



By Dr Keith Thomas of Brewlab,
Sunderland



It's difficult to read the news some days without seeing a report on a new food health scare, either a food poisoning outbreak or a contamination of toxins. Fortunately, as brewers we deal with a beverage relatively resistant to pathogens because of its acidity, alcohol, hops and low oxygen levels. Although we have our concerns these are nothing compared to those of the dairy industry where microbes have a much greater potential to grow and greatly reduce shelf life.

We do, though, have the potential to poison if our ingredients carry toxins into our wort and it is this potential we should consider when drafting our safety assessments on novel products.

Sadly, the brewing industry does have some history on poisoning drinkers. An extensive arsenic contamination in 1900 poisoned 6,000 drinkers in Manchester more than 70 of whom died due to impure sulphuric acid used in preparing brewing sugar. More recently, in 1965, drinkers in Canada suffered poisoning from cobalt sulphate used to enhance foam stability in Dow beer. While not as toxic as arsenic, cobalt does enhance cardiomyopathy and as a result 20 heavy drinkers died before the cause was identified.

Today major poisons are well regulated for food ingredients but toxic materials can still be used in some processings. High on the list of these are pesticides applied to crops including, inevitably, cereals and hops. Also of concern are hormones used to enhance plant growth and which may have toxic effects in long term exposure.

The wide array of pesticides once used on crops is considerably reduced today with broader and integrated approaches to pest management incorporating natural resistances, targeted application and biological control. Moreover, maltsters and hop merchants are keenly aware of the regulations and apply control methods to achieve acceptable levels. This may not apply, however, if you look to include additional materials into your grist or boil. Wild harvested crops may still be exposed to treatments depending on where they are gathered and may not be suitably processed. Even organic beers have been found to contain low levels of glyphosate.

As such it is worth looking at studies tracing toxins during brewing to determine their fate and possible survival. After all, boiling kills microbes so what effect does it have on toxins?

A number of studies have assessed the levels of pesticides and hormones during malting, hop processing and in the stages of brewing. The good news is that our processes do reduce levels such that the final beer can have much lower levels than initially dissolved in wort. In some cases, such as many pesticides, this is because the chemicals are poorly soluble in water and preferentially bind to solid materials. As a result, much is carried away on your spent malt and hops or absorbed into the residues left after the brew. Yeast will also act as a surface for removal so that levels decline progressively in fermentation and maturation.

While this is a positive result for our primary product it does mean that our by-products, particularly spent grain will carry the residues and so not be acceptable for organic use.

Hormones can have a different fate. Gibberellic acid can be used to accelerate germination of cereal grains as well as enhancing levels of malting enzymes and reducing levels of polyphenols. Residual levels may be found in malts and concern could be raised as gibberellic acid does have health concerns. In brewing studies, however, gibberellic acid was found to decompose in mashing and boiling with none remaining in the finished beers.

While these studies provide reassurance we need to be aware of the presence of unknown components when using novel ingredients. Herbal beers are an occasional brew for many of us but increasingly popular as recipes diversify. Heather ale is one long standing example but recreations of medieval recipes may introduce all manner of vegetation to your pint.

Using these carries hazards in two areas. Firstly, the pharmacology of plants is incompletely documented. Leaving aside the contemporary interest in cannabinoids, plenty of plants carry toxins some of which are only located in specific tissues. Rhubarb is increasingly common in drinks but could be fatal if leaves were infused as well as stems. Bracken and broom both grow alongside heather but would introduce toxins if gathered by mistake. Even some herbs prescribed in recipes may have poisonous ingredients. Ground ivy is a noted ingredient in Saxon ale recipes but contains the liver toxin pulegone as well as irritant terpenoids. Low levels may cause limited reaction but long-term exposure could develop problems.

Secondly, some plants have strong associations with fungi and harbour moulds which carry their own wealth of toxins. We are increasingly aware of aflatoxins from moulds in wet environments. Increasing our dose from unintended ingestion would be unfortunate.

In summary we are fortunate to operate processes which manage our exposure and prevent poisoning but do need that additional care when incorporating imaginative ingredients.

