Stanford



Michael Cleary

Lindhard Family Professor of Pediatric Cancer Biology and Professor of Pathology, Emeritus

NIH Biosketch available Online

Bio

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Pathology
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute

ADMINISTRATIVE APPOINTMENTS

- Director of Pediatric Cancer Biology, Stanford University School of Medicine - Pediatrics, (2002- present)
- Associate Chair for Experimental Pathology, Stanford University School of Medicine - Pathology, (2004- present)

PROFESSIONAL EDUCATION

- B.A., The College of Wooster , Chemistry (1974)
- M.S., The University of South Carolina , Chemistry (1976)
- M.D., The University of Cincinnati , Medicine (1981)

LINKS

- Cleary Lab home page: https://web.stanford.edu/group/cleary

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our research focuses on developmental pathways that regulate hematopoietic cell growth and differentiation and are disrupted in the course of neoplastic transformation, particularly in leukemias and lymphomas. We employ a variety of experimental systems for our studies ranging from molecular biology to transgenic and knockout mice. Our current interests are:

1) Characterize novel families of oncoproteins (Pbx and Meis) that dimerize with and regulate the DNA binding properties of Hox proteins. We are investigating how Pbx and Meis proteins contribute to the specificity of Hox function in development and how disruption of their activities leads to neoplasia.

2) We have discovered a group of oncoproteins that are implicated in long-term maintenance of gene expression through their effects on the state of chromatin. We are studying the role that normal chromatin structure plays in gene regulation in hematopoietic cells and how its disruption leads to altered development and cancer.

3) We are defining the properties of cancer stem cells that initiate and sustain the unique disease features of acute leukemias through the use of various adoptive animal models.

Our studies have demonstrated that several of the proteins encoded by cellular oncogenes function in fundamental aspects of gene regulation. These are frequently activated by fusion to other transcriptional proteins resulting in chimeric transcription factors. We are studying the effects and consequences of protein fusion on the transcriptional and transforming activities of these proteins using in vitro and animal models.

In addition to these basic issues concerning leukemia pathogenesis, we are devising new diagnostic procedures for detecting and monitoring leukemia patients based on molecular genetic abnormalities in the malignant cells.

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Cancer Biology (PhD Program)
- Immunology (PhD Program)

Publications

PUBLICATIONS

- **GSK-3 Promotes Conditional Association of CREB and Its Coactivators with MEIS1 to Facilitate HOX-Mediated Transcription and Oncogenesis** *CANCER CELL*
  Wang, Z., Iwasaki, M., Ficara, F., Lin, C., Matheny, C., Wong, S. H., Smith, K. S., Cleary, M. L.
  2010; 17 (6): 597-608
- **Hierarchical Maintenance of MLL Myeloid Leukemia Stem Cells Employs a Transcriptional Program Shared with Embryonic Rather Than Adult Stem Cells** *CELL STEM CELL*
  Somervaille, T. C., Matheny, C. J., Spencer, G. J., Iwasaki, M., Rinn, J. L., Witten, D. M., Chang, H. Y., Shurtleff, S. A., Downing, J. R., Cleary, M. L.
  2009; 4 (2): 129-140
- **Glycogen synthase kinase 3 in MLL leukaemia maintenance and targeted therapy** *NATURE*
  Wang, Z., Smith, K. S., Murphy, M., Piloto, O., Somervaille, T. C., Cleary, M. L.
  2008; 455 (7217): 1205-U29
- **Menin critically links MLL proteins with LEDGE on cancer-associated target genes** *CANCER CELL*
  Yokoyama, A., Cleary, M. L.
  2008; 14 (1): 36-46
- **Pbx1 regulates self-renewal of long-term hematopoietic stem cells by maintaining their quiescence** *CELL STEM CELL*
  Ficara, F., Murphy, M. J., Lin, M., Cleary, M. L.
  2008; 2 (5): 484-496
- **Identification and characterization of leukemia stem cells in murine MLL-AF9 acute myeloid leukemia** *CANCER CELL*
  Somervaille, T. C., Cleary, M. L.
  2006; 10 (4): 257-268
- **The menin tumor suppressor protein is an essential oncogenic cofactor for MLL-associated leukemogenesis** *CELL*
  Yokoyama, A., Somervaille, T. C., Smith, K. S., Rozenblatt-Rosen, O., Meyerson, M., Cleary, M. L.
  2005; 123 (2): 207-218
- **Bmi-1 regulation of INK4A-ARF is a downstream requirement for transformation of hematopoietic progenitors by E2a-Pbx1** *MOLECULAR CELL*
  Smith, K. S., Chanda, S. K., Lingbeek, M., Ross, D. T., Botstein, D., van Lohuizen, M., Cleary, M. L.

