



BK and JC Virus DNA, Real-Time PCR

JC Qualitative: 17220X
JC Qualitative and BK Qualitative: 11068X
BK Quantitative: 11274Z

Clinical Use

- Detect and monitor BK virus infection
- Detect and monitor JC virus infection

Clinical Background

BK virus (BKV) and JC virus (JCV) are double-stranded DNA, human polyomaviruses. More than 70% of the adult population has antibodies to BKV and JCV, with primary infections typically occurring in childhood.¹ In the US, 50% of children develop antibodies to BKV by 3 to 4 years of age and to JCV by 10 to 14 years of age.¹ In immunocompetent individuals, primary BKV infections usually cause a mild respiratory illness and, rarely, cystitis, whereas primary JCV infections are typically asymptomatic. After initial infection, polyomaviruses establish latency in various tissues. The primary sites of latency are uroepithelial cells for BK virus and B-lymphocytes and renal tissue for JCV. Additional sites of latency for both viruses include the ureters, brain, and spleen. BKV and JCV viremia is found in up to 3% of pregnant women but is not associated with disease.¹

Reactivation of latent as well as primary BKV and JCV infections may occur in immunocompromised individuals. BKV infections can lead to interstitial nephritis, hemorrhagic cystitis, and kidney allograft rejection.²⁻⁴ BKV nephropathy is associated with BK viremia of $>5,000$ copies/mL (plasma) and BK viruria $>10^7$ copies/mL and is seen in approximately 8% of kidney transplant recipients.² Though latency is typically associated with the absence of viremia, low levels ($<2,000$ copies/mL, plasma) are seen in some asymptomatic individuals.² JCV is responsible for progressive multifocal leukoencephalopathy, a fatal demyelinating disease of the central nervous system seen in up to 70% of AIDS patients.⁵ Additionally, BKV and JCV viruria are found in approximately 40% of bone marrow transplant patients.²⁻⁴

PCR detects the presence of the virus, not antibodies to the virus; thus, the detection of viral DNA may be indicative of an active infection. The identification of viral DNA may warrant the institution of antiviral therapies and/or a decrease of immunosuppressive therapies.²⁻⁴ Determination of viral DNA presence or concentration is also useful in establishing the cause of allograft rejection.²⁻⁴

Individuals Suitable for Testing

- Transplant recipients receiving immunosuppressive therapies
- Individuals with immunosuppressive diseases, eg, AIDS

Specimen Requirements

0.7 mL frozen urine or potassium EDTA plasma (white-top tube); 0.3 mL minimum. Alternately, submit serum or CSF.

Method

- Real-time polymerase chain reaction
- DNA primers and fluorogenic probes directed at highly conserved sequences of the BKV and JCV genomes
- Analytical sensitivity: varies with specimen type and organism; contact Quest Diagnostics Nichols Institute (1-800-NICHOLS) for more information.
- Analytical specificity: no cross-reactivity with 20 viral and non-viral pathogens
- Reportable range (Quantitative BKV): 500 to 39,000,000 copies/mL
- CPT codes*: BK Quantitative, 87799; JC Qualitative, 87798; JC Qualitative and BK Qualitative, 87798 (x2)

Reference Range

Qualitative: not detected

Quantitative: <500 copies/mL

Interpretive Information

A *not detected* result in the BKV and JCV qualitative assays indicates viral DNA either is not present in the specimen or is present at a concentration below the assay's limit of detection. A *detected* result indicates viral DNA is present. Similarly, in the BKV quantitative assay, a result <500 copies/mL indicates viral DNA is not present in the sample or the concentration is less than the detectable limit.

Inhibitors present indicates the presence of non-specific PCR inhibitors in the sample. Inhibitors will slow the PCR reaction and may result in falsely decreased values.

An increase or decrease in viral DNA concentration may indicate a worsening or resolution of an active infection, respectively. While the presence of viral DNA may indicate

an active infection, DNA results should not be the sole basis for diagnosis of active infection, as low viral concentrations are sometimes seen in asymptomatic individuals.^{2,3} Results should be interpreted in conjunction with other laboratory and clinical findings.

References

1. Kazory A, Ducloux D. Renal transplantation and polyomavirus infection: recent clinical facts and controversies. *Transpl Infect Dis.* 2003;5:65-71.
2. Randhawa P, Ho A, Shapiro R, et al. Correlates of quantitative measurement of BK polyomavirus (BKV) DNA with clinical course of BKV infection in renal transplant patients. *J Clin Microbiol.* 2004;42:1176-1180.
3. Ramos E, Drachenberg CB, Papadimitriou JC, et al. Clinical course of polyoma virus nephropathy in 67 renal transplant patients. *J Am Soc Nephrol.* 2002;13:2145-2151.
4. Randhawa P, Shapiro R, Vatas A. Quantitation of DNA of polyomaviruses BK and JC in Human Kidneys. *J Infect Dis.* 2005;192:504-509.
5. Seth P, Diaz F, Major E. Advances in the biology of JC virus and induction of progressive multifocal leukoencephalopathy. *J Neurovirol.* 2003;9:236-246.

*The CPT codes provided are based on AMA guidelines and are for informational purposes only. CPT coding is the sole responsibility of the billing party. Please direct any questions regarding coding to the payor being billed.

This test was developed and its performance characteristics determined by Quest Diagnostics Nichols Institute. It has not been cleared or approved by the U.S. Food and Drug Administration. The FDA has determined that such clearance or approval is not necessary. Performance characteristics refer to the analytical performance of the test.

Polymerase chain reaction (PCR) is performed pursuant to a license agreement with Roche Molecular Systems, Inc.

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TS1757-HS 09/2005