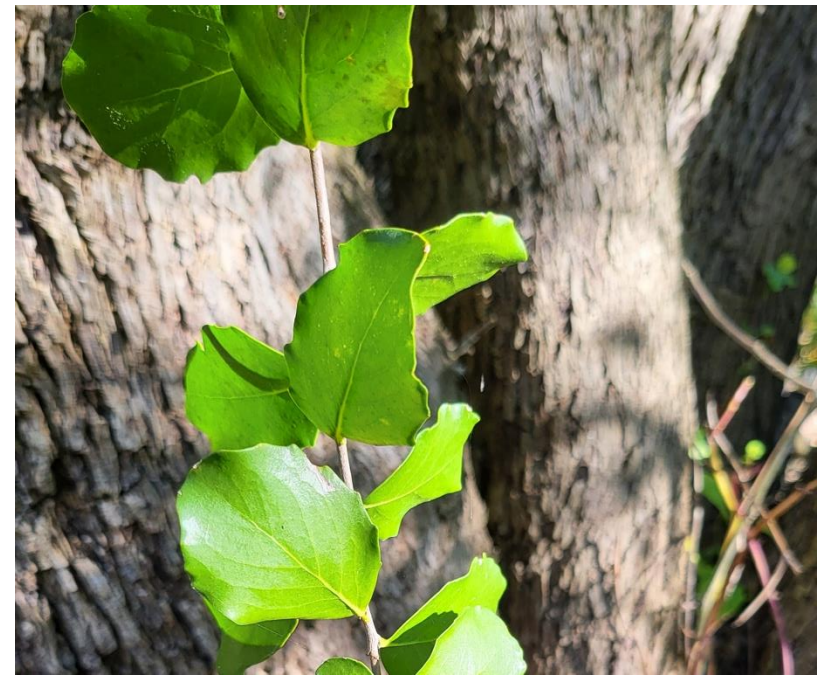
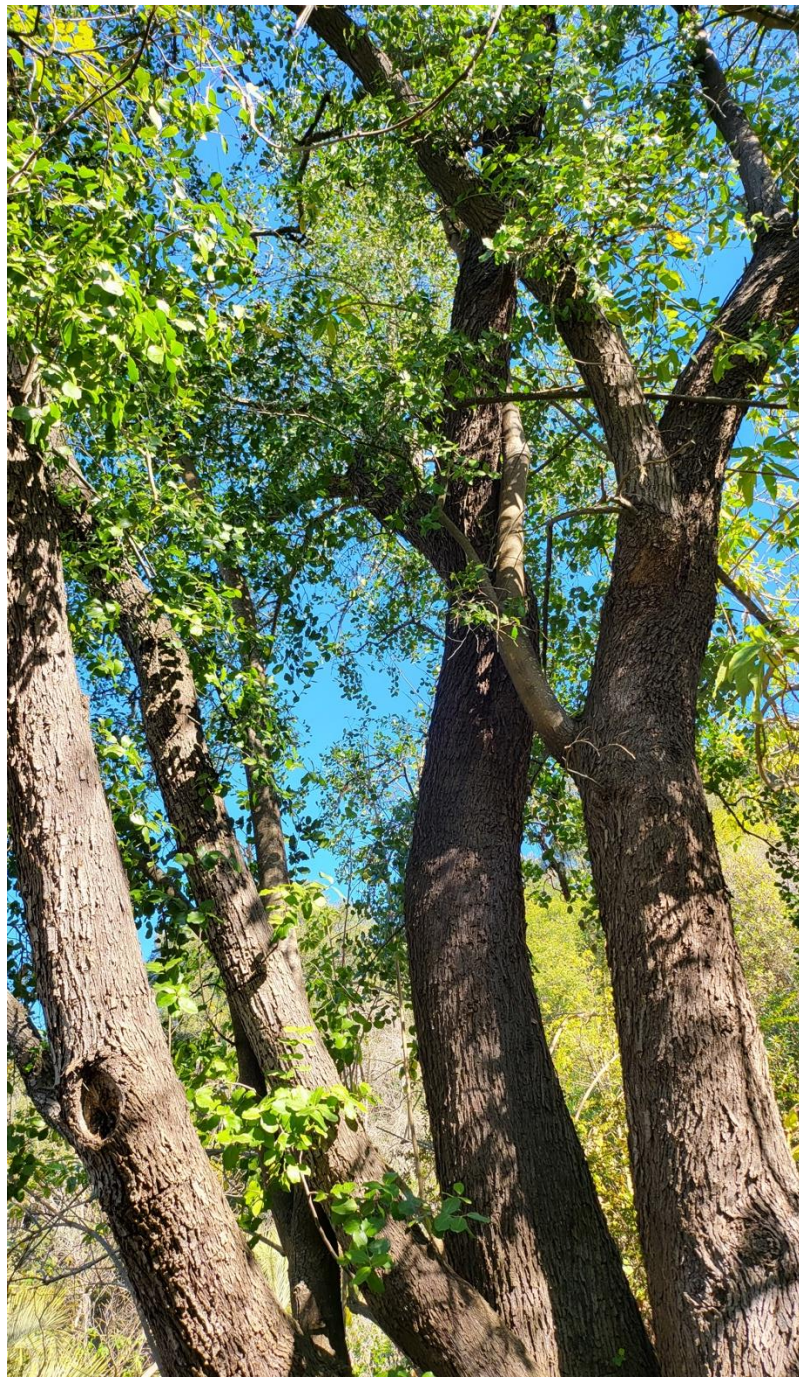
