



2020「中技社科技獎學金」

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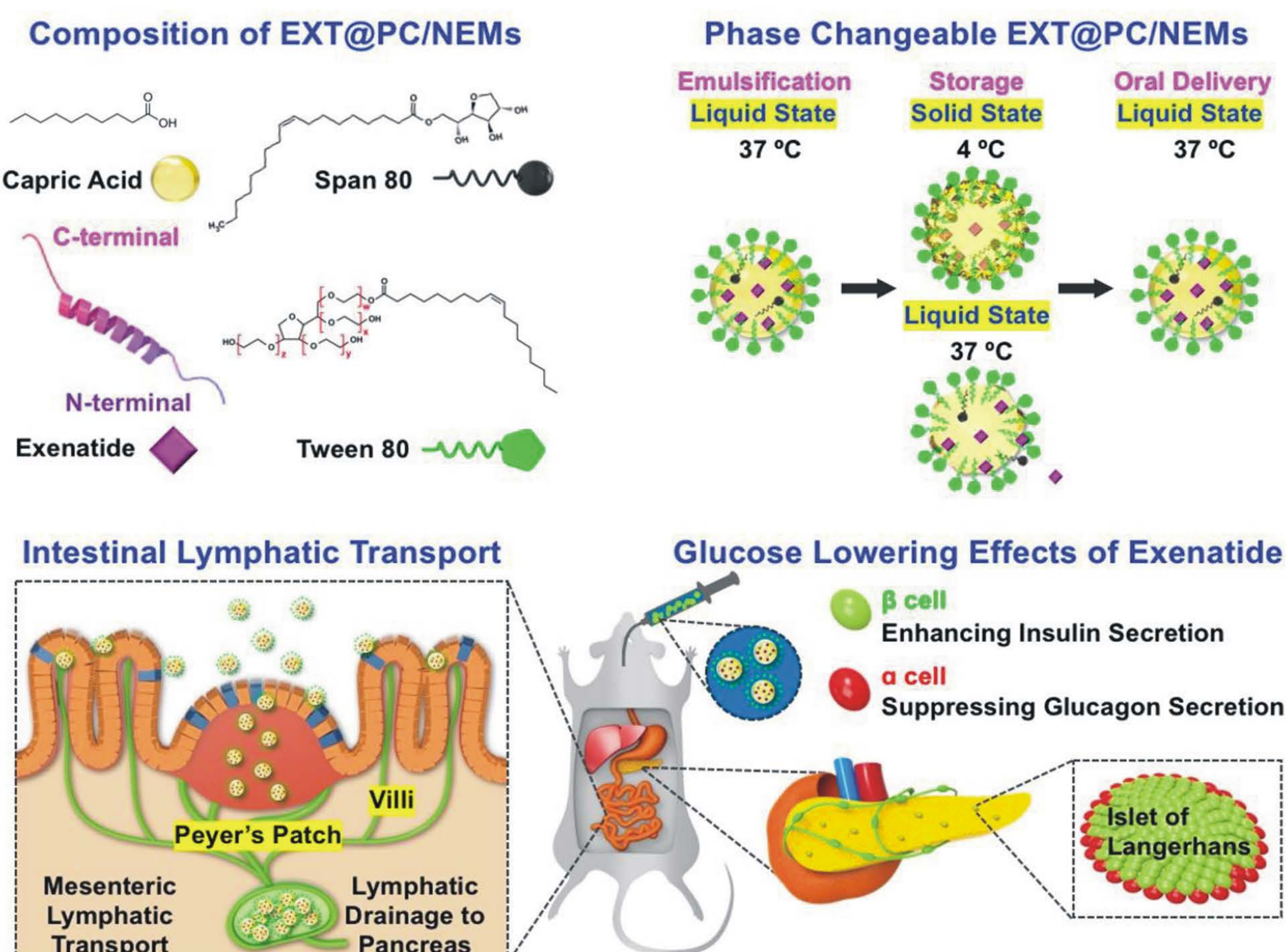
Phase-Changeable Nanoemulsions for Oral Delivery of a Therapeutic Peptide via Lymphatic Transport for Glycemic Control in Diabetes

