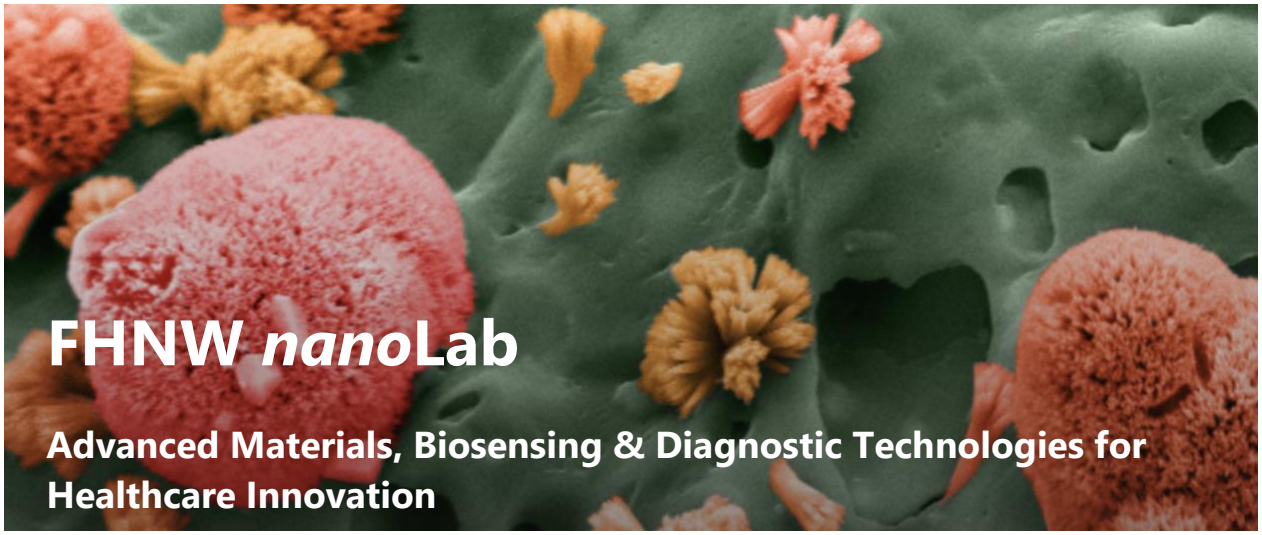

Organization

University of Applied Sciences and Arts Northwestern Switzerland (FHNW)
School of Life Sciences
Institute for Chemistry and Bioanalytics (ICB)
FHNW nanoLab Research Group

Muttenz, Switzerland

About FHNW nanoLab

The FHNW nanoLab is an interdisciplinary applied research group within the University of Applied Sciences and Arts Northwestern Switzerland (FHNW), School of Life Sciences, Institute for Chemistry and Bioanalytics located near Basel, Switzerland.

We develop innovative solutions at the intersection of nanotechnology, chemistry, biomaterials, and materials science. Our research focuses on translating scientific knowledge into practical, industry-oriented applications across a range of sectors, including dental health, food, diagnostics, coatings, textiles, and medical devices.

We collaborate closely with academic institutions, healthcare providers, SMEs and industrial partners, supporting technology development from concept and material design to characterization, biological validation and application-oriented implementation.

Expertise Areas

Functional Materials & Nanotechnology

FHNW nanoLab develops and characterizes functional materials for healthcare, biotechnology and industrial applications. Our expertise covers nanoparticles, hydrogels, carrier systems, functional coatings and bioactive materials based on inorganic, organic and polymeric platforms.

Representative projects include biomimetic enamel regeneration using self-assembling peptide hydrogels for dental regenerative medicine, silica nanoparticle characterization in complex food matrices, and the development of functional materials, coatings and bioactive interfaces for healthcare and industrial applications.

Surface Engineering & Biointerfaces

A core strength of FHNW nanoLab is the engineering and characterization of interfaces between materials and biological systems. We develop surface functionalization strategies to immobilize biomolecules, reduce non-specific binding and control interactions between materials, cells and proteins.

Current activities include biofunctionalized sensor surfaces, antimicrobial and bioactive coatings, implant-relevant surface modifications and the evaluation of material-cell interactions. Surface properties and interface processes are investigated using nanoLab equipment, e.g. QCM-D, ellipsometry, AFM, SEM, XPS and Raman microscopy.

Diagnostic & Sensing Applications

Building on our expertise in functional materials and biointerfaces, FHNW nanoLab contributes to the development of innovative analytical and diagnostic technologies. Our work focuses on assay development, nanoparticle-based detection approaches and sensing concepts for healthcare and life science applications.

Selected examples include EGFR-targeted SERS nanotags for cancer cell visualization, colorimetric reflective immunoassays, nanoparticle detection and quantification workflows, and analytical platforms for quality control and biological target detection.

Rather than developing complete diagnostic devices, FHNW nanoLab contributes expertise in material design, surface engineering, assay development, characterization and validation of enabling technologies for diagnostic and sensing applications.

