Mechanism of damaged DNA mutation identified

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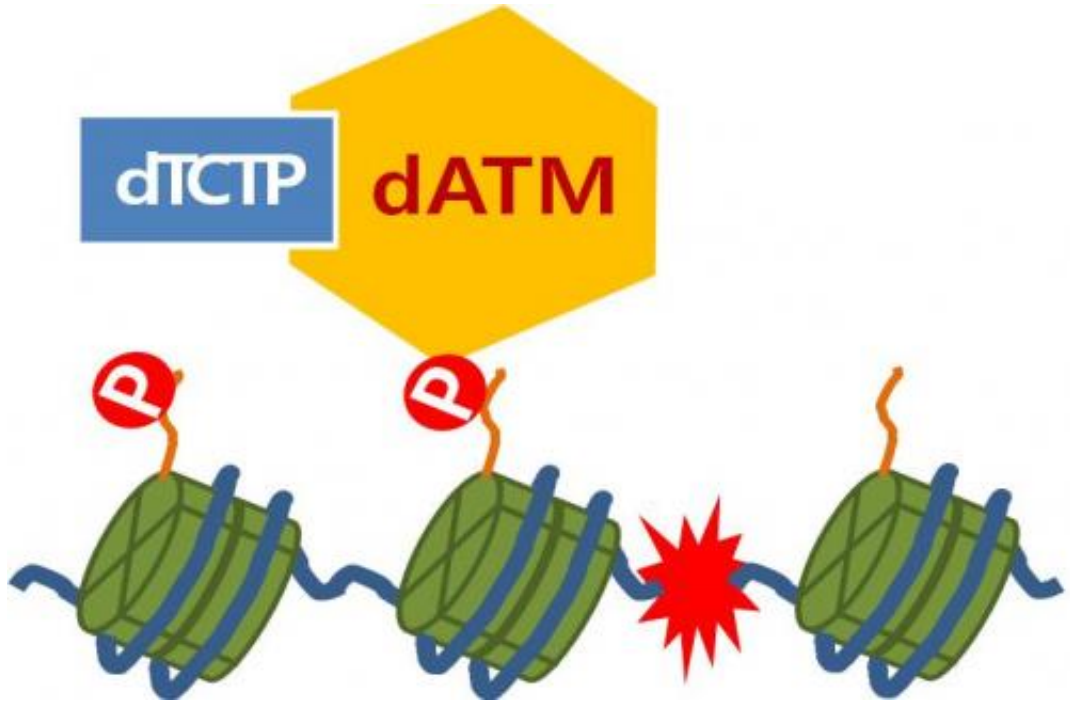

Figure 1. ATM marks the position of the broken DNA, with TCTP helping to facilitate this reaction. DNA (blue line) within the cell nucleus is coiled around the histone protein (green cylinder). When DNA is broken, ATM protein attaches a phosphate group (P). Multiple DNA repair protein recognizes the phosphate as a signal that requires repair and gathers at the site.

A team led by KAIST Department of Biological Sciences' Professor Kwang-wook Choi and Dr. Seong-tae Hong has successfully investigated the operational mechanism of the protein ATM (Ataxia telangiectasia

mutated), an essential protein to the function of a crucial key enzyme that repairs the damaged DNA which stores biometric information. The results were published on December 19th in the *Nature Communications* online edition.

All organisms, including humans, constantly strive to protect the information within their DNA from damages posed by number of factors, such as carbonized material in our daily food intake, radioactive materials such as radon emitting from the cement of the buildings or ultraviolet sunlight, which can cause cancer.

In order to keep the DNA information safe, the organisms are always carrying out complex and sophisticated DNA repair work, which involves the crucial DNA damage repair protein ATM. Consequently, a faulty ATM leads to higher risks of cancer.

Until now, academia predicted that the protein TCTP (Translationally controlled tumor protein) will play an important role in regulating the function of ATM. However, since the main researches regarding TCTP have only been conducted in cultured cells, it was unable to identify exactly what mechanisms TCTP employs to control ATM.