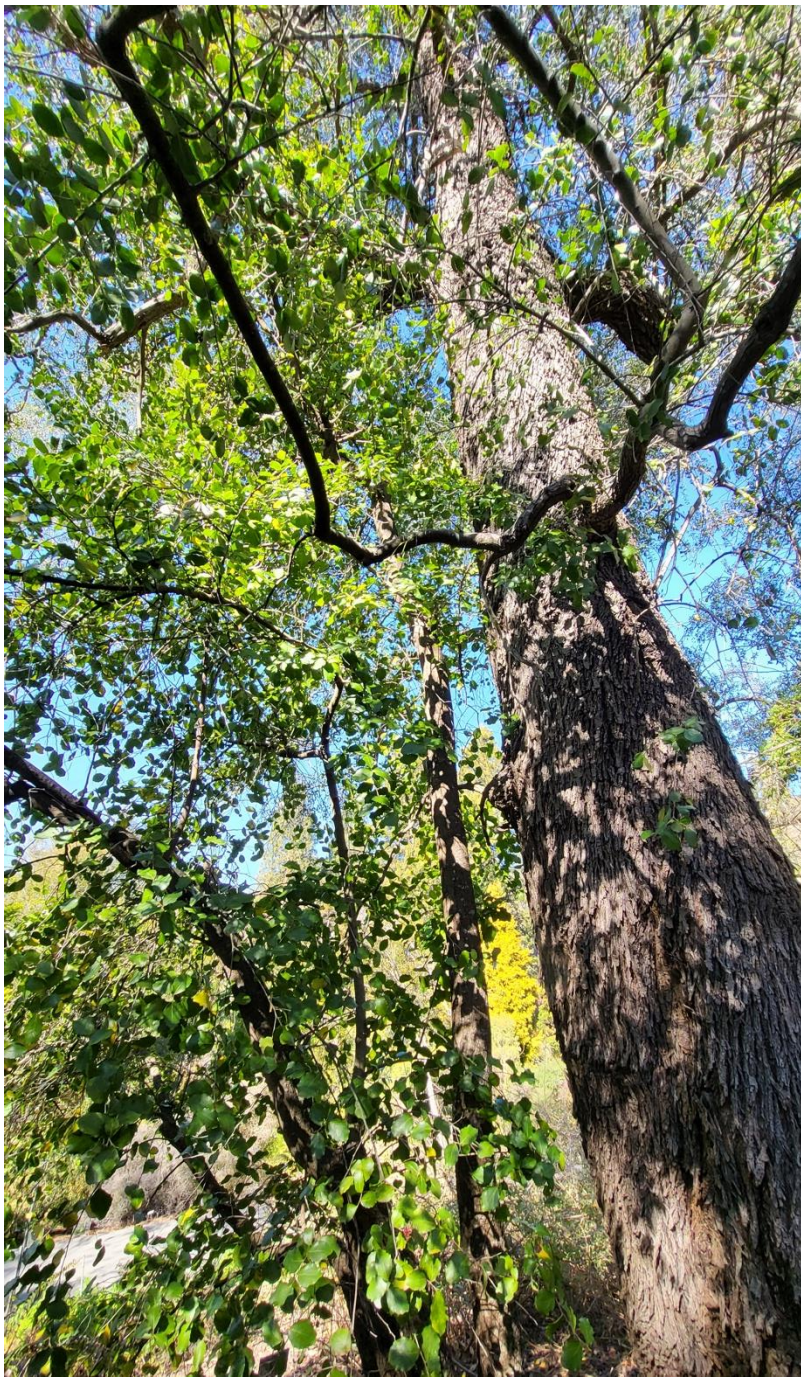


