

## Cancer - Research to Treatment: An Accelerating Journey

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The discovery a single gene had a revolutionary impact on healthcare on the basis of work done by Dr. Mary-Claire King at the University of California in Berkeley because he discovered that a single gene was responsible for certain breast cancers and it changed the diagnosis. In the latter half of 1990, genetics was considered to be a vital aspect and hence the Human Genome Project was launched. The rate of Breast cancer had dramatically increased over the last decade with respect to the improvements in screening by mammograms but still thousands of women do not have access to screening or diagnostics because of a lack in funding. Hence, we were in need of a new testing method to inspire the genetic discovery of Dr. King but a link was not established between genetic and clinical practice in oncology and there raised an urge to investigate the concept of “personalized medicine”. In this review, we investigate the concept of personalized medicine.

**Keywords:** Healthcare, genetics, cancer.

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Though the research work on breast cancer was not the area of expertise for Dr. King’s, she thought to apply genetics could to add some useful contribution to the research at that time and the focus was to identifying a gene that cause cancer. The National Cancer Institute in USA conducted a survey of 1,500 women with breast cancer as part of a study with oral contraceptives but Dr. King asked them to add a query about close relatives with breast cancer. During 1990, Dr. King named the gene as *BRCA* i.e. the gene

involved in Breast Cancer. It also produces a protein called *BRCA1* for suppressing the formation of tumors by repairing the damaged DNA. Mutations in the gene can lead to changes in the protein to stop it from functioning properly, so that the breast tumors are able to grow.

According to the National Cancer Institute, *BRCA1* and *BRCA2*<sup>1</sup> with mutations can account for 25%<sup>2</sup> of hereditary breast cancers and the 5 to 10 %<sup>3</sup> of other breast cancers. If a parent has a mutation in one among the two genes<sup>4</sup>, their child will have a chance of inheriting the one among the two mutations<sup>5</sup>. This effect will increase their risk of developing breast cancer i.e. about 12 % of women without a harmful *BRCA1* mutation will develop breast cancer when compared to about 60%<sup>6</sup> of women with a harmful mutation.

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In Cancer, the genetic causes were not so clear. Although there is a link between certain harmful mutations in BRCA1<sup>7</sup> and the development of breast cancer, there are thousands of possible mutations and other genes that can affect a person's risk of disease.

#### Recent Case Study

In March 2016, a phase 3 clinical trial was conducted with 257 women<sup>8</sup> with a type of breast cancer – HER2 positive<sup>9</sup>. It was observed that, treating them with a combination of drugs before surgery could lead to disappearing of their tumors.

#### Outcome

Tumors disappeared in 7<sup>10-13</sup> among the 66 women<sup>14, 15</sup> who received the combination therapy and only minute traces of the cancer remained in further 11<sup>6-18</sup>. It is early, but this could mean that for certain types of HER2-positive breast cancer, women could have this combination treatment followed by surgery, without the need for chemotherapy<sup>19, 20</sup>.

#### Future Prospective

In order to achieve success, the initiative will require huge amounts of genomic data, which will require institutions to collaborate and share information. In addition to develop a platform for data sharing, there is a need for analyzing the global cancer research to highlight the collaborations.

#### Further Challenges

Dealing with a huge influx of data associated with new research involves the results from clinical trial and medical knowledge. In 1950, it took 10 years for the world's medical knowledge to double and it's projected that the entire world's medical knowledge will double every 73 days by 2020.

It's not only healthcare professionals who will need to navigate the information and patients will be increasingly involved in their own treatment decisions.

### CONCLUSION

Today's research can be transformed into tomorrow's treatment; patients should understand and embrace it. Cancer can be overwhelming and seems to be complicated for many patients and their families to understand. Genomics can also increase that complexity. So, there exists a challenge

to overcome this last obstacle on the journey from bench to bedside.

The groundbreaking aspects of cancer research rely upon clinical trials and major initiatives like the Cancer Moonshot. As technology continues to develop, a better molecular imaging can be seen with a less invasive surgery and more targeted drugs. If patients are empowered to understand and apply the evidence-based information to their own treatment decisions, the path from basic research to clinical application will become shorter than ever.

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