

# Second Thoughts on Biocidal Washing

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## Evaluation of Biocides

After an initial evaluation of biocides, John Smit and Bill Ramey have made the following observations:

1. At 200ppm Adesol 20 and Amberquat kill 3-4 logs of attached bacteria (i.e. the biological activity as expressed in uptake of radiolabelled nutrients goes down by 3-4 orders of magnitude).
2. At 0.01-10ppm these biocides *stimulate growth*. These are both quaternary ammoniums and can provide organic carbon and nitrogen in media where these are normally limited. The molecules are charged and may well adhere to plastic surfaces and be resistant to removal.
3. Cidex (a glutaraldehyde formulation) stimulated growth even more than the quats. This may, however, have been due to nitrites in the mixture.

## Implications

1. The extremely low levels of organic biocides which can stimulate growth make adequate rinsing extremely difficult.
2. A bleach treatment of Volume 1 at 100ppm would be much more effective and safe from a biological point of view. We have sent samples to Jerry Stachiw to test for crazing effects.
3. Bleach does not seem to acceptable anywhere near the concentrators.
4. It is possible that we will have to rely on degassing the water and providing a cover gas during the fill.

Cover gases under consideration are:

- (a) Argon
- (b) Nitrogen
- (c) Carbon Dioxide
- (d) Sterile Air

(a)-(c) are either totally or mostly useless to the nutrient-limited life we are worried about.

As with the biocides it is transitions which are hazardous. Getting to an anoxic state might create problems as low oxygen levels (0.1% - 5%, Ramey guesses) can stimulate otherwise dormant

microaerophils (I hate biology). This is worrisome in the case of (b) (at least) because a reasonably sized nitrogen plant would take many months to achieve 1% oxygen levels. Sterile air, easily achievable by micron-sized HEPA filters, could prove a safer option during the filling stage.

Salvador Gil is preparing a statement on cover gas work at UBC for the March Water Meeting.