A Dead Elephant Was the Beginning of the End for Spain's King

Spain's King Juan Carlos under fire over
elephant hunting trip







The Chilean tree that could help cure malaria (and a host of other diseases)

The rare soapbark produces a chemical that powers new malaria jabs being rolled out across Africa. A single gram can cost \$100,000





QS-21 Adjuvanted Vaccines



SHINGRIX
(ZOSTER VACCINE
RECOMBINANT, ADJUVANTED)

AREXVY
(RESPIRATORY SYNCYTIAL VIRUS
VACCINE, ADJUVANTED)

REVENUE	
2023	2028(p)
 \$4.3B	\$8B
 \$1.5B	\$3B
↓	
46.7%	
\$12.4b	
 GlaxoSmithKline Vaccines	



May 2023

Supporting suppliers on nature:

Our approach to sourcing materials that are highly dependent on nature

GSK

100%
of agricultural, forestry and marine derived materials sustainably sourced and deforestation free by 2030.

Ahead Together

Source: GSK

gsk.com

- FDA & WHO Approved Vaccines (3)
- AS01b/e: Gold Std Adjuvant containing QS-21
- Tens of candidates in clinical trials for broad targets
- Shingrix alone has demanded over 5.3kg of QS-21 to date

Access to low-cost QS-21, will enable new vaccines (and potentially new applications) in both high-income and low-income countries.



Manufacturing System

QS Raw Materials



**Quillaja Saponaria
Forest**

Crude Extraction



**Water + Temp
Countercurrent Extr**

QS Saponins Purification



**Membranes &
Resins Filtration**

QS-21 Purification



**Reverse Phase HPLC /
Acetonitrile**



Advanced Botanicals PLATFORM



ABM-01: *Quillaja saponaria* (soapbark tree)



Tissue Culture &
Genetics



Raw
Materials



Crude
Extracts



Pure
Compounds

Quality

Supply

Environment

Ensure Supply of QS-21 for FDA Approved Vaccines

QS Raw Materials



**Sustainable source
that replaces tree bark**

Crude Extraction



**Water + Temp
Countercurrent Extr**

QS Saponins Purification



**Membranes &
Resins Filtration**

QS-21 Purification



**Reverse Phase
HPLC**

Specification



Scale



Cost



Ensure Supply of QS-21 for FDA Approved Vaccines

QS Raw Materials



Scalable ABM Platform
replaces tree bark

Crude Extraction



Water + Temp
Countercurrent Extr

QS Saponins Purification



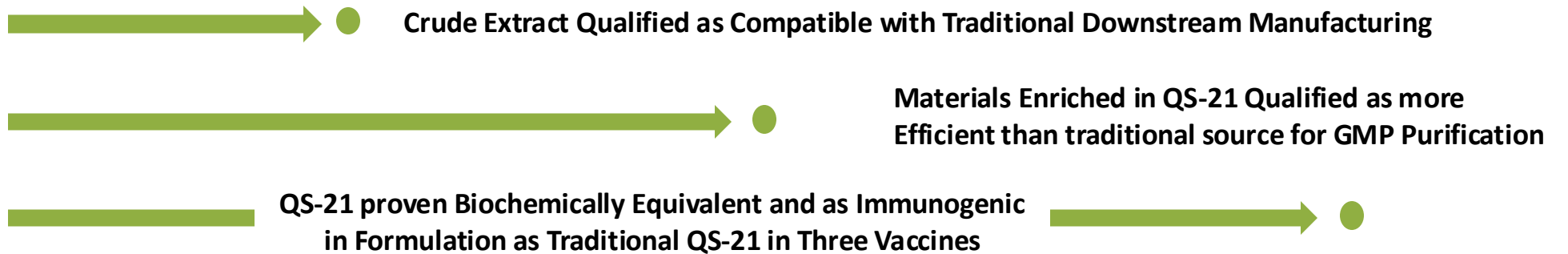
Membranes &
Resins Filtration

QS-21 Purification

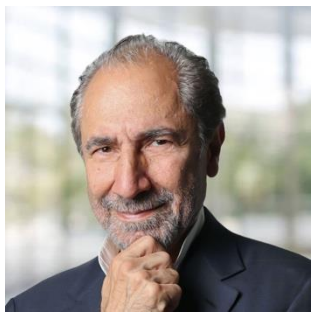


Reverse Phase HPLC / Organic
Solvents

Validation through
Collaboration with
Big Pharma and key
Industry Players



QS-21: Competitive Landscape



amyris

Berkeley
UNIVERSITY OF CALIFORNIA




John Innes Centre
Unlocking Nature's Diversity

saponiQx

a genus





Tissue Culture



Engineered Yeast



Tobacco



Cell Culture

Yield (QS-21%)

