MOLECULAR MAPPING:
the "weapon" recommended against microbial contaminations by Coca-Cola Hellenic

INTRODUCTION

Molecular mapping, also known as **metagenomics**, is the solution advocated for by expert Dr. Kalliopi Chalkou in the “war” raging in the beverage industry against “microbial biofilms”.

With her expertise in microbial biotechnology, as the Head of Quality, Safety, and Environment Governance at Coca Cola Hellenic, the expert spoke at the prestigious 2024 European Beverage Quality Conference.

This advanced technology has been used in CCH since 2013, complementing the strategic quality plan, **which led to an 80% reduction of quality incidents**.

IT’S "A WAR"

Dr. Kalliopi Chalkou deliberately uses the term “war” to describe what is happening in the beverage industry with the phenomenon of “microbial biofilms”, these **clusters of bacterial cells attached to a surface and covered with a film that makes them very resistant to cleaning treatments**.

The stakes are very high, as Coca Cola Hellenic’s market translates to 62 factories worldwide, serving a market of over “700 million consumers on a daily consumers”.

Consumers who, moreover, have turned “towards more and more sensitive food and beverage”, such as “energy drinks, juices, and vitamin waters”. These are “all preservative-free products”, more exposed to “all different kinds of microbiological risks”, which can **potentially have significant consequences on product quality**.

THE ONLY POSSIBLE OPTION, INVESTING IN PREVENTION

In this war, Dr. Kalliopi Chalkou reminds us that there are two possible stances: to face it or to be proactive in prevention. But looking more closely at the stakes and “the cost of a quality incident”, the only possible option for companies is to invest in prevention.

A strong strategic decision. This is what was done at Coca Cola Hellenic with a scientist who has worked to strengthen the company’s entire quality strategy… and to use, since 2013, **a technology that breaks with conventional microbiology, namely “molecular mapping”**.

More than ten years later, Dr. Kalliopi Chalkou recommends this approach to everyone, as “in the next years, it’s going to become frontline weapon against biofilm” – due to the stakes, but also because of the “serious limitations associated with conventional microbiology".

“Molecular mapping is going to become frontline weapon against biofilm"

Its principle, still little known, is precisely described by the scientist: first, it is necessary to collect the microbes present “in raw materials”, “at each different process step” of production , and even “in the rinse water”, or even the finished product, and establish a complete map with these samples.

The objective is then to “perform a total microbial community DNA extraction out of the sample: all this DNA from each sample”, will be sequenced and then compared “versus available databases”. Thanks to this process, “**we know exactly who is there but we also know how many times or what is the presence frequency and what is the abundance of each one of the species**”.

“SPECIES THAT CANNOT BE RECOVERED USING CONVENTIONAL MICROBIOLOGY METHODS"

Any accumulation of specific species and outgrowth as part of total microbial community might be biofilm indication; certain species populations remaining at the same level after application of a cleaning scheme, is evidence for the effectiveness of applied cleaning programs against those.

“In many cases we are dealing with species that cannot be recovered using conventional microbiology methods".

Dr. Kalliopi Chalkou gives some insights to imagine this potential: thanks to molecular mapping, "**we can create a color map so we can see what species is present in low frequency with low abundance in one part of the plant**", "to understand where we have biofilm risk for example".

But also to know through molecular tests "what we receive", on incoming products, raw materials, which can "be very useful information for the supplier's evaluation".

Finally, in terms of quality risks, the scientist praises the tool which can also be a valuable aid, for example, in case of "legal claims" or "consumer claims" about products from several months ago: "We can go back to our freezer to retrieve the sample". On it, "**we can activate the molecular/metagenomic mapping tool and we can get a full analysis of what species are present**".

It is the most "objective" input to any arbitration process, "very clear, very pragmatic" contribution.

INNOVATION BY BIOMÉRIEUX

For her, there is no doubt that "it's an extremely powerful and sensitive tool", "**the depth to which we can go is really impressive**", "unlimited", because "it's only a matter of imagination and understanding" the questions to be addressed.

In this perspective, bioMérieux has innovated by now, offering a **complete Augmented Diagnostic solution** – allowing, with its network of experts, both to help manufacturers **identify the origin of contaminations** and to **implement dynamic control** of their production environments.