Engineering Endothelial Leakiness with Nanotechnology

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Many nanomedicine and nano drug carrier systems depend on the tumor derived enhanced permeability and retention effect (EPR). However, the EPR effect and leaky vessels network within and along the periphery of the tumor is un-engineerable as it is entirely due to the tumor's own metabolic demands and induction. This talk will share our discovery that nanoparticles themselves are capable of inducing endothelial leakiness and coined this phenomenon as "nanomaterials induced endothelial leakiness" (NanoEL)[1]. The gaps that are formed between endothelial cells are so large that whole cancer cells are able to migrate across them[1,2]. In one form of NanoEL, we showed that certain types of nanoparticles find their way between the endothelial cells and bind to an important *adherens junction* protein (VE-cadherin) and disrupt the *adherens junction*. This disruption then triggers an intracellular pathway that pulls adjacent endothelial cells to form those NanoEL gaps. NanoEL happens even without any cancer cells. Size[3], charge[4] and materials' effective density[5] determine NanoEL. While NanoEL poses a certain level of nanosafety risk[6], engineering NanoEL[7,8] can also have therapeutic outcomes like independently tuning leakiness[7] for nanomedicine or drug access to cancer cells[8].

References

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