

Are Cataracts an Amyloid Disease? 2D IR spectra say YES!

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Cataracts are caused by the aggregation of proteins in the eye lens. Many *in vitro* experiments result in amyloid fibrils, but no fibrils have been found in the lens tissue. We measure cataractous lens tissue using 2D IR spectroscopy and observe the cross peak signature of amyloid fibril formation.

Age-related cataract disease prevents clear vision in more than 50% of people over the age of 75. However, previous experiments investigating the aggregation of crystallin lens proteins that cause cataracts showed a discrepancy between *in vitro* and *in vivo* experiments. Studies done on many different crystallin proteins exhibit amyloid fibril formation, including when irradiated with UV light [1-2], but to our knowledge there is little to no evidence that cataracts in humans and mammals contain amyloid deposits [3].

We will report 2D IR spectra collected of lens tissue that we have dissected from pig eyeballs, sliced, and irradiated with UVB light. The 2D IR spectra of the tissue are amazingly easy to collect, with light scatter that is easily suppressed with phase cycling. The crystallin proteins exhibit characteristic cross peaks when they form amyloid fibrils and these cross peaks are observed in the UV irradiated tissue (Fig. 1). We will present data on pig lenses, mice lenses, and if all goes well before CMDS convenes, human lenses too. This data may reclassify cataract formation as one of the amyloid diseases.

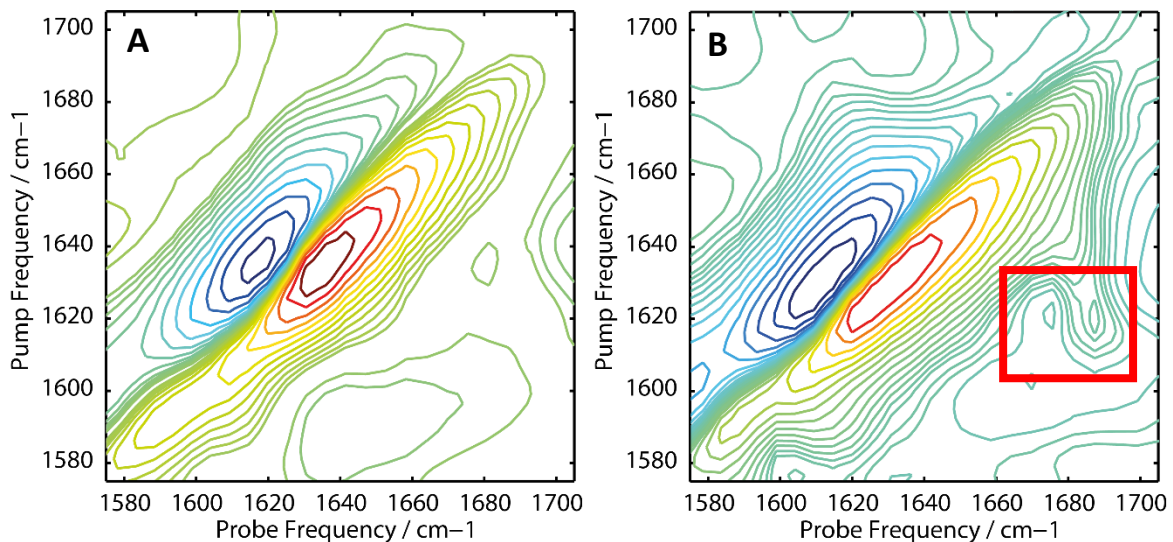


Figure 1. A. Porcine lens slice, 25 μm thick, 20 mM tris buffer, pD 7.4. B. 24 hour UVB-irradiation porcine lens slice, 25 μm thick, 20 mM tris buffer, pD 7.4. No amyloid cross peaks occur in the native lens; cross peaks do occur in UVB-irradiated lens (red box).

[1] Moran, S. D. *et al.* *Biochemistry*. **52**, 36, (2013).

[2] Meehan, S. *et al.* *J. Biol. Chem.* **279**, 5, (2004).

[3] Frederikse, P.H. *Curr. Eye Res.* **20**, 6, (2000).