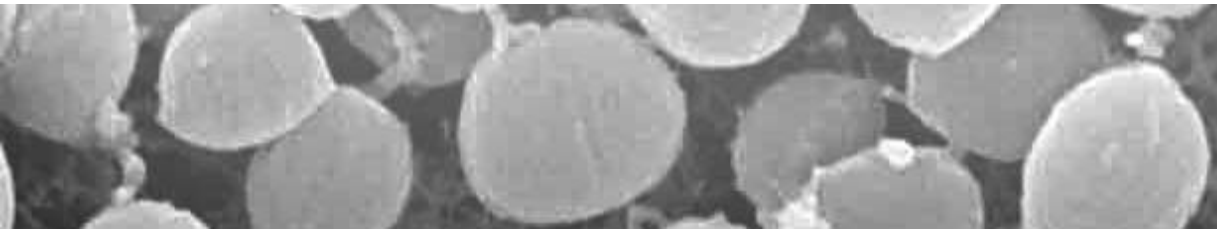


PILGRIM

PILGRIM NEWSLETTER No 2 / 2011

Content

Welcome

In this newsletter we would like to present you our new Technology Testing Platform (TTP) that has been successfully developed within the PILGRIM project. The TTP provides a great opportunity for companies to test the efficacy of their decontamination products and solutions.

One of the main goals of the PILGRIM project is to identify novel, cost effective and efficient MRSA ST398 control methods.

Meticillin-resistant *Staphylococcus aureus* sequence type 398 (MRSA ST 398) are bacteria that are prevalent in pigs in many countries worldwide. MRSA can be transmitted from animals to humans and therefore MRSA-carrier pigs pose a possible threat to people. The environmental persistence of MRSA ST 398 dictates decontamination to be a key component in controlling its transmission to animals and humans.

With the TTP, products to fight the spread of MRSA can be tested in a fast and effective way.

"After presenting first research results in Newsletter No 1, we would like to introduce our newly developed Technology Testing Platform to you. The TTP is a unique opportunity for testing products and innovative technologies to control the spread of MRSA ST 398".

Prof Katharina Stärk, *PILGRIM Coordinator,*
Professor of Veterinary Public Health,
The Royal Veterinary College London (RVC)

Enjoy your reading!

TTP - introduction

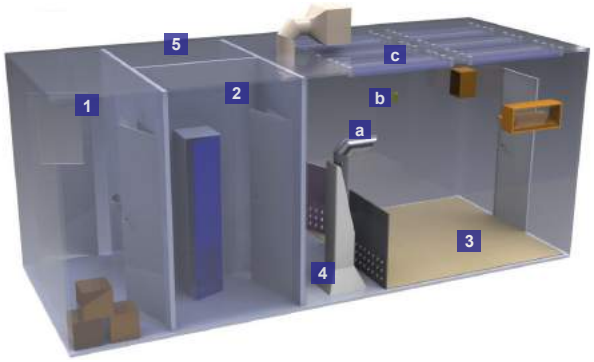
Carriage of MRSA ST398 by pigs is an increasing concern for public health. As the organism has been shown to spread rapidly between animals in a group, between farms and to associated workers, control methods for decontamination are urgently needed to limit its spread to humans and human healthcare facilities.

The long survival times of over 12 months documented for MRSA emphasise that environmental decontamination requires an essential component of hygiene measures and control strategies.

One of the difficulties in the development of new hygiene methods for the control of MRSA in pig farms is the lack of suitable animal accommodation models with standardised conditions to assess the efficacy of novel hygienic and decontamination technologies. Previously, MRSA has been eradicated in equine stables and canine kennels when MRSA-colonized animals were isolated in clean environments and hygiene measures were employed.

In order to evaluate the efficacy and safety of the developed decontamination technologies and products *in vivo* in a farm-like environment, PILGRIM has designed and developed custom-made modular chambers where MRSA-natural carrier pigs can be accommodated.

TTP overview



The farm-style chambers contain the following rooms:

1. **Anteroom**
2. **Changing room**
3. **Pig room**
4. **Work area**
5. **Storage**

The following equipment, developed by PILGRIM partners, are currently installed in the chambers:

- **a** **Air cleansing device**
- **b** **Nebuliser**
- **c** **UVA fluorescent lights**

These chambers provide a model for evaluation and refinement of other decontamination technologies for use in farming and in human healthcare and are available for product testing.

"The in vivo testing model has been developed by PILGRIM. It is an ideal technology platform to evaluate and accelerate the use of proven new technologies for fighting germs in animal farms and human healthcare facilities."

Dr Efstathios Giotis,
Postdoctoral Researcher,
The Royal Veterinary College London (RVC)

TTP - features

Farm-style chambers

For the purpose of the PILGRIM project two insulated stainless steel and fiberglass animal chambers (climacontainers) were constructed by Danbox s/a in Denmark. Each animal chamber is designed to accommodate up to ten piglets.

