In this latter case, a product containing a new stereocentre is formed and the ability to control the selectivity of this process offers a new target for catalyst design and development. *SD*

AMYLOID FIBRILS

Peptides do the twist

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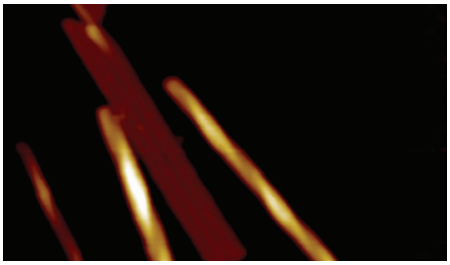

In the initial steps of amyloid fibril formation, proteins or peptides self-associate to form small oligomers. The addition of more polypeptide species leads to larger aggregates, termed proto-fibrils, and eventually mature amyloid fibrils. Gathering detailed information on the structure and growth of the intermediate structures could help develop methods to interrupt or reverse the fibrillization process, which could lead to new treatments for a variety of amyloid-related diseases.

Human islet amyloid polypeptide (hIAPP) is found in amyloid deposits in patients with type 2 diabetes. To find out more about what occurs during fibrillization of hIAPP, a team led by Mingdong Dong at Aarhus University, Denmark, investigated the aggregation of a decapeptide ($hIAPP_{20\text{-}29}$). This oligopeptide is thought to be the region of the protein that initiates fibril formation of hIAPP. Dong and co-workers used a combination of atomic force microscopy and microsecond force microscopy to follow the formation and changes in morphology of the peptide nanostructures throughout the aggregation process — from small strands through to helical fibrils. They also measured the rate at which structures thickened, which is a key property for growth and maturation of fibrillar structures.

Initially the decapeptide self-assembled to form thin strands during the so-called lag phase. As aggregation progressed into the elongation phase, the thin ribbons became wider. After a couple of hours, some of the ribbons began to twist and continued to gradually thicken. Multi-strand mature helical fibrils were then formed from the twisted ribbons; however, instead of forming helical fibrils, some of the flat ribbons thickened further and formed large flat ribbons. These larger flat ribbons are still present at the end of the fibrillization process, which proves that the ribbon structures and helical fibrils can co-exist in solution and that not all proto-fibrils transform into mature amyloid fibrils in the case of the hIAPP decapeptide. Dong and co-workers suggest that the thickening of ribbons makes them energetically stable, which enables them to co-exist with the helical fibrils. *RJ*

DNA–PROTEIN INTERACTIONS

Appreciating allostery

Science **339,** 816–819 (2013)

Allostery is the process in which the binding of a ligand to a protein at one site induces conformational changes that affect the subsequent binding of a second ligand at another site. Now, a team of researchers from Peking University and Harvard University, led by Xiao-dong Su, Yujie Sun and X. Sunney Xie, has shown that allostery is not restricted to proteins and can occur through DNA. They probed how the unbinding of a protein from double-stranded (ds) DNA was affected by the presence of another protein attached nearby to the same dsDNA molecule.

dsDNA molecules featuring two protein binding sites a defined distance apart were attached to a surface. A fluorescently labelled protein was then attached to one site before a second protein was flowed over the immobilized dsDNA–protein complexes. During this period, the rate of detachment of the initially bound protein was monitored using single-molecule fluorescence. Su, Sun and Xie saw that, on binding, the second protein could either stabilize or destabilize the attachment of the first protein depending on the proximity of the two binding sites. The dependence oscillated with a period of 10 base pairs, that is, if a protein was able to stabilize a second protein 10 base pairs away, it would destabilize a protein if it was 5 base pairs away. 10 is the number of base pairs it takes for dsDNA to complete one helix turn, and so this allosteric behaviour is linked to the structure of dsDNA.

It is suggested that the allostery results from the mechanical properties of the dsDNA. Protein binding generally takes place in the major groove of dsDNA, and molecular dynamics simulations show that the binding of one protein affects the size of the adjacent major groove, widening it or narrowing it (depending on the protein) — again with a periodicity of 10 base pairs. Su, Sun and Xie also demonstrated allostery in the binding of enzymes relevant to transcription and were able to use the effect to modify gene expression in living bacteria. *GA*

Written by Gavin Armstrong, Stephen Davey, Russell Johnson and Anne Pichon

blogroll

Fighting fear

Changing the tune on chemistry's bad rap

Chemophobia has led manufacturers and proprietors to advertise 'chemical-free' goods and services; it pops up in literature by activist groups like Safer Chemicals, Healthy Families — and has even infected popular media outlets. The rise in the fear of chemicals and chemistry has many chemists, as well as scientists in all fields, asking what can be done to eradicate chemophobia.

One way to counter chemophobia is for scientists and science writers to tackle it head-on. Michelle Francl, a professor of chemistry who blogs at The Culture of Chemistry, responded to a February *New York Times Magazine* article 'The Boy With a Thorn in His Joints' about parents treating their child's arthritis with 'natural' alternatives instead of the recommended methotrexate. Writing in *Slate* (http://go.nature.com/8a9W24), Francl pointed out that the parents' 'natural' alternatives were also chemicals — ones that have their own safety concerns. Stressing that everything is a chemical and all chemicals have risks are tips that Francl gives for fighting a 'chemophobia pandemic'.

ChemBark offers another way to fight chemophobia — by chemists doing outreach. "I think it is important that every chemist spends some time engaging the general public for the purposes of education and promoting the benefits of our field" wrote ChemBark in his post 'Combatting Chemophobia' (http://go.nature.com/IrpfNS). Writing as if he's talking to an outreach naysayer, ChemBark answers typical questions like "What's in it for me?" and charges like "I can't put that on my CV!"

Why fight chemophobia? For one thing, chemistry is "...the amazing and beautiful science of stuff..." as Hank Green puts it in his video on the nucleus (http://go.nature.com/FmjCRo) for Crash Course — a YouTube channel where you can learn about topics from literature to ecology to chemistry (http://go.nature.com/RlbL7W).

Written by DrRubidium, who blogs at http://scientopia.org/blogs/thirtyseven/ and http://www.thejayfk.com/