

**Appendix G. Value of the Haber's Law Exponent (n) for various gases and vapors for acute RELs developed using OEHHA (1999) procedures**

**TABLE G1. VALUE OF THE HABER'S LAW EXPONENT (*n*) FOR VARIOUS GASES AND VAPORS FOR ACUTE RELS<sup>1</sup>**

Chemical	<i>n</i>	Species/Effect (site of action)	References, Comments
Acrolein	1.2	rat/lethality (local irritant)	U.S. EPA (1992a; U.S.EPA, 1992b) <sup>2</sup>
Acrylonitrile	1.1	rat/lethality (systemic)	(Dudley and Neal, 1942; Appel et al., 1981) <sup>3</sup>
Allyl chloride	0.5	rat/lethality (local irritant)	Adams <i>et al.</i> (1940) <sup>2</sup>
Ammonia	4.6	Human/irritation	Rosenbaum <i>et al.</i> (1993)
	2.02	rat/lethality (local irritant)	Appelman <i>et al.</i> (1982)
Arsine	2.2	rat/lethality (systemic)	IRDC (1985) <sup>2</sup> for 0.5 to 1 hr (n dependent on exposure duration)
	1.0	rat/lethality (systemic)	IRDC (1985) <sup>2</sup> for 4 hr to 1 hr (n dependent on exposure duration)
	2	mice/lethality (systemic)	Levy (1947)
Benzene	2	not given	AICE (1989)
Bromine	2.2	mice/lethality (local irritant)	Bitron & Aharoson (1978) <sup>3</sup>
Carbon monoxide	1	not given	AICE (1989)
Carbon tetrachloride	2.8	rat/lethality (systemic)	Adams <i>et al.</i> (1952) <sup>3</sup>
Chlorine	2.8	rat/lethality (local irritant)	Zwart & Woutersen (1988) <sup>2</sup> for 0.5 hr to 1 hr (n dependent on exposure duration)
	1.0	rat/lethality (local irritant)	Zwart & Woutersen (1988) <sup>2</sup> for 4 hr to 1 hr (n dependent on exposure duration)
	1.3	mouse/lethality (local irritant)	Zwart & Woutersen (1988) <sup>2</sup>
	3.5	mouse/lethality (local irritant)	Bitron & Aharoson (1978) <sup>3</sup>
Chlorine pentafluoride	2	rat, mouse, dog, monkey/lethality (local irritant)	Darmer <i>et al.</i> (1972) <sup>3</sup>
Crotonaldehyde	1.2	rat/lethality (local irritant)	Rinehart (1967) <sup>3</sup>
Dibutyl hexamethylene-diamine	1	rat/lethality (local irritant)	Kennedy & Chen (1984) <sup>3</sup>
1,2-dichloro-ethylene	2	(not applicable)/lethality (systemic)	U.S.EPA (1996), based on the mid-point range of n values from lethality data of <sup>3</sup>
Dimethyldichloro-silane	2	(not applicable)/lethality (local irritant)	U.S.EPA (1996), based on the mid-point range of n values from lethality data of <sup>3</sup>
Ethylene dibromide	1.2	rat/lethality (systemic)	(Rowe <i>et al.</i> , 1952b) <sup>3</sup>
Ethylene imine	1.1	rat, guinea pig/lethality (local irritant)	(Carpenter <i>et al.</i> , 1948) <sup>3</sup>
Fluorine	1.9	rat/lethality (local irritant)	U.S.EPA (1996), derived from LC <sub>50</sub> data of Keplinger & Suissa (1968)
	1.8	mouse/lethality (local irritant)	U.S. EPA (1996), derived from LC <sub>50</sub> data of Keplinger & Suissa (1968)
	1.6	guinea pig/lethality (local irritant)	U.S.EPA (1996), derived from LC <sub>50</sub> data of Keplinger & Suissa 1968)
Formaldehyde	2	not given	AICE (1989)

Chemical	<i>n</i>	Species/Effect (site of action)	References, Comments
Hydrazine	2	(not applicable)/lethality (systemic)	U.S.EPA (1996), based on the mid-point range of <i>n</i> values from lethality data of <sup>3</sup>
Hydrogen chloride	1	rat, mouse/lethality (local irritant)	Darmer (1972) <sup>3</sup>
	1.5	rat/lethality (local irritant)	Hartzell & Johnson (1985) <sup>2</sup>
Hydrogen cyanide	2.7	numerous species/lethality (systemic)	Barcroft (1931) <sup>3</sup>
Hydrogen fluoride	2	rabbits, guinea pigs/ lethality (local irritant)	Machle (1934) <sup>3</sup>
Hydrogen fluoride (low humidity)	1	rat/lethality (local irritant)	Haskell Lab. (1988) <sup>2</sup>
Hydrogen sulfide	2.2	cat, rabbit/lethality (systemic/local irritant)	Lehmann (1892) <sup>3</sup>
	8.2	lethality (systemic/local irritant)	Arts (1989)
Methyl bromide	4.0	severe morbidity (systemic/local irritant)	Pharmaco: LSR, (1994) as cited in DPR (2004) <sup>2</sup> , DPR (1996)
	1	not given	AICE (1989)
Methylene chlorobromide	1.6	rat/lethality (systemic)	Torkelson (1960) <sup>3</sup>
Methyl hydrazine	1.0	squirrel monkey/lethality (systemic and local irritant)	Haun (1970) <sup>2</sup>
	1.0	dog/lethality (systemic and local irritant)	Haun (1970) <sup>2</sup>
Methyl isocyanate	1.1	human/eye irritation	Mellon Institute (1963) <sup>2</sup>
	0.5	rat/lethality (local irritant)	Kimmerle & Eben (1964) <sup>2</sup>
	0.7	rat/lethality (local irritant)	DOW Chemical (1990) <sup>2</sup>
Methyl mercaptan	2	(Not applicable)/lethality (systemic and local irritant)	U.S.EPA (1996), based on the mid-point range of <i>n</i> values from lethality data of <sup>3</sup>
Methyl t-butyl ether	2.0	lethality (systemic)	Snam Progetti (1980) as cited in ten Berge et al., (1986) <sup>3</sup>
Nitrogen dioxide	3.5	guinea pig, mouse, dog, rat, rabbit/lethality (local irritant)	Hine <i>et al.</i> , (1970) <sup>3</sup>
Nitric acid	3.5	not applicable (local irritant)	U.S.EPA (1996), based on NO <sub>2</sub> from Hine <i>et al.</i> (1970)
Perfluoroisobutylene	1.2	rat/lethality (local irritant)	Smith <i>et al.</i> (1982) <sup>3</sup>
Phosgene	1	lethality (local irritant)	Rinehart & Hatch (1964)
Propylene oxide	2.2	rat/lethality (local irritant)	Rowe <i>et al.</i> (1956) <sup>2</sup>
	1.5	guinea pig/lethality (local irritant)	Rowe <i>et al.</i> (1956) <sup>2</sup>
Sulfur dioxide	1	not given	AICE (1989)
Tetrachloroethylene	2.0	rat/lethality (systemic)	Rowe <i>et al.</i> (1952a) <sup>3</sup>
Toluene	2.5	not given	AICE (1989)
Trichloroethylene	0.8	rat/lethality (systemic)	Adams <i>et al.</i> (1951) <sup>3</sup>

<sup>1</sup> developed using procedures specified in OEHHA (1999a). <sup>2</sup> derived by OEHHA.<sup>3</sup> derived by ten Berge (1986).

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