2003; 12 (2): 393-400

- **MicroRNA programs in normal and aberrant stem and progenitor cells** *GENOME RESEARCH*
  Arnold, C. P., Tan, R., Zhou, B., Yue, S., Schaffert, S., Biggs, J. R., Doyonnas, R., Lo, M., Perry, J. M., Renault, V. M., Sacco, A., Somervaille, T., Viatour, et al
  2011; 21 (5): 798-810
- **A Novel Gli3 Enhancer Controls the Gli3 Spatiotemporal Expression Pattern through a TALE Homeodomain Protein Binding Site** *MOLECULAR AND CELLULAR BIOLOGY*
  Coy, S., Caamano, J. H., Carvajal, J., Cleary, M. L., Borycki, A.
  2011; 31 (7): 1432-1443
- **Binding of the MLL PHD3 Finger to Histone H3K4me3 Is Required for MLL-Dependent Gene Transcription** *JOURNAL OF MOLECULAR BIOLOGY*
  Chang, P., Hom, R. A., Musselman, C. A., Zhu, L., Kuo, A., Gozani, O., Kutateladze, T. G., Cleary, M. L.
  2010; 400 (2): 137-144
- **Self-association mediated by the Ras association 1 domain of AF6 activates the oncogenic potential of MLL-AF6** *BLOOD*
  Liedtke, M., Ayton, P. M., Somervaille, T. C., Smith, K. S., Cleary, M. L.
  2010; 116 (1): 63-70
- **The miR-17-92 microRNA Polycistron Regulates MLL Leukemia Stem Cell Potential by Modulating p21 Expression** *CANCER RESEARCH*
  Wong, P., Iwasaki, M., Somervaille, T. C., Ficara, F., Carico, C., Arnold, C., Chen, C., Cleary, M. L.
  2010; 70 (9): 3833-3842
- **Essential Role for Pbx1 in Corneal Morphogenesis** *INVESTIGATIVE OPHTHALMOLOGY & VISUAL SCIENCE*
  Murphy, M. J., Polok, B. K., Schorderet, D. F., Cleary, M. L.
  2010; 51 (2): 795-803
- **Regulating the leukaemia stem cell** *BEST PRACTICE & RESEARCH CLINICAL HAEMATOLOGY*
  Cleary, M. L.
  2009; 22 (4): 483-487
- **Therapeutic targeting of MLL** *BLOOD*
  Liedtke, M., Cleary, M. L.
  2009; 113 (24): 6061-6068
- **Pbx1 functions in distinct regulatory networks to pattern the great arteries and cardiac outflow tract** *DEVELOPMENT*
  Chang, C., Stankunas, K., Shang, C., Kao, S., Twu, K. Y., Cleary, M. L.
  2008; 135 (21): 3577-3586
- **Pbx/Meis deficiencies demonstrate multigenetic origins of congenital heart disease** *CIRCULATION RESEARCH*
  Stankunas, K., Shang, C., Twu, K. Y., Kao, S., Jenkins, N. A., Copeland, N. G., Sanyal, M., Selleri, L., Cleary, M. L., Chang, C.
  2008; 103 (7): 702-709
- **A novel monoclonal antibody against DOG1 is a sensitive and specific marker for gastrointestinal stromal tumors** *AMERICAN JOURNAL OF SURGICAL PATHOLOGY*
  Espinosa, I., Lee, C., Kim, M. K., Rouse, B., Subramanian, S., Montgomery, K., Varma, S., Corless, C. L., Heinrich, M. C., Smith, K. S., Wang, Z., Rubin, B., Nielsen, et al
  2008; 32 (2): 210-218
- **Meis1 is an essential and rate-limiting regulator of MLL leukemia stem cell potential** *GENES & DEVELOPMENT*
  Wong, P., Iwasaki, M., Somervaille, T. C., So, C. W., Cleary, M. L.
  2007; 21 (21): 2762-2774
- **B-cell development fails in the absence of the Pbx1 proto-oncogene** *BLOOD*
  Sanyal, M., Tung, J. W., Karsunky, H., Zeng, H., Selleri, L., Weissman, I. L., Herzenberg, L. A., Cleary, M. L.
  2007; 109 (10): 4191-4199
- **PU.1 and Junb: Suppressing the formation of acute myeloid leukemia stem cells** *CANCER CELL*
  Somervaille, T. C., Cleary, M. L.

