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UKRI Biotechnology and Biological Sciences Research Council

ROSLIN INNOVATION CENTRE

Transforming diagnostics through advanced imaging and academic collaboration to unlock new markets

BetaBugs Limited

Dyneval Ltd. is a precision livestock technology company improving reproductive efficiency through a portable platform that delivers accurate, field-ready measurements of semen motility and health. Using advanced statistical physics-based image analysis, Dyneval provides lab-quality assessments of particle dynamics that enhance breeding decisions and sustainability. The same precision image analysis technology has the potential to rapidly assess which treatments will work to kill off an infecting bacterial population by quantifying impact on bacterial movement and viability, opening new markets in rapid screening of antimicrobial resistance and selection of alternative therapeutics such as bacteriophage.

Based at the Roslin Innovation Centre, Dyneval benefits from world-class expertise accelerating product development into new markets.

Urinary tract infections (UTIs) represent a major global health challenge, ranking among the most common infections in both humans and companion animals. They place a substantial burden on healthcare systems and significantly reduce quality of life, especially when recurrent or difficult to treat. Although many UTIs can be managed with commonly prescribed antibiotics, rising antimicrobial resistance is increasingly leading to treatment failures and prolonged illness. Effective care depends on the ability to rapidly determine which therapeutics will work against the infecting bacteria. However, current diagnostic methods are slow, delaying appropriate, targeted treatment. There is an urgent need for rapid, accurate susceptibility testing to guide timely and effective therapy.

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This **Campus Innovation Award (CIA)** funded collaborative project evaluated how effectively the company's imaging technology could be adapted as a rapid diagnostic tool for human and companion-animal urinary tract infections (UTIs). While traditional imaging can confirm the presence of bacteria, it offers little insight into bacterial type or susceptibility to antibiotics or therapeutic bacteriophages. This proof-of-principle study assessed the capabilities of the company's compact imaging unit and pixel-based analysis software, originally designed for motility assessment, to measure bacterial load and detect changes in cell size, shape and lysis over time following antimicrobial treatment.

The project demonstrated strong potential for the technology to enter the large diagnostic market by generating real-time information on whether the infecting bacterium was resistant or sensitive to the tested therapies. Pixel-level time-series data from liquid samples proved valuable for detecting bacterial levels in urine and determining effective therapies by observing bacterial dynamics changes or destruction in response to specific antibiotics or bacteriophage phage. The next steps would be to develop the system to allow sample splitting to allow a wide array of therapeutics to be tested concurrently as well as to automate the analyses with the use of AI developed with large training sets with defined outcomes.

The CIA-supported collaboration with the academic group, which provided a diverse collection of antibiotic-sensitive and resistant UTI-associated *E. coli* and corresponding phages, enabled rigorous evaluation of the platform. This partnership has positioned the company for future expansion into high-value clinical diagnostics and antimicrobial-susceptibility testing

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"Our academic partnership helped explore new markets for our technology. Providing expertise, biological resources and validation that enabled us to adapt our platform for rapid diagnostic applications in human and companion-animal health. and broaden revenue streams."

Dr. Tiffany Wood, CEO & Co-founder of Dyneval Ltd