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Empowering Ideas

cancer, oncology, solid tumor, metastasis, stroma, collagen

Method of using an implantable biomaterial embedded with Collagen III to prevent metastases after solid tumor resection

Brief Description

Collagen III embedded biomaterial is predicted to decrease collagen network signatures associated with aggressive tumor behavior and suppress tumor progression and metastases at the site of tumor resection.

Docket # 14-7024

STATE OF DEVELOPMENT

In vitro and in vivo POC

INTELLECTUAL PROPERTY

Provisional patent

DESIRED PARTNERSHIPS

- Exclusive license
- Sponsored research

INVENTOR

Susan Volk, Ph.D., V.M.D., B.A.

Dr. Volk's area of research expertise is in tissue repair and regeneration with a focus on the role of the extracellular matrix (ECM) in regulating key aspects of normal and pathologic healing. Her research encompasses all three parts of the wound healing-fibrosis-cancer triad and aims to provide innovative regenerative and oncologic therapies.

LEARN MORE

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Technology Overview

In cancer patients, mortality results primarily from metastatic disease, and the tumor microenvironment plays a critical role in this process. One component of the tumor stroma that surrounds tumor cells is Collagen III (Col3) and Dr. Volk has discovered that Col3 is a critical regulator of migration and invasion of cancer cells, wherein higher levels of Col3 create a non-permissive tumor microenvironment for cancer metastases.

Dr. Volk's in vivo genetic studies demonstrated that reduction of Col3 led to increased tumor growth and metastases in a murine breast cancer model, most likely due to increased myofibroblast density and collagen alignment, resulting in a pro-carcinogenic stroma. Conversely, Col3 containing gels significantly inhibited the migration and invasion of human cancer cell lines in vitro. In vivo, reduced levels of Col3 increased breast cancer cell proliferation and diminished apoptosis in a murine model.

Importantly, addition of Col3 to human breast cancer cells injected in a xenograft model increased apoptosis, suggesting that Col3 can directly kill tumor cells. Previous studies in the Volk laboratory show that Col3 is critical for a regenerative healing response. Therefore, Col3 containing biomaterials are expected to successfully limit aggressive behavior (rapid recurrence and metastasis) of cancer cells in vivo following resection while simultaneously promoting healing after surgery.

Dr. Volk is currently collaborating with the Penn School of Engineering to develop and test an implantable biomaterial that replicates a complex Col3 matrix in order to prevent metastatic disease at the site of the primary tumor resection.

Advantages

- Promote healing following surgical resection while limiting local recurrence and potential metastasis
- Easily inserted after tumor resection; no need for a separate procedure
- Incorporates 3 dimensional structure of Col3 in the biomaterial, which is critical to its function