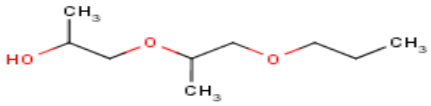
Dipropylene Glycol n-Propyl Ether
(CAS 29911-27-1)

(Synonyms : 1-(2-propoxy-1-methylethoxy)-2-propanol; Arcosolv DPnP, Dowanol DPnP)



Dipropylene Glycol n-Propyl Ether Acute REL

No studies of short-term exposures were located upon which to base an acute REL.

Dipropylene Glycol n-Propyl Ether 8-hour REL

No 8-hour REL was derived at this time due to excessive uncertainty associated with the located studies.

1 Physical and Chemical Properties of Dipropylene Glycol n-Propyl Ether

Description	Colorless liquid; ether-like odor
Molecular formula	$C_9H_{20}O_3$
Molecular weight	176.3 g/mol
Specific gravity	0.922 @ 25°C/25°C
Boiling point	212 ºC
Melting point	-75 ºC
Vapor pressure	0.08 mm Hg @ 25ºC
Log Kow	0.994
Solubility	17.5 g/100 ml H_2O @ 25ºC
Atmospheric half-life	11.5 days
Conversion factor	1 ppm = 7.33 mg/m^3 @ 25ºC

2 Production, Use, and Exposure

Dipropylene Glycol n-Propyl Ether (DPnP) is a colorless liquid with an ether-like odor that evaporates slowly. It is used as a solvent and as a coalescent for water-borne latex coatings. It is a component of cleaning formulations and of household and personal care products from which occupational and consumer exposure is likely.

3 Pharmacokinetics and Metabolism

No data specific to the metabolism of DPnP were located. The primary alcohol function on glycol ethers is easily oxidized by liver alcohol dehydrogenase (ADH). However, the isomer containing the primary alcohol is usually present in the racemic mixture at < 5%. The propylene

glycol ethers have a secondary alcohol function representing > 95% of the racemic mix and are relatively poorer substrates for ADH. They undergo microsomal o-dealkylation to propylene glycol and the alkyl alcohol by mixed function oxidases. Intermediary metabolism results in the conversion to lactic acid, thence to pyruvic acid, and ultimately to CO_2 (Klaassen, 1996).

4 Acute Toxicity of Dipropylene Glycol n-Propyl Ether

No experimental animal data were located for DPnP; however, similarity to propylene glycol n-propyl ether (PnP) is expected. For comparison, PnP is a severe eye irritant. It is a mild skin irritant after a 4-hour exposure in rabbits, but may produce necrosis following 24 hours of dermal contact. Rats exposed to PnP by inhalation for 9 days, 6 hr/d, to 0, 503, 983, and 2000 ppm showed CNS depression at 2000 ppm only. All exposures caused corneal lesions, depressed body weights, and increased kidney and liver weights (Union Carbide in CCOHS). Also in rats exposed by this same regimen but to 0, 105, 486, and 1824 ppm, some potentially irreversible eye effects were seen at 105 and 486 ppm that persisted for the 4-week recovery period. The 105 ppm level may represent a LOAEL for this effect with PnP glycol ether (CCOHS).

5 Derivation of Reference Exposure Levels (RELs)

5.1 Derivation of Interim Acute REL (1-hour exposure) for Propylene Glycol n-Propyl Ether as a proxy for Dipropylene Glycol n-Propyl Ether

No studies of short-term exposure to DPnP were located that were appropriate for the derivation of an acute REL.

5.2 Derivation of 8-hour REL

Since no experimental data for the effects of DPnP following inhalation were located, the following attempt to derive an 8-hour REL was based on data on ocular lesions in rats following exposure to PnP described above. A LOAEL, but not a NOAEL, was reported, so a LOAEL uncertainty factor (UF) of 10 was applied. Since the study was only nine days in length, a subchronic UF of 10 was applied. Significant differences in toxicokinetics or toxicodynamics between rats and humans are not expected to be large for the critical effect so a UF of $\sqrt{10}$ was used for both interspecies UFs. Similarly, the intraspecies toxicodynamic variability is not expected to be great so UFs of $\sqrt{10}$ is used. The expectation of low inter- and intraspecies toxicodynamic variability is partly based on expected similarity to other propylene glycol ethers, and partly on the use of a non-systemic endpoint for toxicity. The use of a non-systemic endpoint is also expected to minimize toxicodynamic differences. However, in the absence of toxicokinetic data specific to DPnP (this REL is based on PnP), the intraspecies toxicokinetic UF is assigned a value of 10 to insure protection of infants, children, and other potentially sensitive populations. The cumulative UF is thus 30,000. This level of uncertainty is too high to provide a meaningful REL value, thus an 8-hour REL was not derived at this time.

Study	Union Carbide (in CCOHS)
Study population	Male rats
Exposure method	Vapor/chamber
Exposure continuity	6 hr/day, 5 d/wk
Exposure duration	9 days
Critical effects	ocular lesions
LOAEL	105 ppm
NOAEL	not observed
Time-adjusted exposure	C * T = K
Extrapolated concentration	56 ppm (105*6/8*5/7)
Human concentration adjustment	56 ppm (not systemic)
LOAEL uncertainty factor	10
Subchronic uncertainty factor	10
Interspecies uncertainty factor	
Toxicokinetic (UF_{A-k})	√10
Toxicodynamic (UF_{A-d})	√10
Intraspecies uncertainty factor	
Toxicokinetic (UF_{H-k})	10
Toxicodynamic (UF_{H-d})	√10
Cumulative uncertainty factor	30,000
8-hour Reference Exposure Level	**Not done**

6. Other toxicity

Other toxicities associated with DPnP are unknown but may be similar to PnP.

7. Conclusions

For both the acute and 8-hr RELs, it should be emphasized that these numbers represent the exposure levels at which no adverse effects are expected for the specified exposure period. However, since these numbers are based on the structurally similar analog, PnP, the toxic effects observed with DPnP may be of greater or lesser intensity, and/or may be qualitatively different.

8. References

CCOHS. Cheminfo Chemical profiles created by CCOHS. Retrieved 8-19-08, 2008.

Klaassen C, ed. (1996). Casarett and Doull's Toxicology; The basic science of poisons. McGraw-Hill New York. 1111