Evaluation of AT580 Aldehyde Sampler
with respect to lower TLV issued by ACGIH

Prepared by: C.R. (Gus) Manning, PhD, CIH Date: 20 May 2009

Background
AT571 Diffusive Samplers (also formerly known as AT568 Samplers) have been used in sampling glutaraldehyde in hospital environments since 1992. The 568/571 Sampler has been validated and shown to have a detection limit of 0.02 ppm for a 15-min sample. With the lowering of the ACGIH TLV (Ceiling) to 0.05 ppm, there was a desire to lower the detection limit in order to measure more accurately at or near the ACGIH TLV.

AT580 Sampler Description
The AT580 Sampler incorporates the same internal sampling medium as the AT571, a glass fiber treated with 2, 4-dinitrophenylhydrazine (DNP). The difference between the two samplers lies in their different external sampling grids. In that respect, the AT580 possesses a substantially larger sampling grid surface than the AT571 (13 cm^2 *versus* 1.8 cm^2). While the AT571 was designed to provide a small, convenient sampler with very high sample *capacity*, the AT580 has been designed for the *highest possible sampling rate*. The anticipated increase in sampling rate of nearly one order of magnitude can be expected to produce a detection limit close to one order of magnitude lower than the AT571 (i.e. on the order of 0.002 ppm for a 15-min sample).

Plan of Study
Glutaraldehyde vapor was generated by injecting a 1% aqueous glutaraldehyde solution through a gas tight syringe into a flowing stream of air using a metering syringe pump. The glutaraldehyde injection rate was matched to the air flow rate of 157 L/min generated by a Miller-Nelson HCS-401 atmosphere control system to generate glutaraldehyde concentrations in the range of interest. Input air generated by the HCS-401 was provided at 50% RH and 25°C prior to glutaraldehyde injection, then passed into a 4" x 4" acrylic rectangular chamber 12" in length generating a linear velocity on the order of 25 cm/sec.

Each separate chamber run was monitored for the entire 15 minute test period by active sampling devices (a) at four representative locations and contained five (5) AT580 placed in a steel basket in the mid-chamber.

At the end of each 15 minute exposure run, the Active Samplers and AT580 Samplers were analyzed for their glutaraldehyde content (as glutaraldehyde-2,4-dinitrophenyl-hydrazine) by HPLC using a method similar to OSHA Method 64.

Results
Results of the study are displayed in tabular form in Table 1 (below) and in graphical form in Figure 1(below).

(a) Sampling cassettes containing DNP-treated glass fiber filters (SKC 225-9003) or sampling tubes containing DNP-treated silica gel (SKC 226-119).

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Table 1

Glutaraldehyde Sampling
Comparison of AT 580 Sampler versus Active Sampler

Chamber Test A - 4 Active Samplers & 5 Diffusive AT 580 Samplers

Exposure Time	Glutaraldehyde Concentration Active Sampling		Glutaraldehyde Concentration AT580 Sampler		% of ACGIH Ceiling	AT580 vs Active Sampler
(min)	*(ppm)*	*(RSD)*	*(ppm)*	*(RSD)*		
15	0.0059	3%	0.0076	6%	12%	129%

Chamber Test B - 4 Active Samplers & 5 Diffusive AT 580 Samplers

Exposure Time	Glutaraldehyde Concentration Active Sampling		Glutaraldehyde Concentration AT580 Sampler		% of ACGIH Ceiling	AT580 vs Active Sampler
(min)	*(ppm)*	*(RSD)*	*(ppm)*	*(RSD)*		
15	0.0065	1%	0.0085	11%	13%	131%

Chamber Test C - 4 Active Samplers & 5 Diffusive AT 580 Samplers

Exposure Time	Glutaraldehyde Concentration Active Sampling		Glutaraldehyde Concentration AT580 Sampler		% of ACGIH Ceiling	AT580 vs Active Sampler
(min)	*(ppm)*	*(RSD)*	*(ppm)*	*(RSD)*		
15	0.025	9%	0.027	7%	50%	108%

