

Guidelines for Biological (&NMR!) Sample Handling & QC:

• Don't contaminate your sample! You can easily introduce impurities that, even in minor concentration, can interfere with biological assays. Briefly, lipophilic compounds can coat the protein targets and thus convey non-specific binding, or fluorescent impurities will mask the signal and lead to large error ranges and fluctuations in the readout.

These problems include:

- Non-volatile hydrocarbons from chromatography solvents remaining in your fractions. Solution: use distilled solvents.
- Softeners (phthalates etc) from plastic syringes, tubing, septa, containers etc., can contaminate your pure samples. Solution: use glassware, Pasteur pipettes, microsyringes, etc, when handling screening and QC samples.
- Fluorescent indicators from TLC plates cause false readings in fluorescence-based assays. Solution: use washed, non-fluorescent silica gel for final purifications.
- Trace (heavy) metal impurities from needles, reagents, silica gel, spatulas, or metal containers cause line broadening in the NMR and irreproducible activities in bioassays. Solution: filter sample through a plug of basic alumina. Use glassware and a polymer-coated spatula to handle final samples. Avoid scratching solid samples from the wall of flasks with a spatula. Spatulas contain nickel, which causes paramagnetically broadened spectra.
- Silica gel contamination. Sample weight is lower than measured due to the presence of silica gel from a column chromatography. Solution: avoid using MeOH in normal phase chromatography on SiO₂.

Pertinent references:

McDonald, G. R.; Hudson, A. L.; Dunn, S. M. J.; You, H.; Baker, G. B.; Whittall, R. M.; Martin, J. W.; Jha, A.; Edmondson, D. E.; Holt, A., "Bioactive contaminants leach from disposable laboratory plasticware." *Science* **2008**, 322, 917.

Thorne, N.; Auld, D. S.; Inglese, J., "Apparent activity in high-throughput screening: Origins of compound-dependent assay interference." *Curr. Opin. Chem. Biol.* **2010**, 14, 315-324.

"In one memorable case, a chemist had been stirring a sample around in an acidic solution with a nickel spatula. The tiny quantity of nickel leached from the spatula was sufficient to flatten the entire spectrum. The reason for this is that the ions of any of the transition (d-block) elements provide a very efficient relaxation pathway for excited state nuclei, enabling them to relax back to their ground state very quickly. Fast relaxation times give rise to broad lines and vice versa, so to summarise, keep NMR solutions well away from any source of metal ions!" from: *Essential Practical NMR for Organic Chemistry*, S.A. Richards and J.C. Hollerton, J. Wiley & Sons, 2011.