1178 DELIVERY OF DNA ORIGAMI CANCER VACCINE USING ALGINATE MICROPARTICLES

Amani Djouadi*, Niksa Roki, Carlos Castro. *The Ohio State University, Powell, OH, USA*

Background Deploying the immune system to seek out and destroy cancer cells is a rapidly developing strategy for cancer treatment and prevention. This is accomplished via vaccination against tumor antigens to elicit an antigen-specific anti-cancer immune response. DNA origami nanodevices (DO) have shown enhanced antigen and adjuvant delivery to antigen-presenting cells (APCs) and stimulation of antigen-specific $CD8^+$ T cells. This enhancement is due to DO's unique properties, including size, shape, modular nature, and programable payload capacity.[1] Despite these features, free DO-based vaccine (DO-VAC) faces a harsh physiological environment within the lymphatic system and the periphery that compromises its integrity and longevity once injected subcutaneously. Previous work demonstrated that alginate-mediated release of vaccines is advantageous to traditional vaccines due to prolonged release of antigen, payload protection, and promoting adequate delivery of payload to lymph nodes.[2] Therefore, it is believed that DO-VAC delivery can be further enhanced by encapsulation in alginate microparticles. . Encapsulation could address the rapid clearance of DO-VAC, produce a strong persistent immune response, and remove the need for booster shots in clinical settings.

Methods We have constructed a rod-shaped DO (92 x 12 x 15nm) using M13 scaffold DNA devoid of endotoxin with standard DO construction methods. To construct the DO-VAC, DO was hybridized to 65 CpG adjuvant molecules and K10-OVA peptides. Alginate particles were manufactured using 2% endotoxin-free alginate and cross-linked in 2% calcium chloride solution using a syringe pump and pressurized nitrogen gas to create microparticles (10 uM – 100 uM). Alginate encapsulated DO was incubated for 28 days at 37°C in PBS in sink conditions and at 4°C in storage conditions. TEM image samples were prepared with standard methods. Agarose gel electrophoresis was used to characterize DO.

Results Agarose gel and TEM imaging demonstrate that DO retains structural stability once released from alginate particles. Based on release studies, alginate encapsulated DO exhibits sustained release properties in release conditions and stability in storage conditions.

Conclusions The sustained release property of encapsulated DO and stability of released DO indicate encapsulation in alginate microparticles is a promising strategy for future vaccine delivery. This delivery platform could be used to promote vaccine payload stability and protection while promoting a robust tumor-specific immune response.

REFERENCES

1. Liu S, Jiang Q, Zhao X, *et al*. A DNA nanodevice-based vaccine for cancer immunotherapy. *Nat Mater*. 2021;**20**(3):42–430. doi:10.1038/s41563-020-0793-6
2. Sarei F, Dounighi NM, Zolfagharian H, Khaki P, Bidhendi SM. Alginate nanoparticles as a promising adjuvant and vaccine delivery system. *Indian J Pharm Sci* 2013 Jul;**75**(4):442–9. doi: 10.4103/0250-474X.119829.

http://dx.doi.org/10.1136/jitc-2022-SITC2022.1178