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## CURRICULUM VITAE

**Name:** Benjamin G. Neel

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### Education:

1977 A.B. Cornell University College of Arts and Sciences, Ithaca, NY  
1982 Ph.D. Rockefeller University, New York, NY  
1983 M.D. Cornell University Medical College, New York, NY

### Postdoctoral Training:

#### Internship and Residencies:

1983-1985 Medical Resident, Beth Israel Hospital, Boston, MA  
1985-1987 Special Resident, Beth Israel Hospital, Boston, MA

#### Research Fellowships:

1985-1989 Special Fellow, Leukemia Society of America (Molecular Biology), Harvard University Department of Cell and Developmental Biology, Cambridge, MA  
1987-1988 Postdoctoral Fellow, Harvard University Department of Cell and Developmental Biology, Cambridge, MA

### Academic Appointment:

2007 - Canada Research Chair, Tier 1  
2007 - Professor of Medical Biophysics, University of Toronto, Toronto, ON  
2006 - William B. Castle Professor of Medicine, Harvard Medical School, Boston, MA  
1999- Professor of Medicine, Harvard Medical School, Boston, MA  
1993-1999 Associate Professor of Medicine, Harvard Medical School, Boston, MA  
1988-1993 Assistant Professor of Medicine, Harvard Medical School, Boston, MA

### Hospital Appointment:

2007- Director, Ontario Cancer Institute, University Health Network, Toronto, ON  
2007 - Senior Scientist, Stem Cell and Developmental Biology, University Health Network, Toronto, ON  
2003 - Deputy Director, Basic Research, Hematology/Oncology Division, Beth Israel Deaconess Medical Center, Boston, MA  
1994- Director, Cancer Biology Program, Beth Israel Deaconess Medical Center

### Licensure and Certification:

1987 Diplomat, American Board of Internal Medicine  
1984 Massachusetts License

### Awards and Honors:

1976 Phi Beta Kappa  
1977 Phi Kappa Phi  
1983 Associated Medical Schools of New York, Award for Biomedical Research  
1985 Special Fellowship, Leukemia Society of America  
1990 Harvard University Nominee for Pew Scholars Program

1992 Harvard University/Hoffman-LaRoche Institute for Chemistry and Medicine  
Grant Recipient  
1992 American Cancer Society, Junior Faculty Research Award  
1992 American Association for Cancer Research, Gertrude Elion Award  
2003, 2008 NIH MERIT Award (Renewed)  
2007 Canada Research Chair, Tier 1  
2009 Premiers Summit Award

**Selected Invited Talks:**

1996 EMBO Workshop on Protein Dephosphorylation, Switzerland  
1996 British Society of Cell Biology Joint Spring Meeting, U.K.  
1996 Hanson Symposium on Molecular Mechanisms of Oncogenesis,  
Adelaide, Australia  
1997 Keystone Meeting on Cell Signaling, Colorado  
1997 FASEB Summer Research Conference on Hematopoietic  
Neoplasms, Vermont  
1997 EMBO-FEBS Workshop on Protein Phosphatases and Protein  
Dephosphorylation, Oxford, England  
1997 Tokyo International Symposium, Tokyo, Japan  
1998 Keystone Meeting on JAK/STAT Signalling, Colorado  
1998 Gordon Research Conference on Second Messengers and  
Protein Phosphorylation, New Hampshire  
1998 FASEB Summer Research Conference on Protein Phosphatases,  
Copper Mountain, Colorado  
1998 International Hematology Congress, Amsterdam  
1998 University of Toronto Department of Immunology Eaton Lectureship  
1999 First Harvard/Munich AML Workshop, Munich, Germany  
1999 FASEB Meeting on Biology of ImmunoReceptors, Saxtons River, Vermont  
2000 Lorne Cancer Conference, Lorne, Australia  
2000 FASEB Meeting on Signal Transduction in the Immune System, Saxtons  
River, Vermont  
2000 The Second International Conference on Signal Transduction, Dubrovnik,  
Croatia  
2001 FASEB Meeting on Receptors and Signal Transduction, Cooper Mountain,  
Colorado  
2001 American Heart Association Annual Meeting, Washington, DC  
2002 Experimental Biology 2002, New Orleans, Louisiana  
2002 Keystone Symposium on Molecular and Cellular Biology of Leukocyte  
Receptors, Lake Tahoe, California  
2002 Fifth International Conference on Phosphatases and Cellular Regulation,  
Okazaki, Japan  
2003 Europhosphatases 2003, Barcelona, Spain  
2003 Gordon Conference on Cell Proliferation, New London, New Hampshire  
2003 FASEB Summer Research Conference on Signal Transduction in the  
Immune System, Snowmass Village, Colorado  
2004 12th International Conference on Second Messengers and  
Phosphoproteins, Montreal, Quebec, Canada  
2004 FASEB Summer Research Conference on Protein Phosphatases,  
Snowmass Village, Colorado  
2005 AACR Annual Meeting, Anaheim, California