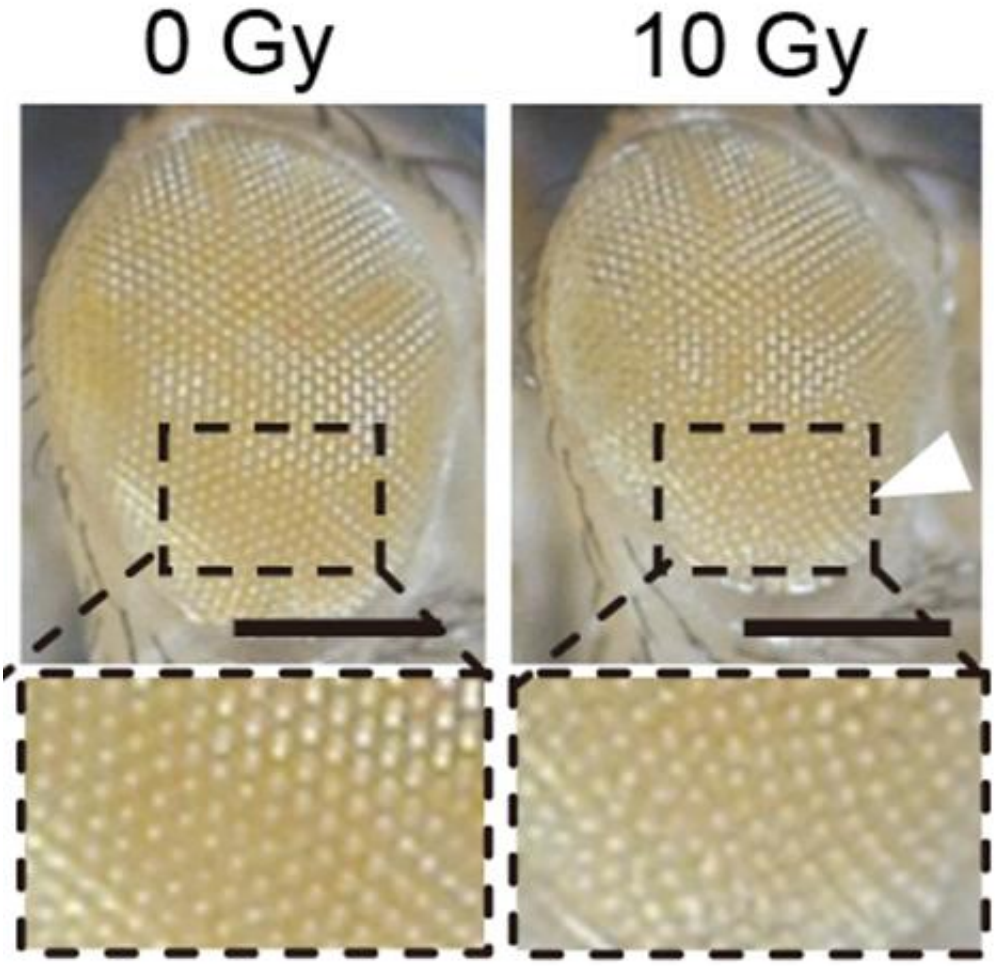

Figure 2. When the amount of TCTP protein is reduced, cells of the Drosophila eye are abnormally deformed by radiation. Scale bars = 200mm

A KAIST research team has determined that TCTP can combine with ATM, and that TCTP increases the enzymatic activity of ATM. In addition, Drosophilia, one of the most widely used model organisms for molecular genetics, has been used to determine that TCTP and ATM play a very important role in repairing the DNA damaged by radiation. This information has allowed the researchers to establish that TCTP plays essential roles in maintaining the DNA information in cell cultures, as well as higher organisms, and to provide specific and important clues

to the regulation of ATM by TCTP.

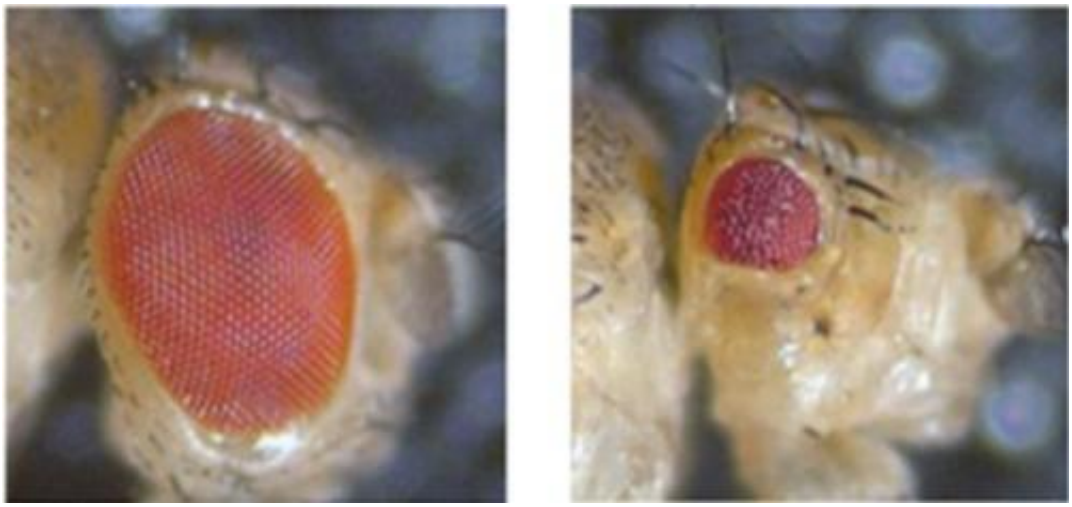

Figure 4. When gene expressions of TCTP and ATM are reduced, large defects occurs in the normal development of the eye. (Left: normal Drosophilia eye, right: development-deficient eye)

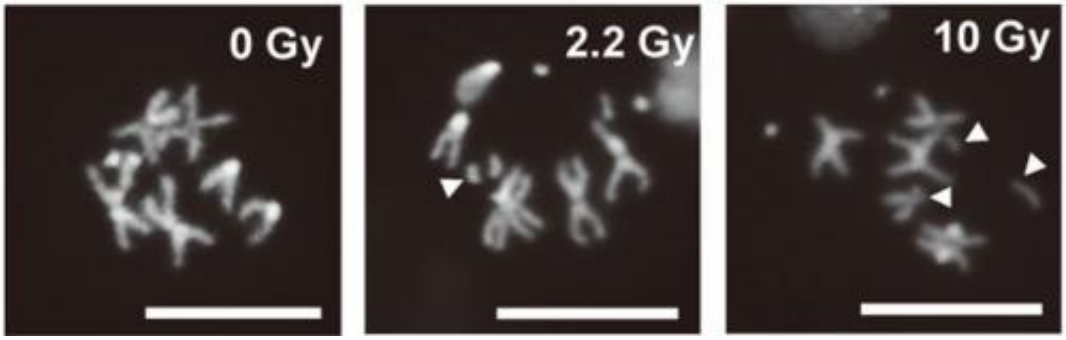

Figure 3. When the amount of TCTP protein is reduced, the chromosomes of Drosophilia are easily broken by radiation. Scale bars = 10 mm.

Professor Kwang-wook Choi says, "[This research] demonstrates that

basic research using Drosophilia can make important contributions to understanding the process of diseases, such as cancer, and to developing adequate treatment."

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