



Comment on Pang et al. (2005) Filtration and transport of *Bacillus subtilis* spores and the F-RNA phage MS2 in a coarse alluvial gravel aquifer: Implications in the estimation of setback distances

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The recent article by Pang et al. (volume 77, pages 165–194) provides a highly useful compilation of field data, which is presented in Fig. 5 of that manuscript. The authors highlighted what they perceived as similar per-distance rates of microbial removal (what they called filter factors) for various field experiments. However, the most glaring feature of these figures was actually the clear variation in filter factor with transport distance, as demonstrated by tracing the curves back to the origin (in Fig. 5). These curves must trace to the origin since at zero transport distance the concentration of microbes must be equal to the injected concentration (or nearly, accounting for reasonable dilution during injection). The resulting curves demonstrate drastic (multiple orders of magnitude) changes in filter factor with transport distance over distances ranging from tens to hundreds of meters. The results are consistent with many previous observations in both the laboratory (e.g. Li et al., 2004; Schijven et al., 1999; Li and Johnson, 2005; Tong et al., 2005) and the field (e.g. Tufenkji and Elimelech, 2004; Zhang et al., 2001). Clearly, a major challenge to determination of setback distance is improved understanding of the mechanisms that govern changes in the “filter factors” with distance of transport.

References

- Li, X., Johnson, W.P., 2005. Non-monotonic variations in removal rate coefficients of microspheres in porous media under unfavorable deposition conditions. *Environmental Science and Technology* 39, 1658–1665.

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- Li, X., Scheibe, T.D., Johnson, W.P., 2004. Apparent decreases in colloid removal rate coefficients with distance of transport under unfavorable deposition conditions: a general phenomenon. *Environmental Science and Technology* 38 (21), 5616–5625.
- Pang, L., Close, M., Goltz, M., Noonan, M., Sinton, L., 2005. Filtration and transport of *Bacillus subtilis* spores and the F-RNA phage MS2 in a coarse alluvial gravel aquifer: implications in the estimation of setback distances. *Journal of Contaminant Hydrology* 77, 165–194.
- Schijven, J.F., Hoogenboezem, W., Hassanizadeh, S.M., Peters, J.H., 1999. Modeling removal of bacteriophages MS2 and PRD1 by dune recharge at Castricum, Netherlands. *Water Resources Research* 35 (4), 1101–1111.
- Tong, M., Li, X., Brow, C., Johnson, W.P., 2005. Detachment-influenced transport of an adhesion-deficient bacterial strain in water-reactive porous media. *Environmental Science and Technology* 39 (8), 2500–2508.
- Tufenkji, N., Elimelech, M., 2004. Deviation from classical colloid filtration theory in the presence of repulsive DLVO interactions. *Langmuir* 20 (25), 10818–10828.
- Zhang, P., Johnson, W.P., Scheibe, T.D., Choi, K., Dobbs, F.G., 2001. Extended tailing of bacterial concentrations at the narrow channel site, Oyster, VA. *Water Resources Research* 37 (11), 2687–2698.