



## Advances in Human Polyomaviruses Field

Marco Ciotti\*

Laboratory of Molecular Virology, Polyclinic Tor Vergata Foundation, Viale Oxford 81, 00133 Rome, Italy

\*Corresponding author: Ciotti M, Laboratory of Molecular Virology, Polyclinic Tor Vergata Foundation, Viale Oxford 81, 00133 Rome, Italy, Tel: +390620902087; E-mail: marco.ciotti@ptvonline.it

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### Editorial

Polyomaviruses are small non-enveloped DNA viruses with a circular double stranded genome of about 5 Kb in length. The genome is contained in a capsid with icosahedral structure of about 45 nm in diameter.

Up to 2007, two human polyomaviruses BK (BKPyV) and JC (JCPyV) were known and named after the initials of the patients where they were first isolated. BKV was isolated from the urine of a kidney transplant patient affected by urethral stenosis [1]. JCV was identified in the brain tissue of a patient with Hodgkin lymphoma who developed a demyelinating disease known as progressive multifocal leukoencephalopathy [2]. After more than thirty years, thanks to the advances of molecular biology techniques, the number of newly uncovered human polyomaviruses increased rapidly. In 2007, the Karolinska Institute (KIPyV) and the Washington University (WUPyV) polyomaviruses were uncovered in the respiratory secretions of patients with acute respiratory symptoms by random PCR and high throughput sequencing [3,4]. Nine additional polyomaviruses were identified in the following years: Merkel cell polyomavirus (MCPyV) [5], human polyomaviruses 6 (HPyV6) and 7 (and HPyV7) [6], trichodysplasia spinulosa-associated polyomavirus (TSPyV) [7], human polyomavirus 9 (HPyV9) [8], human polyomavirus 10 (HPyV10)/Malawy polyomavirus (MWPyV)/Mexico polyomavirus (MXPpyV) [9-11], human polyomavirus 12 [12], Saint-Louis polyomavirus (STLPyV) [13], New Jersey polyomavirus [14]. As for KIPyV and WUPyV molecular biology techniques were instrumental for their discovery.

While it is known the pathogenetic role of BKV and JCV in immunocompromised patients; a clear association with human disease among the novel polyomaviruses has been established only for MCPyV and TSPyV. BKPyV is associated with nephropathy (PyVAN) in kidney transplant patients and hemorrhagic cystitis (PyVHC) in hematopoietic stem cell transplant patients [15,16]. MCPyV is associated with Merkel cell carcinoma, a rare aggressive skin cancer observed in the elderly and immunocompromised patients [5]. TSPyV is associated with the rare skin disorder trichodysplasia spinulosa observed in transplant patient [7].

Phylogenetic studies allowed the characterization of these novel viruses and the definition of genetic relationships with other known polyomaviruses. Currently, the Polyomaviridae family comprises three genera. The Orthopolyomavirus and the Wukipolyomavirus genera include mammalian species, whereas the Aviopolyomavirus genus include the avian species [17].

Future studies are needed to define the pathogenetic role of the novel polyomaviruses, their tissue tropism, route of transmission and site of latency.

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