

JAK2 (Janus kinase 2) - V617F mutation, quantitative detection

ORDERING INFORMATION

REF: *ONC-012-25 RDM Code: 2256685/R*
Tests: 25 Reactions: 38
REF: *ONC-012-50 RDM Code: 1775837/R*
Tests: 50 Reactions: 76
CND Code: *W01060299*
Manufacturer: *BioMol Laboratories s.r.l.*

CONTENTS OF THE KIT

The kit consists of reagents for Real-Time PCR amplification
* the reagents for the extraction of genomic DNA are not supplied in the kit

For in vitro diagnostic use



PRODUCT CHARACTERISTICS

Device belonging to the family of in vitro medical devices **REAL-TIME QUANTITATIVE PCR-SOMATIC MUTATIONS**. Relative quantitative detection of the V617F mutation of the JAK2 (Janus kinase 2) gene by Real-Time PCR technique. Optimized Kit for Biorad CFX96, Biorad Opus Dx and Agilent AriaDx Real-Time PCR.

SCIENTIFIC BACKGROUND

Myeloproliferative neoplasms (MPNs) are hematologic malignancies characterized by the proliferation of one or more myeloid lineages: granulocytic, erythroid, megakaryocytic, and/or mast cell.

The JAK (Janus Kinases) family of enzymes includes JAK1, JAK2, JAK3, and TYK2. These molecules bind to the cytosolic domains of cytokine receptors and are essential for the message transduction of cytokines and growth factors.

Polycythemia vera (PV), idiopathic myelofibrosis (PMF), and essential thrombocythemia (ET) show shared phenotypic features (MPN BCR/ABL neg) that result from direct or indirect constitutive activation of the related tyrosine kinase JAK2 to the hematopoietic growth factor receptors for erythropoietin (EPOR) and thrombopoietin (MPL) and to the G-CSF (Granulocyte Colony-Stimulating Factor) receptor.

§ Cancers (Basel). 2024 Apr 26;16(9):1679. Advances in Molecular Understanding of Polycythemia Vera, Essential Thrombocythemia, and Primary Myelofibrosis: Towards Precision Medicine

§ Front. Pharmacol. 22 July 2024 Sec. Pharmacogenetics and Pharmacogenomics Volume 15 - 2024

§ Ir J Med Sci. 2024 Aug 14. Association between JAK2V617F variable allele frequency and risk of thrombotic events in patients with myeloproliferative neoplasms

§ Myelofibrosis Blood, 20 APRIL 2023 | VOLUME 141, NUMBER 16 1

§ Diagnostics (Basel). 2023 Jan 3;13(1):163. doi: 10.3390/diagnostics13010163. Molecular Genetics of Thrombotic Myeloproliferative Neoplasms: Implications in Precision Oncology

§ Ann Hematol. 2019 May;98(5):1111-1118. International external quality assurance of JAK2 V617F quantification

§ Genetic basis and molecular pathophysiology of classical myeloproliferative neoplasms. Blood. 2017 Feb 9;129(6):667-679. Review.

§ The 2016 revision to the World Health Organization classification of myeloid neoplasms and acute leukemia. Blood. 2016 May 19;127(20):2391-405. Epub 2016 Apr 11.

§ Mutations in MPNs: prognostic implications, window to biology, and impact on treatment decision. Hematology Am Soc Hematol Educ Program. 2016 Dec 2;2016(1):552-560.

§ Classification and diagnosis of myeloproliferative neoplasms: the 2008 World Health Organization criteria and point-of-care diagnostic algorithms. Leukemia. 2008 Jan;22(1):14-22. Epub 2007 Sep 20. Review.

CLINICAL SIGNIFICANCE

Direct activation of JAK2 is caused by a point mutation (V617F in exon 14 JAK2 or, less commonly, by insertions or deletions in exon 12 of the JAK2 gene). Indirect activation, on the other hand, is caused by point mutations in the thrombopoietin receptor, MPL or by mutations in the gene CALR chaperone calreticulin (CALR) that allow to bind MPL and activate JAK2 indirectly. The JAK2 V617F mutation is the result of a substitution of a guanine in thymine to the nucleotide 1849 of the exon 14 of the JAK2 gene, which causes a single valine/phenylalanine amino acid substitution at codon 617. The mutation causes a kinase activity of JAK2 ligand-independent. This mutation can be found in about 70% of chromosome-Philadelphia negative MPNs (Ph-MPDs): it is present in 65-95% of patients with PV, 23-57% of patients with ET and 35-50% of patients with PMF. 20-30% of patients with polycythemia vera become homozygous due to mutation through a mechanism of loss of heterozygosity.

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DESCRIPTION	LABEL	VOLUME		STORAGE
		ONC-012-25	ONC-012-50	
Mix oligonucleotides and probes	Mix V617F JAK2 10X	1 x 95 µl	2 x 95 µl	- 20 °C
Mix buffer and Taq-polymerase enzyme	Mix Real-Time PCR 5X	1 x 190 µl	2 x 190 µl	- 20 °C
Deionized H ₂ O	Deionized H ₂ O	1 x 1 ml	2 x 1 ml	- 20 °C
Genomic DNA or recombinant DNA-standard	CAL 1 (Standard 1) (600000 copies) V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA-standard	CAL 2 (Standard 2) (60000 copies) V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA-standard	CAL 3 (Standard 3) (6000 copies) V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA-standard	CAL 4 (Standard 4) (600 copies) V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA Control 1	Control 1 Range 40-70% MUT V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA Control 2	Control 2 MUT 100% V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C
Genomic DNA or recombinant DNA Control 3	Control 3 WT 100% V617F JAK2	1 x 22 µl	2 x 22 µl	- 20 °C

TECHNICAL CHARACTERISTICS

COD. ONC-012-25 / COD. ONC-012-50

STABILITY	18 months
REAGENTS STATUS	Ready to use
BIOLOGICAL MATRIX	Genomic DNA extracted from whole blood, tissue, cells
CONTROLS	Recombinant DNA for at least 3 analytical sessions (ONC-012-25) Recombinant DNA for at least 6 analytical sessions (ONC-012-50)
STANDARD CURVE	Recombinant DNA, 4 points at known concentration from 300 to 300000 copies for each allele. Standard curve unique for both alleles. Result of the analysis as allele burden (% MUT/WT+ MUT).
TECHNOLOGY	Real-time PCR; oligonucleotides and specific probes for the wt allele and the mutated allele in multiplex PCR; a single reaction for both alleles; 2 FAM/HEX fluorescence channels
VALIDATED INSTRUMENTS	Biorad CFX96 Dx, Biorad Opus Dx and Agilent AriaDx
RUNNING TIME	110 min
THERMAL CYCLING PROFILE	1 cycle at 95 °C (10 min); 50 cycles at 95 °C (15 sec) + 60 °C (1 min)
ANALYTICAL SPECIFICITY	Absence of non-specific pairings of oligonucleotides and probes; absence of cross-reactivity
LIMIT OF DETECTION (LOD)	≥ 0,025 ng of genomic DNA; ≥ 2% JAK2 (MUT) versus JAK2 (WT); ≥ 10 copies; validated with the WHO 1st International Reference Panel for Genomic JAK2 V617F (National Institute for Biological Standards and Control NIBSC)
LIMIT OF BLANK (LOB)	0% NCN
REPRODUCIBILITY	99,9%
DIAGNOSTIC SPECIFICITY / DIAGNOSTIC SENSITIVITY	100%/98%