Your Expert Partner in Preclinical Drug Development
Are you looking for a contract research organisation to support your preclinical drug development?

We are specialized in solving complex research questions using interdisciplinary cutting-edge techniques.

With a renowned expertise in biotechnology and life-science, we can support and enhance your product development. We have QA/QC programs in place.

Our partners include international pharmaceutical companies as well as enterprises in an early stage.

FOI is your advanced research partner with a unique profile of research groups covering all needs in the early stage drug development.

Areas of in-house research capabilities:
• Synthesis of bioactive compounds
• Chemometrics and computational chemistry
• Protein characterization and assay development
• Macromolecular structure determination and modelling
• Analytical capabilities
• In vivo infection models for preclinical evaluation of antimicrobial compounds and vaccines
• Models for lung effects
• Ex vivo model for airway contraction
• In vitro lung cell model
• Model for skin penetration
Synthesis of bioactive compounds
PhD Anna-Karin Tunemalm,
anna-karin.tunemalm@foi.se, or
Sandra Lindberg, sandra.lindberg@foi.se

Do you need organic compounds such as drug candidates, intermediates, metabolites or reference substances for analytical use?

We can offer
• General organic synthesis, including development of synthetic methods (in a mg – kg scale)
• Synthesis of
  - isotope labelled compounds
  - highly potent or air sensitive compounds
• Structural and quantitative analysis using NMR-spectroscopy
• In vitro, in vivo and in silico studies on physical-chemical properties

Our laboratory is e.g. equipped with
• A continuous flow reactor
• Two full size glove boxes for synthesis or toxicological, analytical and other testing assignments.
• Preparative HPLC for purification of organic compounds

Selected reading
• A new micro-scale method for the conversion of phosphorus oxyacids to their halogenated analogues, using cyanuric fluoride in solution and on solid support. Wärme R., Juhlin L., Phosphorus Sulfur and Silicon relat. (2010), 185(12), 2402-2408.
Chemometrics and computational chemistry  
PhD Susanne W Lindström, susanne.lindstrom@foi.se

Do you need to understand what factors that have most influence on your experimental results? Are you producing complex data sets with biological or chemical questions? Do you need to understand structure activity/property relationships?

We can support you with
- Statistical experimental design, analysis and interpretation
- Extracting most important variables in your data table
- Molecular interaction models
- Interpretation of biological and chemical diversity
- Structure-activity relationships
- Classification of complex samples
- Visualization

Protein characterization and assay development  
PhD Fredrik Ekström, fredrik.ekstrom@foi.se

Do you need a simple and reliable assay, suitable for high throughput screening of a chemical library or do you wish to study complex or rapid kinetics in order to characterize and optimize your lead-compound? Do you wish to increase the turn-over of your product development by shifting from a time consuming in vivo assay and to a high-throughput in vitro assay? Regardless of your need, the Biochemistry group at FOI possesses a flexibility that matches your expectations and complements your organization.

- Development and validation of assays
- Characterization and optimization of ligands by Stopped-Flow- or complex enzyme kinetics
- Receptor binding studies using state-of-the-art techniques such as Time-Resolved Fluorescence Decay Spectrometry
- Recombinant protein expression in bacteria or cell lines
- Characterization of irreversible inhibitors and other highly toxic compounds
- Protein purification from simple or complex matrices
Do you want to improve your product by structure-assisted design or elucidate the mechanism of action?

- Structure determination using X-ray crystallography or Small Angle X-ray Scattering (SAXS) with focus on structure determination of ligand-target complexes
- Primary structure determination using Liquid Chromatography-Mass Spectrometry (LC-MS), including characterization of glycosylation sites and modified residues
- Computational chemistry including Structure-Activity Relationships (SAR)
- Protein crystallization under aerobic and anaerobic conditions

Selected reading

Analytical capabilities
PhD Crister Åstot, crister.astot@foi.se, or
PhD Tove Johansson Mali’n, tove.johansson.malin@foi.se

Do you need support to analyze your drug candidate? Are there metabolites yet to be discovered? The analytical chemical laboratory at FOI offers sophisticated analytical instrumentation and experienced scientists. We can develop and validate analytical methods to meet your highest demands. A broad range of instrumental techniques are available for quantitative and qualitative analysis of bioactive substances, including small molecules, peptides and protein complexes.

Activities
Small molecules:
- Quantitative and qualitative analysis of diverse biomedical samples
- Structure determination
- In vitro drug metabolism studies
- Chemical stability studies

Peptides/proteins:
- Protein identification and characterization
- Determination of disulphide bridge positions
- Analysis of pegylated proteins
- Glycosylation and deamidation studies

Analytical techniques
The facility includes techniques of high sensitivity and selectivity:
- LC-MS/MS (liquid chromatography tandem mass spectrometry, Xevo-TQ and QTof)
- GC-MS (gas chromatography mass spectrometry)
- NMR (Nuclear Magnetic Resonance)
- LC-ICP-MS (Inductively Coupled Plasma Mass Spectrometry)
Selected reading


Sangart Inc. contracts complex analytical chemistry investigations on polymers and proteins by NMR and LCMS techniques to FOI. The analytical capabilities of the laboratory in Umeå, the competency and professionalism of the staff and the elaborate reports have been an asset to our organization.

