

Landmark study links tumor evolution to prostate cancer severity

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Findings from Canadian Prostate Cancer Genome Network (CPC-GENE) researchers and their collaborators, published today in *Cell*, show that the aggressiveness of an individual prostate cancer can be accurately assessed by looking at how that tumour has evolved. This information can be used to determine what type and how much treatment should be given to each patient, or if any is needed at all.

The researchers analyzed the whole genome sequences of 293 localized prostate cancer tumours, linked to clinical outcome data. These were then further analyzed using machine learning, a type of statistical technique, to infer the evolutionary past of a tumour and to estimate its trajectory. They found that those tumours that had evolved to have multiple types of cancer cells, or subclones, were the most aggressive. Fifty-nine per cent of tumours in the study had this genetic diversity, with 61 per cent of those leading to relapse following standard therapy.

"By incorporating time into the context of the existing knowledge we have about where a tumour is at diagnosis we were able to very accurately identify those patients whose prostate tumours needed no treatment, those men who could be cured by existing treatments, and those men who had very aggressive tumours and may have benefitted from novel therapeutic options," says Dr. Paul Boutros, Principal Investigator, Ontario Institute for Cancer Research and leader of CPC-GENE.

"Clinical decision making in treating prostate cancer can be very

difficult. These findings pave the way for a new tool to improve our ability to determine the best approach for each individual patient, including sparing patients from unnecessary treatment or over-treatment and the associated side effects," says Professor Robert Bristow, Director of the Manchester Cancer Research Centre at the University of Manchester U.K., formerly of the Princess Margaret Cancer Centre in Toronto.

"Tumours are a community of related cancer cells, and by examining their DNA using machine learning, we can gain insight into how they evolved from normal cells. In this paper, we show that the past evolutionary history of a tumour helps predict whether that tumour will progress into an aggressive form," says Dr. Quaid Morris, Associate Professor, The Donnelly Centre for Cellular and Biomolecular Research, University of Toronto, who collaborated with the CPC-GENE team on the study.

"Prostate cancer is the most common cancer among men," says Reza Moridi, Ontario's Minister of Research, Innovation and Science.

"Ontario congratulates this research team, whose work is pointing the way toward improved testing and treatment."

The study's findings are not its only contributions to prostate [cancer research](#). The sequencing data generated during the course of the study are now freely available online to researchers worldwide to carry out further analyses, becoming the largest prostate cancer genomics resource available to-date.

CPC-GENE is a team of multidisciplinary researchers from across Canada working to crack the genetic code of prostate cancer. Through funding of approximately \$20 million, research of this magnitude has been made possible through a partnership between the Movember Foundation, Prostate Cancer Canada, and the Ontario Institute for

Cancer Research. Dr. Stuart Edmonds, Vice-President of Research, Health Promotion and Survivorship at Prostate Cancer Canada, has released the following statement:

"From the tireless work of researchers to the selfless giving of donors, we applaud the efforts of everyone who has played a role in helping make CPC-GENE possible. Since its beginnings as an ambitious undertaking that was massive in scope, the goal of this project has been to greatly improve personalized care for men with [prostate cancer](#). The findings published in *Cell* - widely considered one of the most prestigious and highest impact medical journals - represent a monumental stride towards that goal. Together, we will continue to advance this important work on behalf of the one in seven Canadian men who will be diagnosed with [prostate cancer](#) and their families."

More information: Shadrielle Melijah G. Espiritu et al, The Evolutionary Landscape of Localized Prostate Cancers Drives Clinical Aggression, *Cell* (2018). [DOI: 10.1016/j.cell.2018.03.029](https://doi.org/10.1016/j.cell.2018.03.029)

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