- 2005 Keynote Speaker, National Neurofibromatosis International Consortium for the Molecular Biology of NF1 and NF2, Aspen, Colorado
- 2005 17th Pezcoller Symposium on Molecular Understanding of Solid Tumors, Trento, Italy
- 2005 Europhosphatases 2005, Cambridge, England
- 2005 FASEB Summer Research Conference on Hematological Malignancies, Saxton's River, Vermont
- 2005 FASEB Summer Research Conference on Growth Factor Receptor Tyrosine Kinases in Mitogenesis, Morphogenesis and Tumorigenesis Tucson, Arizona
- 2005 Salk/EMBL Oncogenes and Growth Control Meeting, La Jolla, California
- 2006 International Symposium of Kobe University on Signal Transduction, Kobe, Japan
- 2007 USA-Japan Cooperative Cancer Workshop on Animal Models of Hematological Malignancies, Kauai, Hawaii
- 2007 5<sup>th</sup> International Aachen Symposium on Cytokine Signaling, Aachen, Germany
- 2007 AACR Annual Meeting, Los Angeles, California
- 2007 Signaling and Metabolic Pathways in Cancer Workshop, Madrid, Spain
- 2007 FASEB Summer Research Conference on Growth Factor Receptor Tyrosine Kinases in Mitogenesis, Morphogenesis and Tumorigenesis, Tucson, Arizona
- 2008 20<sup>th</sup> Lorne Cancer Conference, Lorne, Australia
- 2008 FASEB Summer Research Conference on Protein Phosphatase Snowmass Village, Colorado
- 2008 Gordon Research Conference on Growth Factors and Signalling, Oxford, United Kingdom

**Meetings Organized:**

- 1995, 1997 Co-Organizer, Cold Spring Harbor Laboratory meeting on Tyrosine Phosphorylation and Cell Signaling, New York
- 1999, 2001
- 2003, 2005
- 2007, 2009
- 1999 Vice-Chair (elected), Gordon Conference on Cell Proliferation
- 2000 Vice-Chair (elected), FASEB Phosphatase Meeting
- 2001 Chair (elected), Gordon Conference on Cell Proliferation
- 2002 Chair (elected), FASEB Phosphatase Meeting

**Editorial Boards:**

- 1993- Editorial Board Member, Virology
- 1995- Editorial Board Member, Journal of Biological Chemistry
- 1996-2000 Editorial Board Member, Molecular and Cellular Biology
- 1997- Editorial Board Member, Cell Growth and Differentiation
- 1997-2000 Editorial Board Member, Genes and Development
- 2000-2010 Editor, Molecular and Cellular Biology
- 2002- Editorial Board Member, Cancer Cell
- 2009- Editorial Board Member, Current Opinion in Genetics and Development
- 2010- Editorial Board Member, Journal of Experimental Medicine
- 2010 - Board of Reviewing Editors, Science Signaling
- 2011 - Scientific Editor, AACR, Cancer Discovery

## Memberships and Professional Societies:

American Society for Microbiology  
American Association for Cancer Research  
American Association of Arts and Sciences

