King County Department of Natural Resources
Water and Land Resources and Wastewater Treatment Divisions
April, 1997

# Policy regarding discharge of 2-4% glutaraldehyde disinfectant solutions to King County Sanitary Sewer

**Cold sterilant solutions containing no more than four percent glutaraldehyde may be discharged to the King County sanitary sewer system provided appropriate best management practices (BMPs) are followed.**

Many hospitals, clinics and dental clinics use glutaraldehyde solutions at 2 -4% to disinfect surgical instruments. When these solutions lose their ability to disinfect, they must be discarded. These solutions are likely to designate as state dangerous waste, defined as over 1% glutaraldehyde in WAC 173-303.

It is the determination of King County that such spent glutaraldehyde solutions are treatable within its wastewater treatment system and meet all other conditions for a Domestic Sewage Exclusion under WAC 173-303-071.

This paper summarizes information relevant to discharge policies for glutaraldehyde-contaminated wastewater from dental and medical cold sterilization processes (usually at 2-4% glutaraldehyde concentration). The information is based on CHEMBANK data (RTEC, CHRIS, HSDB updated through July 96); the *Merck Index, Clinical Toxicology, Handbook of Toxic and Hazardous Chemicals and Carcinogens*, other articles and personal communications.

## Treatability criteria

The four criteria for treatability in the sewer system are applied to 2-4% glutaraldehyde solutions below:

*1. Protecting the treatment plant from interferences.* Disinfectant solutions containing 2-4% glutaraldehyde currently discharged to the sanitary sewer system have no detectable impact on King County's treatment facilities (personal communication, Dick Finger, 12/13/96).

*2. Preventing the discharge of untreated pollutants to receiving waters.* A literature review indicates that glutaraldehydes are readily biodegradable in secondary activated sludge treatment plants (see background section). Effluent toxicity is regularly monitored

by fish bioassay and reported to the Washington State Department of Ecology. There is no NPDES permit limit or marine water quality criteria for glutaraldehyde.

*3. Preventing contamination of biosolids:* The biodegradation rates of glutaraldehyde indicate that only trace concentrations, if any, would be in the biosolids. Any trace concentration in the feed should biodegrade further during aerobic and anaerobic digestion process. Currently there are no limits for glutaraldehyde in biosolids.

*4. Protecting health and safety of POTW personnel:* Glutaraldehyde is highly soluble in water. Lower vapor pressure also reduces the likelihood that inhalation would be a substantial route of exposure. There are no OSHA requirements for glutaraldehyde.

**Steps recommended to reduce the discharge of 2-4% glutaraldehyde disinfectant solutions:**

*Pollution prevention*

- Use only the quantity necessary
- Scrape wastes, especially amalgam residues, from instruments prior to sterilization

*All known and reasonable technologies*

- Glutaraldehyde is the disinfectant of choice. Alternatives, such as phenols, are less attractive environmentally.
- Use autoclave to sterilize where possible (metal instruments)

*Best management practices*

1. Use glutaraldehyde cold sterilant solution per manufacture's directions
2. Use only the quantity necessary
3. Scrape wastes, especially amalgam residues, from instruments prior to sterilization
4. Use an autoclave to sterilize where possible
5. After discharging glutaraldehyde solution down the sanitary sewer drain, flush with several gallons of water so that the solution doesn't sit in the sink trap.

*BACKGROUND*

*Industrial uses of glutaraldehyde:*

- chemical disinfectant for cold sterilization of medical and dental equipment (2% solution either alkaline or acid; also 2% alkaline solution in 70% isopropanol.)
- tanning agent for leather
- enzyme cross-linking agent
- used in adhesives, sealants and electrical products
- biocide in oil industry
- embalming fluid 25% solution

Grades 99%, 50% biological solution, 25% solution.

*Wastes from glutaraldehyde:*
Spent disinfectant solution. Possible waste from tanning and oil industries.

*Quantity of glutaraldehyde used in King County:*
Current production or import/export data for King County could not be found. The approximately 1200 dental offices in the county dispose of one to four quarts every 28 days, for a total of 300-1200 gallons per month from dental offices in King County. Medical clinics and hospitals also discharge spent cold sterilant. In King County, two tanners (SIC 3111-01), Klineburger Brothers Taxidermy, Seattle and Sportsman. Taxidermy in Enumclaw, and one leather finisher (SIC 2843-01), Pace International in Kirkland were found. Possible oil biocide related uses are unknown. Probably the greatest use is as a cold sterilant.

*Physical properties*
freezing point -14° C
boiling point 187-189° C
vapor density 3.4 (air = 1)
vapor pressure17 mm Hg at 20° C
volatile in steam
soluble in water

*Fate in treatment plant*
A literature search of disinfectants in sewage treatment systems indicates biodegradability at sufficiently low influent concentrations. Gerike and Gode tested 25 active ingredients of disinfectants including alcohols, aldehydes, phenols and quaternary ammonias. Except the ammonias, which varied, all were found readily biodegradable in sewage treatment plants. At dilutions below inhibitory thresholds they reported that no further measures need to be taken for removal or destruction of disinfectants. Inhibitory limits for glutaraldehyde are 130 mg/L or 0.00013%. Sewage treatment plants were only impaired at high influent concentrations. Other sources show 23% biodegradability of 100mg/L solution in 6 days (Ritter) and biodegradability in biosolids approaching 90% of 0.9 mg/L and 1.7 mg/L solutions (Waggy). TOXCHEM model shows a 67% biodegradation (personal communication, Judy Kennedy, 11/26/96). Ritter's figures may be low due to biocidal effect at a concentration of 100 mg/L. If so, then Gerike and Godes' inhibitory limit of 130 mg/L may be high. TOXCHEM, like any fate model is subject to much variability and has been shown to be unreliable by giving lower than measured rates (personal communication, Rick Renaud, 1/14/97).

References:
Finger, Dick, King County Water and Land Resources Department. Personal communication, 12/13/96.

Gerike, P. and Gode, P. "The Biodegradability and Inhibitory Threshold Concentration of Some Disinfectants". Chemosphere CMSHAF, Vol. 21, No.6, p 799-812, 1990. 1 tab, 25 ref. 1990.

Kennedy, Judy. Washington State Department of Ecology. Personal communication, 11/26/96.

Rick Renaud, King County Water and Land Resources Department. Personal communications, 1/14/97..

Ritter, "Ready Biodegradability: Modified MITI-Test (I) for Piror 850", RCC Project 245327, May 1990. (Internet listing)

Waggy, "Glutaraldehyde Ecological Fate and Effects Studies", Union Carbide Research and Development Department Project No 515G02, October, 1981. (Internet listing)