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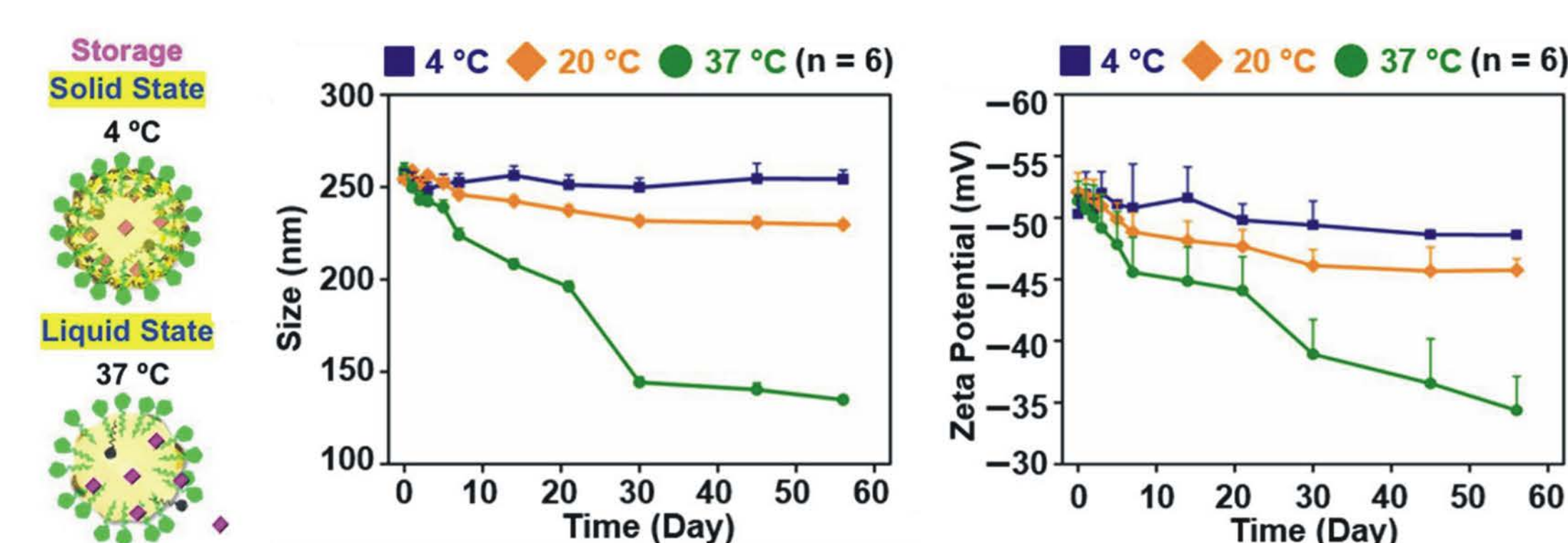


