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CHOLESTERYL ESTERS
TRICLYCERIDES
PROTEIN
CHOLESTEROL
LECITHIN

IBR

37°C
35°C
30°C
25°C
32°C
28°C

40°C
10°C

T-jump

page 61-62
page 69

AUSTRIAN SAXS BEAMLINE AT *elettra*
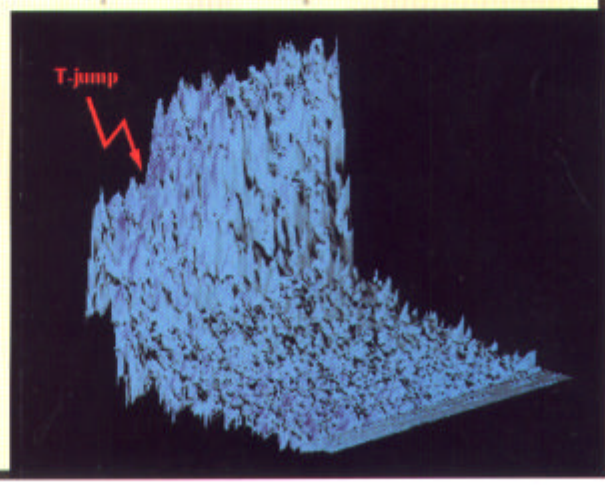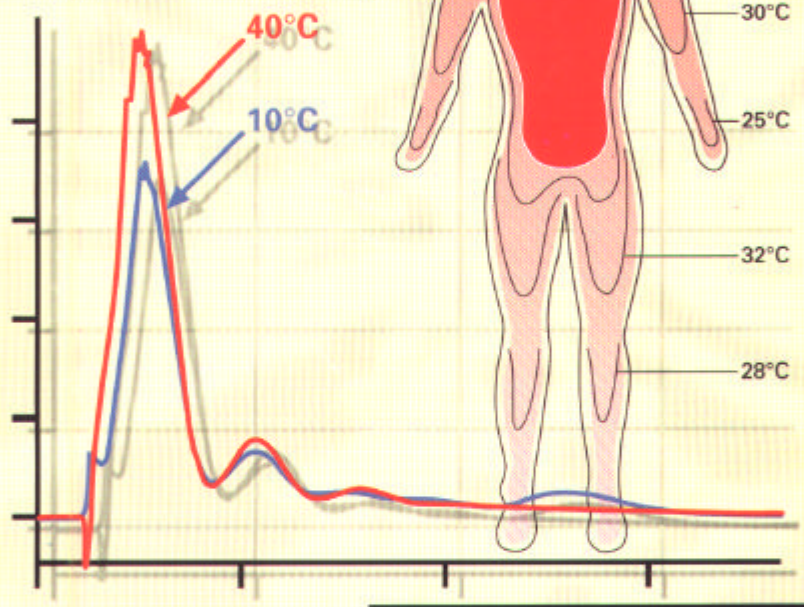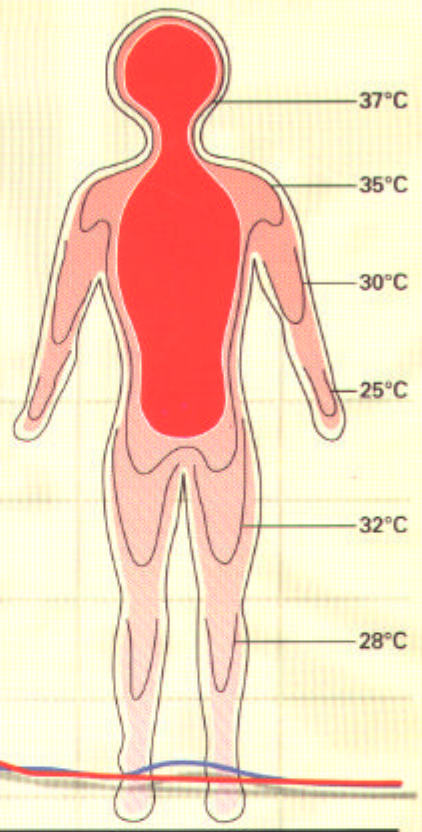
TIME RESOLVED SMALL ANGLE SCATTERING STUDIES ON PROTEINS IN SOLUTION USING THE CCD CAMERA AT THE SAXS BEAMLINE

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Since third generation synchrotron sources like ELETTRA provide sufficient flux of photons, so that time dependent small angle scattering studies on proteins in solution can be carried out. In order to investigate the structural and conformational changes of proteins upon their reaction the time resolved scattering technique requires a high brilliance and high quality of the x-ray beam and due to this a highly developed detector system designed to detect this high flux of scattered photons. Recently CCD-cameras are the instrument of choice to obtain scattering patterns in the time range of 100ms. Such a CCD device was installed in autumn 1998 at ELETTRA's SAXS beamline.

In former experiments we have investigated the binding behavior of the chaperonin system GroEL-GroES in the presence of different nucleotides. Using a 1-dim gas detector we were able to obtain scattering patterns in the time range of 1s with sufficient good statistic. The CCD detector allowed us now to follow the cycle of the chaperonin reaction in the time range of about 100 ms and therefore to study the conformational changes during the reaction.

Fig. 1.:

Small angle scattering pattern (100 ms exposure time, incident flux, 10^{12} ph/s)
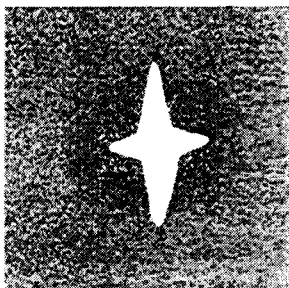
The readout time of the CCD chip was reduced to 100 ms and the data acquisition was started by a trigger signal. In figure 1 an image of a 100 ms exposure is shown. The „star" in the middle is a special adapted beamstop in order to avoid blooming of the CCD. The counting rates are about 100 counts/pixel in the outer range of the image (background and water scattering) and 400 counts/pixel in the inner area (=protein scattering).
Currently software is under development in order to analyze the sequence files (containing 256 frames images and covering about 73 Mb of memory) transforming them from the raw data to the scattering curve for further data treatment.