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Discoid Nanoparticles: reaction environment-dependent Size Response

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In recent years, the develop of new drug delivery system (DDS) was necessary to optimize the treatment efficiency, thus overcoming the limits of traditional therapy such as targeting and drug half life. However, many treatments cause immunogenicity. Several DDS was developed such as liposomes, niosomes and other type of nanoparticles, but they can have some limits like the recognition and elimination of the immune system or the tumour targeting. These drawbacks can be bypassed by modifying sizes and shapes of liposomes. Discoidal Nanoparticles (DNs) are obtained from liposomes by adding Styrene-Maleic Acid copolymer (SMA) (Fig. 1). The molecular ratio between styrene and maleic anhydride, pH and temperature of microenvironment reaction can affect the synthesis of DN [1]. In this work we studied the use of SMA as copolymer, which is able to synthesis DN by starting from spherical liposomes (DMPC) at different molar ratio of copolymers (2:1 and 4:1), pHs (range of pH from 3.5 to 11.5) and temperatures (4°C, 25°C, 37°C, 65°C). The SMA copolymer can form DN, and their properties depend on the reaction environment. In fact, at different pHs, particle sizes are modified according to these physical parameters. The modification of temperature can influence the synthesis of DN. Currently, the best condition is obtained at pH = 7.4 and 25°C by using 2:1 molar ratio of copolymer. The results are in agreement with previously reported data using SMA as a copolymer under different reaction conditions [1]. These properties could be affected the synthesis of DN as well as drug delivery, but DN could be a innovative DDS for anticancer therapy.

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Reference:

1. "Effect of polymer composition and pH on membrane solubilization by styrene-maleic acid copolymers". Scheidelaar S., Koorangevel M.C., van Walree C.A., Dominguez J.J., Dorr J.M. and Killian J.A., Biophysical Journal, 2016.

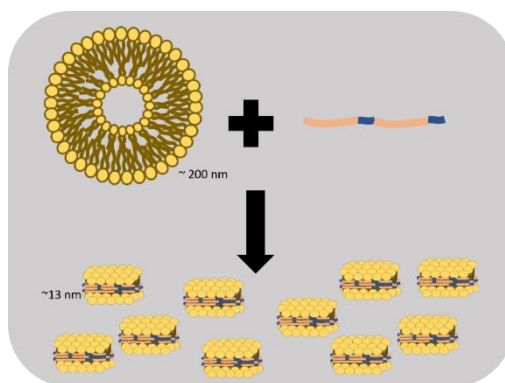


Figure 1: Schematic representation for the synthesis of DN starting from liposomes and SMA.

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