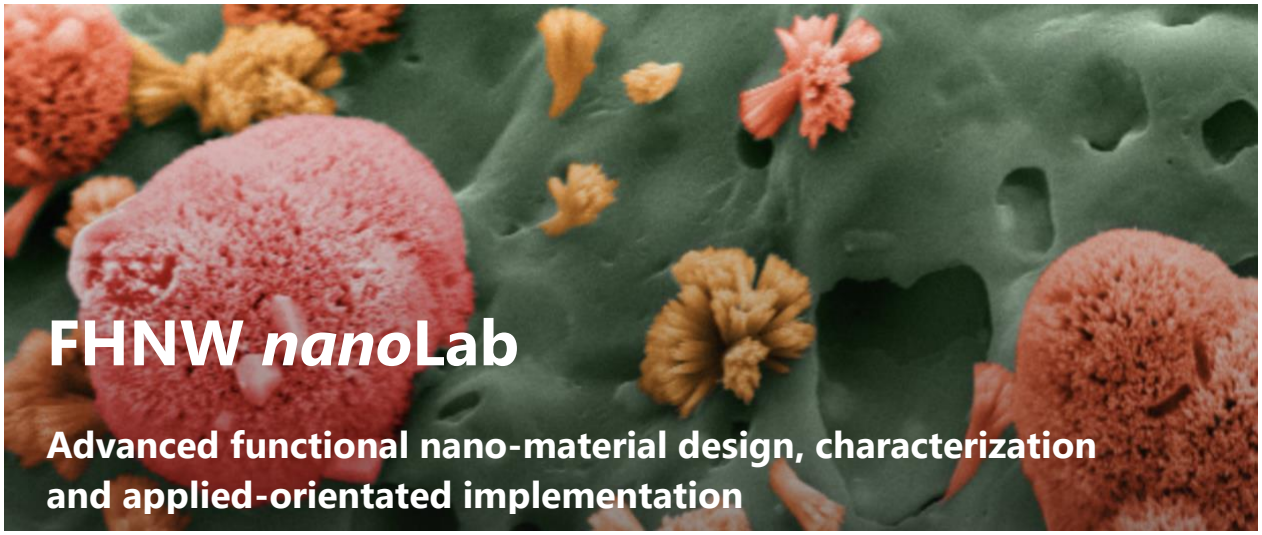


## Organization

**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, biology, 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, industry and healthcare institutions by supporting technology development from concept and material design to characterization, and cell-based evaluation (BSL 2) for application-oriented implementation.

# Expertise Areas

## Functional Materials

FHNW nanoLab develops and characterizes functional materials with nano-features. Our expertise covers nanoparticles, carrier systems, hydrogels, 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 and bioactive interfaces.

## Surface & Biointerface Engineering

A core strength of FHNW nanoLab is the engineering and characterization of surfaces and 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 biomolecules.

Current activities include biofunctionalized sensor surfaces, bioactive coatings, characterization of nano-roughness, self-assembling peptide hydrogels for periodontal tissue engineering and the evaluation of material-cell interactions.

## 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.

Selected examples include EGFR-targeted SERS nanotags for cancer cell visualization, colorimetric reflective immunoassays, and analytical platforms to study aptamer interactions, surface binding and biomolecular absorption.

# Infrastructure

## Advanced Analytics

FHNW nanoLab combines synthesis and characterization infrastructure with biological testing capabilities (up to BSL 2) for technology development and performance evaluation. 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)

# What We Offer to Horizon Europe Consortia

## We can contribute to:

- Diagnostic technology development
- Sensor development and evaluation
- Surface engineering and biofunctionalization
- Material and interface characterization
- Nano- and biomaterial design and optimization
- Analytical method development
- In vitro testing
- Applied research and prototype testing
- Technology transfer and SME collaboration

# Current Interest in Horizon Europe

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

- Coatings for textiles, paper, glass, metal, etc.
- Surface finishing for sensors, electrodes etc.
- Biomarker Detection Technologies
- SERS nanotag development
- Personalized Medicine
- Biomaterials and Biointerfaces
- Vesicle and advanced carrier systems
- Regenerative Medicine
- Sustainable Healthcare Solutions
- Nanotechnology for oral and dental application
- Advanced Analytical Methods and 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
- 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.

# Contact

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# Meaningful Publication

## 1. Diagnostics

**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 to oral health

**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.