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How Next Generation Sequencing is going to transform how we treat cancer patients

Human papillomavirus (HPV) is involved in the development of a number of anogenital cancers and is increasingly involved in the development of oropharyngeal squamous cell carcinoma (OPSCC), a cancer of the base of the tongue and the thyroid. Much of what is currently known about HPV role in cancer development comes from studies of cervical cancer. Women whose immune system does not clear the HPV virus are at an increased risk of developing cervical cancer. Infection of the cervical epithelium with HPV causes cellular immortalization but additional alterations are required for invasive cancer to develop. One such alteration in the integration of the HPV virus into the human genome which is observed in most, but not all, cervical cancers. We have been studying HPV's role in the development of OPSCC using several whole genome sequencing strategies. The first is mate pair next-generation sequencing on the Illumina sequencing platform. The second is whole genome sequencing (WGS) on the BGI sequencing platform. These studies have revealed that HPV's role in the development of OPSCC is different than in cervical cancer as HPV is only integrated into about 30% of HPV-positive OPSCCs. Furthermore, these studies have demonstrated that HPV plays different roles in the development of different OPSCCs. WGS not only can determine where HPV has integrated into the human genome but also the structure of the chromosomal region after the integration event. WGS can also characterize many other genomic alterations that occur in these cancer genomes. I will describe our work characterizing how we've utilized genome sequencing to study HPV's role in the development of OPSCC.

Biography

David I Smith is the Chairman of the Technology Assessment Group for the Mayo Clinic Center for Individualized Medicine. He is an expert of advanced DNA sequencing methodologies and how to use these to study the molecular alterations that occur during cancer development. His research focuses on the different roles that Human papillomavirus plays in the development of different cancers. His group also studies genome instability during cancer development and the role that the common fragile sites plays in this.

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