Preventing and treating infectious diseases

Combating bacterial and fungal infections through novel approaches to prevention and treatment

- Analyse the molecular mechanisms of antibiotic resistance and host-pathogen interactions.
- Identify and validate new therapeutic targets.
- Isolating antibacterial or antifungal molecules through library screening and molecular design.
- High-resolution characterization of molecular structures for inhibitor design.

Combating pathogenic and emerging viruses

- Analyse the molecular mechanisms underlying viral infections.
- Defining novel therapeutic targets and characterising their structures.
- Building efficient multi-purpose vaccine platforms.
- Characterizing molecular structures for the development of vaccines and treatments.

To enhance the value of technical platforms, knowledge and molecules in collaboration with the pharmaceutical industry

Applications

Pathogens
P. aeruginosa, S. pneumoniae, Candida auris, *VIH,* influenza and chikungunya viruses, Nipahvirus, virus Epstein-Barr, …

Diseases
Mucoviscidosis, measles, rabies, influenza, COVID-19, …

Therapies
HIV neutralising antibodies, polyvalent vaccines, phagotherapy, beta-lactam resistance, bacterial anti-virulence factors

Expertise

In vitro biofilm engineering
Microbiology
Cellular and *in vitro* infection models
Pan-genomic screening
Human monoclonal antibodies
Click chemistry labelling
Design of vaccine platforms
Phage displayirected evolution
Super-resolution microscopy
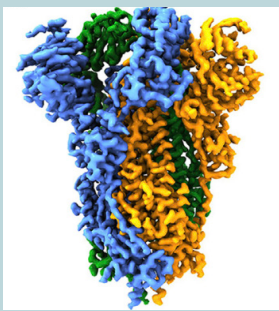Cryo-electron microscopy
Protein crystallography
High field NMR
Atomic force microscopy

In figures

8 PhD students incl. CIFRE per year
41 researchers
41 publications per year
2 patents
2 EU projects
2 industrial partnerships

Networks & ecosystem

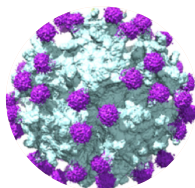## Covid-19 sterilising vaccines

SARS-CoV-2: Complete protection of macaques with synthetic virus-like particles

> Sterilising and mucosal immunity-enhancing vaccines
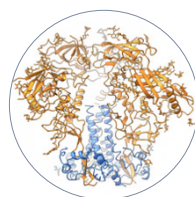
Cell Reports Medicine 2022, 3(2):100528

Prevention and vaccines

Antigenic pseudo-viruses against SARS-CoV-2
Human monoclonal antibodies (mAb)
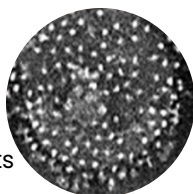Multimeric vaccine platform

Viral targets

Structures of viral proteins
Viral envelope glycoproteins
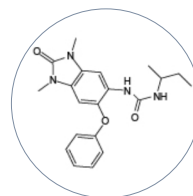Cell entry and budding
Viral polymerases

Anti-virals

Viral polymerase inhibitors
Human mAb neutralisation tests

Anti-fungals

Candida auris
Epigenic targets
Transcription factors
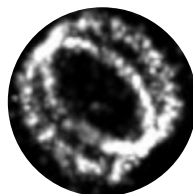
Prevention and treatment

Bacterial targets

Structures of bacterial proteins
Secretion systems
Division complexes
Bacterial spores
Biofilms

Antibiotics and resistance

Antimicrobial peptides
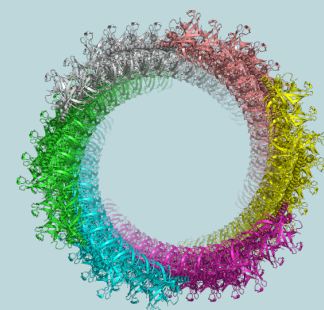Bacterial wall
Penicillin binding proteins
Antibodies mAb

Synergy of methods in structural biology

Regulation of bacterial growth.

> Development of new antibiotics

Nature Communications, 2021, 12(1):2987

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