2006; 10 (6): 456-457

- **Binding to nonmethylated CpG DNA is essential for target recognition, transactivation, and myeloid transformation by an MLL oncoprotein** *MOLECULAR AND CELLULAR BIOLOGY*
  Ayton, P. M., Chen, E. H., Cleary, M. L.
  2004; 24 (23): 10470-10478
- **Pbx3 deficiency results in central hypoventilation** *AMERICAN JOURNAL OF PATHOLOGY*
  Rhee, J. W., Arata, A., SELLERI, L., Jacobs, Y., Arata, S., Onimaru, H., Cleary, M. L.
  2004; 165 (4): 1343-1350
- **Dimerization: a versatile switch for oncogenesis** *BLOOD*
  So, C. W., Cleary, M. L.
  2004; 104 (4): 919-922
- **Leukemia proto-oncoprotein MLL forms a SET1-like histone methyltransferase complex with menin to regulate Hox gene expression** *MOLECULAR AND CELLULAR BIOLOGY*
  Yokoyama, A., Wang, Z., Wysocka, J., Sanyal, M., Aufiero, D. J., Kitabayashi, I., Herr, W., Cleary, M. L.
  2004; 24 (13): 5639-5649
- **The TALE homeodomain protein pbx2 is not essential for development and long-term survival** *MOLECULAR AND CELLULAR BIOLOGY*
  Selleri, L., DiMartino, J., van Deursen, J., Brendolan, A., Sanyal, M., Boon, E., Capellini, T., Smith, K. S., Rhee, J., Popperl, H., GROSVELD, G., Cleary, M. L.
  2004; 24 (12): 5324-5331
- **Leukemic transformation of hematopoietic progenitors by MLL-GAS7 in the absence of Hoxa7 or Hoxa9** *BLOOD*
  So, C. W., Karsunky, H., Wong, P., Weissman, I. L., Cleary, M. L.
  2004; 103 (8): 3192-3199
- **Similar MLL-associated leukemias arising from self-renewing stem cells and short-lived myeloid progenitors** *GENES & DEVELOPMENT*
  Cozzio, A., Passegue, E., Ayton, P. M., Karsunky, H., Cleary, M. L., Weissman, I. L.
  2003; 17 (24): 3029-3035
- **Transformation of myeloid progenitors by MLL oncoproteins is dependent on Hoxa7 and Hoxa9** *GENES & DEVELOPMENT*
  Ayton, P. M., Cleary, M. L.
  2003; 17 (18): 2298-2307
- **Dimerization contributes to oncogenic activation of MLL chimeras in acute leukemias** *CANCER CELL*
  So, C. W., Lin, M., Ayton, P. M., Chen, E. H., Cleary, M. L.
  2003; 4 (2): 99-110
- **Genomewide demarcation of RNA polymerase II transcription units revealed by physical fractionation of chromatin** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Nagy, P. L., Cleary, M. L., Brown, P. O., Lieb, J. D.
  2003; 100 (11): 6364-6369
- **Pbxl regulates nephrogenesis and ureteric branching in the developing kidney** *DEVELOPMENTAL BIOLOGY*
  Schnabel, C. A., Godin, R. E., Cleary, M. L.
  2003; 254 (2): 262-276
- **MLL-GAS7 transforms multipotent hematopoietic progenitors and induces mixed lineage leukemias in mice** *CANCER CELL*
  So, C. W., Karsunky, H., Passegue, E., Cozzio, A., Weissman, I. L., Cleary, M. L.
  2003; 3 (2): 161-171
- **Common mechanism for oncogenic activation of MLL by forkhead family proteins** *BLOOD*
  So, C. W., Cleary, M. L.
  2003; 101 (2): 633-639
- **Associations between human disease genes and overlapping gene groups and multiple amino acid runs** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Karlin, S., CHEN, C. F., Gentles, A. J., Cleary, M.

