

HEALTH & WELLBEING

Adjuvant from baby trees

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Triterpene compound QS-21 is an increasingly important adjuvant or immune booster used alongside vaccines, including for Covid-19, shingles and malaria. Traditionally extracted from the bark of *Quillaja saponaria*, a tree native to Chile, prices of QS-21 have recently skyrocketed due to laws protecting against deforestation and other factors, says Gaston Salinas, CEO of US-based Botanical Solution (BSI) – to 'around \$200,000 to \$400,000/g'.

However, BSI believes it could have a solution to address the bottleneck. The company is already producing tissue cultured *Quillaja saponaria* biomass containing QS-21 in the lab for its biofungicide product *Quillibrium*, sold under agreement with Syngenta in Latin America. Now, the same technology – involving 'baby trees' grown in a biofactory – could be harnessed to produce sufficient QS-21 for the pharma sector, Salinas says, adding that in the next 18 to 24 months, BSI is poised to ramp up production to

kilogram scale.

QS-21 has seen its popularity rise with a greater understanding of its effectiveness as an adjuvant, Salinas says. A component of Novavax's *Nuvaxovid* vaccine, for example, it can dramatically improve effectiveness and hence reduce the dose of active pharmaceutical ingredient (API).

Typically, most vaccines require only around 50µg of QS-21 per dose, Salinas says, adding that the compound has been used for many years in vaccine formulations and has a relatively low toxicity profile.

'More and more, QS-21 is becoming a gold standard in terms of improving the efficacy of modern vaccines,' says Salinas. Although methods are available to produce the compound semi-synthetically, natural routes to QS-21 are strongly preferred for safety and other reasons.

To produce the raw materials in the lab, BSI starts by inoculating tissue cultured *Q. saponaria* plants into bioreactor systems at 30–60 days of age. These are then grown rapidly under carefully selected conditions to ensure optimum metabolite yield.

The company is now exploring the potential of its baby tree technology to lab-grow other active compounds from plants – including novel bioherbicides for crop protection.

BSI is not the only company working in the bio-adjuvant space. In September 2021, US based biotech Agenesis announced the launch of subsidiary company SaponiQx, also aimed at finding more sustainable routes to produce pharma adjuvants. Rather than using mini-plants, in this case the approach is to start by using cells – reprogramming them not unlike a computer to make compounds of interest such as QS-21.

'Agenesis is pleased for SaponiQx to collaborate with Gingko Bioworks to develop its novel saponin products from sustainably sourced raw materials, with a goal to meet the current demands placed on the vaccine industry for pandemic vaccines,' says Garo Armen, CEO and Chairman of Agenesis and Executive Chairman of SaponiQx. The SaponiQx pipeline is led by the best-in-class QS-21 *Stimulon* adjuvant used in GSK's *Shingrix* vaccine and is planned to include a wide portfolio of saponin-based adjuvants and vaccines.

In May 2022, BSI won the Award for 'Best Biotech Startup Business of the Year' from the World BioProtection Forum at the NEC in Birmingham, UK.

