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England, ² BetaTec Hop Products Inc. 5185 MacArthur Blvd. N.W., Washington, D.C. 20016
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metabolite control using natural hop beta acids.**

Bacterial infection during the production of sugar is a significant issue. Bacteria consume sugar, leading to yield loss and the production of metabolites. Classically lactic acid is the metabolite that is associated with infection but other compounds can also be produced e.g. nitrite and dextran. Nitrite generally has little adverse effect; high nitrites have been reported to produce higher ash levels by reaction with sulphites, although their presence is a general indication of infection. However in Europe a recent regulatory change tightened the amount of nitrite allowed in animal feed (directive 2010/6/EU). This regulation changed a requirement for the level of nitrite from 15ppm in feedstuffs to 15ppm in feed materials. i.e. all feed ingredients have to have less than 15ppm. This has made it difficult for some producers to conform as some factories have significant levels of nitrite in their molasses, making control of nitrite a significant issue. The ESST subsequently set up a focus group to explore the issue. Hop beta acids have been proven to be very effective at controlling nitrite formation. Measurement has shown that in general nitrite is found in the the early stages of extraction. Further into the extraction system lower pH removes nitrite. It is demonstrated that by treating the hot part of the mixer in a tower system nitrite can be controlled.

Dextran can also cause serious processing issues. There are two sources of dextran it can be produced in the beets during storage and also by bacteria in the extraction system, mainly by mesophilic *Leuconostoc*. For external sources enzymes can be used to break down the dextran while dextran formed in the factory can, potentially, be controlled by biocide. *Leuconostoc* grow in the cooler areas of the extraction and can be treated by dosing into the cold point of the extractor or even into the raw juice after the mixer.

Organic acids are common metabolites of thermophilic bacteria, lactic acid is the standard measure of an infection and is widely analysed however other acids such as acetic and butyric acid are rarely analysed. Measurements throughout an extraction system give a profile with high level throughout the system with peaks mid extractor (mid tower) and a spike in the cold point. Treatment for general infection control needs to be holistic, treating the entire system. It is also important to have good dosing points, especially mid tower. A dosing spur that penetrates into the middle of the tower is advised to give good mixing.