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Cellular ribosome stress response with respect to drug development for cancer, cell damage and aging

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Our lab has identified that ribosome heterogeneity determines the function of each ribosome. Eukaryotic ribosomal protein S3 (rpS3) which switches its function as a DNA repair enzyme for damaged DNA when modified under various cellular stress conditions. Ribosomal protein S3 is a multifunctional protein working not only for translation but also for the prevention of DNA damage, cancer and aging processes. The function of rpS3 in the DNA repair processing is connected with cell viability and protein quality control. UV induced DNA damage is repaired by the nucleotide excision repair (NER) pathways; defects in these pathways lead to a genetic instability known as xeroderma pigmentosum (XP) eventually developing skin cancers. Here, we showed that XP-D cells overexpressing rpS3 showed markedly increased resistance to UV through XPD and rpS3 interaction thus augmenting the helicase activity of XPD protein, possibly preventing skin cancers.We also confirmed the DNA repair domain of rpS3 which can independently repair the damage DNA and facilitating the repair of damaged cells from skin, which could be used for anti-aging agent and cosmeceutics. It has been known that rpS3 has a metastasis inhibitory activity. We also identified the domain with an inhibitory effect on cancer cell metastasis which could be developed for anti-metastatic drugs. RpS3 has multiple extra-ribosomal functions through different post-translational modifications in humans and yeasts. This ribosome heterogeneity determines the fate of rpS3 between a ribosomal component for translation, and a stress response regulator to prevent cellular damage such as cancer, DNA damage and aging in general. Animal studies showed that this could be applied not only for the development of cancer drugs but also for cosmeceutics.

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Biography

Joon Kim has been studying stress and DNA damage responses in human and yeast cells, supervised 40 PhD and 85 MS students and published about 200 papers. He graduated from Seoul National University (B.S. in Microbiology, 1981) and UC Berkeley (PhD in Biochemistry, 1989). He did his post-doc at Harvard Medical School. He has served as Presidents of Microbiological Society of Korea, and Federation of Korean Microbiological Societies. He also worked as Director of Division of Life Sciences, National Research Foundation of Korea, the national funding agency. He will serve as President of FAOBMB(Federation of Asian and Oceanican Biochemists and Molecular Biologists) until 2025.

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