

AQUATEST

Advanced microbial QUALity monitoring
and hygienization TEchniques for
Secure water Trading



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This event is co-financed by the European Commission
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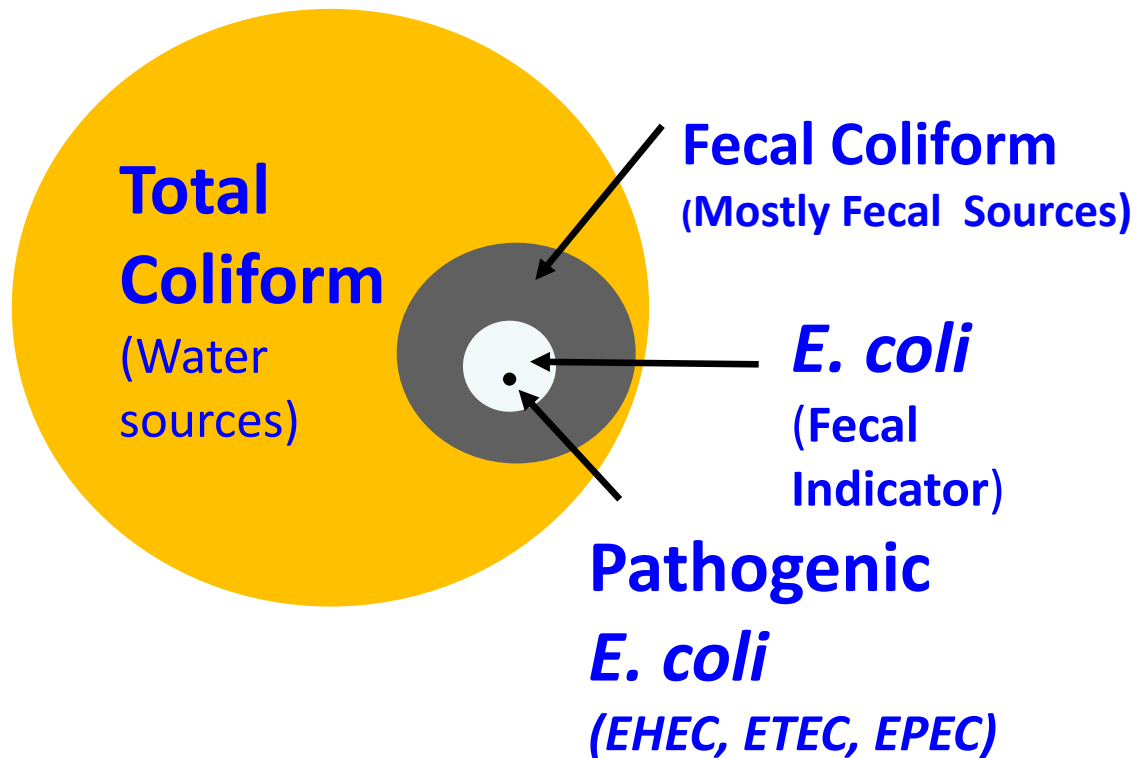
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Coliform Bacteria





Advanced microbial **QUALITY** monitoring and hygienization **TE**chniques for **S**ecure water **T**rading (**AQUATEST**)

Objectives

The aim is to use the project as a kick-off for :

- ❖ **Development of a on-site pathogen detection system, based on nucleic acid amplification, hybridization and electrical DNA/RNA chip, for a set of pathogens.**
- ❖ **Exploring light-activated nanoparticle based decontamination approaches for small volume/mobile setups.**
- ❖ **Establishing a consortium for long term cooperation between India and Europe for implementation of region specific integrated strategies for management of water quality.**

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AQUATEST Partners

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Wolfgang Fritzsche
Coordinator (EU) –AQUATEST
Institute of Photonic Technology (IPHT) Jena, Germany



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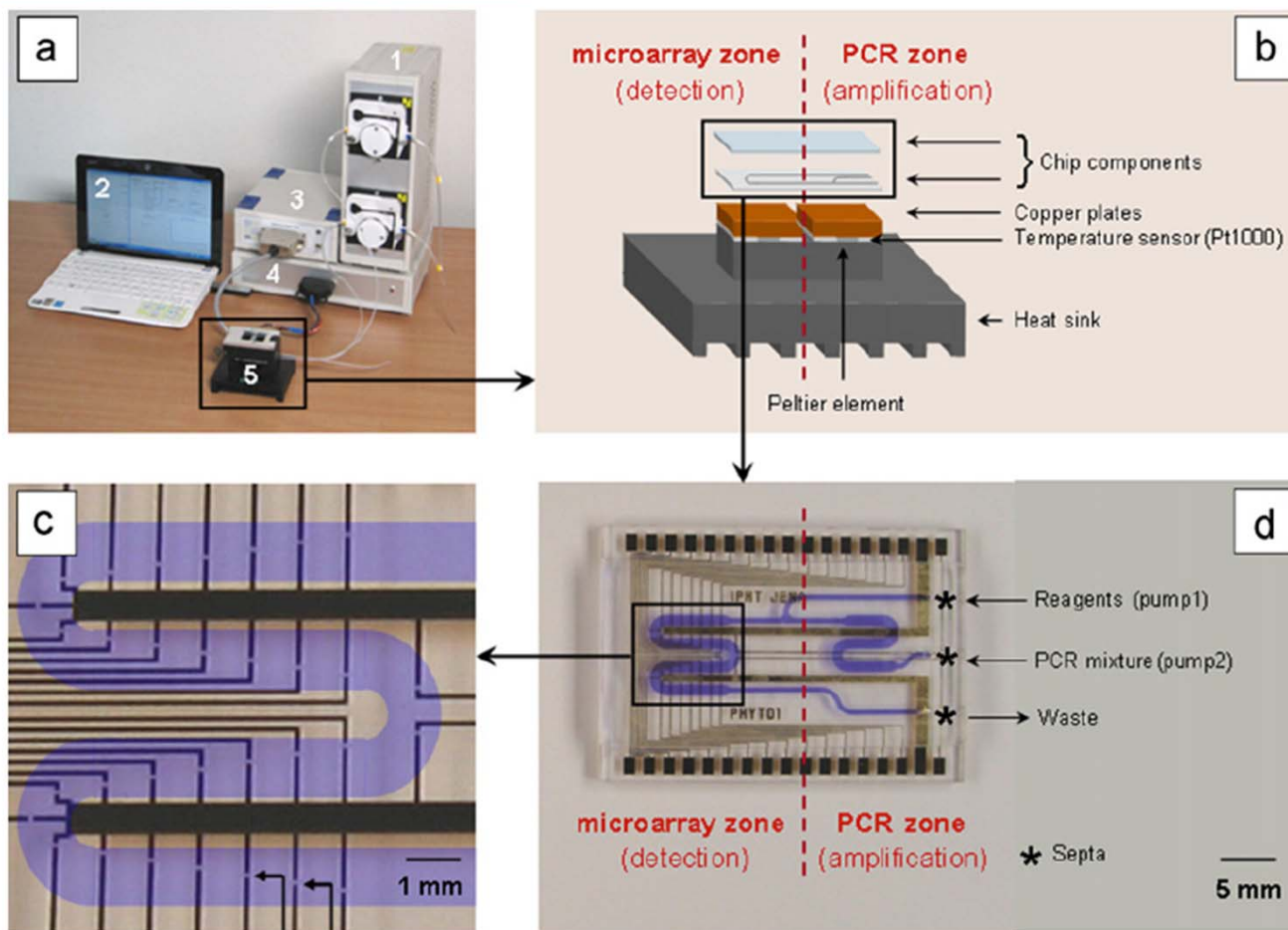


