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Hydrogels for precise tumor inoculation in preclinical research

Researchers in the Appel lab have developed hydrogels for tumor inoculation that improve precision and statistical power in preclinical mouse models of cancer.

Preclinical research suffers from a reproducibility crisis, which wastes time, money, and animals. Upwards of 30% of inoculated mice fail to form tumors in the commonly used allograft and xenograft mouse models of cancer. Tumor inoculation can be performed in basement membrane extract (BME, e.g., Matrigel), but this method introduces undefined components. Both saline and BME methods lead to tumors with large variance in size, which limits statistical power.

To improve tumor inoculation, the researchers have formulated injectable self-assembling hydrogels of alginate and calcium, which produce tumors with greatly improved size precision. The gels require only a simple mixing step, prevent cell settling, and are temperature insensitive. The mixture can additionally include tumorigenic factors such as laminin or hyaluronic acid.

Photo description: Hydrogel encapsulated inoculation (b) offers more consistent tumor formation as compared to saline inoculation (a). The self-assembled hydrogel components are illustrated in (c). Credit: Inventors

Stage of Development

Prototype with *in vivo* validation. The researchers have demonstrated that mouse melanoma tumor inoculation with their hydrogels shows lower size variance, as compared to saline or BME.

Applications

- Hydrogel-based tumor inoculation kit for preclinical cancer research

Advantages

- More precise tumor size allows higher powered experiments
- Compared to saline inoculation:
  - Higher proportion of mice grow tumors
  - More accurate model for cancer microenvironment
- Compared to BME inoculation:
  - More reproducible, molecularly defined components
  - Easy workflow because gelation is not temperature dependent

Publications

- Grosskopf et al. "Consistent Tumorigenesis with Self-Assembled Hydrogels Enables High-powered Murine Cancer Studies" *pre-print* 2021

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