IFEAT 2012 Preview: F&F Biotech Ingredients

Thomas Plocek discusses the complexities of biotech ingredient production and its effect on the industry

"Many [F&F biotech ingredient] production plants may be similar to craft breweries," says Plocek. "The techniques will be similar as will the equipment."

Ingredients produced via biotech pathways provide great promise, but the technological challenges are significant, noted Thomas Plocek (Aroma Chemical Services International Inc.) in a recent interview with P&F *magazine. Plocek will present "Biotechnology and the Changing Role of the Sales Agent in the Fragrance and Flavor Industry" as part of the annual meeting of the International Federation of Essential Oils and Aroma Trades, taking place November 4–8 at the Marina Bay Sands Hotel in Singapore* (www.ifeat.org).

Thomas Plocek

***P&F:* Many naturally occurring materials can be produced via biotech processes; however, not all processes are easily achieved. Given this, is there "low-hanging fruit" in the F&F ingredient universe?**

Plocek: I do not believe there is "low-hanging fruit" ripe for the taking with new biotechnology or synthetic biology techniques. All biological approaches are difficult to very difficult and while many methods have become much less expensive they remain highly complex. Understanding and modifying life is exceptionally complex and inexact.

***P&F:* Given the purity of the products of these processes, what types of olfactory notes/facets might be lost?**

Plocek: Since many believe that everything produced naturally will eventually be able to be produced via biotechnology, any valuable notes should, in principle, be able to be produced via biotechnology. Economics will be the driving force as it has always been when new materials become available at lower prices. Valuable trace components will become the new high-priced ingredients as the major components can be bio-produced at lower cost from sugar. There will be great challenges to perfumers as odor values experience major relative changes.

***P&F:* What are the cost-saving possibilities?**

Plocek: In principle, the lowest raw material cost will be about four times the cost of sugar. In essence the remaining costs will be similar to brewing. The key variables will be the yield per liter of reactor volume and the time. Other materials needed to maintain the life of the organism vary with the organism and the exact conditions. Since the production of ethanol is a similar process developed over thousands of years, the price of pure ethanol is probably approximately the lowest cost possible. At present this would be about $2 per kilo.

However, while there have been projections that some key materials will reach low price levels within five to eight years, I think it is unrealistic to believe that many products will reach this level anytime soon. Higher priced or limited volume materials are likely to be the first targets. Furthermore, prices will have to remain high to recover very high R&D investments. Valencene and farnasene are now commercially available, but their prices are not yet plunging, although over time they are likely to decline in price substantially.

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***P&F:* What are the advantages, given the abundant starting materials?**

Plocek: There are vast advantages to synthetic biology over traditional chemistry. Some of the obvious are steriospecificity and molecular complexity that are critically important to many F&F materials. In addition, the processes and ingredients are natural, biodegradable and normally very safe in human contact as well as to the environment. Temperatures are similar to all life. Many production plants may be similar to craft breweries. The techniques will be similar as will the equipment. Large production units will often not be needed. The industry may move back toward more of a craft industry, undermining many of the economies of scale. I believe it will

enable smaller organizations to become more competitive with larger organizations.

***P&F:* Are there GMO concerns/limitations related to biotech?**

Plocek: There are sometimes very severe political and/or social constraints on GMOs, but the F&F products coming out of these processes contain no molecules derived from the modified organisms. All the enzyme catalysts from the GMO organism are natural as are the metabolic products of these processes. In essence, it is similar to obtaining milk from hybrid cows without adding hormones or other chemicals to their natural feed. The organism is the hybrid cow with natural sugar as feed and the F&F ingredient is the milk. It is very different from GMO crops where the modified DNA remains in the product and is ingested when the product is eaten. Those countries and/or regions that excessively limit synthetic biology and related biotechnology will find themselves falling behind both economically and probably also in quality of life elements.

***P&F:* You mention "communication of technology" in your conference abstract as an emerging responsibility of sales agents. How do you feel this change will alter the job of sales staff in the coming years? Does the industry have to make any changes in the way it does business to accommodate these changes?**

Plocek: Most of the research and innovative organizations are located in the developed countries which are also the areas of greatest consumption of ingredients. Most sales agents are located in these areas while many of our source material comes from less developed parts of the world. I believe it will be valuable for sales/agent partners to educate themselves sufficiently to be able to help their key suppliers. They will need to identify potential opportunities and significant competitive threats so that the suppliers can, hopefully, make some wise adjustments and decisions. This may be difficult to accomplish, but I think it will become an increasingly important competitive advantage as we move further into the biotech century.

In part, my presentation is intended to help us start to move toward a more aware industry. The industry will have to reconsider the role of patents since the R&D will be very expensive, but imitation will be very inexpensive. A do-it-yourself level one biotechnology lab can be established in a home kitchen for less than $10,000. Much of the organisms, DNA and enzymes are commercially available. Sequencing DNA [costs] have plunged more than 100,000 times in less than 10 years and are expected to fall much further. The economics of practice have dropped dramatically but the cost of developing knowledge and judgment is very high. It is not very expensive to do things, but what should you do? This is the challenge.