2002; 99 (26): 17008-17013

- **Transformation of bone marrow B-cell progenitors by E2A-HLF requires coexpression of BCL-2** *MOLECULAR AND CELLULAR BIOLOGY*
  Smith, K. S., Rhee, J. W., Cleary, M. L.
  2002; 22 (21): 7678-7687
- **MLL-AFX requires the transcriptional effector domains of AFX to transform myeloid progenitors and transdominantly interfere with forkhead protein function** *MOLECULAR AND CELLULAR BIOLOGY*
  So, C. W., Cleary, M. L.
  2002; 22 (18): 6542-6552
- **Toxoplasma gondii asexual development: Identification of developmentally regulated genes and distinct patterns of gene expression** *EUKARYOTIC CELL*
  Cleary, M. D., Singh, U., Blader, I. J., Brewer, J. L., Boothroyd, J. C.
  2002; 1 (3): 329-340
- **The AF10 leucine zipper is required for leukemic transformation of myeloid progenitors by MLL-AF10** *BLOOD*
  DiMartino, J. F., Ayton, P. M., Chen, E. H., Naftzger, C. C., Young, B. D., Cleary, M. L.
  2002; 99 (10): 3780-3785
- **Male infertility, impaired spermatogenesis, and azoospermia in mice deficient for the pseudophosphatase Sbf1** *JOURNAL OF CLINICAL INVESTIGATION*
  Firestein, R., Nagy, P. L., Daly, M., Huie, P., Conti, M., Cleary, M. L.
  2002; 109 (9): 1165-1172
- **Pbx1 inactivation disrupts pancreas development and in Ipf1-deficient mice promotes diabetes mellitus** *NATURE GENETICS*
  Kim, S. K., SELLERI, L., Lee, J. S., Zhang, A. Y., Gu, X. Y., Jacobs, Y., Cleary, M. L.
  2002; 30 (4): 430-435
- **A trithorax-group complex purified from Saccharomyces cerevisiae is required for methylation of histone H3** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Nagy, P. L., Griesenbeck, J., Kornberg, R. D., Cleary, M. L.
  2002; 99 (1): 90-94
- **Progenetix.net: an online repository for molecular cytogenetic aberration data** *BIOINFORMATICS*
  Baudis, M., Cleary, M. L.
  2001; 17 (12): 1228-1229
- **Molecular mechanisms of leukemogenesis mediated by MLL fusion proteins** *ONCOGENE*
  Ayton, P. M., Cleary, M. L.
  2001; 20 (40): 5695-5707
- **Requirement for Pbx1 in skeletal patterning and programming chondrocyte proliferation and differentiation** *DEVELOPMENT*
  Selleri, L., Depew, M. J., Jacobs, Y., Chanda, S. K., Tsang, K. Y., Cheah, K. S., Rubenstein, J. L., O'Gorman, S., Cleary, M. L.
  2001; 128 (18): 3543-3557
- **Pseudo-phosphatase Sbf1 contains an N-terminal GEF homology domain that modulates its growth regulatory properties** *JOURNAL OF CELL SCIENCE*
  Firestein, R., Cleary, M. L.
  2001; 114 (16): 2921-2927
- **The Hox cofactor and proto-oncogene Pbx1 is required for maintenance of definitive hematopoiesis in the fetal liver** *BLOOD*
  DiMartino, J. F., SELLERI, L., Traver, D., Firpo, M. T., Rhee, J., Warnke, R., O'Gorman, S., Weissman, I. L., Cleary, M. L.
  2001; 98 (3): 618-626
- **Expression of Pbx1b during mammalian organogenesis** *MECHANISMS OF DEVELOPMENT*
  Schnabel, C. A., SELLERI, L., Jacobs, Y., Warnke, R., Cleary, M. L.
  2001; 100 (1): 131-135
- **A carboxy-terminal domain of ELL is required and sufficient for immortalization of myeloid progenitors by MLL-ELL** *BLOOD*
  DiMartino, J. F., Miller, T., Ayton, P. M., Landewe, T., Hess, J. L., Cleary, M. L., Shilatifard, A.

