New technology provides first view of DNA damage within entire human genome

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New technology providing the first view of DNA damage throughout the entire human genome developed by Cardiff University scientists could offer a valuable new insight into the development and treatment of conditions like cancer.

Professor Ray Waters, Dr Simon Reed and Dr Yumin Teng from Cardiff University's Department of Genetics, Haematology and Pathology have developed a unique way of measuring DNA damage frequency using tiny microarrays.

Using the new method Cardiff scientists can, for the first time, examine all 28,000 human genes where previous techniques have only allowed scientists to analyse parts of about five human genes.

The new patented technique offers an unprecedented view of DNA damage in humans caused by agents that can create conditions like cancer.

Professor Waters said: "This is really an exciting development and offers us the chance to examine DNA damage in the entire human genome.

"The approach is especially useful to examine the damage to people's DNA that can go on to cause cancer. We can also examine DNA damaging anti-cancer therapeutics and how responses in individual patients vary."

Human DNA can be damaged in many different ways – through radiation, chemicals and events in the body itself. Genetic defects in DNA repair can lead to cancer prone conditions, immunity defects, premature ageing and other problems.

In normal individuals there are many examples of DNA damage being linked to cancer, for example through smoking or over exposure to ultra-violet rays.

There is little evidence as to how DNA repair varies amongst the normal population and how normal individuals cope with anti-cancer therapies that damage the DNA in their cancer cells and normal cells.

The novel technology, developed with funding from the Medical Research Council (MRC) and Cancer Research Wales, will have implications for cancer risk assessment, for cancer diagnostics and for developing new cancer therapeutics.

Professor Ray Waters is Head of Cardiff University's Cancer Studies Interdisciplinary Research Group. Consisting of more than 50 researchers, the Group is working together on new cancer therapeutics and diagnostics which can be taken through to the clinic.

He was deputy chair of the UK Government Committee on Medical Aspects of Radiation in the Environment (COMARE) and he drove its 2009 report on the health risks associated with sunbed usage.

Professor Waters added: "The method has some very exciting potential applications. We are already working alongside companies such as Agilent to see if our method can be used by the chemical and pharmaceutical industries for routine genotoxicity testing. Here, determining whether new agents damage DNA is a crucial step in their development

"The technique could also be used for other purposes like examining DNA damage in the skin from sunburn, and we will be looking to develop this application over the coming months and years.

"For future developments input from our current team of Mark Bennett, Yanbo Deng, Katie Evans, Matthew Leadbitter, Dr James Powell and Dr Shirong Yu will be crucial."

Provided by Cardiff University