

PLANT BIOTECH

RECOMBINANT MELANIN EXPRESSED IN PLANTS

NEW YORK—A proprietary gene expression system that acts quickly and temporarily to produce recombinant products in plant tissues—Biosource Genetics Corp.'s (Vacaville, CA) Geneware®—produces melanin for a "natural" sunscreen. Based on a plant RNA virus vector, the system inserts recombinant RNA directly into the plant's cytoplasm. Once inserted, the vector begins expressing the recombinant product in a matter of days—much faster than other transformation methods that target the cell nucleus.

Biosource Genetics has a contract to supply the Redwood City, CA-based firm Advanced Polymer Systems (APS) with recombinant melanin by July 1989. That firm will incorporate Biosource's melanin into its crosslinked polymeric "Micro-sponge®" for topical use. At a press conference here last fall, APS officials noted that unlike PABA (para-aminobenzoic acid, now the sunscreen of choice), melanin completely blocks not only UV-A and UV-B ultraviolet radiation, but also the highly mutagenic UV-C (of which none reaches

the earth now, thanks to the ozone layer).

The vector, according to company president and CEO Robert L. Erwin, is constructed from viral replication genes plus selected promoters. Once in the plant cells the vector multiplies by cell-cell transmission.

Neither stable over time nor sexually transmitted, the Biosource vector disappears after a few weeks. But that's enough time to "crank out a lot" of melanin, according to Erwin, who claims expression levels of greater than 20 percent of the cell mass.

Biosource scientists are experimenting with various production methods. They have had success with bioreactor cultures, generally using tobacco plant cells grown in airlift reactors (76 liters working volume). In one system, melanin is secreted into the medium; researchers are adapting that system to continuous flow culture. "We believe we can also produce melanin in a whole plant, but don't know if it will be useful to scale up this way," Erwin notes.

Melanin from plants will be a more convenient and less expensive alter-

native to current commercial sources, which are now extracted from octopus, squid, and other cephalopods. Melanin from *Sepia officinalis* now costs about \$74/gram.

The vector leads the way for augmenting production of valuable compounds already made by plants—for example, increasing the production of the chemotherapeutic agent vincristine in periwinkles.

Besides the melanin-gene vector, Biosource Genetics is developing another version of the vector that will function as a gametocide. Plant breeders currently inhibit pollen production with chemical gametocides, which make it easier to produce hybrid seeds. But whereas chemical gametocides sterilize the entire plant, the recombinant gametocide Erwin envisions would sterilize only the pollen by inducing cytoplasmic male sterility.

Other applications in development at Biosource include using plant bioreactor cultures to produce carbohydrates for cosmetic uses and to produce stereoselective enzymes.

—Pamela Knight

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