t(4;9)(q21.22;p24) SEC31A/JAK2

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Abstract
Review on t(4;9)(q21.22;p24) SEC31A/JAK2, with data on clinics, and the genes involved.

KEYWORDS
Chromosome 4; chromosome 9; translocation; SEC31A; JAK2; Hodgkin Lymphoma

Clinics and pathology

Disease
Hodgkin Lymphoma

Phenotype/cell stem origin
Hodgkin and Reed-Sternberg cells, which derive from pre-apoptotic crippled germinal center (GC) B-cells, are positive for CD30, CD15, CD40 and IRF4/MUM1

Epidemiology
Hodgkin lymphoma itself is common, but this particular translocation may be rare within the disorder. However, it is not often assayed for; found in 2/131 cHL cases examined: a M/31 with nodular sclerosis cHL, alive 60 mths after diagnosis; and a M/83 with lymphocyte-depleted cHL who died at day 14 (Van Roosbroeck et al, 2011).

Treatment
SEC31A/JAK2 acts as a constitutively activated tyrosine kinase and is sensitive to JAK2 inhibition

Prognosis
Yet unknown.

Cytogenetics

Cytogenetics morphological
JAK2 breakapart (commonly available).

Genes involved and proteins

SEC31A (SEC31 homolog A, COPII coat complex component)

Location
4q21.22

DNA/RNA
gene is 72,606 bp with 25 exons; transcribed from the - strand; coding region is 62,863 bp with 24 exons

Protein
1166 amnio acids. Protein transport protein SEC31A is ubiquitously expressed and forms part of the coat protein complex II (COPII) which is comprised of at least four other proteins in addition to SEC31A this complex is involved in formation of transport vesicles from the ER to Golgi. Protein localized to the cytoplasmic side of the cell membrane and is GTP-dependent.

JAK2 (janus kinase 2)

Location
9p24.1

DNA/RNA

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143,098 bp with 24 exons; transcribed from the + strand; coding region is 104,804 bp with 23 exons.

**Protein**
Protein is 1132 amino acids with multiple functional domains; regulated by auto-phosphorylation. Non-receptor protein tyrosine kinase, ubiquitously expressed.

**Germinal mutations**
Germline mutations associated with autosomal dominant Familial Thrombocythemia

**Somatic mutations**
'Gain of Function' V617F mutation and mutations in exon 12 of the gene common in patients with Polycythemia Vera, Myelofibrosis with Myeloid Metaplasia or idiopathic erythrocytosis.

**Result of the chromosomal anomaly**

**Hybrid gene**

**Note**
Fusion results in 5' SEC31A fused to 3' partner gene JAK2

**Description**
Exon 22 SEC31A is fused with exon 17 of JAK2 in the two reported cases (Van Roosbroeck et al, 2011)

**Detection**
FISH using JAK2 and SEC31A breakapart probes, rtpCR or RNAseq.

**Fusion protein**

**Oncogenesis**
The fusion protein is a constitutively activated tyrosine kinase: JAK2 activation is mediated by a domain region of SEC31A that lies between the WD-40-like and proline-rich domains of the protein (Van Roosbroeck et al, 2011).

**References**


This article should be referenced as such: