

Table 4.2. Relative lethality of selected natural and synthetic poisons: order-of-magnitude groupings relative to sarin

Synthetic poisons ^a	Relative lethality ^b (sarin = 1000)	Natural poisons ^c	
		Name	Source
Homocholine Tammelin-ester ¹ Dioxin ² 33 SN ⁺ 3	10 ⁻⁴ to 10 ⁻³	Botulinal toxin type A, α -fraction ³¹	Botulinal toxin type A
		Botulinal toxin type A, crystalline ³²	<i>Clostridium botulinum</i> bacteria
		Tetanal toxin, crystalline ³²	<i>Clostridium tetani</i> bacteria
Ethylthioethyl-metastox ⁺ 4 Seleno-VE ⁵ HC-3 ⁶ VX ⁷ Ro 3-0422 ⁸ TL 1236 ⁹ Gd-42 ¹⁰ DCMQ ¹¹ Phospholine ¹² 3152 CT ¹³ Soman ¹⁴ (-)-Sarin ¹⁵	10 ⁻³ to 10 ⁻²	Botulinal toxin type A, amorphous ³⁴	<i>Clostridium botulinum</i> bacteria
		Palytoxin ³⁵	<i>Palythoa</i> zoanthid coelenterates
Sarin ¹⁶	10 ⁻² to 10 ⁻¹	Batrachotoxin ³⁶	Kokói arrow poison
		Ricin, crystalline ³⁷	Castor beans, the seeds of <i>Ricinus communis</i>
		C-alkaloid E ³⁸	Calabash-curare arrow poison
Tabun ¹⁷ Armin ¹⁸ Gd-7 ¹⁹ Methyl fluoroacetate ²⁰	10 ⁻¹ to 1	Saxitoxin ³⁹	<i>Gonyaulax catanella</i> dinoflagellate marine algae
		Tetrodotoxin ⁴⁰	Puffer-fishes and certain salamanders
Hydrogen cyanide ²¹ Cadmium oxide ²² Mustard gas ²³ Parathion ²⁴ Lewisite ²⁵ Phosgene ²⁶ Arsine ²⁷	1 to 10	Atelopidtoxin ⁴¹	<i>Atelopus zeteki</i> , a Panamanian arrow-poison frog
		Abrin, crystalline ⁴²	Jequirity beans, the seeds of <i>Abrus precatorius</i>
		Indian Cobra neurotoxin ⁴³	Indian Cobra venom
Cyanogen chloride ²⁸ Chlorine ²⁹ White arsenic ³⁰	10 to 10 ²	BWSV-toxin ⁴⁴	Black Widow Spider venom
		Ricin, amorphous ⁴⁵	Castor beans, the seeds of <i>Ricinus communis</i>
Methyl fluoroacetate ²⁰	10 ² to 10 ³	Kokói arrow-poison ⁴⁶	<i>Phyllobates aurotaenia</i> , a Columbian frog
		Russell's Viper venom ⁴⁷	<i>Vipera russelli</i>
		Israeli scorpion venom ⁴⁸	<i>Leiurus quinquestriatus</i>
Hydrogen cyanide ²¹ Cadmium oxide ²² Mustard gas ²³ Parathion ²⁴ Lewisite ²⁵ Phosgene ²⁶ Arsine ²⁷	10 ³ to 10 ⁴	α -Aminitin ⁴⁹	The Death-Cap mushroom, <i>Amanita phalloides</i>
		Indian Cobra venom ⁵⁰	<i>Naja naja</i>
Phosgene ²⁶ Arsine ²⁷	10 ⁴ to 10 ⁵	Brown Widow Spider venom ⁵¹	<i>Latrodectus geometricus</i>
		<i>d</i> -Tubocurarine ⁵²	Tube-curare arrow poison
		Aconitine ⁵³	Roots of Monk's-Hood, <i>Aconitum napellus</i>
Cyanogen chloride ²⁸ Chlorine ²⁹ White arsenic ³⁰	10 ⁵ to 10 ⁶	Physostigmine ⁵⁴	Calabar beans, the seeds of <i>Physostigma venenosum</i>
		North American scorpion venom ⁵⁵	<i>Centruroides sculpturatus</i>
Cyanogen chloride ²⁸ Chlorine ²⁹ White arsenic ³⁰	10 ⁵ to 10 ⁶	Strychnine ⁵⁶	<i>Strychnos nuxvomica</i> bark or seeds
		Black Widow Spider venom ⁵⁷	<i>Latrodectus mactans mactans</i>
Cyanogen chloride ²⁸ Chlorine ²⁹ White arsenic ³⁰	10 ⁵ to 10 ⁶	Ouabain ⁵⁸	<i>Strophanthus gratus</i> seeds
		Nicotine ⁵⁹	<i>Nicotiana</i> tobacco plants
Cyanogen chloride ²⁸ Chlorine ²⁹ White arsenic ³⁰	10 ⁵ to 10 ⁶	Western Diamondback rattlesnake venom ⁶⁰	<i>Crotalus atrox</i>
		Bee venom ⁶¹	The honey bee, <i>Apis mellifera</i>

