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PROSTATE CANCER

Do the maths – modelling tumour growth

A new phenomenological model of prostate tumour growth that qualitatively recapitulates cancer progression has been presented in *Proceedings of the National Academy of Sciences USA*. This model has the potential to aid personalized medicine and reduce the need for invasive diagnostic tests.

Lorenzo and colleagues used the phase-field method, diffusion–reaction equations and isogeometric analysis to generate a model of prostate tumour growth that accurately reproduces growth patterns observed in *in vitro* experiments and in the clinic. They also propose an equation that models prostatic PSA dynamics, which can result in solutions that are readily interpreted by a urologist.

The model demonstrated the ability to predict the known shape instability of prostate tumours, changing from an initial spheroidal pattern to fingered geometry. Data generated by the model suggested that this shape change is a tumour response aimed at avoiding starvation, hypoxia and necrosis. Tumour branching minimizes the distance of the innermost cancer cells from external nutrients and could aid survival and growth.

The researchers also performed a tissue-scale, personalized simulation of tumour growth using the prostatic anatomy of a tumour generated using images obtained during a CT scan of a patient with prostate cancer.

The investigators conclude that their new model is the first step in the generation of a comprehensive computer model that could be integrated into clinical software to aid in the personalized diagnosis of prostate cancer, prediction of disease progression, exploration of treatment options and management of follow-up monitoring. It could also reduce the need for invasive diagnostic procedures, such as biopsy, reducing morbidity.

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> “a model of prostate tumour growth that accurately reproduces growth patterns”

ORIGINAL ARTICLE Lorenzo, G. *et. al.* Tissue-scale, personalized modeling and simulation of prostate cancer growth. *Proc. Natl Acad. Sci. USA* **113**, E7663–E7671 (2016)