Cancer Prevention by Vaccination

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During the past 30 years an important role of infections became obvious in causing some common human cancers. Presently 20-21% of the global cancer burden is directly or indirectly linked to infectious events, with wide variations between more developed and resource-constrained societies. Three common human cancers have been linked to infections: hepatocellular carcinoma, caused by persistent *Hepatitis* B or C virus infections, cancer of the cervix uteri, triggered by high risk *Papillomavirus* infections, and gastric cancer, linked to a bacterial infection, *Helicobacter pylori*, but in part (~ 10%) also to *Epstein-Barr virus* (EBV) infections. In addition, EBV contributes to nasopharyngeal carcinomas, Burkitt's lymphomas, B-cell lymphomas arising under immunosuppression and mainly to the mixed cellularity type of Hodgkin's disease. Other infections include Kaposi's sarcoma linked to *Human Herpesvirus* type 8, which represents one of the most frequent tumors in Africa. A*nogenital papillomavirus* types also cause cancers at genital non-cervical sites and are responsible for about 25-30% of oropharyngeal cancers. The T-lymphotropic retrovirus type I causes the endemic form of adult T-cell leukaemia. Regional parasitic infections, *Schistosoma, Opisthorchis*, and *Clonorchis* infections, contribute to bladder and rectal cancers or to cholangiocarcinomas. Very recently, a novel polyomavirus DNA has been cloned and characterized from Merkel cell carcinomas.

The identification of infectious causes of cancer paved the way for novel strategies for cancer prevention. Vaccination against Hepatitis B virus in early childhood resulted in a drastic reduction of persistent infections with this agent. First data became available pointing to a reduction of hepatocellular carcinomas in perinatally vaccinated children. Attempts to vaccinate against specific types of high risk Papillomaviruses turn out to be extremely promising in order to prevent cancer of the cervix. Obviously, these vaccines are capable to prevent persistent high risk HPV infections and also early precursor lesions of cervical cancer.

The development of preventive vaccines against Hepatitis B and high risk HPV provides very encouraging results and, if globally applied and as successful as presently suspected, could theoretically prevent up to 15% of cancers in females.