## Study Sections:

1992 Ad Hoc Reviewer for NIH DSR IRG Study Section  
1993, 1994 Study Section member, California State Tobacco Related Diseases Program  
1995 Ad Hoc Reviewer, Veterans Administration  
1995 Ad Hoc Reviewer, Israeli National Science Foundation  
1996 Reviewer for NCI-Frederick Intramural Program  
1995-1998 Member, NIH Biology II Study Section  
1997-2001 Study Section member, American Cancer Society, Mass. Division  
1998-2000 Member, NIH Molecular Biology Study Section (CDF-1)  
1997- Study Section member, The Medical Foundation, Boston, MA  
2004- Member, Hematology Study Section  
2004- Reviewer, California State Breast Cancer Research Program  
2004- Member, STARR Cancer Consortium  
2008- Reviewer, Molecular and Integrative Signal Transduction (MIST)

## Major Research Interests:

Tyrosine phosphatases, scaffolding adapters, signal transduction, mouse models of signaling abnormalities and human disease, insulin and leptin signalling, body mass regulation, glucose homeostasis, breast carcinogenesis, leukemogenesis.

## Teaching Experience:

1990-1993 Co-director, Cellular and Developmental Biology 200B: core cell biology course in Cell Biology, Division of Medical Sciences, Harvard University  
1993 Lecturer, Immunology 212 and Genetics 205  
1994 Lecturer, Core Cell Biology Course (CDB200B)  
1995- Section Leader, Core Cell Biology Course (CDB200B)  
2004- Co-Director, Cell Biology and Biochemistry core course, Harvard Medical School  
2004- Co-Director, CB201 (Core graduate student Cell Biology Course)

## Patents:

Methods for identifying a tyrosine phosphatase abnormality associated with neoplastic disease.

Inventors: Freeman, Jr.; Robert M. (Boston, MA); Plutzky; Jorge (Boston, MA); **Neel; Benjamin G.** (Wayland, MA); Rosenberg; Robert D. (Brookline, MA)

Peptide which binds SH domains of protein tyrosine phosphatase SH-PTP1.

Inventors: Klingmuller; Ursula (Arlington, MA); Michnick; Stephen (Westmount, CA); **Neel; Benjamin G.** (Wayland, MA); Lorenz; Ulrike (Boston, MA); Lodish; Harvey F. (Brookline, MA)

Activated mutants of SH2-domain-containing protein tyrosine phosphatases and methods of

use thereof.

Inventors: **Neel, Benjamin G** (Wayland, MA).; O'Reilly, Alana M. (Watertown, MA); Shoelson, Steven (Natick, MA); Pluskey, Scott (Allston, MA) pending

P97/Gab2 gene, genetically manipulated animals and methods of use thereof.

Inventors: Gu, Haihua, **Neel Benjamin G**, Kinet, Jean-Pierre. pending

Combinations of rapamycin macrolide and a tyrosine kinase inhibitor for the treatment of cancer.

Inventors: **Neel, Benjamin G.** and Mohi, Golam. pending.

Diagnosis and Treatment of Noonan Syndrome and Neoplastic Disorders.

Inventors: **Neel, Benjamin G**, Roberts, Amy, Kucherlapati, Raju, Araki, Toshiyuki, Swanson, KD. Pending.

