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The role of Simian Virus 40 (SV40) in childhood malignancies: Passenger or pathogen?

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The question whether Simian Virus 40 can cause human tumours has been one of the most controversial topics in cancer research during the last 50 years. SV40 is a primate polyomavirus that does not naturally infect humans but may have been introduced into human population as a result of contaminated poliovaccines, provided to millions of individuals in Europe and USA in the time of polio mass vaccination between 1950s and early 1960s. Many independent studies have detected SV40 in a variety of human malignancies, so in lymphomas, brain and bone tumours, sarcomas, and mesothelioma but with significant discrepancies in frequency. Moreover it was demonstrated that SV40 multiplies in human cells, replicates in transformed human cells, causes dramatic chromosome rearrangements and damages, and increases activity of telomerase. Therefore mounting evidence suggests that SV40 is an emergent human pathogen.

The oncogenic potential of SV40 is based on the large T-antigen (L-TAG), the primary viral gene product responsible for SV40 replication and SV40 mediated cell transformation. L-TAG binds and inactivates the products of several tumour suppressor genes.

We established a RQ-PCR based TaqMan assay for rapid and highly reproducible detection and quantification of SV40 and to use this method for analysing DNA samples from different childhood malignancies as well as from healthy people, giving new facts for ongoing discussion of the role SV40 could play in human malignancies. We found SV40 in 62 from 91 lymphoma specimens and in overall 151 of 297 osteosarcoma specimens, derived from 3 different countries: Germany (24 SV40+/108), Hungary (114 SV40+/145, Bulgaria (13 SV40+/44)). SV40 was absent in 147 of 149 blood control-samples from Germany, in 134 from 166 blood samples from healthy Hungarian volunteers, and in 30 out of 32 Bulgarian blood control samples. These data strongly support an important role of SV40 in these different childhood malignancies and demonstrate, that SV40 is not an innocent bystander, but a pathogen in human cancer.

Nevertheless there is still a lot we do not know about this virus: how it is transmitted, whether age of transmission matters, whether it controls any disease process, and where is the host of the virus in healthy people?

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