Methods & Infrastructure

Advanced Analytics & Biological Validation

FHNW nanoLab combines extensive synthesis and characterization infrastructure with biological testing capabilities up to BSL 2 for technology development and inhouse validation. Among other techniques we offer comprehensive characterization using:

- Scanning Electron Microscopy (SEM)
- Transmission Electron Microscopy (TEM)
- Confocal Laser Scanning Microscopy
- RAMAN Microscopy
- Fourier-Transform-Infrared spectroscopy (FTIR)
- UV/ vis spectroscopy
- X-ray Photoelectron Spectroscopy (XPS)
- Nuclear Magnetic Resonance (NMR)
- Micro-computed tomography (micro-CT)
- Contact Angle Analysis
- Ellipsometry
- Quartz Crystal Microbalance with Dissipation (QCM-D)
- Energy Dispersive X-ray Spectroscopy (EDX)
- Dynamic and Static Light Scattering (DLS/SLS)

Biological validation includes mammalian and bacterial cell culture, ELISA, Western blot, flow cytometry (FACS), transfection techniques and material-cell interaction studies. This integrated approach enables the evaluation of novel materials, diagnostic platforms, biosensors and medical technologies from proof-of-concept to application-oriented testing

What We Offer to Horizon Europe Consortia

We can contribute to:

- Diagnostic technology development
- Biosensor development and validation
- Surface engineering and biofunctionalization
- Material and interface characterization
- Nanomaterial development
- Biomaterial design and optimization
- Analytical method development
- In vitro testing and biological validation
- Technology transfer and SME collaboration
- Applied research and prototype evaluation

Current Interest in Horizon Europe

The FHNW nanoLab is particularly interested in collaborative projects related to:

- Biosensors
- Biomarker Detection Technologies
- Diagnostic Devices
- Personalized Medicine
- Nanotechnology for Healthcare
- Biomaterials
- Regenerative Medicine
- Advanced Analytical Technologies
- Sustainable Healthcare Solutions
- Coatings for textiles, paper, glass, metal
- SERS nanotag development
- Surface finishing for sensors, electrodes etc.
- Nanoparticle detection

Why Partner with FHNW nanoLab?

- More than 15 years of experience in applied research and innovation.
- Strong expertise bridging chemistry, biology, materials science and healthcare
- Extensive experience collaborating with industry, SMEs and healthcare stakeholders.
- Comprehensive analytical, materials and biological testing capabilities under one roof.
- Proven track record in interdisciplinary and translational research.

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Meaningful Publication

1. Latest Diagnostic Publication

Stumpo, A., Coelho, R., Núñez López, M., Kind, L., De Roo, J., Jacob, F., & Saxer, S. (2026). Two-step PEG-based surface functionalization of gold nanoparticles enables specific SERS imaging of EGFR in an ovarian cancer cell model. *Materials Today Bio, 40*, 103602. https://doi.org/10.1016/j.mtbio.2026.103602

Short description:
This study presents a novel two-step surface engineering strategy for gold nanoparticles, enabling highly specific Surface-Enhanced Raman Spectroscopy (SERS) imaging of EGFR-expressing ovarian cancer cells. The work demonstrates expertise in nanoparticle functionalization, biosensing, surface chemistry, analytical characterization and targeted diagnostic technologies, highlighting the potential of nanotechnology-enabled approaches for future point-of-care and cancer diagnostics.

2. Nanoparticel Analytic/ Quality Control

Maffeis, V., Otter, A., Düsterloh, A., Kind, L., Palivan, C., & Saxer, S. (2024). High-Throughput Silica Nanoparticle Detection for Quality Control of Complex Early Life Nutrition Food Matrices. *ACS Omega, 9*. https://doi.org/10.1021/acsomega.3c09459

Short description:
This work establishes a high-throughput analytical workflow for detecting and quantifying silica nanoparticles in highly complex matrices. The study combines sample preparation, size-exclusion chromatography, electron microscopy and elemental analysis to provide robust nanoparticle characterization. It demonstrates FHNW nanoLab's expertise in advanced analytics, nanoparticle characterization and method development for quality control and regulatory applications.

3. Biomaterials & Tissue Engineering

Koch, F., Wolff, A., Mathes, S., Pieles, U., Saxer, S. S., Kreikemeyer, B., & Peters, K. (2018). Amino acid composition of nanofibrillar self-assembling peptide hydrogels affects responses of periodontal tissue cells in vitro. *International Journal of Nanomedicine, 13*, 6717-6729. https://doi.org/10.2147/IJN.S175992

Short description:
This study investigates how the amino acid composition of self-assembling peptide hydrogels influences the behavior of periodontal tissue cells. The work demonstrates that subtle modifications in peptide design can significantly affect cell adhesion, proliferation and tissue-specific responses. Combining biomaterials engineering, nanostructured hydrogel design and biological evaluation, the study highlights FHNW nanoLab's expertise in regenerative biomaterials, cell-material interactions and the development of bioactive materials for tissue engineering applications.

4. Biomaterials/ Translation in Healthcare

Kind, L., Stevanovic, S., Wuttig, S., Wimberger, S., Hofer, J., Müller, B., & Pieles, U. (2017). Biomimetic Remineralization of Carious Lesions by Self-Assembling Peptide. *Journal of Dental Research, 96(7), 790-797*. https://doi.org/10.1177/0022034517698419

Short description:
This study demonstrates how self-assembling peptide scaffolds can induce biomimetic regeneration of early carious lesions by promoting the formation of new hydroxyapatite crystals within demineralized enamel. Combining biomaterials development, nanostructured self-assembly, advanced imaging and analytical characterization, the work highlights FHNW nanoLab's experience in translational healthcare research and regenerative biomaterials.