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**Combination of PCR and microarray detection on one chip platform
Julich et al. BiosensBioact (2011)**

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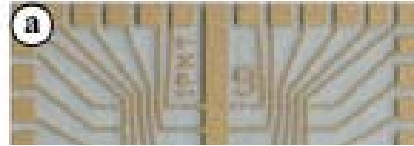
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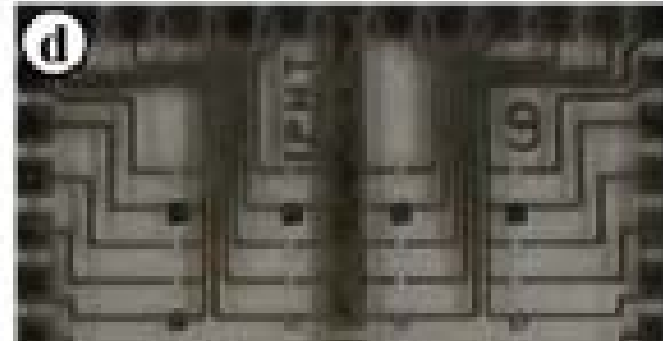
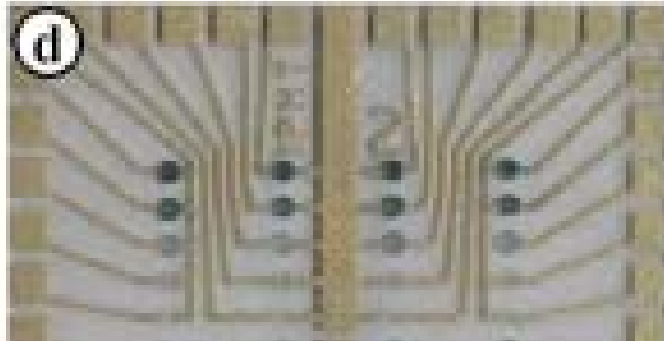
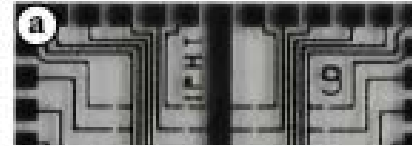
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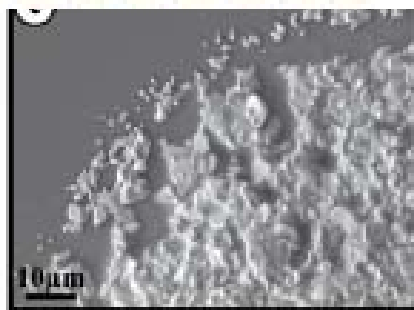
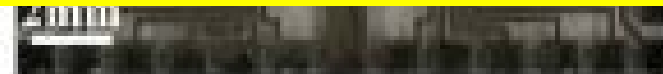
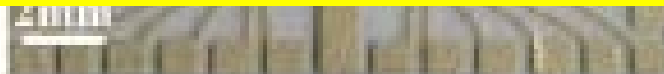
I



II



Screen-printing is utilized for microelectrode array preparation in order to provide affordable chip substrates. *Schüler et al. Biosens. Bioact. (2009)*

