

# Measuring lead levels in hair

## Topics

Atomic spectra, analytical chemistry

Andy Crumpton is a chemist working for the pharmaceutical company GlaxoSmithKline. Some years ago, he was given day release to work towards a degree at the local university. Part of the course covered atomic absorption spectrometry, a technique that allows very small concentrations of metals to be accurately determined. This is done by measuring the amount of light that they absorb at wavelengths corresponding to electron transitions between energy levels in atoms of the metal of interest.

He was required to do a project on this technique, and decided to investigate the levels of lead in the water in his parents' house which was quite old and had lead piping. To do this, he took samples of his parents' hair. This is because lead accumulates in hair over time and this would lead to higher, and therefore more easily measurable, levels than those in the water.

On making his measurements he was shocked to find extremely high lead levels in his father's hair samples, but not those from his mother. Naturally he re-checked his results but with the same outcome. He first assumed that the lead was from the water pipes, and was concerned about any possible health risk, but the low level of lead in his mother's hair seemed to contradict this.

The solution to this mystery was eventually found in the bathroom cabinet. Andy's father has gone prematurely grey and had been using Grecian Formula hair dye to conceal this without telling anyone – even his wife. Grecian Formula contains about 0.6% lead ethanoate (lead acetate) to colour the hair.

Note. Lead salts are toxic but the use of lead ethanoate in hair dye is permitted because it is considered not to be absorbed through the skin (although it seems possible that it could get into the body if users allow dye to get onto their hands and do not then wash them thoroughly before eating).