Chambers are equipped with a computerized climate control and alarm system (temperature, relative humidity, lights, ventilation) (Type KRH-20, Opticon, H&F Electronics B.V., Netherlands). There is provision for extra air inlets, heating/exhaust systems and a sealed effluent disposal system is in place with sufficient capacity to safely dispose all waste from the weekly cleaning of the chambers.

Flexibility

The TTP is a very flexible testing platform for evaluating decontamination technologies and products.

It is an open platform on which any kind of decontamination system can be installed and evaluated. The testing environment can be adapted to the needs of companies and other organisations to test their specific products and technologies.

Until now, the TTP has been used to test decontamination technologies on MRSA-colonised piglets. Instead of the MRSA carrier pigs, other animals as well as other microorganisms can be part of the testing environment in the farm-style chambers.

TTP - success story

Results of *in vitro* tests

Six two week old naturally MRSA ST398-colonised piglets were used and two farm style chambers were purposely constructed by Danbox A/S with controlled temperature, ventilation and humidity.

These studies have confirmed previous *in vitro* and *ex vivo* experiments: All three strategies were efficient in significantly reducing MRSA and total coliform populations on animals, wall surfaces and in the chamber's air. Results suggest that sustainability of the decontamination state of the chamber depends on the initial microbial contamination levels of the chamber and the duration of the treatments.

Practical experience

Three companies and research organisations successfully tested the following products in the TTP.

- UVA activated photocatalytic paints developed by the Institute of Chemical Technology Praque (CZ)
- Charged electrochemical solutions created by Aguacure Ltd (UK)
- Air purification system provided by Virobuster GmbH (DE)

To test the decontamination solutions of ICT and Aguacure, a spray system and a photocatalytic system were installed. Both can be used and modified to test other decontamination products. Different systems can also be installed in the testing chambers.

Photocatalytic system: UVA activated paints

Novel, antimicrobial and self-cleansing surface covers such as photocatalytic paints, tiles or films, can be tested in the chambers. The first *in vivo* experiments assess the efficacy of photocatalytic paints, integrating nano-scale photoactive metal oxide thin films and/or other nanoparticles, applied to walls in the animal area. A diffuse lighting system of 16 water resistant lamp holders has been installed on the ceiling of the chambers. UVA intensity can be increased or decreased with the addition or removal of lamp tubes.

UVA activated photocatalytic paints developed by ICT were evaluated in the TTP with the photocatalytic system. The paint consists of two individual layers. The first layer is a special base paint that improves the adhesion of the photocatalytic paint on stainless steel. The final coating is activated by the UVA-light and decontaminates the surface on which the paint is applied.

Spray system: Electrochemical solution

An ultrasonic dry-fog spray system has been installed in the chambers to deliver antimicrobial solutions in the form of mist. The system comprises an air compressor (Sealpump Engineering Limited, UK) connected to an atomizer (Sonicom, UK) shattering liquids with sound waves. Potential antimicrobial solutions are stored in pressure vessels and after being pumped into the atomizer/nozzle are sheared into fine droplets (vapour) by the acoustic field and distributed into the chambers in the form of mist/fog.

The spray system was used to test an electrochemical solution of Aguacure.

Benefits of the TTP to Virobuster

Virobuster development started in 2002 building on many years of experience in decontamination technologies. The main goal was to provide the medical market with an Air Hygiene Solution. However, as the awareness and knowledge regarding the impact of air hygiene on health care were very low, Virobuster required to provide evidence based data as a prerequisite for field trials in hospitals.

> *"The only way to obtain representative data relevant to real-life settings are so called 'simulation tests' in a laboratory field."*

"Simulation tests" provide an excellent tool to reduce the initial investments costs for obtaining a representative data. These results can be a positive trigger for further, real-time field trials and research projects. Virobuster used testing chambers in pre-phases to create credibility for its products in not yet developed markets like air hygiene.

Virobuster tested an air cleansing stand alone device (STERIBASE 300 PLUS, Virobuster) that had been slightly adapted to fulfil the airstream needed. The device uses the antimicrobial effect of UV-C on air filtered through the Steribase tube. A fan circulates air through the device so that air is exposed to UV-C within the tube. The fan operates at low noise levels suitable for animal accommodation.

The TTP allowed Virobuster to acquire the required data for its innovative air cleansing device within a few weeks.

"The TTP provides data about a decontamination product. This is crucial in order to attract industrial partners for field trials. "

Fahmi Yigit,
CEO / CTO of Virobuster,
Windhagen, Germany

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Test your product

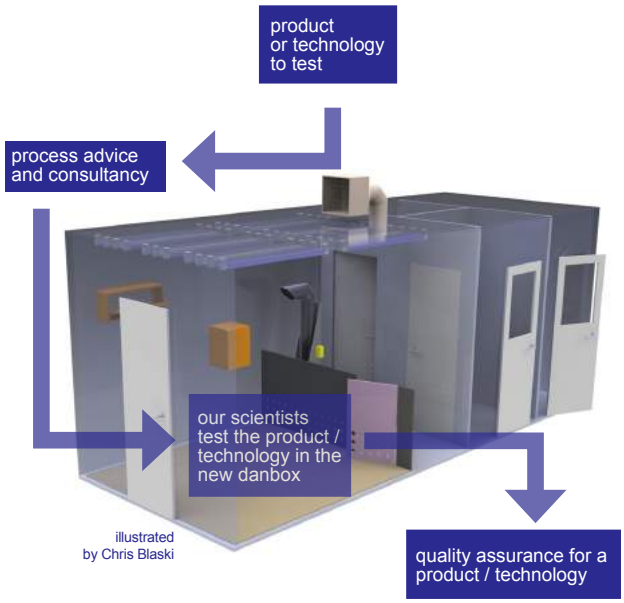
Are you developing decontamination technologies or products?