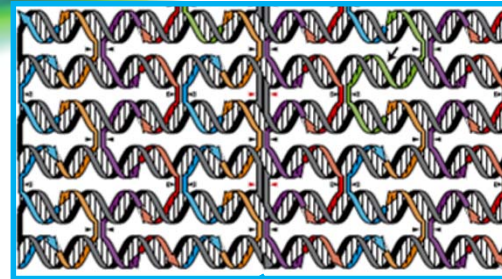




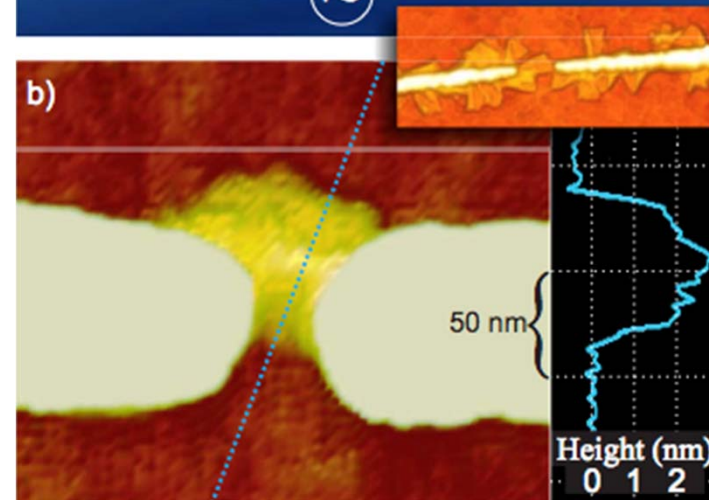
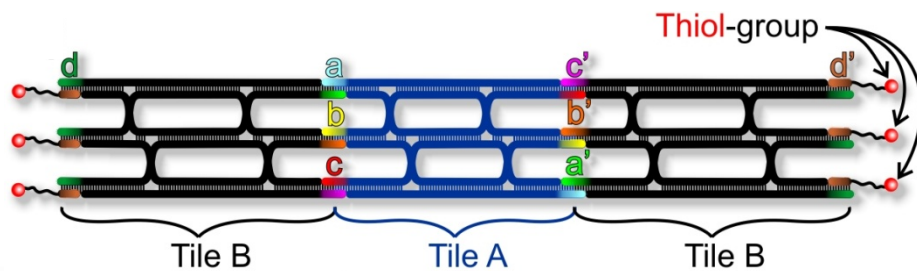
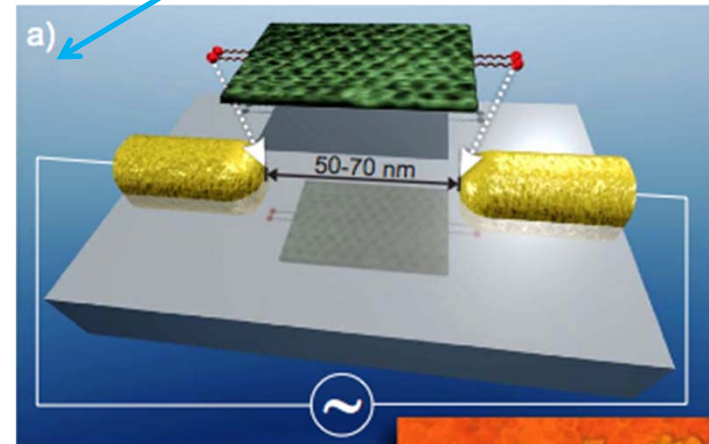
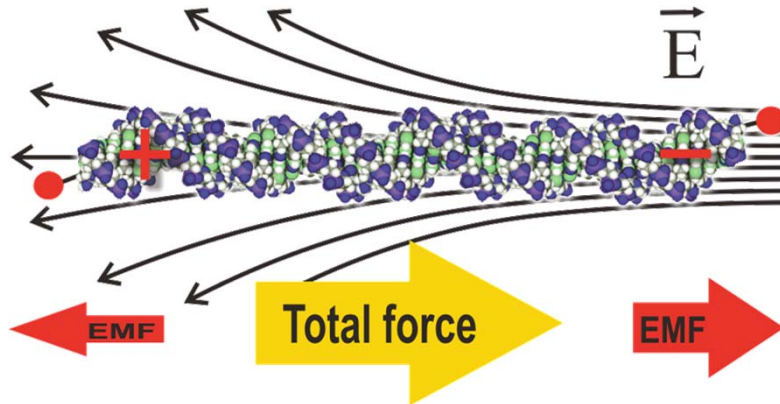
Jussi Toppari
Nanoscience Center, University of Jyväskylä, Finland



Dielectrophoretic trapping of DNA origamis and TX-tile structures



V. Linko, *et al.* *Small* (2009)
 V. Linko, *et al.* *Nanotechnology* (2011)



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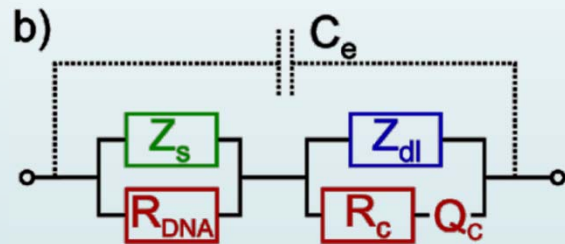
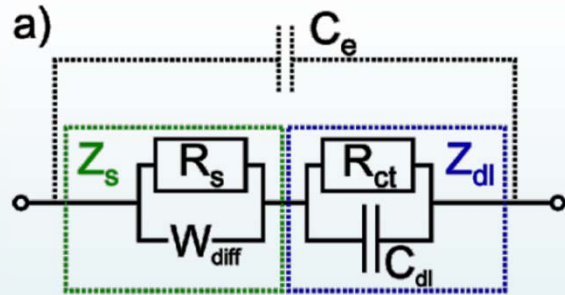
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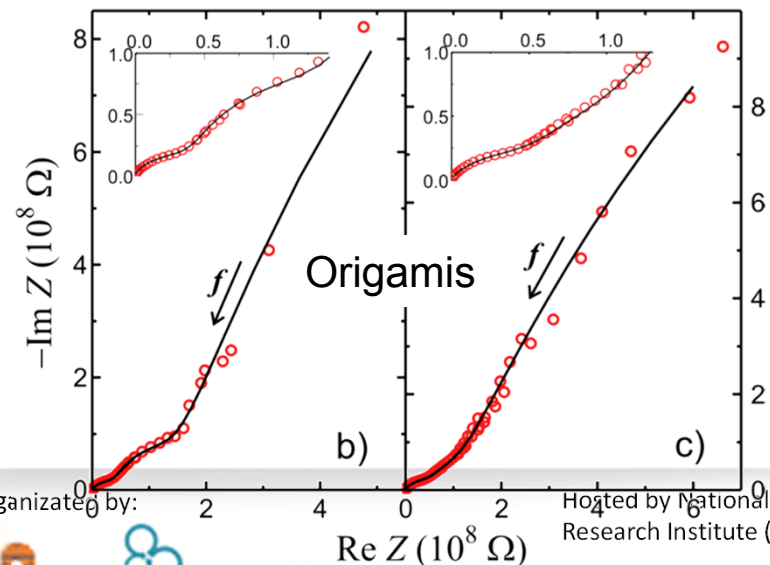
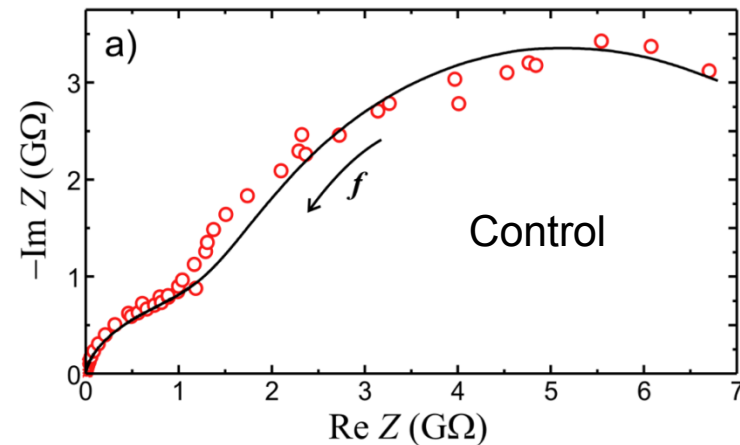
Characterization of Conductance Mechanisms of DNA Structures by impedance spectroscopy

