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DESIGNING A BIOSENSOR USING CRISPR-CAS 9 TECHNIQUE FOR MICROBIOME ANALYSIS

Abstract

The microgravity conditions in space can cause a significant change in the genome of an organism including human DNA. This leads to mutation (change in the DNA sequence). This phenomenon mainly occurs due to the exposure to harmful ionizing radiation. Future space exploration requires the study of DNA repair mechanisms and molecular biology toolkits to help the astronauts overcome the problems faced by the exposure to harmful radiation for a long time. This can also be used to check the viability of the DNA repair mechanism in space conditions where there is a high chance of increase in risk associated with it. CRISPR-Cas 9 is one of the genome editing techniques which is said to revolutionise the domain of molecular biology. It is a unique technology which aids genome editing by adding, removing or altering the sections of the DNA sequence. This system consists of two key elements Cas-9 and Guide RNA which recognises the damaged DNA and helps in the repair mechanism. The International Space Station (ISS) has achieved the recognition of conducting the first genome editing using CRISPR-Cas 9 in space on yeast cells.

Thus, this paper focuses on determining the pros and cons of the technique and try to do a microbiome analysis using the technique. This is one of the applications of the CRISPR technique which is still under extensive research. The objective is to identify the microbial communities from a particular sample using CRISPR based sensors. The experimentation involves the design of the guide RNA specific to the DNA sequence and selecting a particular Cas-9 protein which helps in cleaving the DNA which are detected by methods like fluorescence. The sensors are designed to operate considering the space conditions like microgravity, radiation and extreme temperatures. This can be a future perspective which can be used to study the microbial communities on the surface of other planets.