# Two studies highlight the role DNA repair processes play in production of mutation-prone sequences involved in cancer

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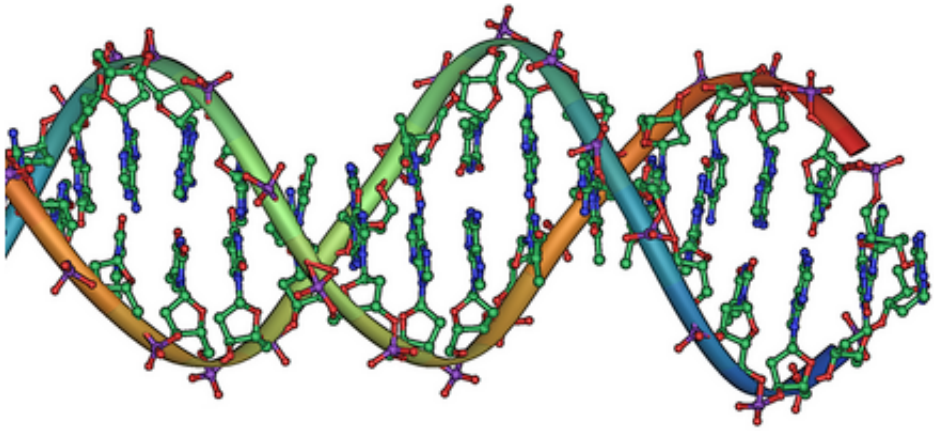

DNA double helix. Credit: public domain

(Medical Xpress)—The results of two studies by two different teams studying the role that DNA repair plays in the production of mutation-prone sequences—precursors to cancer, have been published in the journal *Nature*. In the first, a team working in Australia found patterns when they studied approximately 1,200 whole genome sequences looking at mutation densities in enhancer, promoter heterochromatic sequences and gene coding sequences, which were related to more than a

dozen types of cancer. In the second study a team working in Spain found similar patterns when looking at sequences from approximately 36 skin cancer samples found in the Cancer Genome Atlas project. Ekta Khurana with Weill Cornell Medical College, has published a *News & Views* research piece on the work done by the two teams and suggests that such studies are laying the groundwork for the development of future diagnostic tools and treatments that can be tailored to individual patients.

In recent years, scientists have made much progress in early diagnosis of cancer and especially in treatment of it, unfortunately, not nearly as much progress has been made in uncovering the process behind the genetic mutations that lay the foundation for the development of most types of cancers. In these new efforts, both teams have been looking at the role that DNA repair plays in the process.

To gain more insight, both teams have been studying multiple examples of certain types of cancers, such as those that are caused by exposure to ultraviolet light, or smoke from cigarettes. Prior research has found that a process called nucleotide excision repair is set off by exposure to either as the body attempts to repair the damage they cause. This process, Khurana notes, is difficult to study because it occurs alongside other genetic activities, most particularly, DNA transcription. In the first study, the team in Australia found mutations rates as much as five times higher in regions where transcription factors were expected to bind than were found in flanking sequences. Meanwhile, the team in Spain found an increase in density in the centers of active promoters that were associated with reduced levels of nucleotide excision repair.

Taken together the studies suggest nucleotide excision repair in areas where DNA regulation is occurring, is held back by bound transcription-initiation mechanisms, which apparently lead to the growth of cancer cells.

**More information:** Dilmi Perera et al. Differential DNA repair underlies mutation hotspots at active promoters in cancer genomes, *Nature* (2016). DOI: 10.1038/nature17437

Radhakrishnan Sabarinathan et al. Nucleotide excision repair is impaired by binding of transcription factors to DNA, *Nature* (2016). DOI: 10.1038/nature17661