V. Linko, *et al.* Small (2009);
V. Linko, *et al.* Nanotechnology (2011)



C_e = geometric self-capacitance
 C_{dl} = double-layer capacitance
 R_{ct} = charge transfer resistance
 R_s = resistance of "electrolyte"
 W_{diff} = diffusion of ions
 R_{DNA} = electronic resistance of DNA
 R_c and Q_c : parallel route through the double-layer via origami

$Z_W = 1/[W(i\omega)^{1/2}]$ = Warburg impedance
 $Z_{CPE} = 1/[Q(i\omega)^n]$ = Constant phase element



A PCR-based molecular
toolbox for the microbial
characterization of
bioreactors for the
treatment of organic
wastes

Francesc Prenafeta Boldú
IRTA-GIRO
Spain



Current new research in industrial anaerobic digestion processes:

Correlations between microbial interactions and operational conditions



Importance of microbial characterization in AD reactors:

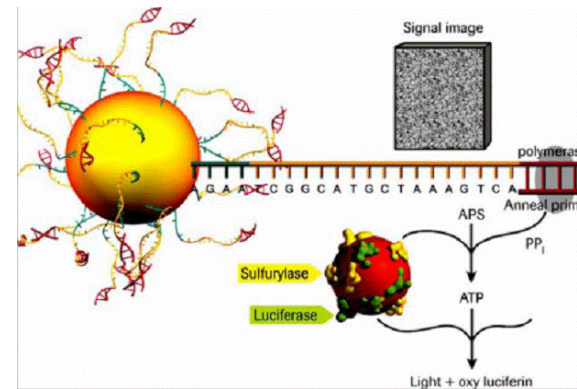
- **Monitoring of functional microorganisms**
- **Detection of pathogens**

Our experience

Characterization of full microbiomes

Aim: to thoroughly characterize the microbial community structure and diversity of eubacteria and archaea and correlate this data with the applied treatments.

Approach: high throughput DNA sequencing (pyrosequencing) of tagged 16S rRNA genes; bioinformatics for data processing (mothur, megan), and numerical analysis (rarefaction curves, multivariate CCA)



Nathalie Herlin-Boime
Service des Photons, Atomes, et Molécules /
Laboratoire Francis Perrin URA CEA-CNRS
France.



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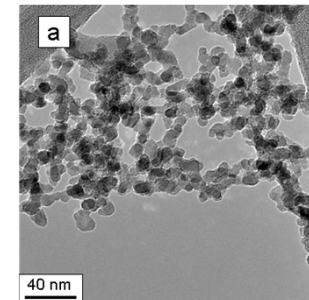
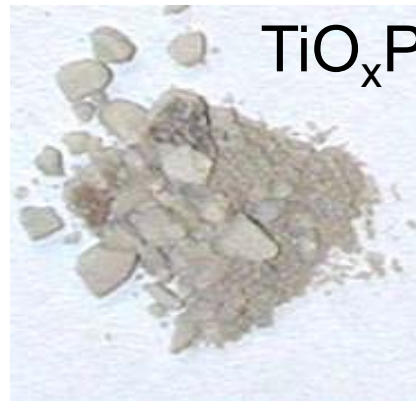
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Synthesis of Metal/TiO₂ nanopowders from the same liquid precursor ... : Ti(OC₃H₇)₄



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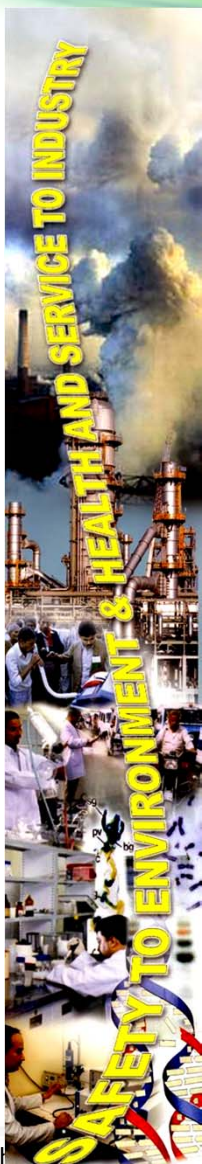
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- ❖ **Controlled synthesis of various titanium oxide phases**
- ❖ **Photo induced activity of TiO₂-M under UV light & visible light**
- ❖ **Samples from TiO₂ nanoparticles by CEA are currently fabricated and measured electro-optically at NSC, Jyväskylä. The purpose is to study and develop plasmonic enhancement for the photocatalysis**