研究重點

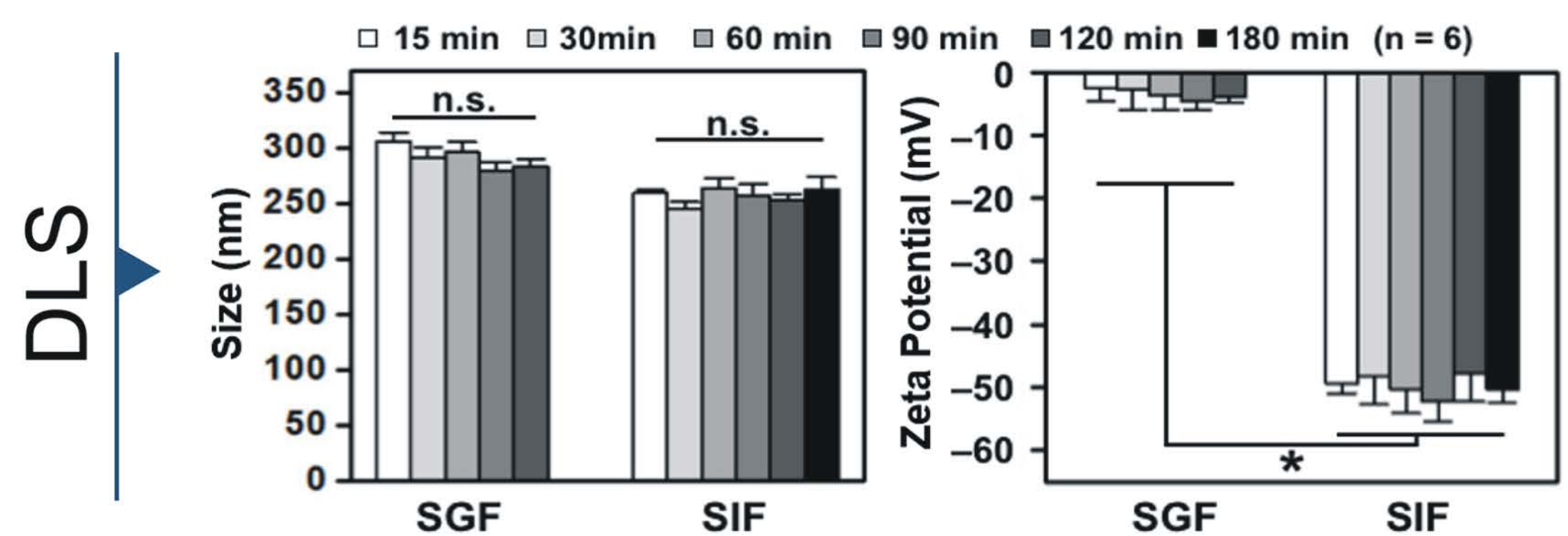


The oral absorption of a therapeutic peptide (such as exenatide; EXT) that can improve glycemic control in the treatment of type 2 diabetes is limited by multiple barriers of the intestinal epithelium. This work presents an oil-structured nanoemulsion system that consists of a phase-changeable fatty acid that allows EXT (EXT@PC/NEMs) to be delivered orally and absorbed efficiently in the small intestine. To construct an appropriate vehicle to encapsulate EXT, an oil-in-water single emulsion is generated at 37 °C, which is above the melting point of the fatty acid but below the denaturation temperature of the peptide. The as-prepared EXT@PC/NEMs are physically stable when stored at 4 °C, as they form a solid core, which prevents drug leakage. Upon their oral delivery at body temperature, the deformable liquid EXT@PC/NEMs may undergo effective cellular uptake, enhancing their permeability across the intestinal epithelium. The orally administered PC/NEMs significantly improve the bioavailability of EXT via intestinal lymphatic transport, ultimately accumulating in the pancreas, suggesting the possibility of orally delivering labile peptide drugs. The delivered EXT may act on pancreatic β - and α -cells to stimulate insulin release and suppress glucagon secretion, respectively, reducing the blood glucose level, eventually having antidiabetic effects.