0.25-1

0.0012

NA

0.27

Yield (Total Saponins%)

1-5

-

-

-

Current Scale (g)

250-5000

Lab

NA

<100

Purification

HPLC / Novel

HPLC

HPLC

HPLC

QS-21: Competitive Advantages

Validated Value Proposition

QS-21
(FDA)

GMP QS-21 Stand Alone

- QS-21 Specification
- Scalable manufacturing (FDA)
- Cost effective
- Sustainable - Tree bark free



Target Customers

Big Pharma I



Competitors

Unfair Advantage

Sustainability
IP

QS-21

GMP QS-21 Stand Alone

- Purity > 95%
- Formulation Properties
- Sustainable – Tree bark free
- Scalable Manufacturing



Big Pharma II



Current/Potential
Scale



Green Purification

GMP QS-21 Adjuvant Formulation CRODA

- Sustainable – Tree bark free
- Scalable Manufacturing



& Other Vaccine
Developers



Validation
IP



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Special Reports Fierce 50 Resources Events Subscribe

PHARMA

Sanofi keeps Novavax afloat with \$1.2B bet on its vaccine platform

By Kevin Dunleavy · May 10, 2024 10:53am

Novavax Sanofi COVID-19 Quarterly Sales



In exchange, Sanofi receives access to Novavax's Matrix-M adjuvant technology. Novavax can receive up to \$200 million plus tiered royalties for each Sanofi vaccine product developed using the platform.

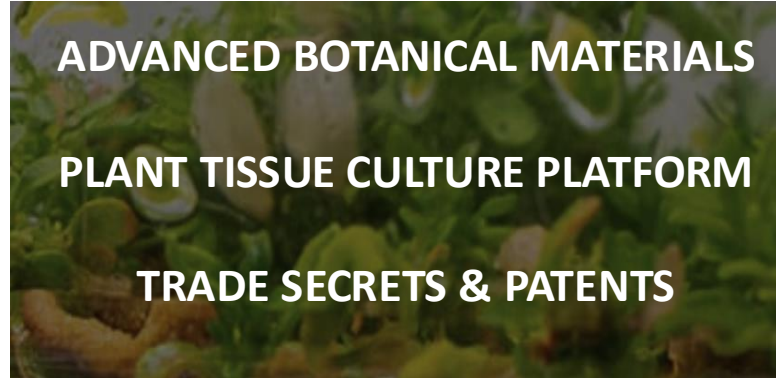
On a day when struggling Novavax slashed its 2024 revenue projection from a range of \$800 million to \$1 million to a window of \$400 million to \$600 million, the company announced that it has partnered with vaccine powerhouse Sanofi in a \$1.2 billion deal. (Stock photo/Getty Images)

- Need for Additional Saponins: QS-7, QS-17, QS-18, Fractions A&C
- Transition to Sustainable Raw Materials
- Demand for Commercially Relevant Adjuvant Systems (AS)
- Governmental, NGO and Company growing interest in AS's Mimics.

PROBLEM



SOLUTION



MARKET FIT



PRODUCTS & MARKETS OVERVIEW

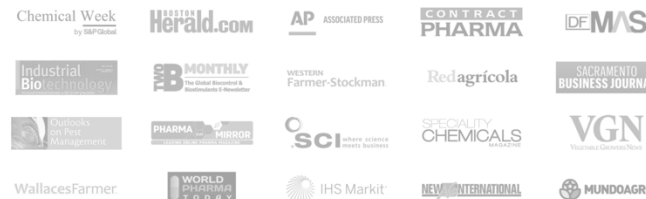


TAM
\$60B¹

**Agriculture:
Crop Protection**



Distribution
syngenta



Distribution
CRODA



**Pharma: Vaccines
& Adjuvants**

TAM
\$41B²

¹Dunham&Trimmer, 2019

²<https://www.marketsandmarkets.com/PressReleases/vaccine-technologies.asp>

Botanical Solution Inc. (BSI) Series A extended to over \$23 Million

Funding to accelerate scalable commercial production of pharmaceutical grade QS-21 for human vaccines, R&D lab expansion, opening new markets for vaccine developers.

DAVIS, Calif., August 19, 2024. Today, Botanical Solution Inc. (BSI) announced it has closed another \$7.6 million financing, as part of Series A, that will fund the commencement of in-house production of QS-21, pharmaceutical grade vaccine adjuvant. Using cost-effective and scalable proprietary methods, BSI will expand QS-21 use in broader vaccine applications.

