



BIOMEDICINE

Drug design, discovery & validation

- Protein-ligand interactions: bioinformatics, proteomics, structure resolution, molecular docking, interactomics
- Design and optimization of inhibitors & drugs
- Software and algorithms to analyse the structure and function of proteins to develop new therapeutics
- Target discovery and target-based virtual screening for antimicrobial-drug development
- Validation of antimicrobial and antitumor compounds: *in vitro*, *in vivo*, animal models (mice, zebrafish, etc.)
- Applied quantum mechanics and molecular dynamics to understand molecular processes and improve drug design
- Photo-pharmacology: design of new methods and drugs with less side effects

Diagnostics & therapeutics

- Lateral flow-based diagnostic devices
- New tools for Parkinson diagnostics
- Enhancing protein solubility for protein therapeutics
- Protein-based therapeutics for Oncology, Parkinson and other degenerative diseases
- Targeted drug delivery and drug carrier formulation for therapeutics and theragnostics in oncology, degenerative diseases and rare diseases

Immunology

- Antigen discovery and prophylactic modulation of immune system (vaccines & adjuvants)
- Regulation of immune response; oxidative stress and inflammation process leading to pathologies
- Processing, antigenic presentation, and cellular response in tolerance, autoimmunity, and cancer

Genomics, big data & AI

- Functional analysis of different classes of genomic variants and association studies in complex diseases
- Bioinformatics analysis of patterns of genome variation
- Analysis and visualization of genome big data
- Virulence/no virulence studies, epidemiology
- Diagnosis and Prognosis of brain tumours by magnetic resonance spectroscopy with AI

Reproduction

- Genome integrity analysis
- Bio banking
- Spermiogenesis and sperm physiology
- Fertility analysis & diagnostics
- Stable cell lines from tissue, immortalisation
- Oxidative stress and inflammation regarding fertility-related pathologies



INDUSTRIAL BIOTECHNOLOGY

Protein & biomass production

- Lab-scale protein production in several organisms (*E. coli*, yeast, mammalian cells, insect cells-BVs)
- Design of novel yeast promoters and stress-tolerant strains for protein production and fermentation processes

Enzymology & other applications

- Design/modify industrial enzymes to increase productivity with synthetic processes
- Computational analysis/theoretical molecular biology applied to the improvement of industrial enzyme production process (better affinity, better stability, substrate binding, catalysis, more efficiency, etc.)
- Use of amyloid fibers for enzymatic or energetic activity

ANIMAL BIOTECHNOLOGY

Reproduction & conservation

- Biotech developments for bio banking and species conservation
- Therapies for infertility treatments & diagnostics
- Genome integrity analysis
- Stable cell lines from tissue, cell immortalization

Drug design & discovery

- Identify therapeutic targets for vaccine & diagnostic kits
- Protease inhibitors as drugs
- Genomics & interactomics

(see *Biomedicine portfolio*)

Immunology

- Zebrafish models
- Host-pathogen interactions
- Vaccines/NP for immunization
- Biosensors to monitor fish health
- Oral vaccination for cows against respiratory diseases or to boost immune system to reduce the use of antibiotics