^a Homocholine Tammelin-ester is 3-trimethylammonioethyl methylphosphonofluoridate iodide; Dioxin is 2,3,7,8-tetrachlorodibenzo-p-dioxin; 33SN + is O-ethyl S-2-trimethylammonioethyl methylphosphonothiolate iodide; Ethylthioethyl-metastox+ is OO-dimethyl S-2-(S'-ethyl-S'-ethylthioethylsulphonio)ethyl phosphorothiolate bromide. Seleno-VE is O-ethyl Se-2-diethylaminoethyl ethylphosphonoselenolate; HC-3 is 4,4'-bis(NN-dimethyl-N-2-hydroxyethylammomoacetyl)biphenyldibronide; VX is O-ethyl S-2-diisopropylaminoethyl methylphosphonothiolate; Ro 3-0422 is 3-(diethylphosphoryl)-1-methylquinolinium methosulphate; TL 1236 is 2-methyl-5-trimethylammonioethyl N-methylcarbamate chloride; Gd-42 is O-ethyl S-2-(S'-methylthioethylsulphonio)ethyl methylphosphonothiolate methosulphate; DCMQ is 5-NN-dimethylcarbamoyl-1-methylquinolinium bromide; Phospholine is OO-diethyl S-2-trimethylammonioethyl phosphorothiolate iodide; 3152 CT is 1-(3'-trime-thylammoniophenoxy)-3-(3'-trimethylammoniophenoxy)-5'-NN-dimethylcarbamoyl)propane diiodide; Soman is 1,2,2-trimethylpropyl methylphosphonofluoridate; Sarin is isopropyl methylphosphonofluoridate; Tabun is ethyl NN-dimethylphosphoroamidocyanidate; Armin is O-ethyl O-4-nitrophenyl ethylphosphonate; Gd-7 is O-ethyl S-2-ethylthioethyl methylphosphonothiolate; Mustard gas is bis(2-chloroethyl) sulphide; Parathion is OO-diethyl O-4-nitrophenyl phosphorothionate; Lewisite is 2-chlorovinyl-dichloroarsine. For structural formulae, see table 1.4 and page 23.

^b The "relative lethality" was determined as follows. Reported LD50 figures for the following combinations of experimental animal and route of administration were assembled from the cited literature: iv/mouse, ip/mouse, sc/mouse, iv/rat, sc/rat, iv/guinea-pig, iv/cat, iv/rabbit. Within each animal/administration-route set, each agent LD50 was converted into a lethality-index relative to sarin, assigning a reference value of 1000 to the sarin LD50 concerned. For example, the sc/mouse index for batrachotoxin is taken as 10 because its sc/mouse LD50 and that of sarin were around 0.002 and 0.2 mg/kg respectively. In this table, the agents are ranked according to their lowest lethality-index. Only in the case of the italicized synthetic poisons were animal parenteral LD50s unavailable. In these cases, respiratory LC50s were used instead, except for white arsenic, where an oral LD50 was used. The respiratory LD50 of sarin in man is estimated to be about 1000 micrograms.

^c The venoms of *Vipera russelli*, *Leiurus quinquestriatus* and *Latrodectus geometricus* appear to be the most poisonous snake, scorpion and spider venoms known.