**Indian Institute of Toxicology Research
Lucknow-226 001, INDIA**



Motto of Laboratory

**Safety To Environment & Health And Service To
Industry**

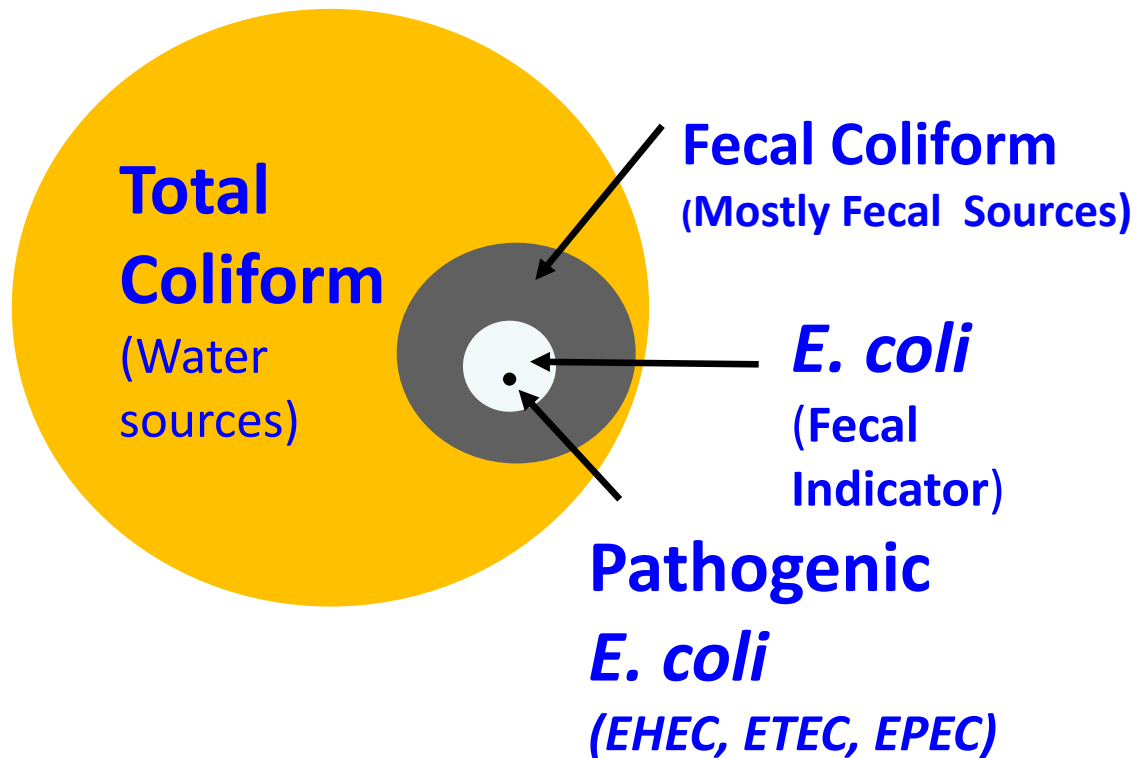
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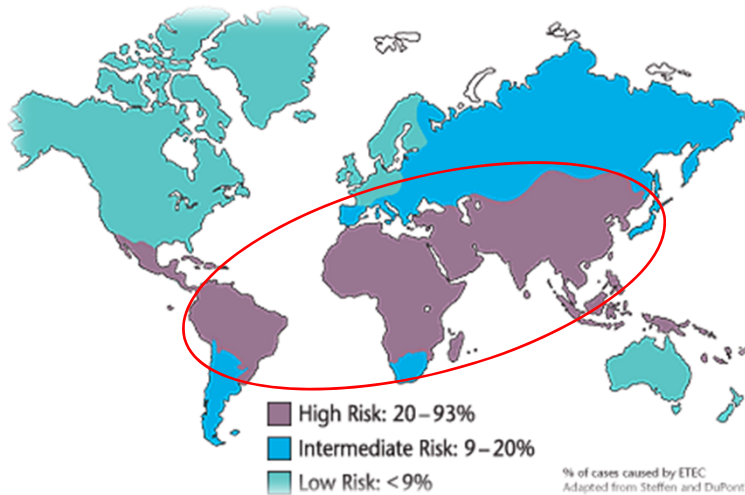
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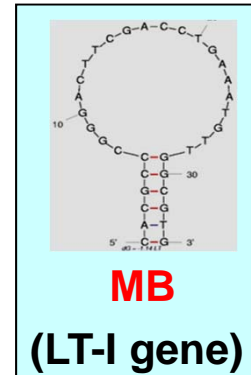
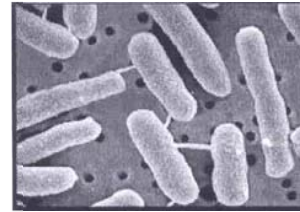
Coliform Bacteria



Molecular Beacon for culture-independent Quantitative detection of **Enterotoxigenic *E. coli***



**Traveler's diarrhea:
Global scenario**



Sensitivity: 2 cfu/mL
Time*: ~2 hours
 (*Direct extraction from water
without pre-enrichment)

Environmental Science & Technology 44: 6475–6480 (2010)

