

New molecular tools for the fight against hospital-associated infections

Researchers at Jikei University School of Medicine in Tokyo, Japan are using a Freedom EVO® workstation with an integrated HydroSpeed™ plate washer and Infinite® F200 PRO multimode reader to perform high throughput compound screening as part of their research to help combat persistent bacterial infections.

There is currently a major problem with increasing numbers of virulent bacterial strains that are causing chronic infections in clinical settings worldwide. Some of these strains have the ability to attach onto the surfaces of implanted medical devices, such as catheters, pacemakers and artificial joints, by forming structures known as biofilms. Biofilms are composed of an extracellular matrix of biological macromolecules, including proteins, nucleic acids and polysaccharides, which forms a scaffold through which bacterial cells can attach to the solid surfaces. Bacteria within biofilms have a low susceptibility to the immune system and antibiotics, which means that infection is more difficult to eradicate in many cases. “It is this biofilm that we are trying to disrupt,” explained Dr Ken-ichi Okuda, Assistant Professor in the Department of Bacteriology at Jikei University School

of Medicine. “Our first objective is to find compounds that prevent formation of the biofilms, and then we will analyze the detailed composition of the molecular interactions of these compounds with the bacteria. We anticipate that understanding the mechanisms behind biofilm formation will lead to the development of effective preventive measures and treatment. Then, of course, the concomitant use of these measures with antimicrobial agents, such as antibiotics, should provide a significant advantage in a clinical setting.”

The team is performing a large scale screening program to identify inhibitory compounds, using a Freedom EVO workstation with an integrated HydroSpeed plate washer and Infinite F200 PRO microplate reader, as Dr Okuda described: “The bacterial pre-culture is loaded onto the Freedom EVO in the

afternoon, together with the compound plates and the required number of assay plates, and the platform will do the rest. The system automatically makes dilutions of the compound plates, and the required volume of each compound is dispensed into the assay plates, followed by the bacterial culture. The Robotic Manipulator Arm then transfers the assay plates to an integrated incubator, and incubation continues overnight at 37 °C. After about 16 hours, the plates are transferred to the HydroSpeed for washing and staining. The Cell Protection™ feature of this instrument allows us to make fine adjustments to the flow speed and head movements, which is crucial to avoid the biofilm peeling off the base of the plate during washing. The biofilm formation is then quantified by measuring the absorbance of stained bacterial cells growing in the base of the 96-well plates. As the biofilms can form patchily on the bottom of

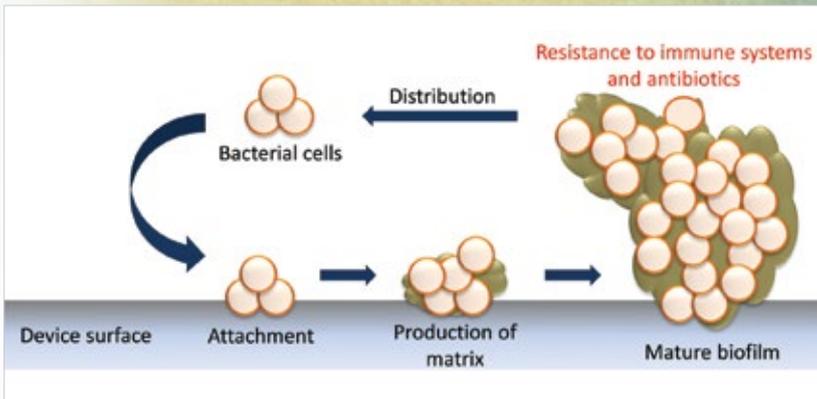
“The strength of the Freedom EVO workstation is its scalability to fit experimental needs.”



Dr Ken-ichi Okuda and Ms Satomi Yamada with the department's Freedom EVO workstation



The Department of Bacteriology team. Front row (left to right): Ms Yumi Tokoro, Dr Akiko Tajima, Ms Satomi Yamada. Back row (left to right): Dr Tadayuki Iwase, Dr Yoshimitsu Mizunoe, Dr Ken-ichi Okuda, Dr Akio Chiba



Biofilm formation increases bacterial resistance to immune responses and antibiotics

wells, the multiple reads per well function of the Infinite F200 PRO is very important to us. The software was initially set up by Tecan's support team, but the settings can be changed by the user quite easily. We can adjust various settings on the integrated Infinite and HydroSpeed instruments from the Freedom EVOware® software."

Dr Okuda explained the benefits of automating the work: "We are now pushing ahead with our screening studies using a number of bacterial strains that have biofilm-forming abilities, assaying around 10,000 different conditions each month. Performing the whole process by hand was a two-day task; manually dispensing the compounds or washing the plates is laborious and very time consuming, even using an eight-channel multipipette. We now have a continuous automated operation, so the only manual handling tasks are the preparation of the bacterial culture and the set-up of the compound plates. We start in the afternoon, analyze the data the following morning, and are able to use our time far more effectively."

"I think the strength of the Freedom EVO workstation is its high scalability to fit experimental needs," concluded Dr Okuda.

"With a rich selection of peripheral instruments such as incubators, plate readers and washers, we have been able to build a system that fulfills our exact requirements."

To learn more about Tecan's cell biology solutions, go to www.tecan.com/cellbiology

To find out more about the Department of Bacteriology at Jikei University School of Medicine, visit www.square.umin.ac.jp/saikin



The department's Freedom EVO workstation has a fully integrated HydroSpeed plate washer and Infinite F200 PRO microplate reader