

## Leukaemia Section

### Mini Review

# t(8;14)(q24;q11)

Jacques Boyer

Laboratoire d'Hématologie, CH du MANS, France (JB)

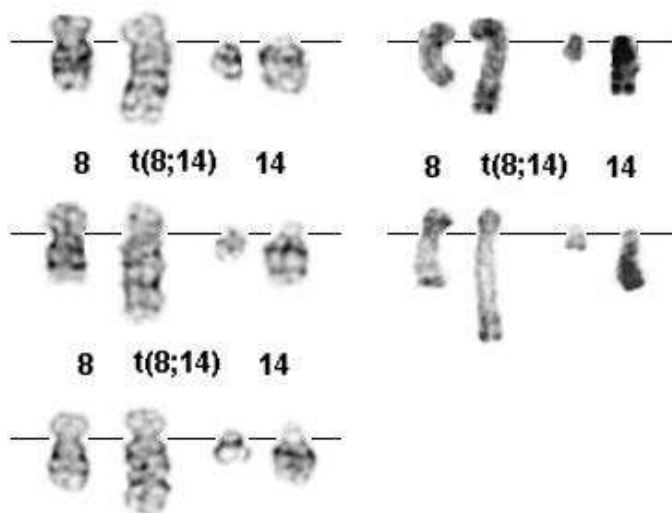
Published in Atlas Database: April 2001

Online updated version : <http://AtlasGeneticsOncology.org/Anomalies/t0814ID1061.html>

DOI: 10.4267/2042/37757

This work is licensed under a Creative Commons Attribution-Noncommercial-No Derivative Works 2.0 France Licence.  
© 2001 Atlas of Genetics and Cytogenetics in Oncology and Haematology

## Identity



t(8;14)(q24;q11) G-banding - courtesy Charles Bangs and Leena Borkar, and R-banding (right) - courtesy Jacques Boyer.

## Clinics and pathology

### Disease

Acute lymphoblastic leukemia (ALL), (rare lymphoblastic lymphoma).

### Phenotype/cell stem origin

T lineage (TCR alpha beta + or TCR gamma delta). May be early-B lineage: conceivably the rare cases with early-B lineage represent a bipotential B-T lineage.

### Epidemiology

Rare: prevalence 0.5 to 1.3 % among all cases off ALL and about 2% among T ALL; male predominance; median age 5 years.

### Clinics

Bulky extramedullary leukemia, central nervous system (CNS) infiltration.

### Cytology

High white blood cell count.

### Prognosis

The disease progress rapidly and response to conventional therapy is poor, median survival 11 months.

## Cytogenetics

### Additional anomalies

Sole anomaly in half cases; additional anomalies are variable.

## Genes involved and proteins

### Note

On the molecular point of view the proto oncogen c-myc is juxtaposed with the gene of the T-cell receptor alpha chain (TCR-alpha).

### C-MYC

**Location:** 8q24

### DNA/RNA

c-myc has three exons, two promoters P1 and P2 control the c-myc transcription.

### Protein

Myc protein is a transcription factor of the helix loop leucine zipper family that activates transcription as obligate heterodimer with a partner protein, Max.

### TCR -alpha and TCR-delta

**Location:** 14q11.2

### DNA/RNA

The TCR delta variable (V) diversity (D) joining (J) and constant region genes are situated within the TCR alpha locus between the TCR alpha V and the TCR alpha J segments. The TCR alpha/delta locus is transcribed in a centromere to telomere direction.

### Protein

T-cell receptor.

## Result of the chromosomal anomaly

### Hybrid gene

#### Description

The majority of breakpoints are localised within the TCR delta gene although they may also involve TCR alpha J and rarely TCR alpha V. The 3' part of the TCR alpha gene is relocated downstream of the c-myc protooncogene. The c-myc oncogene is not structurally altered.

#### Transcript

Detection of TCR alpha rearrangements is hampered by the large number of J segments.

### Fusion protein

#### Note

No fusion protein but promoter exchange.

#### Description

High levels of electrophoretically normal p64 and p67 c-myc proteins are detected and both products keep their instability. Preferential utilization of P2 is maintained.

#### Oncogenesis

The activation of the gene myc is likely to result from its juxtaposition to the enhancer element of the TCR

alpha gene with stimulates constitutive synthesis of normal c-myc.

## To be noted

### Note

The identification of a breakpoint to the 3' side of c-myc suggest that this translocation is analogous to the t(2;8) and t(8;22) in Burkitt lymphoma. It is hypothesized that quantitative alteration of c-myc transcription alone may be sufficient for altered growth.