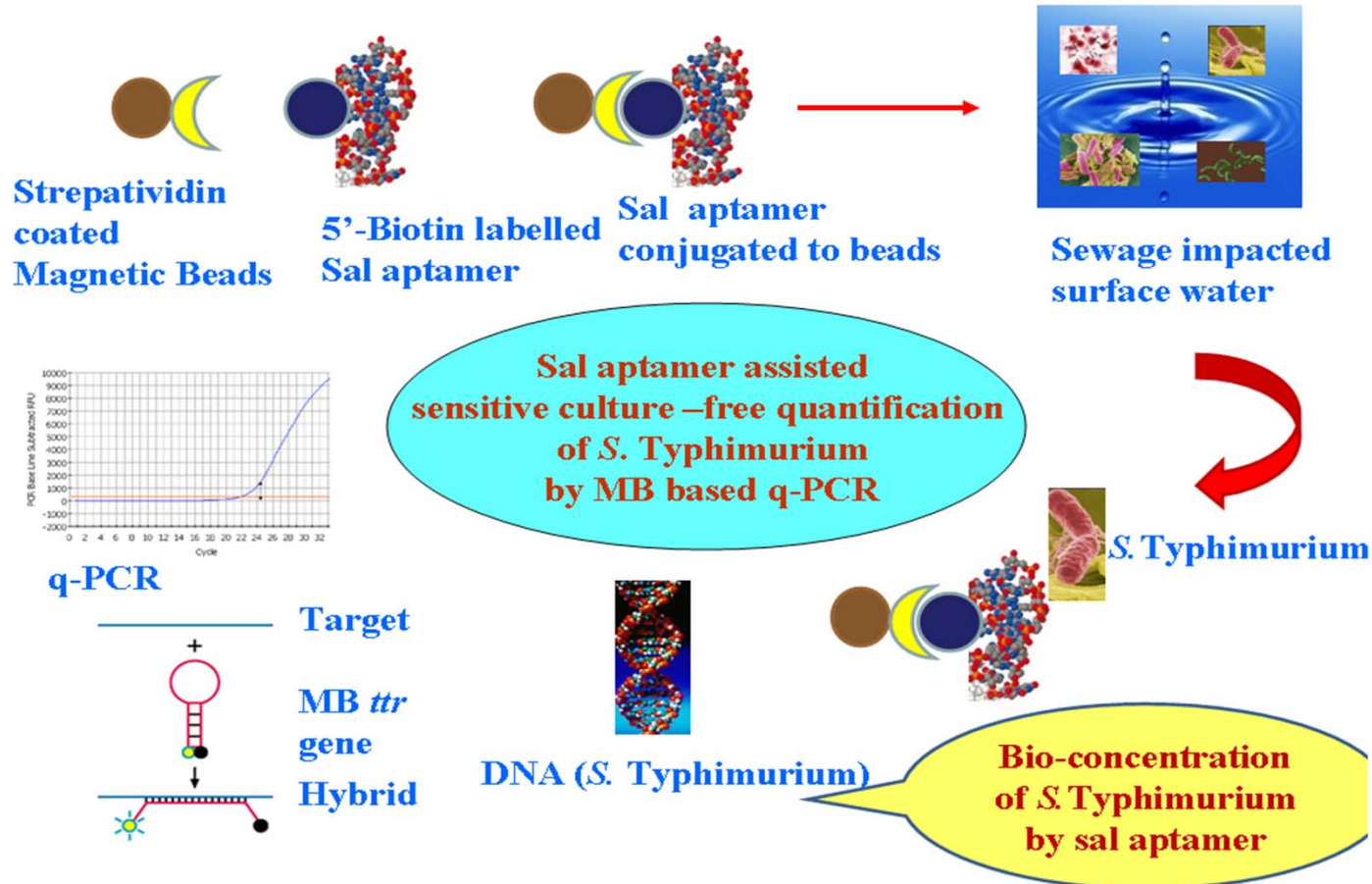
Environmental Science & Technology 42: 4577–4582 (2008)



CSIR-IITR



Strategy for concentration and culture-independent Quantification of *Salmonella Typhimurium*



Aptamer Sequence: 5'-TAIGGCGGCGTCACCCGACGGGGACTTGACATTATGACAG-3'

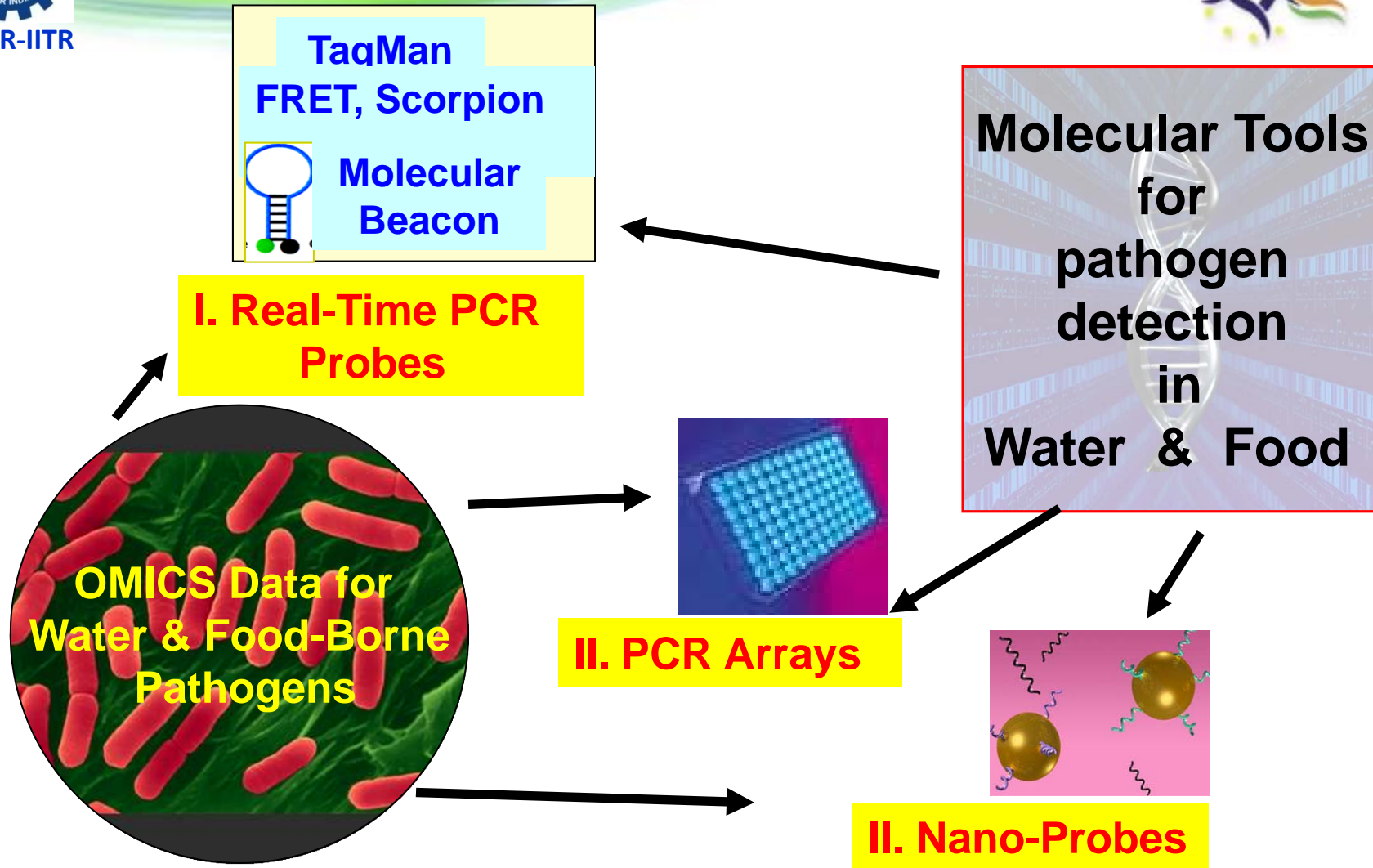
Environmental Science & Technology 45 (20): 8996–9002 (2011)