### **Bibliography:**

#### **Original reports: (Bold indicates Neel Lab members)**

1. Anderson SM, Hayward WS, **Neel BG**, Hanafusa H. Avian erythroblastosis virus produces two messenger RNAs. *J. Virol.*, 1980; 36:676-683.
2. Hayward WS, **Neel BG**, Astrin SM. Induction of lymphoid leukosis by avian leukosis virus: activation of a cellular onc gene by promoter insertion. *J. Supramol. Struct. Cell. Biochem.* (suppl. 5), 1981; 0:101.
3. Hayward WS, **Neel BG**, Fang J, Robinson HL, Astrin SM. Avian lymphoid leukosis is correlated with the appearance of discrete new RNAs containing viral and cellular genetic information. *Hematol Blood Transfus.* 1981;26:439-44.
4. **Neel BG**, Hayward WS, Robinson HS, Fang J, Astrin SM. Avian leukosis virus-induced tumors have common proviral integration sites and synthesize discrete new RNAs: oncogenesis by promoter insertion. *Cell* 1981 Feb;23(2):323-34.
5. Hayward WS, **Neel BG**, Astrin SM. Activation of cellular onc gene by promoter insertion in avian leukosis virus-induced lymphoid leukosis. *Nature* 1981 Apr 9;290(5806):475-80.
6. **Neel BG**, Wang LH, Mathey-Prevot B, Hanafusa T, Hanafusa H, Hayward WS. Isolation of 16L virus: a rapidly transforming sarcoma virus from an avian leukosis virus induced sarcoma. *Proc. Natl. Acad. Sci. USA*, 1982 Aug;79(16):5088-92.
7. **Neel BG**, Gasic GP, Rogler CE, Skalka AM, Ju G, Hisinuma F, Pappas T, Astrin SM, Hayward WS. Molecular analysis of the c-myc locus in normal tissue and in avian leukosis virus-induced lymphomas. *J. Virol.*, 1982; 44:158-166.
8. Neel BG, Jhanwar SC, Chaganti RS, Hayward WS. Two human c-onc genes are located on the long arm of chromosome 8. *Proc Natl Acad Sci USA* 1982 Dec;79(24):7842-6
9. Hayward WS, Neel BG, Shin CK, Jhanwar Sc, Chaganti, RS. The role of host c-onc genes in viral and non-viral neoplasia. *Prog CLin Biol Res.* 1983;119:119-32

10. Jhanwar SC, **Neel BG**, Hayward WS, Chaganti RSK. Localization of c-ras oncogene family on human germ-line chromosomes. Proc. Natl. Acad. Sci. USA, 1983 Aug;80(15):4794-7.
11. Jhanwar SC, **Neel BG**, Hayward WS, Chaganti RSK. Localization of the cellular oncogenes ABL, SIS and FES on human germ-like chromosomes. Cytogenet. Cell Genet., 1984;38:73-5.
12. Chernoff J, Schievella AR, **Jost CA**, Erickson RL, **Neel BG**. Cloning of a cDNA for a major human protein-tyrosine-phosphatase. Proc. Natl. Acad. Sci. USA, 1990 Apr;87(7):2735-9.
13. **Gebert JF, Moghal N, Frangioni JV**, Sugarbaker DJ, **Neel BG**. High frequency of retinoic acid receptor abnormalities in human lung cancer. Oncogene 1991 Oct;6(10):1859-68
14. **Plutzky J, Neel BG**, Rosenberg, RD. Isolation of a src homology 2-containing tyrosine phosphatase. Proc Natl Acad Sci U.S.A. 1992 Feb;89(3):1123-7.
15. **Frangioni JV, Beahm PH, Shifrin V, Jost CA, Neel BG** . The non-transmembrane tyrosine phosphatase PTP-1B localizes to the endoplasmic reticulum via its 35 amino acid C-terminal sequence. Cell 1992 Feb 7;68(3):545-60.
16. Plutzky J, **Neel BG**, Rosenberg RD, Eddy RL, Shows TB. Chromosomal localization of an SH-2 containing tyrosine phosphatase. Genomics 1992 Jul;13(3):869-72.
17. Shou C, Farnsworth CL, **Neel BG**, Feig LA. Molecular cloning of cDNAs encoding a guanine-nucleotide-releasing factor for RAS p21. Nature 1992 Jul 23;358(6384):351-4.
18. Simmons DL, **Neel BG**, Stevens R, Evett G, Erikson RL. Identification of an early-growth-response gene encoding a novel putative protein kinase. Mol. Cell. Biol., 1992 Sep;12(9):4164-9.
19. **Freeman RM**, Plutzky J, **Neel BG**. Identification of a human src homology 2-containing protein-tyrosine-phosphatase: A putative homolog of Drosophila corkscrew. Proc. Natl. Acad. Sci. USA 1992 Dec 1;89(23):11239-43.
20. Pei D, **Neel BG**, Walsh CT. Overexpression, purification, and characterization of SHPTP1, a Src homology 2-containing protein-tyrosine-phosphatase. Proc. Natl. Acad. Sci. USA, 1993 Feb 1;90(3):1092-6.
21. **Frangioni JV, Neel BG**. Solubilization and purification of enzymatically active glutathione S-transferase (pGEX) fusion proteins. Anal. Biochem., 1993 Apr;210(1):179-87.
22. **Frangioni JV, Neel BG**. Use of a general purpose mammalian expression vector for studying intracellular protein targeting: Identification of critical residues in the nuclear lamin A/C nuclear localization signal. J. Cell Science, 1993 Jun;105(pt 2):481-8.
23. **Lechleider RJ, Freeman RM, Neel BG**. Tyrosyl phosphorylation and growth factor receptor association of the human *corkscrew* homolog, SH-PTP2. J. Biol. Chem. 1993 Jun 25;268(18):13434-38.

