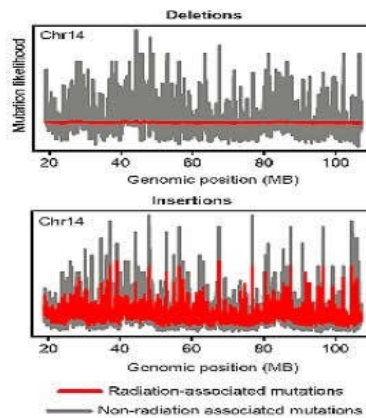




Radiation and DNA Damage



Researchers from the Wellcome Trust Sanger Institute and their collaborators have identified two characteristic patterns of DNA damage in human cancers that are caused by ionising radiation. The research published in *Nature Communications*, could help doctors identify tumours that may be the result of radiation as well as determine the right treatment strategy. The findings can also explain how radiation causes cancer.

While it is already known that ionising radiation such as gamma rays, x-rays and radioactive particles damage the DNA and can cause cancer, it is not clear how this happens or how many tumours can be caused by radiation.

Previous studies show that DNA damage leaves a mutational signature on the genome of a cancer cell. During this study, the researchers examined the mutational signatures in 12 patients with secondary-radiation-associated tumours and compared them with 319 that had not been exposed to radiation. The comparative findings showed that two mutational signatures for radiation damage were independent of cancer type. The researchers then checked these findings with prostate cancers that had or had not been exposed to radiation and found the same two mutational signatures.

The first mutational signature is a deletion where small numbers of DNA are cut out while the second is a balanced inversion where the DNA is cut in two places. These balanced inversions are not typically found in the body but can be the result of high-energy radiation.

Dr Sam Behjati, clinician researcher at the Sanger Institute and the Department of Paediatrics, University of Cambridge, said: "Ionising radiation probably causes all types of mutational damage, but here we can see two specific types of damage and get a sense of what is happening to the DNA. Showers of radiation chop up the genome causing lots of damage simultaneously. This seems to overwhelm the DNA repair mechanism in the cell, leading to the DNA damage we see."

Professor Adrienne Flanagan, a collaborating cancer researcher from University College London and Royal National Orthopaedic hospital points out that this is the first research that specifically defines DNA damage caused by ionising radiation. These findings could help doctors diagnose individual cases more effectively as well as identify which cancers are caused by radiation. Greater understanding of this mechanism could help determine how to treat different cancers.

Source: [Wellcome Trust Sanger Institute](#)
Image Credit: Nature Communications

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