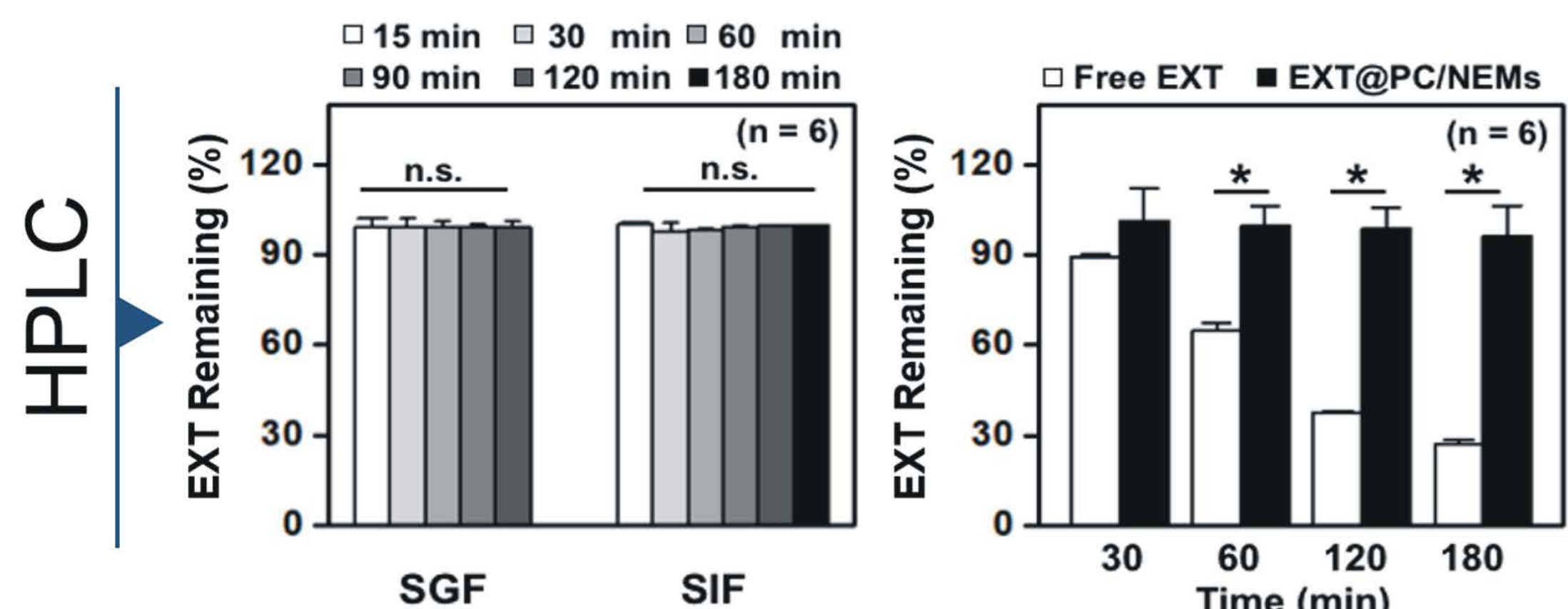
研究成果



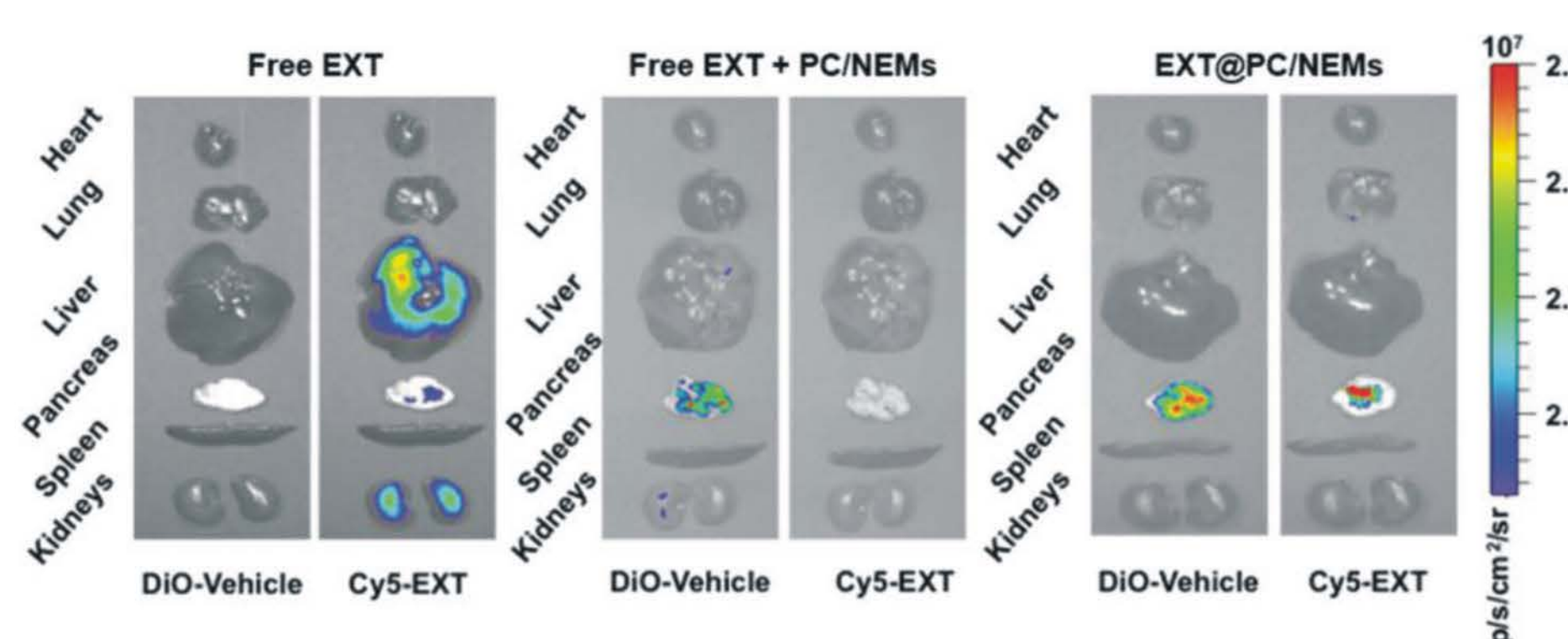
■ The **solid core** formed at 4 °C contributed to the long-term stability, both in size and zeta potential.