24. **Lechleider RJ**, Sugimoto S, **Bennett AM**, Kashishian AS, Cooper JA, Shoelson S, Walsh CT, **Neel BG**. Activation of the SH2-containing phosphotyrosine phosphatase SH-PTP2 by its binding site, Phosphotyrosine 1009, on the human PDGF receptor. *J. Biol. Chem.* 1993 Oct 15;268(29):21478-81.
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26. **Frangioni JV**, Oda A, Smith M, Salzman EW, **Neel BG**. Calpain-catalyzed cleavage and subcellular relocation of protein tyrosine phosphatase 1B (PTP-1B) in human platelets. *EMBO J.* 1993 Dec;12(12):4843-56.
27. **Shifrin VI**, **Neel BG**. Growth factor-inducible alternative splicing of nontransmembrane phosphotyrosine phosphatase PTP-1B pre-mRNA. *J Biol Chem* 1993 Dec 5;268(34):25376-84.
28. **Lorenz U**, Ravichandran KS, Pei D, Walsh CT, Burakoff SJ, **Neel BG**. Lck-dependent tyrosyl phosphorylation of the phosphotyrosine phosphatase SH-PTP1 in murine T cells. *Mol. Cell. Biol.* 1994 Mar;14(3):1824-34.
29. **Frangioni JV**, **Moghal N**, Stuart-Tilley A, **Neel BG**, Alper SL. The DNA binding domain of retinoid acid receptor beta is required for ligand-dependent suppression of proliferation. Application of general purpose of mammalian coexpression vectors. *J. Cell Science*, 1994: Apr;107(pt 4):827-38.
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32. **Bennett AM**, **Tang T**, Sugimoto S, Walsh CT, **Neel BG**. Protein-tyrosine-phosphatase SHPTP2 couples platelet-derived growth factor receptor beta to Ras. *Proc. Natl. Acad. Sci. USA* 1994 Jul 19;91(15):7335-9.
33. Pei D, **Lorenz U**, Klingmuller U., **Neel BG**, Walsh CT. Intramolecular regulation of protein tyrosine phosphatase SH-PTP1: a new function for Src homology 2 domains. *Biochem* 1994 Dec 27;33(51):15483-93.
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35. Klingmuller U, **Lorenz U**, Cantley LC, **Neel BG**, Lodish HF. Specific recruitment of the SH-PTP1 to the erythropoietin receptor causes inactivation of JAK2 and termination of proliferative signals. *Cell* 1995 Mar 10;80(5):729-38.