2000; 96 (12): 3887-3893

- **A carboxy-terminal deletion mutant of Notch1 accelerates lymphoid oncogenesis in E2A-PBX1 transgenic mice** *BLOOD*
  Feldman, B. J., Hampton, T., Cleary, M. L.
  2000; 96 (5): 1906-1913
- **Set domain-dependent regulation of transcriptional silencing and growth control by SUV39H1, a mammalian ortholog of Drosophila Su(var)3-9** *MOLECULAR AND CELLULAR BIOLOGY*
  Firestein, R., Cui, X. M., Huie, P., Cleary, M. L.
  2000; 20 (13): 4900-4909
- **HoxA9-mediated immortalization of myeloid progenitors requires functional interactions with TALE cofactors Pbx and Meis** *ONCOGENE*
  Schnabel, C. A., Jacobs, Y., Cleary, M. L.
  2000; 19 (5): 608-616
- **MLL rearrangements in haematological malignancies: Lessons from clinical and biological studies** *BRITISH JOURNAL OF HAEMATOLOGY*
  DiMartino, J. F., Cleary, M. L.
  1999; 106 (3): 614-626
- **Trimeric association of hox and TALE homeodomain proteins mediates Hoxb2 hindbrain enhancer activity** *MOLECULAR AND CELLULAR BIOLOGY*
  Jacobs, Y., Schnabel, C. A., Cleary, M. L.
  1999; 19 (7): 5134-5142
- **Disrupted differentiation and oncogenic transformation of lymphoid progenitors in E2A-HLF transgenic mice** *MOLECULAR AND CELLULAR BIOLOGY*
  Smith, K. S., Rhee, J. W., Naumovski, L., Cleary, M. L.
  1999; 19 (6): 4443-4451
- **Growth stimulation of primary B cell precursors by the anti-phosphatase Sbf1** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  De Vivo, I., Cui, X. M., Domen, J., Cleary, M. L.
  1998; 95 (16): 9471-9476
- **Association of SET domain and myotubularin-related proteins modulates growth control** *NATURE GENETICS*
  Cui, X. M., De Vivo, I., Slany, R., Miyamoto, A., Firestein, R., Cleary, M. L.
  1998; 18 (4): 331-337
- **The oncogenic capacity of HRX-ENL requires the transcriptional transactivation activity of ENL and the DNA binding motifs of HRX** *MOLECULAR AND CELLULAR BIOLOGY*
  Slany, R. K., Lavau, C., Cleary, M. L.
  1998; 18 (1): 122-129
- **Pim1 cooperates with E2a-Pbx1 to facilitate the progression of thymic lymphomas in transgenic mice** *ONCOGENE*
  Feldman, B. J., Reid, T. R., Cleary, M. L.
  1997; 15 (22): 2735-2742
- **Meis proteins are major in vivo DNA binding partners for wild-type but not chimeric Pbx proteins** *MOLECULAR AND CELLULAR BIOLOGY*
  CHANG, C. P., Jacobs, Y., Nakamura, T., Jenkins, N. A., Copeland, N. G., Cleary, M. L.
  1997; 17 (10): 5679-5687
- **Immortalization and leukemic transformation of a myelomonocytic precursor by retrovirally transduced HRX-ENL** *EMBO JOURNAL*
  Lavau, C., Szilvassy, S. J., Slany, R., Cleary, M. L.
  1997; 16 (14): 4226-4237
- **Chimeric oncoprotein E2a-Pbx1 induces apoptosis of hematopoietic cells by a p53-independent mechanism that is suppressed by Bcl-2** *ONCOGENE*
  Smith, K. S., Jacobs, Y., CHANG, C. P., Cleary, M. L.
  1997; 14 (24): 2917-2926
- **Disruption of a homolog of trithorax by 11q23 translocations: Leukemogenic and transcriptional implications** *CHROMOSOMAL TRANSLOCATIONS AND ONCOGENIC TRANSCRIPTION FACTORS*

