Dean's diagnosis
DIAN DIAGNOSTICS

Dean Medical Laboratory Report

DIAN Medical Laboratory Test Report

MPN mutation 4-item test package

nspection unit: Shanghai Songjiang District Central Hospital

Dean Code: 990129401857

Name:Yindi Miao
gender:Female
Age: 79 years old

Type of Visit: Inpatient

Submitting Doctor: Zhu Ruifeng

Department / Bed Number: Hepatology Ward / 5306
Outpatient / Inpatient Number: 77000464419
Clinical Diagnosis: Infectious fever, gallstones, Grade 1 hypertension (high)

Customer Code: 77000464419
Sample Type: EDTA-anticoagulated peripheral blood, bone
Sample Status: Normal appearance

Item Name	Gene	Region Tested	Result	Variant Type	Variant Classification
MPN Mutation 4-Item Detection Package	JAK2	V617F	negative 0.00%	/	/
	CALR	Exon9	No mutations found	/	/
	JAK2	Exon12	No mutations found	/	/
	MPL	Exon10	No mutations found	/	/

ıg methods and equipment

Sanger Sequencing Technology, Sanger Sequencing Method, Digital PCR / ABI 3500

Explain and recomm

1. JAK2 gene mutations occur in various myeloproliferative neoplasms (MPNs) and other hematological malignancies. The main mutation site is the JAK2 gene c.1849G>T (V617F) mutation, as well as JAK2 exon 12 mutations. In the 2008 WHO classification system, the presence or absence of JAK2 mutations became a major indicator for diagnosing MPN.

2. The JAK2 V617F mutation is located on JAK2 exon 14 and has a high mutation rate in BCR-ABL negative MPNs. The positive rate is over 90% in patients with polycythemia vera (PV) and reaches 60% in patients with essential thrombocythemia (ET) and essential myelofibrosis (PMF).

3. Detecting JAK2 V617F mutations can help understand the condition of MPN and predict prognosis. It can also monitor minimal residual disease and indicate relapse.

1) JAK2 V617F, as a molecular marker, can be more effectively used for the diagnosis of myeloproliferative disorders such as PV and ET. For individuals who are JAK2 V617F negative, it is recommended to further investigate gene mutations in CALR, MPL, and JAK2-12 exons, as well as NGS mutation tests for other related myeloid genes. If all results are negative, secondary causes need to be ruled out.

2) JAK2 V617F mutations provide information for targeted therapy of leukemia; positive patients can be treated with corresponding drug inhibitors.

3) After treatment, patients can have their JAK2 V617F mutations tested regularly for minimal residual disease (MRD) monitoring and efficacy monitoring, and to observe disease relapse.

2. Exon 12 of JAK2 gene

1. JAK2 gene mutations occur in various myeloproliferative neoplasms (MPNs), including polycythemia vera (PV), essential thrombocythemia (ET), and essential myelofibrosis. PMF and other hematologic malignancies are mainly caused by JAK2 V617F mutations and JAK2 exon 12 mutations. In the 2008 WHO classification system, the presence or absence of JAK2 mutations is a primary indicator for diagnosing MPN.

2. JAK2 exon 12 mutations occur in approximately 3% of PV patients and are rare in ET and PMF, and can be used as an auxiliary diagnostic indicator for PV patients.

3. The NCCN guidelines clearly state that patients who are negative for JAK2 gene V617F and have erythropoietin (EPO) levels below normal should be screened for JAK2 exon 12 mutations to diagnose PV.

3. CALR gene

1. The CALR gene is located on chromosome 19p13.13, encoding a calreticulin that participates in multiple biological processes such as cell proliferation, apoptosis, and immune responses. CALR gene mutations are mainly concentrated in exon 9, with the most common being L367fs*46 and K385fs*47 mutations (accounting for approximately 85% of all mutation types).

2. CALR gene mutations are characteristic mutations of myeloproliferative neoplasms (MPN), mainly seen in MPN patients and rarely in patients with myelodysplastic syndromes (MDS).

3. CALR mutations are specific molecular markers for MPN patients who are negative for JAK2 and MPL mutations, providing a basis for treatment selection. Combined detection of JAK2, MPL, and CALR gene mutations can achieve a positive rate of up to 97% in MPN patients.

Inspector: Yao Li
Reviewer: Xu Yang
Laboratory: Hangzhou Dian

Special seal for inspection

Sampling Time: 2025-11-21 11:26
Receiving Time: 2025-11-21 18:19
Reporting Time: 2025-11-24 17:11

Address: Building 1, No. 329, Jinpeng Street, Sandun Town, Xihu District, Hangzhou
Tel: 4007118000
Receiving Unit: Shanghai Dian Medical Laboratory

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4. MPL gene

1. Thrombopoietin receptor (MPL) is one of the homologous receptors of JAK2, playing an important role in regulating megakaryocyte maturation while regulating myeloid cell proliferation. It has been found that changes in the nucleotide sequence of the MPL gene can lead to a change in amino acid position 515 from tryptophan (W) to leucine (L) or lysine (K) (denoted as MPL W515L/K).

2. Foreign researchers have discovered that some patients with myeloproliferative neoplasms (MPNs) have a mutation in the MPL codon 515. The positive rates of MPL W515L/K in ET and PMF are 5% and 5%, respectively.

10%. This test is used to assist in the clinical diagnosis and differential diagnosis of MPN.

3. When diagnosing essential thrombocytosis (ET) and essential myelofibrosis (PMF), if the JAK2 V617F mutation is negative, it is recommended to screen for clonal markers such as CALR gene exon 9 and MPL W515L/K.

4. For MPL W515L/K, given its relative specificity in PMF, it has been recommended for inclusion in the WHO's main diagnostic indicators for PV and PMF.

(1) The testing scope of this project includes: JAK2 gene V617F mutations, common mutation types in JAK2 gene exon 12, all mutations in CALR gene exon 9, and MPL gene W515L/K mutations. Mutations at other sites are not included in this test.

(2) JAK2 V617F is detected using digital PCR, with a reporting limit of 0.01%.

(3) JAK2 exon 12, CALR exon 9, and MPL W515L/K are analyzed using Sanger sequencing. Due to methodological limitations, mutations below 20% cannot be effectively detected.

(4) This test result is negative. The possibility of other rare mutations in the patient cannot be ruled out. Please make a comprehensive judgment based on morphological, cytogenetic, or other test results and clinical symptoms.

References

[1] NCCN Clinical Practice Guidelines in Oncology (NCCN Guidelines®) in Myeloproliferative Neoplasms, Version 3.2022.

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[3] Klampfl T, et al. Somatic mutations of calreticulin in myeloproliferative neoplasms. N Engl J Med 2013; 369:2379–2390.

[4] Tefferi A, Vardiman JW. 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. doi: 10.1038/sj.leu.2404955.

[5] Kralovics R, et al. A gain-of-function mutation of JAK2 in myeloproliferative disorders. N Engl J Med. 2005 Apr 28;352(17):1779-90. doi: 10.1056/NEJMoa051113. PMID: 15858187.

[6] Beer PA, et al. MPL mutations in myeloproliferative disorders: analysis of the PT-1 cohort. Blood 2008; 112:141–149.

[7] Rumi E, et al. Clinical effect of driver mutations of JAK2, CALR, or MPL in primary myelofibrosis. Blood 2014; 124:1062–1069.

[8] Barbui, T, et al. The 2016 WHO classification and diagnostic criteria for myeloproliferative neoplasms: document summary and in-depth discussion. Blood Cancer Journal 8, 15 (2018). https://doi.org/10.1038/s41408-018-0054-y.

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Report Service

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