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RESEARCH FOR EARLY DETECTION

Dr Simon Tsao’s research has the potential to help surgeons and specialists who treat cancer patients

PhD Candidate and General Surgery Trainee Dr Simon Tsao is investigating the use of nanotechnology that can identify melanoma tumour markers via a simple blood test.

With financial support provided through two RACS Foundation for Surgery Scholarships, Dr Tsao is researching suitable biomarkers for the detection of circulating tumour cells (CTC) and circulating tumour DNA (ctDNA) and working with other scientists to develop a sensitive method capable of identifying and characterising CTCs.

If successful, the work could aid in the treatment of melanoma by enabling clinicians to determine within days or hours if a patient’s prescribed drug therapy is proving effective without the need for scans or biopsy. Dr Tsao said that until recently there had been no known specific tumour markers for melanoma, the fourth most commonly diagnosed cancer in Australians, that are easily detectable.

However, he said that his work at the Olivia Newton-John Cancer Research Institute in Melbourne had demonstrated the clinical implications of using ctDNA to monitor disease progression in melanoma patients in what has been termed a “liquid biopsy”.

He said the goal of the research was to provide treating doctors with a means to diagnose and quantify a patient’s CTC and ctDNA loads in clinic quickly to address several challenges faced with current melanoma management. “CTC are cells that are released from the tumour during various processes and they are responsible for establishing metastasis,” Dr Tsao said. “In many different types of cancers, higher numbers of CTCs have been shown to reflect higher tumour load and therefore the number of CTCs is a reflection of the seriousness of the disease. Quantification of melanoma CTCs is extremely difficult for many reasons and we are hoping to find a solution.”

“ctDNA, on the other hand, are fragments of DNA released constantly by some tumour cells and their quantity in any blood sample may inform us about the seriousness of the disease. ctDNA levels change very rapidly with changes in the disease status and therefore within two or three days of starting a new drug treatment we can know whether the therapy is working.”

“If we rely on scans to tell us if the tumour has shrunk, we can still be waiting for months after the initiation of therapy to get a definitive result. “Yet, by monitoring the patient’s ctDNA levels we can see when they are becoming resistant several months earlier than we could by using traditional scans.”

“For prostate cancer the measurement of serum PSA is a proven biomarker and our research aims for a simple blood test to inform clinicians promptly to introduce new therapies rather than waiting for the tumour to grow again which is the case with our current melanoma management plan.”

Dr Tsao is a SET 2 Trainee and is undertaking his PhD through the University of Melbourne and the Department of Surgery at the Austin Hospital in Melbourne. He is working under the supervision of Professor Chris Christophi, Head of the Department of Surgery at Austin Hospital, Professor Jonathan Cebron, Medical Director of Austin Health Cancer Services, and Dr Andreas Behren from the Ludwig Institute for Cancer Research.

For the past nine months he has been conducting his research at the Australian Institute for Bioengineering and Nanotechnology at the University of Queensland in a collaboration with Professor Matt Trau.

Dr Tsao’s work has been presented at the CTC symposium held in Sydney last year, won the John Ham Medal for Best Paper at last year’s General Surgeons Australia ASC and has recently been accepted for publication in Nature’s Scientific Reports.

He described the emerging field of CTC and ctDNA analysis as greatly exciting and one which had the potential not only to reduce melanoma cancer mortality rates but also fundamentally change the treatment of a variety of cancers.

“This is one of the hottest areas of cancer detection research around the world now because so many people can see the potential of the technology,” he said.

“We think it has the potential to help move us from treating cancer as a potentially fatal disease to managing cancer as a chronic illness.”

“It is as if all the necessary components to change cancer treatment have come together at the same time.”

With Karen Murphy

SUCCESSFUL SCHOLAR

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and New Zealand but also because it was one of the most challenging to study.

“Most tumour markers used so far were based on peptides or proteins secreted by the tumour cells such as PSA and CA15-3, but there are no known proteins specifically and consistently secreted by melanoma.

“That means we had to wait for the technology to develop to a point which could allow us to go looking for, and capture, CTC and ctDNA.

“Many major hospitals, particularly in America, are using CTC to identify colorectal and breast cancer but we are one of the first to do this work for melanoma which is very exciting.

“Within the next few years, we hope to be able to conduct these blood tests in clinics.”

Dr Tsao received a Foundation for Surgery John Lavelle Research Fellowship for the second year and a Foundation for Surgery ANZ Journal of Surgery Scholarship for the third year of his PhD, which he hopes to complete by the end of the year.

He thanked the College for the support extended to him.

“The scholarships allowed me to focus on my research rather than worry about work and finance,” he said.

“More importantly, though, it’s a formal recognition from the College that they support my work which I believe has the potential to help surgeons and specialists who treat cancer patients.

“Taking time off from formal surgical training is always stressful for a Trainee so it’s reassuring to have the College’s support.”

With Karen Murphy