*Nils U. Olsson, Ph.D. Vice President of Quality. Sangart, Inc. San Diego, CA, USA*
In vivo infection models for preclinical evaluation of antimicrobial compounds and vaccines
PhD Laila Noppa, laila.noppa@foi.se, or
PhD Emelie Näslund Salomonsson, emelie.salomonsson@foi.se, or
MSc Elin Nilsson, elin.nilsson@foi.se

Are you developing new pharmaceutical drugs? We offer help with preclinical testing of your early drug candidates in our in vivo infection models.

The rapidly emerging threat of multi-resistant pathogens highlights the great demand for research developing novel strategies and drugs to combat infections. A critical step in evaluations of potential antimicrobial compounds is the availability of relevant in vivo infection models.

If you are involved in research and development of novel antimicrobials, FOI has designated facilities for animal infections which are equipped with an in vivo imaging instrument.

Features of our in vivo infection models include:
• Determination of in vivo stability of candidate drug compounds in small animals
• Early toxicity evaluations
• Trauma associated infections – incision and burn wounds
• Lung infection models
• Gastrointestinal infection models
The research group at FOI is internationally recognised in the field of molecular infection and has also experience from contract research from biotech companies and institutes to evaluating vaccines and antimicrobial compounds.

FOI has carried out several studies on new antimicrobial compounds under development by Innate Pharmaceuticals. FOI’s recognised competence and expertise in the area of bacterial infections and together with their infrastructure and quality of documentation of results are major strengths in providing support in development of new antimicrobial drugs. We are very positive regarding the plans to establish techniques for direct visualisation of bacteria in real time during infection. This will provide new powerful tools in studies of bacterial infections and evaluation of new drug candidates.

Sune Rosell, CEO Innate Pharmaceuticals, Sweden

Selected reading
Models for lung effects
Prof Anders Bucht, anders.bucht@foi.se, or
Bo Koch, bo.koch@foi.se

Are you developing new pharmaceutical drugs?
FOI can offer you help with preclinical testing of your early drug candidates in our models for:
• Acute and chronic asthma
• Industrial chemicals

Evaluate following in vivo effects:
• Lung mechanics/respiration
• Inflammatory cells and mediators
• Histopathological changes
• Emphysema formation

Ex vivo model for airway contraction
Lina Thors, lina.thors@foi.se

We can offer precision-cut lung slices (PCLS) for airway contraction measurements.

In vitro lung cell model
Barbro Ekstrand-Hammarström,
barbro.ekstrand-hammarstrom@foi.se

We have the ability to evaluate the cellular effects in both primary lung cells and epithelial cell lines.
Using our lung cell systems, we can evaluate the following end-points after exposure to your substances:
• Toxicity
• Oxidative stress
• Pro-inflammatory responses

Viability assay
Epithelial cell exposed to nanoparticles
Model for skin penetration
Bo Koch, bo.koch@foi.se

Many drugs are designed to be applied on the skin. We use human or animal skin to study:
- Penetration of active substances
- Effect of different formulations
- Toxicological evaluation
- Effects of decontamination

Selected reading
- Skin decontamination of organophosphorus compounds with RSDL. Bo Koch, Lina Thors, Mona Koch, Lars Hägglund, Anders Bucht. 11th International Symposium on Protection against Chemical and Biological Warfare Agents, June 3-5 2013, Stockholm, Sweden.
What is FOI?

FOI (The Swedish Defence Research Agency) is one of Europe’s leading research institutes in the defence and security area. The agency is mainly financed on contracts’ basis and is responsible to the Ministry of Defence. The core business is research, method and technology development and studies.

CBRN Defence and Security

FOI’s CBRN Defence and Security Division house many of the country’s leading experts on chemical, biological, radioactive and nuclear (CBRN) issues and are working on projects relevant to the performance of our defence forces and to the civilian crisis management system.

FOI is every day accumulating new knowledge relating to the emission and dispersion of chemicals and microbiological agents, to ionizing radiation and to radioactive materials. Dissemination may occur in air, to the ground or in water. Important areas of work include environmental issues, radiation protection and chemical hazards. The division has a solid research base in fields such as analytical chemistry, organic chemistry, toxicology, microbiology, medicine, physics, environmental chemistry and geology. The analytical laboratory is part of international networks consisting of the world’s leading laboratories, giving us access to a unique spectrum of expertise. We provide support for our customers also in the field of threat and risk assessment.

Contact information

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