New technique uses 'simulated' human heart to screen drugs

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Dr Helen Maddock from the Centre for Applied Biological and exercise Sciences at Coventry University

A Coventry University scientist has developed a pioneering new way –

using samples of beating heart tissue – to test the effect of drugs on the heart without using human or animal trials.

The breakthrough is the work of Dr Helen Maddock – an expert in cardiovascular physiology and pharmacology from the University's Centre for Applied Biological and Exercise Sciences – and could lead to the lives of hundreds of future patients being saved and the quality of their treatments improved.

Adverse effects of drugs on the cardiovascular system are a major cause of many medical treatments failing, but heart-related side-effects can often only be detected once a drug is being used on patients in clinical trials – by which time it is too late.

Dr Maddock's in vitro technique – which means 'in glass' in reference to it taking place in a laboratory environment rather than in a living organism – uses a specimen of heart tissue attached to a rig allowing the muscle to be lengthened and shortened whilst being stimulated by an electrical impulse, mimicking the biomechanical performance of cardiac muscle.

Trial drugs can then be added to the tissue to determine whether or not they have an adverse effect on the force of contraction of the muscle (and therefore of the heart), a test that could only previously be performed in vivo – i.e. on living animals – often with inconclusive results.

This 'simulated' cardiovascular system – known as a work-loop assay – provides the most realistic model of heart muscle dynamics in the world to date, and opens up unprecedented possibilities for identifying negative effects of drugs early and inexpensively – potentially saving lives and speeding up the development of successful drug treatments.

Dr Maddock has formed a spin-out company – InoCardia Ltd – from Coventry University to begin implementing her groundbreaking technique in the pharma industry, and it has already received a quarter of a million pound investment from Warwickshire-based technology investment firm Mercia Fund Management.

Dr Maddock, who spent almost ten years developing the technique, said:

"I'm delighted that our research is at a stage where we can confidently say the work-loop assay we've created is the world's only clinically relevant in vitro human model of cardiac contractility. It has the potential to shave years off the development of successful drugs for a range of treatments.

"Both the pharma industry and regulators recognise that existing methods of assessing the contractility of the heart are fraught with problems, so we're incredibly excited to be able to introduce a new way to accurately determine the safety of drugs in respect of the heart without the need to test on humans or animals."

Mark Payton, managing director of Mercia Fund Management, added:

"InoCardia benefits from a proprietary approach following many years of investigation by Helen and her team, and offers the potential for early screening of compounds in development without the initial need for extensive animal trials. Through a markedly accelerated drug development process, this will decrease timelines to drug development, and as a consequence greatly reduce the cost of new drug development. The end beneficiary will, of course, be patients receiving novel treatments sooner."

Dr Maddock and InoCardia Ltd are already in discussions with a multinational biopharmaceutical company with a view to applying the

assay in industry.

Provided by Coventry University

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