

# Shaping A Cure for Cancer

## Dr Kris Kilian

Dr Kris Kilian is leading a team of researchers building geometrically patterned tumours, using techniques adapted from the microelectronics industry, to better understand patient-specific disease, and to aid drug discovery and development.

The research, published in the journal *Nature Materials*, involves a "soft lithography" technique, where silicon manufacturing enables creation of a silicone rubber stamp, that can be inked with materials that promote cancer cell growth for geometrically defining hundreds of microtumours, using patient-derived cells, across a single 1 cm<sup>2</sup> chip. The resulting microtumour array can then be used to study cancer progression, develop new drugs, or as a method to screen drugs on a patient's own cells to determine what drugs work best.

"The current best-practice for developing anti-cancer drugs involve adding the

compound to cells cultured on plastic, followed by a test to see if the drug kills the cells. However, flat plastic dishes do not reflect the complexity of tumour tissue", says Kilian, corresponding author on the study. "This could inadvertently lead to viable drugs being rejected. What we have done is develop new cell culture materials through materials engineering that better reflect the environment of real tumours."

Kilian's work has led to novel insights into the role of a tumour's geometry and its aggressiveness, where certain shapes at the tumour border appear to mediate the major causes of suffering in cancer: metastasis, drug resistance and tumour recurrence. Using this approach, the deadly features responsible can be spatially engineered, thereby allowing new drugs to be tested across hundreds of microtumours. The small footprint of the chip opens up avenues for screening many drugs and their combinations in a short amount of time.

"Since our technique can be used with cells from a patient's biopsy, there is enormous potential for individualised-therapy," says Kilian.

"Our vision is to use our chips to both understand a patient's disease, and to assign the right therapy to the right person quickly and accurately. It is tremendously important to understand how cells interact with materials if we want to effectively model disease states. We believe these advances show great promise for easing the suffering of people struggling with cancer."

This work was initiated by Dr Kilian at the University of Illinois at Urbana-Champaign before his move to UNSW Sydney in 2017. Full details of the study: J Lee, AA Abdeen, KL Wycislo, TM Fan, KA Kilian (2016) Interfacial geometry dictates cancer cell tumorigenicity, *Nature Materials* 15 (8), 856

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