Chamber Test D - 4 Active Samplers & 5 Diffusive AT 580 Samplers

Exposure Time	Glutaraldehyde Concentration Active Sampling		Glutaraldehyde Concentration AT580 Sampler		% of ACGIH Ceiling	AT580 vs Active Sampler
(min)	*(ppm)*	*(RSD)*	*(ppm)*	*(RSD)*		
15	0.044	11%	0.046	3%	88%	105%

Chamber Test E - 4 Active Samplers & 5 Diffusive AT 580 Samplers

Exposure Time	Glutaraldehyde Concentration Active Sampling		Glutaraldehyde Concentration AT580 Sampler		% of ACGIH Ceiling	AT580 vs Active Sampler
(min)	*(ppm)*	*(RSD)*	*(ppm)*	*(RSD)*		
15	0.044	11%	0.044	3%	88%	100%

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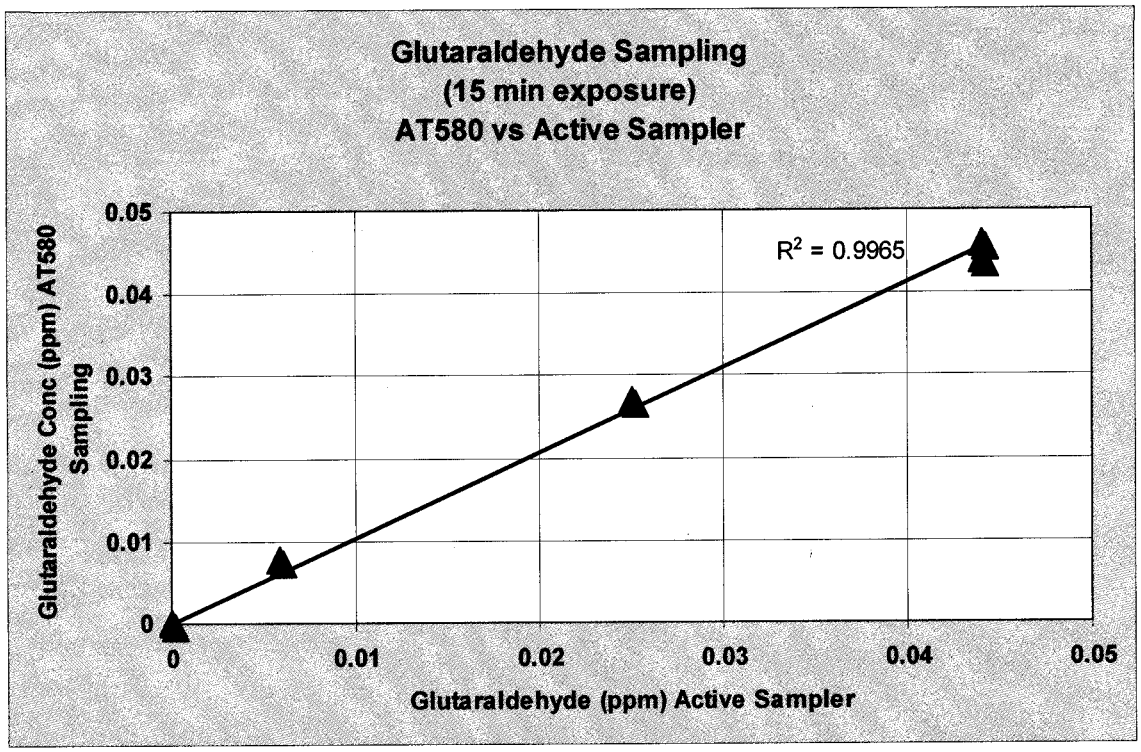
Figure 1

Glutaraldehyde Sampling
Comparison of AT 580 Sampler versus Active Sampler



Conclusions

The AT580 Sampler functioned effectively and accurately in measuring exposures in the range of 0.006 - 0.045 ppm of glutaraldehyde for a 15-minute sampling time with a difference of <10% between active and diffusive samplers for measurements within 50%-100% of the ACGIH TLV.

Based on the lab's detection limit of 0.008 µg/sampler (determined from spike-and-recovery), the detection limit (in *ppm*) for a 15-minute air sample taken with the AT80 Sampler is estimated to be 0.002 ppm.