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# Mathematical modeling predicts response to Herceptin

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Cancer researchers are turning to mathematical models to help answer important clinical questions, and a new paper in *Cancer Research*, a journal of the American Association for Cancer Research, illustrates how the technique may answer questions about Herceptin resistance.

Sofia Merajver, M.D., Ph.D., scientific director of the Breast Oncology Program at the University of Michigan Comprehensive Cancer Center, and a senior editorial board member of Cancer Research, said the potential of mathematical oncology is nothing short of revolutionary. These landmark papers now have a potential forum in the Mathematical Oncology section of *Cancer Research*, whose wide readership will help the new results reach the clinic.

"Computational power has reached the point where models that could previously only be used to predict weather patterns, space travel or the effect of nuclear explosions can now be used in the clinic to estimate the impact of certain drugs," said Merajver.

The current paper, which was carried out at the Breakthrough Breast Cancer Research Unit Edinburgh and led by Dana Faratian, M.D., a clinical lecturer in pathology at the University of Edinburgh, examined the role of PTEN protein expression on resistance to Herceptin. PTEN is a protein that acts as a tumor suppressor gene.

"Herceptin has benefited thousands of women with HER2 positive breast cancer, but only a third to half of patients treated with this agent

respond," said Faratian. "We need to know which patients will or won't respond to treatment and this research is a step towards realising that aim."

For the current study, Faratian and colleagues built a mathematical model that used 56 differential equations to analyze the change in concentrations of 56 separate biological entities including proteins and lipid second messengers.

Researchers worked with 122 breast cancers treated with Herceptin and found that quantitative PTEN protein expression was a key determinant of who would be resistant or sensitive to Herceptin.

Furthermore, using the mathematical modeling techniques, the absence of PTEN was more predictive than could be determined using standard multivariate or laboratory analysis.

"This paper is a major step forward because as revolutionary as Herceptin has been, there are many patients who fail. This helps us understand why and it would not have been possible without the new mathematical techniques," said Merajver.

Source: American Association for Cancer Research (news : web)