Available for download here: ftp://newftp.epa.gov/COMPTOX/Sustainable_Chemistry_Data/Chemistry_Dashboard/Abstract_Sifter/

References: 1) Baker N et al. F1000 Res. 2017 Dec 21;6. pii: Chem Inf Sci-2164.
2) Smith, et al. Environ Health Perspect. 2016 Jun;124(6):713-21.

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