Research focus includes:
- Oral delivery of drugs offers the highest patient compliance and ease of use.
- Chitosan (CS), a polysaccharide derived from the deacetylation of chitin, is known for its biocompatibility, nonreactivity, and mucoadhesivity. (Landriscina et al., 2015)
- In nanoparticle form, it can increase the bioavailability of therapeutic agents which may otherwise be limited by their low intestinal absorption and instability in the gastrointestinal (GI) tract. (Chen et al., 2013)

Impact of Professor’s Research
The Chung Lab uses nanomedicine and tissue engineering to address clinical limitations.

Research focus includes:
- Nanoparticles to target diseases such as atherosclerosis and autosomal dominant polycystic kidney disease (ADPKD).
- Improving contrast agents to enhance imaging techniques such as magnetic resonance imaging (MRI) and positron emission tomography (PET).

Methods
- Chitosan Nanoparticles are formed using acetic acid, MilliQ H$_2$O, Chitosan, a cross-linker (sodium tripolyphosphate (TPP) or polyglutamic acid, as well as a drug (metformin hydrochloride) to be loaded into the nanoparticle.
- Chitosan solution is added dropwise to the cross-linker solution and final solution is vortexed and sonicated.
- The solution is distributed in 5mL Eppendorf tubes and centrifuged for 30 minutes at 14,000 RPM at 14°C.
- After centrifuging, the solvent is poured out, and the nanoparticle pellet is preserved and washed with 20%, 60%, and 100% Ethanol.
- The completed solution is preserved in a -80°C freezer for 24 hours, then lyophilized for 8 hours until analysis in DLS.

Results
- The most dramatic size differences were seen after 1 hour elapsed, especially in low pH such as pH 1.2 and 2.5; noticeable degradation from 161 nm (diameter) to 9.20 nm was noticed under pH 2.5.

Results
- Clumping was more noticeable in lower pH (A), indicating further degradation, while CS-NPs at higher pH (C) preserved its shape better and less clumping was present, indicating less degradation.

Figure 1. Derivation and chemical structure of chitosan. news.com.au, indiamart.com.

Figure 2. “Our Vision”. chunglaboratory.com.

Figure 3. A DLS Instrument. USC School of Pharmacy Core Facilities.

Figure 4. A Transmission Electron Microscope. Hitachi High Technologies America.

Figure 5. SEM Imaging of Chitosan after 2 hours under untreated conditions (A), 2.5pH (B), and 7.4pH (C) preserved its shape better and less clumping was present, indicating less degradation.

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