Cellular responses to DNA damage: from mechanistic insights to applications in cancer therapy

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As DNA is frequently subject to a wide array of molecularly distinct forms of damage, life has evolved multiple DNA repair and associated processes, collectively termed the DNA-damage response (DDR). The importance of DDR mechanisms is underlined by their deregulation or loss causing cancer and various human genetic disorders whose pathologies include stem-cell exhaustion, developmental defects, infertility, immune-deficiency, neuro-degeneration, cancer predisposition and/or premature ageing. Work in my laboratory aims to decipher DDR mechanisms, particularly those triggered by DNA double-strand breaks. In this talk, I will describe some of our recent work using CRISPR-Cas9 genetic screens and ensuing mechanistic studies to identify new DDR factors/regulators and then define their functions. I will also explain how such work is identifying new avenues for anti-cancer therapy and is helping us understand how cancer cells can evolve resistance to therapeutic agents.