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FROM THE LITERATURE

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## DIETHYLENE GLYCOL TOXICITY

Diethylene glycol is not only found in wine these days, it seems. The scandal into which irresponsible Austrian vintners and their government watchdogs corkscrewed this summer has drawn attention to a toxic chemical that has turned up in all sorts of unexpected places. In view of its apparently tempting economic and organoleptic qualities, it is worth reviewing diethylene glycol's toxicity profile.

## Human experience

Insight into the lethality of diethylene glycol (DEG) was gained when in 1937 a new and previously untried 'elixir of sulphanilamide' preparation made by the S.E. Massengill Co. containing 72% DEG killed 105 people (Calvery & Klumpp, *Sth. med. J.*, Nashville 1939, 32, 1105). The lowest total dose of the Massengill elixir reported to cause death in the children involved, the youngest aged only 7 months, was 5 ml (3.6 ml DEG); total doses in the adults that died ranged from 20-240 ml of the elixir (14-170 ml DEG). No dose-response data are available, but a cumulative dose of 14 ml DEG in an adult weighing 60 kg is equivalent to a total intake of about 0.23 ml/kg; the average fatal dose in adults was about 71 ml DEG, or 1.2 ml/kg (i.e. about 1.3 g/kg\*). Some of the survivors tolerated much higher doses.

The first symptoms of poisoning were nausea and vomiting, with pain felt over the kidney region and abdomen. After an initial increase, urine production decreased and finally stopped. Drowsiness and coma usually preceded death, which occurred 2-22 days after the first dose of the elixir. Most of the few clinical studies showed albumin, casts and red blood cells in the urine and elevated levels of urea nitrogen in the blood. Levels of circulating white blood cells were also increased, possibly due to concentration of the blood (Calvery & Klumpp, *loc. cit.*; Ruprecht & Nelson, *J. Am. med. Ass.* 1937, 109, 1537). Similar signs and symptoms were again seen in seven Cape Town children who died after receiving sedative mixtures in which DEG had been substituted for the usual vehicle, propylene glycol. No data on the level of DEG in the mixtures or the amounts consumed are reported (Bowie & McKenzie, *S. Afr. med. J.* 1972, 46, 931).

Pathological examination of the dead in both incidents identified the kidney as the principal target; the liver was also affected. Typically the kidneys became pale and swollen. Microscopically the lesion consisted mainly of hydropic degeneration of the convoluted tubules, desquamation of the tubular epithelia and blockage of the

\*The specific gravity of diethylene glycol is 1.118.