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IITR, India: Database on relevant genotypes of water-borne pathogens, detection strategies and q-PCR probes



CEA, France : Photo-catalytic dielectric particles for decontamination



GIRO, Spain: DNA amplification by PCR; waste -water treatment systems and strategies

Project Goal:

- System for on-site detection of pathogens
- Nanoparticle based light-activated decontamination approaches/reactors



IPHT, Germany : Platform for electrical DNA microarray/ chip PCR; optical properties of nano-particles



JYU, Finland: Plasmonic structures, photocatalytic activity and electrical detection

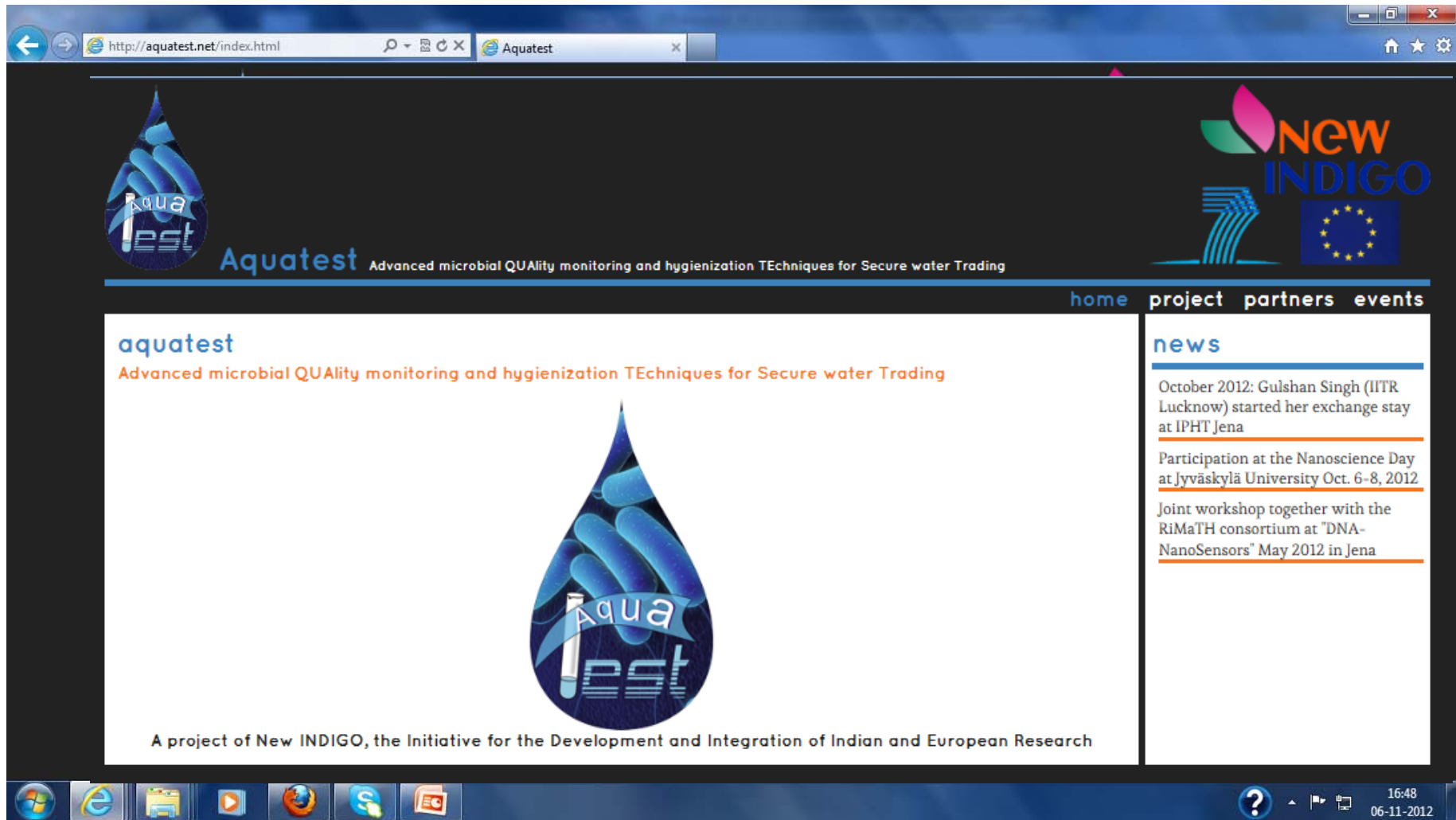


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http://aquatest.net/index.html

Aquatest Advanced microbial QUALity monitoring and hygienization TEchniques for Secure water Trading

NEW INDIGO

home project partners events

aquatest
Advanced microbial QUALity monitoring and hygienization TEchniques for Secure water Trading

news

- October 2012: Gulshan Singh (IITR Lucknow) started her exchange stay at IPHT Jena
- Participation at the Nanoscience Day at Jyväskylä University Oct. 6-8, 2012
- Joint workshop together with the RiMaTH consortium at "DNA-NanoSensors" May 2012 in Jena

A project of New INDIGO, the Initiative for the Development and Integration of Indian and European Research

16:48
06-11-2012

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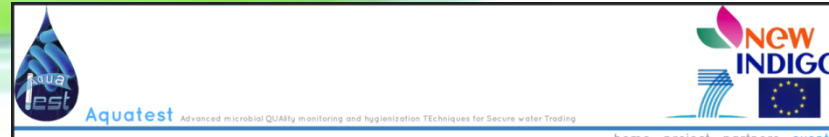


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The **Aquatest kick-off meeting** took place May 10-12, 2012 on occasion of the International Symposium DNA-NanoSensors, hosted by the German partner IPHT in Jena.