Waring, P. M., Cleary, M. L.
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- **The Hox cooperativity motif of the chimeric oncoprotein E2a-Pbx1 is necessary and sufficient for oncogenesis** *MOLECULAR AND CELLULAR BIOLOGY*
  CHANG, C. P., DeVivo, I., Cleary, M. L.
  1997; 17 (1): 81-88
- **The p53-binding protein 53BP2 also interacts with Bcl2 and impedes cell cycle progression at G(2)/M** *MOLECULAR AND CELLULAR BIOLOGY*
  Naumovski, L., Cleary, M. L.
  1996; 16 (7): 3884-3892
- **True histiocytic lymphoma following therapy for lymphoblastic neoplasms** *BLOOD*
  Soslow, R. A., Davis, R. E., Warnke, R. A., Cleary, M. L., Kamel, O. W.
  1996; 87 (12): 5207-5212
- **Helix-loop-helix proteins LYL1 and E2a form heterodimeric complexes with distinctive DNA-binding properties in hematolymphoid cells** *MOLECULAR AND CELLULAR BIOLOGY*
  Miyamoto, A., Cui, X. M., Naumovski, L., Cleary, M. L.
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- **Pbx modulation of Hox homeodomain amino-terminal arms establishes different DNA-binding specificities across the Hox locus** *MOLECULAR AND CELLULAR BIOLOGY*
  CHANG, C. P., Brocchieri, L., Shen, W. F., Largman, C., Cleary, M. L.
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- **TRUE HISTIOCYTIC LYMPHOMA - A STUDY OF 12 CASES BASED ON CURRENT DEFINITION** *LEUKEMIA & LYMPHOMA*
  Kamel, O. W., Gocke, C. D., Kell, D. L., Cleary, M. L., Warnke, R. A.
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- **PBX PROTEINS DISPLAY HEXAPEPTIDE-DEPENDENT COOPERATIVE DNA-BINDING WITH A SUBSET OF HOX PROTEINS** *GENES & DEVELOPMENT*
  CHANG, C. P., Shen, W. F., Rozenfeld, S., Lawrence, H. J., Largman, C., Cleary, M. L.
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- **VIRUS-ASSOCIATED HEMOPHAGOCYTIC SYNDROME CHARACTERIZED BY CLONAL EPSTEIN-BARR-VIRUS GENOME** *AMERICAN JOURNAL OF CLINICAL PATHOLOGY*
  DOLEZAL, M. V., Kamel, O. W., VANDERIJN, M., Cleary, M. L., Sibley, R. K., Warnke, R. A.
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  MONICA, K., LeBrun, D. P., DEDERA, D. A., Brown, R., Cleary, M. L.
  1994; 14 (12): 8304-8314
- **ENL, THE GENE FUSED WITH HRX IN T(1119) LEUKEMIAS, ENCODES A NUCLEAR-PROTEIN WITH TRANSCRIPTIONAL ACTIVATION POTENTIAL IN LYMPHOID AND MYELOID CELLS** *BLOOD*
  Rubnitz, J. E., Morrissey, J., Savage, P. A., Cleary, M. L.
  1994; 84 (6): 1747-1752
- **EPSTEIN-BARR VIRUS-ASSOCIATED NATURAL-KILLER LARGE GRANULAR LYMPHOCYTE LEUKEMIA** *HUMAN PATHOLOGY*
  Gelb, A. B., VANDERIJN, M., Regula, D. P., CORNBLEET, J. P., Kamel, O. W., Horoupian, D. S., Cleary, M. L., Warnke, R. A.
  1994; 25 (9): 953-960
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  Hunger, S. P., Brown, R., Cleary, M. L.
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- **FREQUENCY AND PROGNOSTIC-SIGNIFICANCE OF HRX REARRANGEMENTS IN INFANT ACUTE LYMPHOBLASTIC-LEUKEMIA - A PEDIATRIC-ONCOLOGY-GROUP STUDY** *BLOOD*

Rubnitz, J. E., Link, M. P., Shuster, J. J., Carroll, A. J., Hakami, N., Frankel, L. S., Pullen, D. J., Cleary, M. L.
1994; 84 (2): 570-573

- **FUSION WITH E2A ALTERS THE TRANSCRIPTIONAL PROPERTIES OF THE HOMEODOMAIN PROTEIN PBX1 IN T(119) LEUKEMIAS** *ONCOGENE*
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  1994; 9 (6): 1641-1647
- **2 TYPES OF GENOMIC REARRANGEMENTS CREATE ALTERNATIVE E2A-HLF FUSION PROTEINS IN T(1719)-ALL** *BLOOD*
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  Naumovski, L., Cleary, M. L.
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  LeBrun, D. P., Ngan, B. Y., Weiss, L. M., Huie, P., Warnke, R. A., Cleary, M. L.
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- **CHIMERIC ONCOPROTEINS RESULTING FROM CHROMOSOMAL TRANSLOCATIONS IN ACUTE LYMPHOBLASTIC-LEUKEMIA** *SEMINARS IN CANCER BIOLOGY*
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- **CHIMERIC HOMEOBOX GENE E2A-PBX1 INDUCES PROLIFERATION, APOPTOSIS, AND MALIGNANT-LYMPHOMAS IN TRANSGENIC MICE** *CELL*
  DEDERA, D. A., Waller, E. K., LeBrun, D. P., SENMAJUMDAR, A., Stevens, M. E., Barsh, G. S., Cleary, M. L.
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  Waller, E. K., ZIEMIANSKA, M., Bangs, C. D., Cleary, M., Weissman, I., Kamel, O. W.
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