



Jean-Paul Fevre, President/CEO of Plant Advanced Technologies introduces his new technology PAT plant milking®



Jean-Paul Fevre

EURO COSMETICS: *Mr. Fevre, your company, Plant Advanced Technologies in France have come up with a unique, patented solution to the ongoing challenge of production of rare active compounds.*

Jean-Paul Fevre: Our company Plant Advanced Technologies (PAT) was founded in 2005 in France (Nancy). Now we have over 40 employees working in PAT (half in research, 10 PhD).

PAT is specialized in sourcing rare, uncommon, highly desirable actives from very specific plant species. We have developed a technology "PAT plant milking®" that enables production and harvest of these secondary metabolites from rare, slow to grow, protected plants without killing these plants.

EURO COSMETICS: *Could you explain how your technology, "PAT plant milking®" compares with traditional plant extraction, which we all know uses dead plants.*

Jean-Paul Fevre: Traditional plant extracts are almost all coming from dead plants that are dried, crushed and finally dipped in a solvent to extract their active molecules. Since thousands of years our humanity is doing about the same. We do not see as much radical changes for the production of active compounds as we have seen for agriculture production since the invention of agriculture (7–8 000 BC). We are still collecting in the wild or at the most using agriculture technics to harvest in fields plants to be processed.

Your readers must understand that plants produce active compounds to defend themselves against pathogens (i.e; fungi, insects, bacteria, other plants, herbivores, ...) not for the cosmetic or pharmaceutical industries!

Collecting in the wild or harvesting from cultured fields do not guaranty that the plant is at its best for active compounds production, as the plant need to be stimulated to trigger the proper biosynthesis pathway.

"PAT plant milking®" is a technology we have developed to answer to these challenges.

Plant species are cultivated soilless using aeroponics conditions in controlled greenhouses. Roots are often the richest part of the plants for active content, because roots are the most exposed part to pathogens, and are the least investigated and the least used.

Thanks to soilless aeroponics conditions, PAT has access to the

roots compartment of the plants, and can control all parameters that will trigger the desired biosynthesis pathway. Elicitors*, nutrition, precursors, UV, ... may be used to boost the production of the actives. Despite some unsuccess on few species, most of the time we see spectacular increase in the root content (10 to 100 folds more than compared to plain field production!).

Plant production need to be finely tuned and only aeroponics in greenhouses can give us this possibility.

So when plants are ready (roots full of active compounds), roots of living plants are dipped for half an hour in a solvent. Due to osmotic pressure of the solvent (most of the time green solvents) the roots start to release their content.

After plants are removed, roots are washed and plants are moved back to the cultivation area. Typically, they will regrow new roots within few weeks and the cycle of production can start again (stimulation and harvest). Plants are not destroyed by the process and can be re-use several time during the growing season and the years after.

The solvent accumulates the exudates of thousands of plants of the same species and the active compounds content builds up in the tank. After it is just a matter of filtration and concentration/purification to prepare the novel extract.

EURO COSMETICS: *You have an interesting Marketing Phrase "Sourcing the Unsourceable". What do you mean with this apparent paradox ?*

Jean-Paul Fevre: Really with very few thousands of plants, PAT is able to produce high quantities of active without impacting the environment (plants, water, nutrients, ... are all recycled).

We have some productions, where we do a cycle per month (6 months of growing conditions under our latitude, France) while plants produce 50 times more than plain field plants not stimulated, that means with only 10,000 sq feet of production in greenhouse for example we replace 3 millions sq feet field (68 acres)!

This technology is a breakthrough in the production of active compounds, especially when actives are specifically in the tiny roots from protected, slow to grow species.

In brief, PAT is bringing a sustainable sourcing solution for the production of these new unsourceable molecules for the future.

EURO COSMETICS: *Why is it so important to give access to these natural molecules?*

Jean-Paul Fevre: I want to quote my associate and co-founder of PAT, Pr. Frédéric Bourgaud, our VP Research:

“It is generally estimated that there are approximately 300,000 species of higher plants. Out of these, only a few thousands are used for medicinal or cosmetic use. Thus, there are potentially many more important discoveries in plant kingdom to be exploited for application. There are literally millions of natural chemical structure types resulting from nature’s combinational chemistry effort supplying almost unimaginable chemical diversity, which yields stereochemically complex structures with diverse functional groups, ideal molecules for interacting specifically with biological target molecules. More importantly, nature has been “doing” combinational chemistry for eons, not just a decade or two, and has been selecting products from this natural library that have specific biological advantage.”

Our lives have depended for thousand years of the biological activities of these molecules, even until now (most of pharmaceuticals products are from or inspired by natural molecules). PAT is in the quest of these new actives.

EURO COSMETICS: *You have some other interesting technologies already. Please tell us something about your “Target binding®” technology.*

Jean-Paul Fevre: Our “Target binding®” technology is a technology we have developed that allows to identify very quickly (few hours instead of months!) molecules that bind to a specific target. In the fields of cosmetic or pharmaceutical, we know some targets of interest (enzymes) that need to be inactivated or the action need to be modified. Only molecules that bind with the enzymes could be of interest. As there are hundreds of molecules in a plant extract, high throughput screening extracts is efficient to discover general activities from plant species. “Target binding®” technology allows to identify the possible molecules that interact with the target. We are developing this approach for cosmetic, pharmaceuticals and even crops protection. Linked to our “PAT plant milking®” sourcing technology, this is an unrivalled solution for discovery of the actives of the future.

EURO COSMETICS: *What are your actual products at the present time and what are the major markets currently?*

Jean-Paul Fevre: Until now PAT was working on exclusive basis with few large companies on some exclusive molecules: PAT provides since 2013 an unique active to a luxe leader for its last anti-ageing skincare product.

In 2016 another innovative active is launched with the company Laboratoires Expanscience (Neurovity®).

PAT is releasing this year its 2 first catalog products that were presented in New York In-Cosmetics show last September. Four new actives will complete the catalog this winter.

All these products bring to the industry innovative activities and a sustainable image.



PAT also signed last week a research collaboration with chemical giant BASF on discovery of new plant molecules for crop protection.

We work also for the pharmaceutical market too. In fact all markets that need innovative molecules from plants!

EURO COSMETICS: *What is your plan to develop in North-America?*

Jean-Paul Fevre: As we are new comer, we are currently looking for an US distributor in order to share the value of our catalog products with its customers.

EURO COSMETICS: *Any plan to “milk” plants in US ?*

Jean-Paul Fevre: Working in Florida on tropical species could be a good move one day! Tropical climate of Florida could help to speed-up some of our research programs as we could use our greenhouses most of the year working instead of 6 months period in temperate climate like France. Access to tropical biodiversity species will be a key point in the future. That’s the reason we have launched a subsidiary company in La Réunion island (French island in Indian Ocean) to milk the outstanding local biodiversity there. US host also a great diversity of plants to be discovered.

EURO COSMETICS: *Looking forward, could you give us a glimpse of other technologies you have in the pipeline and why formulators should be on the lookout for them ?*

Jean-Paul Fevre: First we have outstanding new molecules in the pipe for the years to come, and these molecules will renew the interest of looking for new plant species not only old pots ! Our research group work also on metabolic engineering to identify specific genes involved in highly desirable actives and to improve their production. We offer sourcing solutions.

EURO COSMETICS: *Thank you for the conversation.*

* Elicitors are natural molecules that trigger the intracellular defense of an organism.