Priority Research Area:

Discovery, Diagnostics, Therapy for Healthcare

Acronym: D^2TH

The NCU demonstrates potential in biomedical research, particularly in the discovery of disease biomarkers and the development of cutting-edge diagnostic and therapeutic methods. NCU's interdisciplinary approach fosters collaboration across cell biology molecular biology, immunology, biochemistry, pharmacology, and clinical sciences, creating a dynamic environment for translational research. The university employs advanced methodologies, including cell imaging and analysis, metabolomics, next-generation sequencing, proteomics, microbiome studies, and bioinformatics, essential for precise biomarker identification, disease signatures, and the advancement of personalized medicine. By driving innovation in precision diagnostics, NCU contributes to tailored treatment strategies that enhance therapeutic effectiveness while minimizing adverse effects. Furthermore, the university emphasizes partnerships with leading healthcare institutions and industry stakeholders, facilitating the translation of research findings into practical clinical applications. This integration of groundbreaking research with clinical practice accelerates the development of innovative therapies and diagnostic tools, solidifying NCU's position as a key contributor to modern healthcare solutions.

Primary disciplinary targets (WoS):

Biochemistry & Molecular Biology; Cell Biology & Pathophysiology, Chemistry; Biomedical Engineering; Clinical Medicine; Genetics & Genomics; Pharmacology & Pharmacy; Immunology; Microbiology; Biotechnology & Applied Microbiology; Instruments and Instrumentation; Biophysics; Mathematical & Computational Biology; Interdisciplinary applications

Thematic range

Discovery:

- Basic research in disciplines relevant to healthcare;
- Identification of essential components and mechanisms of cellular pathophysiology;
- Application of X-omic approaches (including metabolomics, lipidomics, proteomics, genomics, transcriptomics, epigenomics, microbiomics, and integrated multi-omics);
- Research on advanced drug formulations for controlled drug release and delivery, aimed at treating civilization-related diseases;

- Development and testing of new drug candidates, theranostics, and targeted drug delivery systems; innovations in biocatalysis (e.g., green synthesis of chiral drugs);
- Development of low- and non-invasive sampling methods, reducing animal use in compliance with 3R/6R principles;
- Development of novel, ethically proven, non-invasive preclinical in vivo, animal based models for drug and bioactive formulation development, and disease mechanistic studies;
- Implementation of novel high-throughput and high-tech methods for in vitro diagnostics (IVD), including emerging green, high-throughput, and multiplatform technologies;
- Utilization of *in silico* disease models for simulation and prediction;
- Application of Computer-Aided Drug Design (CADD) for optimized drug discovery;
- Investigation of mechanisms underlying drug resistance;
- Research on food-, microbiome-, cosmetics- and lifestyle- assisted therapy, spiritual resilience, and well-being in modern healthcare.

Translational Medicine:

- Discovery and validation of biomarkers for diagnostic, therapy, and transplanted organ quality assessment;
- Development of diagnostic, therapeutic, and pharmaceutical care strategies for integrated healthcare;
- Screening and application of substances of natural origin;
- Development and validation of innovative diagnostic, therapeutic, and rehabilitation strategies;
- Big data analysis encompassing the 5Vs: volume, velocity, variety, veracity, and value;
- Application of artificial intelligence (AI) for data analysis, diagnostics, drug design, drug repurposing, patient monitoring and hypothesis formulation;
- Exploration of ethical, legal, and intellectual property issues in translational and personalized medicine;
- Adoption of the "One Health" approach, which integrates human health, animal health, and environmental sustainability.

Clinical Medicine and Healthcare:

- Conducting clinical trials to evaluate new diagnostic methods therapies and interventions;
- Advancing regenerative medicine techniques to restore tissue and organ function;

- Driving precision and personalized medicine initiatives for tailored treatment;
- Employing robot-assisted surgery to improve surgical outcomes;
- Researching and enhancing quality-of-life metrics for various patient populations;
- Innovating in organ transplantation techniques and protocols;
- Developing and implementing gene editing and cell-based therapies to treat complex conditions;
- Implementing law, ethics, human identity, and social context in medical experiments, clinical trials, and personalized medicine.