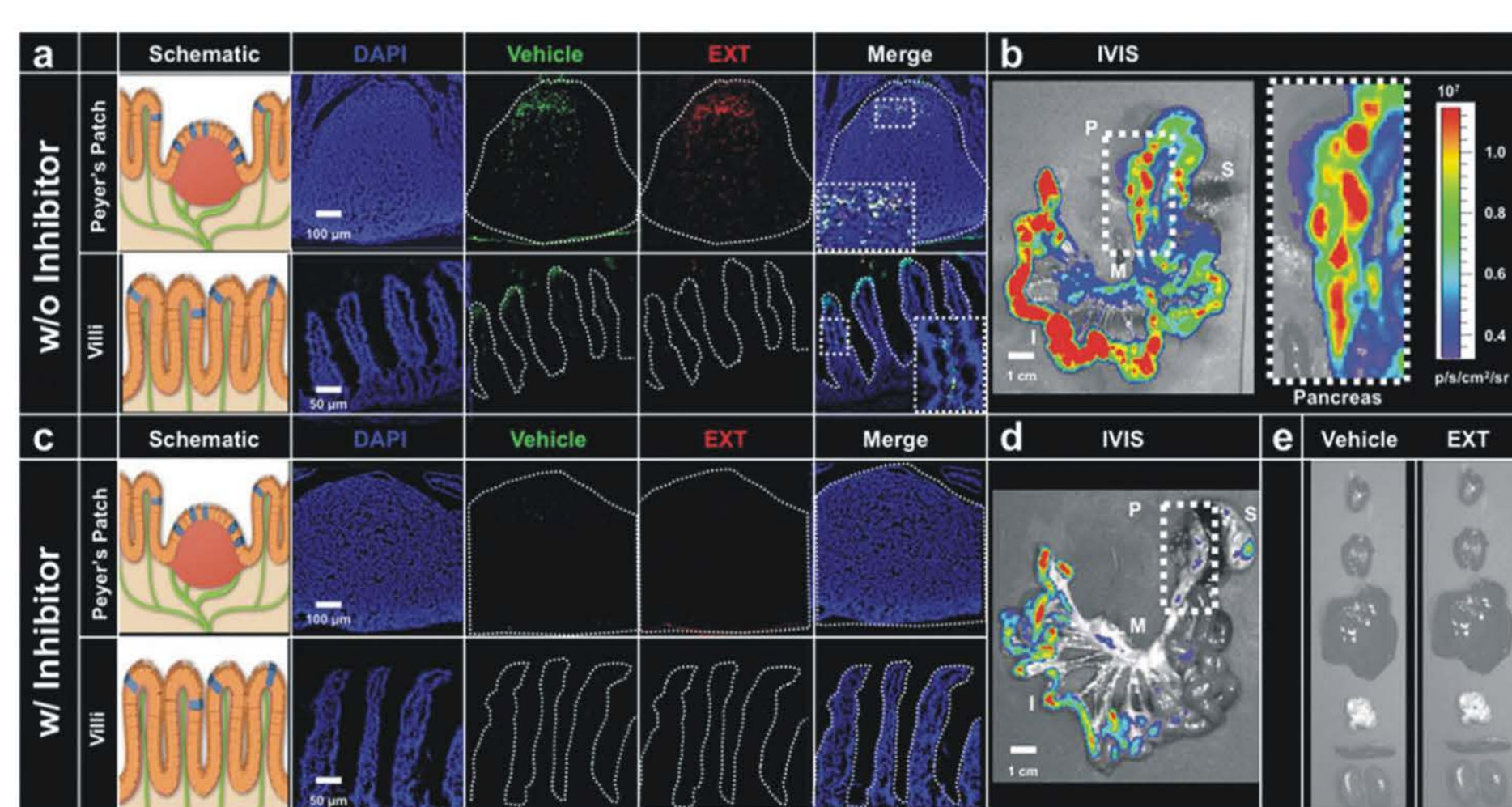
■ The **physical stability** is well persistent in the harsh pH environment during GI tract.



