

# Licensing Opportunity



## 'Multifunctional Catheter' combines photodiagnostics en photodynamic therapy using Biofunctional Nanoparticles

- In-vivo monitoring of micro organism colonization whilst catheter can remain in the blood vessel
- Through NIR light excitation and visible light detection sensitivity significantly increased
- Catheter can remain in situ for a longer period of time due to PDT destruction of undesired micro organisms
- Targeted treatment of the patient by using specific antibiotics is made possible

Multifunctional Catheter

2011

## Background

Catheter related infections

"...there are three bacteria most important with respect to catheter related infections: coagulase negative staphylococci (essentially *S. epidermidis*), *Staphylococcus aureus* and *Candida* species, mainly *Candida albicans*.

*Infections with S. aureus and C. albicans in general are very serious. When infection is proven with blood cultures, in general, catheters will be removed and replaced directly. Sometimes however, with very important catheters, there can be discussion about the need to remove the catheter.*

*Both S. aureus and C. albicans therefore could be interesting targets to detect with the new device within the catheters."*  
*Dr. Lodewijk Spanjaard, senior Clinical Bacteriologist and Head of the Section Hygiene and Infection Control at our department, Medical Microbiology, in the AMC, Amsterdam.*

A device which accurately and timely informs clinicians about colonisation of the catheter, could be of much help for proper decision making whether to remove the catheter.

Gram-negative bacteria remain the most common cause of Catheter Associated Urinary Tract Infections (CAUTIs). These bacteria are becoming increasingly resistant to commonly used oral antibiotics, and this makes the treatment of these infections progressively more complicated.

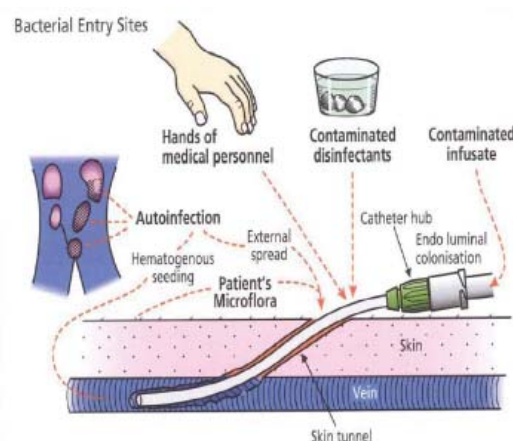
- CAUTIs account for approximately 40% of all hospital-acquired infections.
- Estimated > 560,000 nosocomial UTIs and 13,000 attributable deaths annually
- Excess length of stay -2-4 days
- Increased cost - \$0.4-0.5 billion per year nationally

In Central Line-Associated Bloodstream Infections (CLABSIs) coagulase-negative Staphylococcus, *S. aureus*, Enterococcus species, *Candida* species and gramnegative bacilli are predominant:

- Nosocomial bloodstream infections are eighth leading cause of death in the United States
- 249,000 bloodstream infections in United States hospitals each year
- Increase the duration of hospitalization by 7 to 21 days
- Cost of a bloodstream infection between \$23,242 ± \$5.184 (2005)

## Technology

The technology combines luminescence up-conversion nanocrystals whose emitted light is quenched until bound to a specific strain or type of micro organism.



## R&D Status

UvA/AMC offers partners the opportunity to co-develop and apply the new diagnostic device. UvA/AMC are currently working on preparatory experiments to start a "proof of principle" study. The selected micro-organism is *Staphylococcus epidermidis*.

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This bacterium is the most important cause of catheter related infections. Although infections with this bacterium are clinically often less life threatening, there is among clinicians frequently much dispute about the need to remove catheters (potentially) colonized with *S. epidermidis*, or to leave them in situ.

Partners joining this project will obtain the right to the development and the commercialization of the IP (Patent application submitted, May 2011) associated with this innovative device.

## Inventors

Dr H. Zhang, Chemistry, nanotechnology  
Nanoparticle optimization and functionalization

Dr M.C.G. Aalders, Physics, biomedical optics, Optical engineering  
Design of the light coupling/detection unit, connecting between medical needs and technological possibilities

Prof Dr T. van Gool, Medicine, virology, bacteriology  
Problem definition, organize meetings with peers, the end-users, to ensure maximum clinical value

Zaat, Nanochemistry  
Synthesizing upconversion nanoparticles with proper core/shell structure and doping element in order to have both high upconversion luminescence and FRET efficiency. Establishing quantitatively the relation between the upconversion luminescence quenching and targeting results.