Experiment title: "Structure of Nucleic Acid complexed with Cationic Polyelectrolytes"

Experiment number: SC-872
Beamline: BM26B
Date of experiment: from: 07.12.2001 to: 09.12.2001
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Experimental set up:

The wavelength energy was 15.0 keV and the beam focus had a size of 300x300 m^2 at sample position. The sample/detector distance was d=1.75m and the resolution had an accessible wave vector range of q = 0.25-5 nm^{-1}.

Beamtime

The beamtime was dedicated as following:
-9 hours: beamline alignment, set up installation and tests.
-17 hours were dedicated to a new system of hydrated DOPE/DOTAP/DNA complexes solublized in alcanes. Scans at different ratios of DOPE/DOTAP and different hydration rates were carried out. We systematically varied the solvent from octane, decane and dodecane.
-15 hours were dedicated to polyplexes.

We studied DNA/polycation complexes by small and wide angle X-ray scattering SAXS and WAXS. We focused ours investigation on mixtures of nucleic acid with cationic polymers. Firstly, we investigated DNA condensed with linear and branched polyethylenimine (PEI) for isoelectric (w/w=1:0.13) and positively charged complexes (w/w=1:0.675) as function of pH (4.5-9) [see figure]. Further on, the same measurements were carried out under different salt concentrations (0-1000 mM). Secondly, for DNA/polylysine complexes SAXS-scans were recorded in Millipore water at different charge ratios from isoelectric to highly positively charged complexes (n =10n). DNA/polylysine and DNA/protamine sulfate complexes with a fivefold positive excess charge were studied under different salt concentrations (0-1000mM).

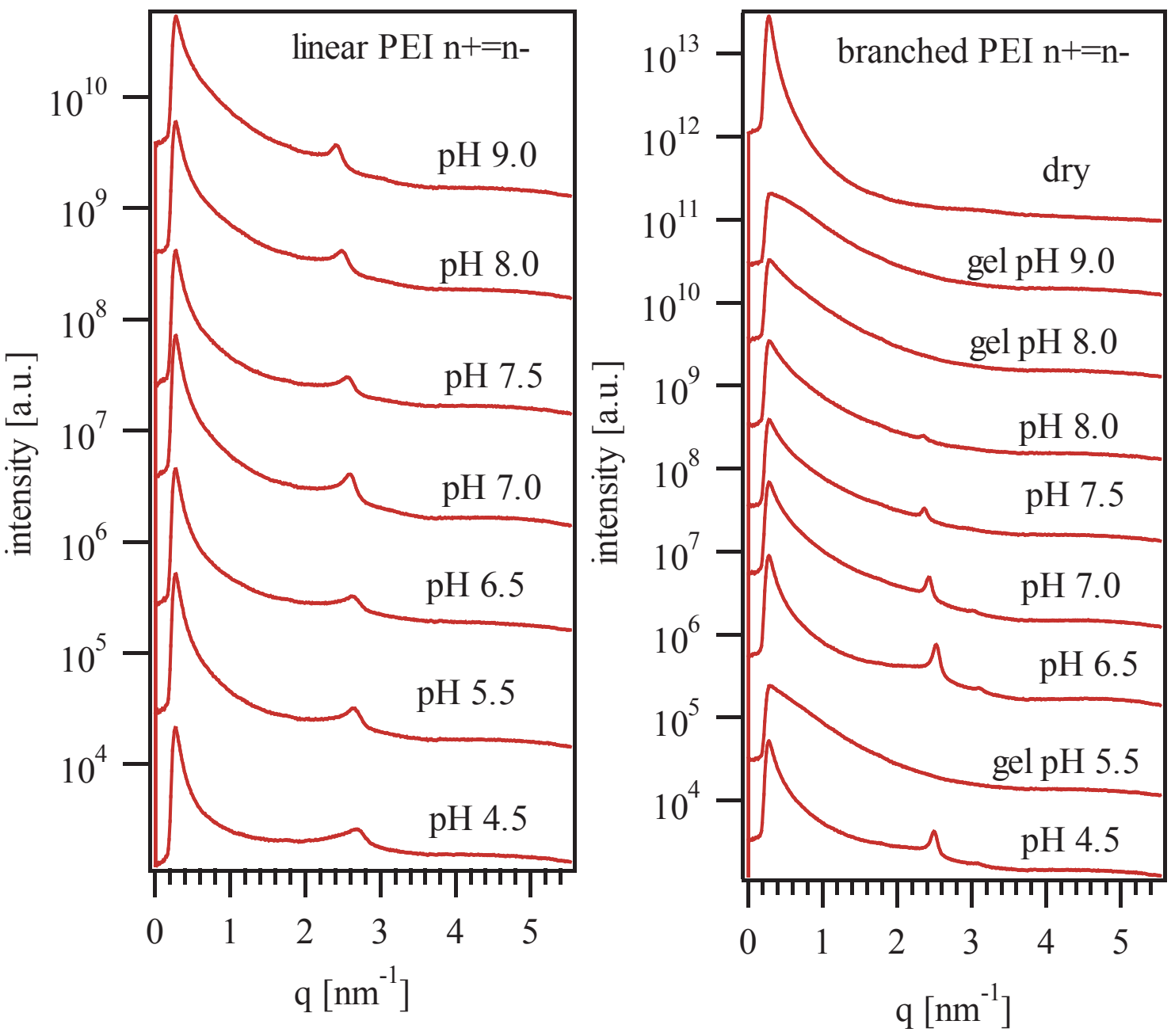

Figure: Small angle X-ray scans of linear and branched PEI complexes with DNA. The sharp correlation peak corresponds to average DNA packing density in the condensed phase. The comparison shows that the branched PEI complex react stronger on pH changes then linear PEI complexes.