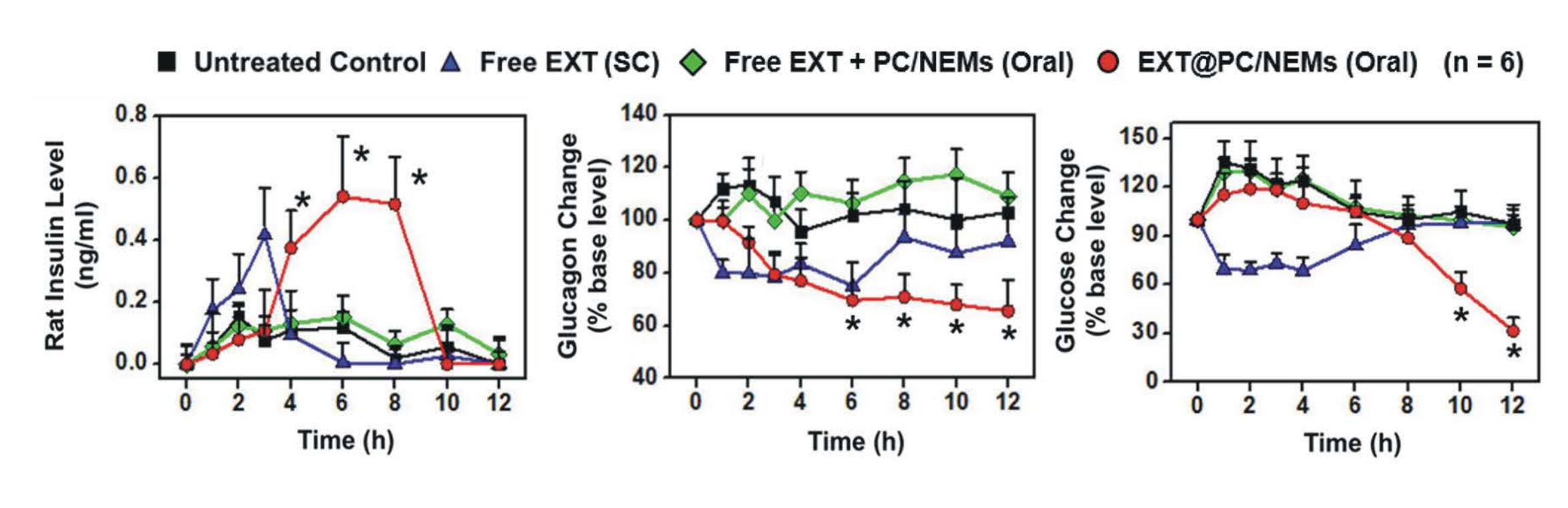
■ The emulsion carrier is resistant to pH changes and degradative enzymes.



