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Emerging Company Profile

OmegaGenesis: Nanoscale Angiogenesis

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Wound healing has been a notoriously difficult indication, but OmegaGenesis Inc. believes it may succeed where others have failed by delivering nanoparticles of an inorganic element directly into cells, where they accumulate and stimulate angiogenesis. The europium hydroxide nanorods, which also have shown potential to resuscitate dormant follicles to promote hair growth, should be ready for Phase I testing next half.

Europium is one of the rare earth metals, the series of elements at the bottom of the periodic table, some of which have been identified as medically useful. Among these are gadolinium, which is used as an MRI contrast agent, and lanthanum, which is the active ingredient in the phosphate binder Fosrenol from Shire plc.

While europium is better known for its use in lasers and televisions, researchers at The Mayo Clinic decided to study the element's biological properties. The researchers found that europium hydroxide, when formed into rods, was able to enter endothelial cells and cause a dose-dependent increase in endothelial cell proliferation and vascular sprouting.

OmegaGenesis has exclusive worldwide rights to Mayo Clinic's IP and technology covering the use of europium hydroxide nanorods. The clinic is eligible for royalties.

The company determined that smaller molecules with relatively large surface area are best at promoting angiogenesis, and has patented methods of producing the nanorods using microwaves to synthesize the precise size and shape desired.

"Europium hydroxide is typically 50- 500 nanometers in size, so we protected the technology needed to get it down to a smaller range," President and CEO Oostur Raza told BioCentury. "The nanorods are 100 nanometers long and five nanometers in width, a size that allows them to get into the cell, while the long cylindrical shape means a lot of surface area."

Nanorods also are much smaller than a typical cell, which is in the neighborhood of 2,000 nanometers. According to Raza, the size difference allows the rods to accumulate inside

cytoplasmic compartments to bring about the cell proliferation and sprouting that underpin angiogenesis.

The mechanism by which europium hydroxide causes angiogenesis has not been pinned down. Raza noted that the same markers of angiogenic activity that are seen with VEGF also are present when europium hydroxide is administered, notably the presence of reactive oxygen species (ROS).

To prove the nanomaterial could promote vessel formation in a setting where new blood vessels do not typically sprout on their own, “we injected the same material in mice ears, which showed we could see angiogenesis in an external setting,” he said.

The company’s two lead programs are for wound healing and hair growth.

Initially, Raza said, OmegaGenesis will seek proof-of-concept by testing the product in simple wounds to show that its proangiogenic activity can accelerate healing.

“Internal wounds are more difficult, but we know that we won’t have any immune rejection issues” because europium hydroxide is inorganic, said Raza, who noted immune rejection has been a problem with growth factors for the indication.

Unlike other rare earth metals like gadolinium, which has been associated with toxicities such as nephrogenic systemic fibrosis, Raza said no safety issues have been seen with the europium hydroxide nanorods.

For internal wound healing, Raza believes europium could stimulate growth of capillaries that supply nutrients to muscles, allowing faster healing. He envisions the nanorods being administered to a patient locally prior to surgery to boost the surrounding vasculature, which could speed up healing and reduce the chance of infection following the procedure.

OmegaGenesis also is working with a pair of doctors at the University of Arizona to evaluate europium hydroxide’s ability to improve healing in diabetic wounds.

In parallel, the company is developing europium hydroxide nanorods as a topical product for stimulating hair growth.

“By sprouting new capillaries and providing nutrients to hair follicles that are partially dormant, we believe that they can be reactivated,” said Raza.

He added that this indication could provide a shorter and more straightforward path to market, because the trials and regulatory pathway are well-defined.

OmegaGenesis is looking to raise \$20 million in a private round this summer, which should carry the company to a point where it has data from pilot studies in both indications.