## References

Mathieu-Mahul D, Caubet JF, Bernheim A, Mauchauffé M, Palmer E, Berger R, Larsen CJ. Molecular cloning of a DNA fragment from human chromosome 14(14q11) involved in T-cell malignancies. *EMBO J*. 1985 Dec 16;4(13A):3427-33

Erikson J, Finger L, Sun L, ar-Rushdi A, Nishikura K, Minowada J, Finan J, Emanuel BS, Nowell PC, Croce CM. Deregulation of c-myc by translocation of the alpha-locus of the T-cell receptor in T-cell leukemias. *Science*. 1986 May 16;232(4752):884-6

Mathieu-Mahul D, Sigaux F, Zhu C, Bernheim A, Mauchauffé M, Daniel MT, Berger R, Larsen CJ. A t(8;14)(q24;q11) translocation in a T-cell leukemia (L1-ALL) with c-myc and TcR-alpha chain locus rearrangements. *Int J Cancer*. 1986 Dec 15;38(6):835-40

McKeithan TW, Shima EA, Le Beau MM, Minowada J, Rowley JD, Diaz MO. Molecular cloning of the breakpoint junction of a human chromosomal 8;14 translocation involving the T-cell receptor alpha-chain gene and sequences on the 3' side of MYC. *Proc Natl Acad Sci U S A*. 1986 Sep;83(17):6636-40

Shima EA, Le Beau MM, McKeithan TW, Minowada J, Showe LC, Mak TW, Minden MD, Rowley JD, Diaz MO. Gene encoding the alpha chain of the T-cell receptor is moved immediately downstream of c-myc in a chromosomal 8;14 translocation in a cell line from a human T-cell leukemia. *Proc Natl Acad Sci U S A*. 1986 May;83(10):3439-43

Bernard O, Larsen CJ, Hampe A, Mauchauffé M, Berger R, Mathieu-Mahul D. Molecular mechanisms of a t(8;14)(q24;q11) translocation juxtaposing c-myc and TcR-alpha genes in a T-cell leukaemia: involvement of a V alpha internal heptamer. *Oncogene*. 1988 Feb;2(2):195-200

Park JK, McKeithan TW, Le Beau MM, Bitter MA, Franklin WA, Rowley JD, Diaz MO. An (8;14)(q24;q11) translocation involving the T-cell receptor alpha-chain gene and the MYC oncogene 3' region in a B-cell lymphoma. *Genes Chromosomes Cancer*. 1989 Sep;1(1):15-22

Inaba T, Murakami S, Oku N, Itoh K, Ura Y, Nakanishi S, Shimazaki C, Nishio A, Nakagawa M, Fujita N. Translocation between chromosomes 8q24 and 14q11 in T-cell acute lymphoblastic leukemia. *Cancer Genet Cytogenet*. 1990 Oct 1;49(1):69-74

Isobe M, Sadamori N, Russo G, Shimizu S, Yamamori S, Itoyama T, Yamada Y, Ikeda S, Ichimaru M, Kagan J. Rearrangements in the human T-cell-receptor alpha-chain locus in patients with adult T-cell leukemia carrying translocations involving chromosome 14q11. *Cancer Res*. 1990 Oct 1;50(19):6171-5

Soudon J, Bernard O, Mathieu-Mahul D, Larsen CJ. c-myc gene expression in a leukemic T-cell line bearing a t(8;14)(q24;q11) translocation. *Leukemia*. 1991 Jan;5(1):60-5

Cigudosa JC, Calasanz MJ, Gullón A, Prósper F, Cuesta B, Rifón J, Rocha E. A new case of acute lymphoblastic leukemia B-cell type with chromosomal rearrangements involving the T-cell receptor breakpoint at band 14q11. *Am J Hematol.* 1992 Oct;41(2):137-9

Kasai M, Maziarz RT, Aoki K, Macintyre E, Strominger JL. Molecular involvement of the pvt-1 locus in a gamma/delta T-cell leukemia bearing a variant t(8;14)(q24;q11) translocation. *Mol Cell Biol.* 1992 Oct;12(10):4751-7

Lange BJ, Raimondi SC, Heerema N, Nowell PC, Minowada J, Steinherz PE, Arenson EB, O'Connor R, Santoli D. Pediatric leukemia/lymphoma with t(8;14)(q24;q11). *Leukemia.* 1992 Jul;6(7):613-8

Secker-Walker LM, Campana D, Hawkins JM, Sampson RE, Coustan-Smith E. Karyotype and T-cell receptor expression in

T-lineage acute lymphoblastic leukemia. *Genes Chromosomes Cancer.* 1992 Jan;4(1):41-5

. Cytogenetic abnormalities in adult acute lymphoblastic leukemia: correlations with hematologic findings outcome. A Collaborative Study of the Group Français de Cytogénétique Hématologique. *Blood.* 1996 Apr 15;87(8):3135-42

Shima-Rich EA, Harden AM, McKeithan TW, Rowley JD, Diaz MO. Molecular analysis of the t(8;14)(q24;q11) chromosomal breakpoint junctions in the T-cell leukemia line MOLT-16. *Genes Chromosomes Cancer.* 1997 Dec;20(4):363-71

---

*This article should be referenced as such:*

Boyer J. t(8;14)(q24;q11). *Atlas Genet Cytogenet Oncol Haematol.* 2001; 5(3):190-192.

---