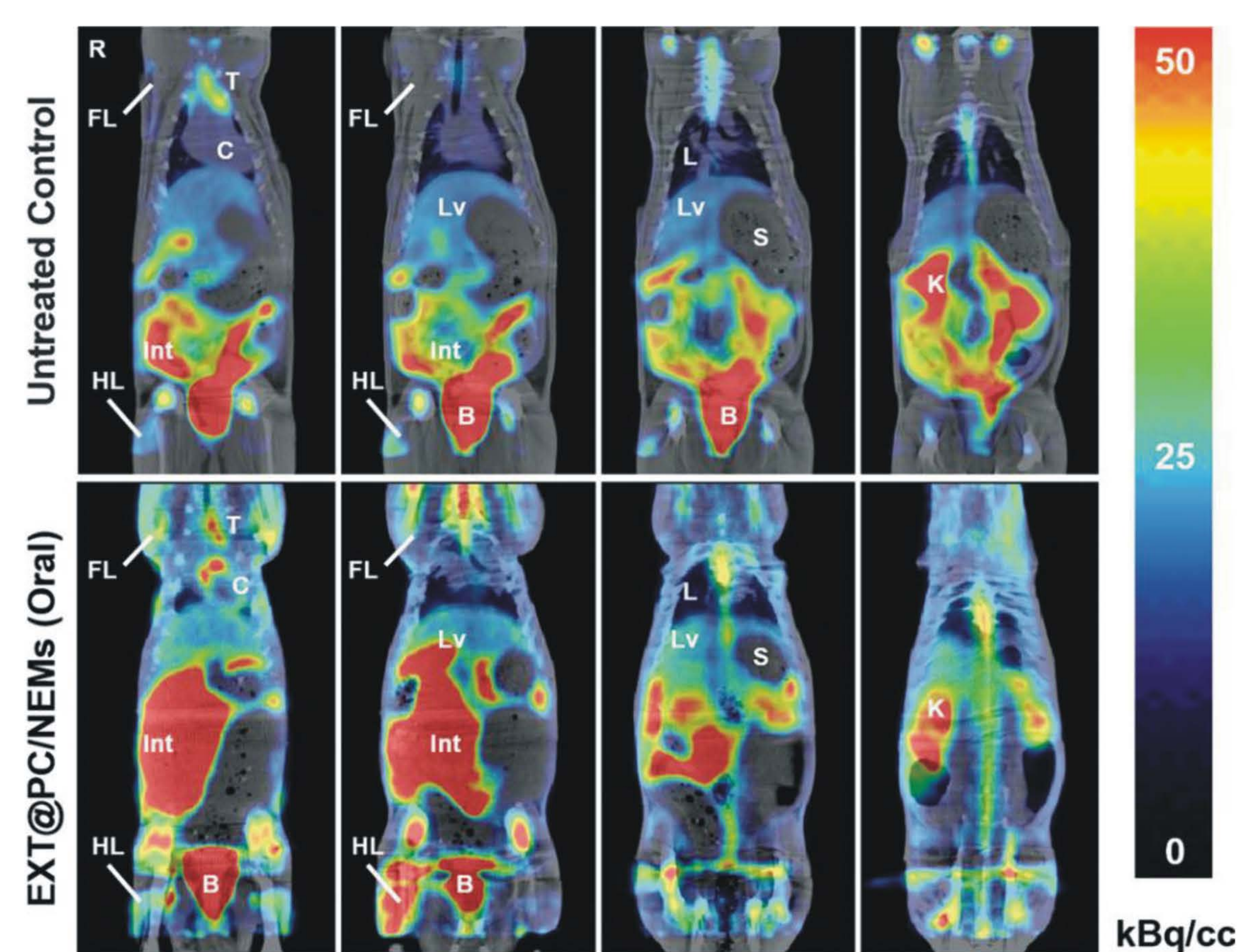
■ The PC/NEMs not only protect the EXT throughout the harsh GI environment but render EXT the **targeting effect toward the pancreas**.



■ The absorption of EXT@PC/NEMs is dependent on the lymphatic transport.



■ The peroral administration of EXT@PC/NEMs exhibited prolonged glycemic control with stimulated insulin level and suppressed glucagon level.



■ The EXT@PC/NEMs-treated rats showed enhanced muscle glucose metabolism under animal PET investigation.

研究生活及心得等

首先感謝中技社的青睞，能獲得此研究獎學金對我而言是莫大的殊榮與肯定。感謝宋信文教授對我的細心教學與指導，也給我相當自由的發展空間。研究的道路上總是充滿各種挫折、失敗與孤獨，因此也要感謝實驗室學長姐、學弟妹的相互關照與幫忙。最終，感謝我所有的家人、朋友，你們給予我無條件的支持與鼓勵，是我繼續往前邁進的最大動力。



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