This conference addressed the development of novel nanosensors for DNA detection, a field of key interest also for the Aquatest objectives.

A joint session with participants from a water-pathogen related German research project "RiMaTH", also coordinated by the IPHT, brought the Aquatest consortium together with RiMaTH participants from industry and academia

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Participation at the 'Nanoscience Days' at University of Jyväskylä, Finland and AQUATEST Workshop : Bionanosensors, October 8-9, 2012, with presentation & discussion on novel bioanalytical detection schemes of special interest to Aquatest participants.

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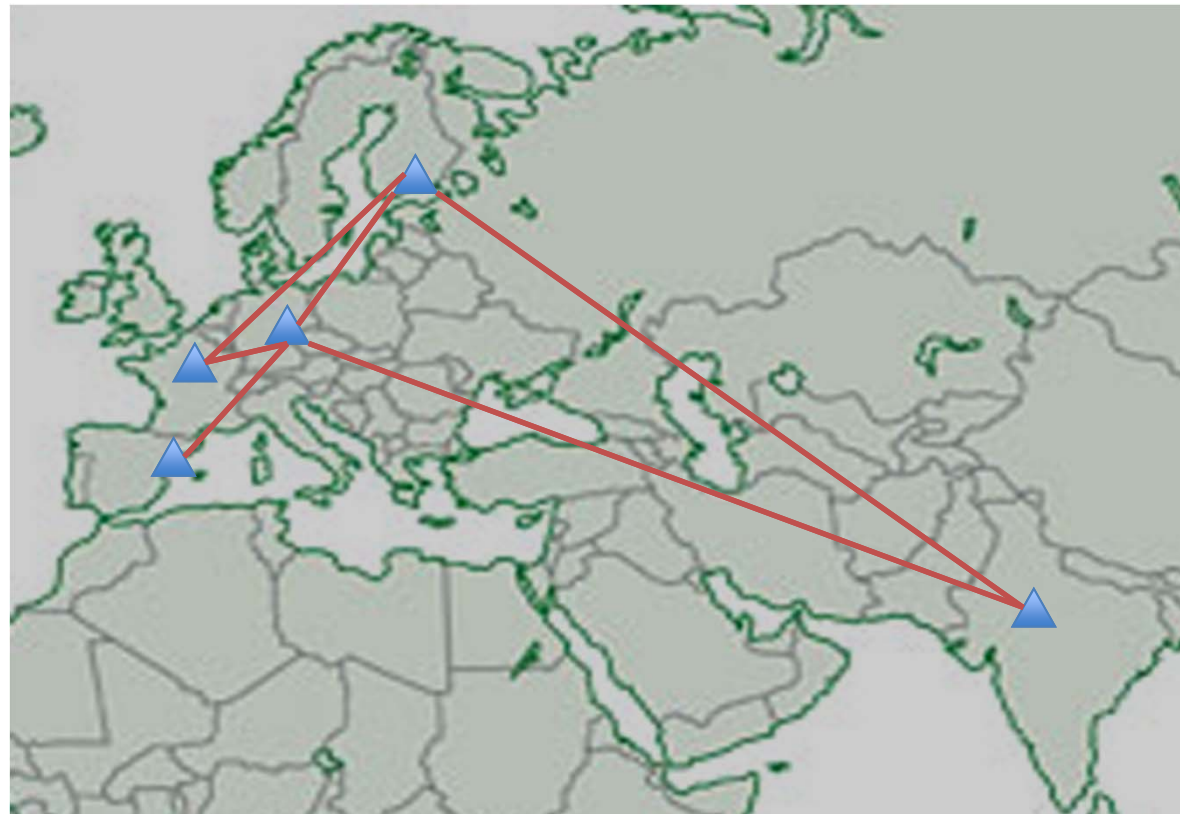
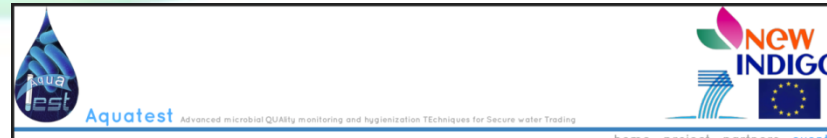


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Partner location and travel 2012

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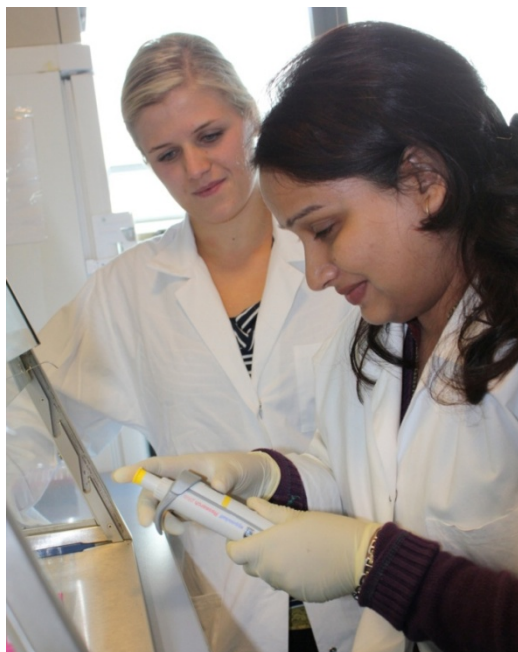


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Gulshan Singh together with Stefanie Treppner from the IPHT

Oct. 15, 2012 : PhD student, Gulshan Singh for the IITR Lucknow started a 6 weeks exchange stay at the IPHT Jena in order to establish PCR-based water pathogen detection techniques on the chip-based instrumentation developed there.

May 2012: PhD students Kosti Tapio and Boxuan Shen from NSC, University of Jyväskylä carried out 2 and 4 weeks exchange stays, respectively, in IPHT Jena, in order to test and initiate new methods for electronic detection of DNA.



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