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High-throughput Microfluidics Tumor-Stroma Platform

-Cancer is a leading cause of death around the world, accounting for nearly 10 million deaths in 2020 according to the WHO. Common cancer therapies, particularly chemotherapeutics, tend to be expensive with a relatively low rate of success. Further, they take a toll on the patient's body. Personalized therapeutics, while more successful, require large amounts of a patient blood, are time consuming and are also expensive. 3D tumor models, while commonly used in immuno-oncology studies and cancer therapy development, are usually spheroid-based and rarely integrate a tumor-stroma interphase. Because tumor stromal cells produce growth factors, chemokines and extracellular matrix, they have been shown to have a major role in tumor initiation, progression and metastasis.

Researchers at Arizona State University have developed a high throughput tumor model platform that includes the tumor, vasculature and the stroma, to produce a more physiologically relevant tumor-on-a-chip. This platform is designed in such a way to make it more efficient to use in standard laboratories and research clinics. Design specifications make cell seeding and injections more efficiently achieved with this platform. Drug screening is also optimized as multiple drugs can be tested simultaneously on the same chip.

This high-throughput, physiologically relevant platform more closely resembles the in-vivo tumor environment and could prove very useful in personalized medicine.

Potential Applications

- Personalized medicine
  - Particularly useful in testing immunotherapies
- Cancer research
- Drug screening/discovery

Benefits and Advantages

- Highly physiologically relevant as it incorporates tumor, stroma and vasculature
- Allows for sufficient migration of cells between tumor reservoir and stroma region
- Nutrient and ECM exchange is also facilitated between the regions on the platform
- Does not require as many punch biopsies compared to traditional 3D models
- Compatible with multi-pipette systems to increase efficiency in cell seeding, injections, etc.
- Can be used to screen multiple drugs at the same time on the same chip

For more information about the inventor(s) and their research, please see

Dr. Nikkhah's departmental webpage

Dr. Nikkhah’s laboratory webpage