Do you wish to evaluate their efficacy and efficiency?

Are you interested in collaborating with the Royal Veterinary College as the TTP operator?

TTP process of testing

The following illustration shows the different steps of the testing process:



How effective is the tested technology?

- The TTP can be used to demonstrate the efficacy and safety level of a product or technology.
- Decontamination systems can be validated under challenge from MRSA ST398 carrier pigs.
- Decolonisation methods and their effects on MRSA and the normal flora *in vivo* or *in vitro* can be evaluated in a decontaminated environment.

How could your business benefit?

- The TTP builds on the expertise of our excellent scientists.
- Innovative facility to test your products and technologies in a fast and effective way.
- Process advice and individual consultancy maximise your return from testing.
- Full validation processes and project management ensure a professional service with excellent data management, statistical analysis and report writing.

Further information

Please visit the TTP website for key facts and further details.

http://www.fp7-pilgrim.eu/ttp

If you are interested in testing your decontamination product or technology in the TTP, or wish to receive more information please contact us:

Ms Joanna Cocker,
Scientific Assistant
Ph: +44 (1707) 666241
Mail: jcocker@rvc.ac.uk

Team of the RVC Enterprise London

designed by accelopment

PILGRIM Presentations

In the second half of 2010 PILGRIM members presented their research results at the following conferences:

2nd ASM Conference on Antimicrobial Resistance in Zoonotic Bacteria and Foodborne Pathogens in Animals, Humans and the Environment. 8-11 June 2010, Toronto, Canada

- Identification of Self-Decontaminating Photocatalytic Surface Agents effective Against Meticillin-Resistant *Staphylococcus aureus* (MRSA) ST 398.
  Presenter: Dr Efstathios Giotis et al.
- Clonal spread of MRSA CC398 sublineages within and between Danish pig farms.
  Presenter: Dr Carmen Espinosa-Góngora

14th International Symposium on Staphylococcal Infections. 6-9 September 2010, Bath, UK

- Distribution and variation of SCCmec elements carried by livestock-associated MRSA isolates, Denmark.
  Presenter: Dr Jesper Larsen
- High occurrence of MRSA strains from diverse genetic background among Belgian Veterinarians.
  Presenter: Dr Cristina Garcia-Graells
- A gnobiotic model to study the colonisation of piglets with MRSA ST 398 and the effects of bacterial interfere.
  Presenter: Dr Efstathios Giotis
- A novel 64-strain S. aureus Microarray: Desing, Validation and Investigation of Host Specificity.
  Presenter: Dr Alex J McCarthy
- S. aureus CC398 specific detection by targeting the restriction-modification system enconding sau1hsdS1 gene.
  Presenter: Dr Marc Stegger et al.

PILGRIM Publications

The following dissemination material has been delivered since the publication of Newsletter No 1:

- Giotis ES, Tito D, Bostock J, Zita J, Kluson P, Krysa J, Yigit F, Kold K, Loeffler A, Guardabassi L, Lloyd DH and Stärk KDC. Development of pig accommodation suitable for testing the effects of hygiene and disinfection on MRSA carrier pigs. The Pig Journal Volume 65, due for publication May/June 2011
- van Cleef BA, Graveland H, Haenen AP, van de Giessen AW, Heederik D, Wagenaar JA, Kluytmans JA. Persistence of livestock-associated MRSA after short term occupational exposure to pigs and veal calves.J Clin Microbiol. 2011 Jan 12. [Epub ahead of print]
- Moodley A, Latronico F, Guardabassi L. Experimental colonization of pigs with methicillin-resistant *Staphylococcus aureus* (MRSA): insights into the colonization and transmission of livestock-associated MRSA. Epidemiol Infect. 2010 Dec 15:1-7. [Epub ahead of print]
- Stegger M, Lindsay JA, Moodley A, Skov R, Broens EM, Guardabassi L. Rapid PCR detection of *Staphylococcus aureus* clonal complex 398 by targeting the restriction-modification system encoding sau1hsdS1. J Clin Microbiol. 2010 Dec 1. [Epub ahead of print]
- McCarthy AJ, Lindsay JA. Genetic variation in *Staphylococcus aureus* surface and immune evasion genes is lineage associated: implications for vaccine design and host-pathogen interactions. BMC Microbiol. 2010 Jun 15;10 (1):173

All publications and other documents are available on www.fp7-pilgrim.eu

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