

# BIOMOLECULAR COMPLEX PURIFICATION

**Biocomplex** is specialized in macromolecular sample preparation and purification for functional and structural studies using ultracentrifugation and chromatographic methods. Biocomplex also actively develops new purification methods, often in co-operation with manufacturers. Our technologies can be used in different combinations to purify large macromolecular complexes such as **viruses, virus-like particles, exosomes, membrane vesicles, large protein complexes** etc.

**Biocomplex has operated as the ESFRI Instruct Centre for Virus and Macromolecular Complex Production (ICVIR; 2009-2016)**



Photo Wilma Hurskainen

**LOCATION** Biocenter 1, Viikki Campus (Viikinkaari 9), University of Helsinki, Helsinki, Finland

**CONTACT**  
[grp-biocomplexservice@helsinki.fi](mailto:grp-biocomplexservice@helsinki.fi)

**HOME PAGE**  
<https://www.helsinki.fi/en/helsinki-institute-of-life-science/hilife-research-infrastructures>

## PEOPLE



**Minna Poranen**  
Principal Investigator  
Biocomplex Director



**Dennis Bamford**  
Professor Emeritus  
Scientific Consultant



**Katri Eskelin**  
Senior Scientist  
Biocomplex Coordinator



**Hanna Oksanen**  
Principal Investigator  
Biocomplex Vice-Director

## PREPARATIVE ULTRACENTRIFUGATION

Our ultracentrifugation platform comprises a farm of ultracentrifuges equipped with swing out and fixed angle rotors with different capacities (Fig. 1). We also have instrumentation for gradient making and fractionation as well as super-speed centrifuges.

We provide techniques for separation of macromolecules based on:

- Rate-zonal (sedimentation rate);
- Equilibrium (buoyant density);
- Flotation;
- Differential centrifugation (sedimentation rate).

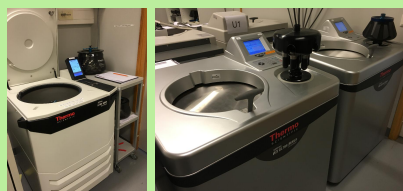


Fig. 1. Biocomplex centrifugation services

## ASYMMETRICAL FLOW FIELD-FLOW FRACTIONATION (AF4)

AF4 is suitable for the purification of fragile macromolecular complexes due to the following properties:

- No stationary phase. This eliminates the pressure and shear forces during separation;
- Mobile phase composition can be readily modified according to the studied sample;
- Suitable for separation of broad range of particle sizes ranging from nano- to micrometers;
- Polydisperse samples can be fractionated in a single experiment.

Separation is based on hydrodynamic radius. It is achieved by applying two flows: the cross flow and the channel flow (Fig. 2). In normal elution mode, small sample components with higher diffusion coefficients elute before large complexes.



Fig. 2. (upper panel) In AF4, separation takes place in a thin open channel. Porosity of the ultrafiltration membrane determines the sizes of molecules that retain in the channel for separation. (lower panel, left) AF4 equipment. (lower panel, right) CM monolithic columns.

## MONOLITHIC CHROMATOGRAPHY

CIM® monolithic columns are designed for purification of large macromolecular complexes (Fig. 2). Biocomplex provides weak (DEAE) and strong (QA) anion exchange columns for purifications.

The benefits of the CIM columns are:

- Large pore sizes enable efficient binding of large macromolecular complexes;
- High flow rates enable fast separation;
- Due to convective -based transport, binding to active sites is not affected by the low diffusivity of large complexes;
- High yields and concentrations can be achieved.

## INSTRUCT-HiLIFE and INSTRUMENT-FI

Biocomplex is part of the **Helsinki Institute of Life Science research infrastructure Instruct-HiLIFE** that belongs to a national structural biology network **Instruct-FI**. Instruct-FI promotes training and state-of-the-art research in structural cell biology (Biocomplex, cryoEM, NMR, crystallization, nativeMS, protein production, biocatalysis, structure-based drug design). Instruct-FI activities are located at the Universities of Helsinki, Oulu, Turku, Åbo Academi, Eastern Finland and Tampere. Instruct-FI is included on the Finnish Research Infrastructure 2014-2020 roadmap.

We provide access to equipment and expertise at various levels:

- Guiding new users through unfamiliar structural cell biology technologies;
- Facilitating expert users to access specialist, cutting-edge technologies;
- Providing full service packages;
- Training and project planning
- Collaboration