NANOMATERIALS FOR IMAGING AND TREATMENT OF AMYLOIDOSIS

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Background

8 million people per year are diagnosed with light-chain (AL) amyloidosis, a progressive disease than can quickly affect the kidney, heart, and nervous system if left untreated. The current method of diagnosis involves histological confirmation via biopsies of bone marrow, fat, and organs. Typically, the accumulation of amyloid occurs systemically. However, in some cases the accumulation of amyloid is confined within a particular organ only, leading to false negatives.

To further complicate diagnosis, AL amyloidosis and multiple myeloma (MM) share similar biochemical pathways, and some MM patients also present with AL amyloidosis (~15%). In the US alone, about 65,000 people have MM and another 30,000 are diagnosed each year. The prognosis of patients with MM with overlapping AL amyloidosis is worse than MM patients without amyloidosis.

Thus, there is a need for a non-invasive technique to detect light-chain amyloidosis in order to help distinguish between the diseases (AL amyloidosis vs MM vs both), and between disease presentation (amyloid accumulation systemically vs locally).

Technology Summary

Dr. Sharma's group has developed a non-invasive technique to visualize and localize light-chain amyloid deposition. Their novel water soluble gold-nanoparticle conjugate, Au-NP-194, binds to light-chain amyloid with high affinity and specificity. In combination with PET imaging, visualization and localization of AL amyloidosis in vivo is made possible.

Early studies have confirmed that Au-NP-194 binds to light-chain amyloid in urine and tissue biopsies of AL and MM patients (see below, L-R: bone marrow, bone marrow, heart - R ventricle).
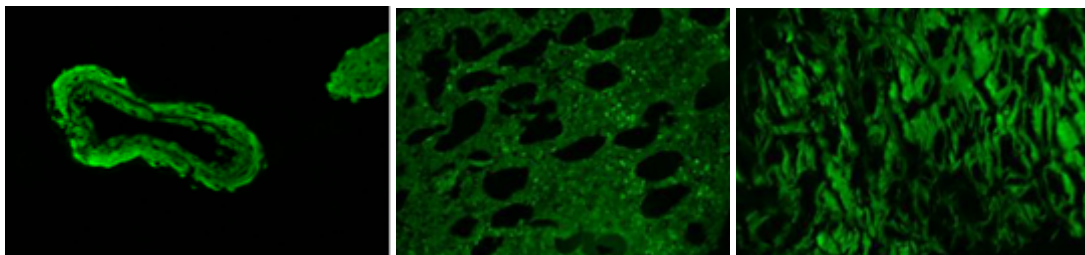
Advantages:

- Noninvasive detection of amyloid accumulation (outside the CNS)
- Biodegradable PET tracer

- Addition of ^{64}CU to the conjugate makes the tracer inert

Patent

Pending