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37. **Moghal N., Neel BG**. Evidence for impaired retinoic acid receptor-thyroid hormone receptor AF-2 cofactor activity in human lung cancer. *Mol. Cell. Biol.* 1995 Jul;15(7):3945-59.
38. David M, **Chen HE**, Ling L, Goelz S, Larner AC, **Neel BG**. Differential regulation of the IFN-stimulated Jak/Stat pathway by the SH2-domain containing tyrosine phosphatase SHPTP1. *Mol. Cell. Biol.* 1995 Dec;15(12):7050-8.
39. Itoh K., **Tang TL., Neel BG**, Sokol SY. Specific modulation of ectodermal cell fates in *Xenopus* embryos by glycogen synthase kinase. *Development*, 1995 Dec;121(12):3979-88.
40. Maestrini E, Tamagnone L, **Longati P**, Cremona O, Gulisano M, Bione S, Tamanini F, **Neel BG**, Toniolo D, Comoglio PM. A family of transmembrane proteins with homology to the MET-hepatocyte growth factor receptor. *Proc. Natl. Acad. Sci. USA*, 1996 Jan 23;93(2):674-78.
41. **Bennett AM, Hausdorff SF, O'Reilly AM, Freeman RM, Neel BG**. Multiple requirements for SHPTP2 in epidermal growth factor-mediated cell cycle progression. *Mol. Cell. Biol.*, 1996 Mar;16(3):1189-202.
42. **Chen HE, Chang S**, Trub T, **Neel BG**. Regulation of colony-stimulating factor 1 receptor signaling by the SH2 domain-containing tyrosine phosphatase SHPTP1. *Mol Cell Biol.* 1996 Jul;16(7):3685-97.
43. **Lorenz U**, Bergemann AD, Steinberg HN, Flanagan JG, Li X, Galli SJ, **Neel BG**. Genetic analysis reveals cell-type specific regulation of receptor tyrosine kinase c-Kit by the protein tyrosine phosphatase SHP1. *J. Exp. Med.* 1996 Sep 1;184(3):1111-26.
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48. **Nadler MJ**, McLean PA, **Neel BG**, Wortis HH. B cell antigen receptor-evoked calcium influx is enhanced in CD22-deficient B cell lines. *J. Immunol.* 1997 Nov 1;159(9):4233-43.



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51. **Timms JF**, Carlberg K, **Gu H, Chen H, Kamatkar S, Nadler MJS**, Rohrschneider LR, **Neel BG.** Identification of major binding proteins and substrates for the SH2-containing protein tyrosine phosphatase SHP-1 in macrophages. *Mol. Cell. Biol.* 1998 Jul;18(7):3838-50.
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54. **Gu H**, Pratt JC, Burakoff SJ, **Neel BG.** Cloning of p97/Gab2, the major SHP2-binding protein in hematopoietic cells, reveals a novel pathway for cytokine-induced gene activation. *Mol Cell* 1998 Dec;2(6):729-40.
55. **Oh ES, Gu H**, Saxton TM, **Timms JF, Hausdorff S**, Frevert EU, Kahn BB, Pawson T, **Neel BG**, Thomas SM. Regulation of early events in integrin signaling by the protein-tyrosine phosphatase SHP-2. *Mol. Cell. Biol.*, 1999 Apr;19(4): 3205-15.
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58. Miller BA, Barber DL, Bell LL, Beattie BK, Zhang M-Y, **Neel BG, Yoakim M**, Rothblum LI, Cheung JY. Identification of the erythropoietin receptor domain required for calcium channel activation. *J. Biol. Chem.*, 1999 Jul 16;274(29):20465-72.
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63. **Chen B**, Bronson RT, **Klaman LD**, Hampton TG, Wang, JF, Green PJ, Magnuson T, Douglas PS, Morgan JP and **Neel BG**. Mice mutant for *Egfr* and *Shp2* have defective cardiac semilunar valvulogenesis. *Nature Genet.* 2000 Mar;24(3):296-99.
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65. Gadina M, Sudarshan C, Visconti R, Ahou YJ, **Gu H, Neel BG**, O'Shea JJ. The docking molecule *Gab2* is induced by lymphocyte activation and is involved in signaling by interleukin-2 and interleukin-15 but not other common gamma chain-using cytokines. *J. Biol. Chem.* 2000 Sep 1;275(35):26959-66.
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69. Bjorbaek C, Buchholz RM, Davis SM, Bates SH, Pierroz DD, **Gu H, Neel BG**, Myers MG Jr, Flier JS. The role of *SHP-2* in ERK activation by leptin receptors. *J Biol Chem.*, 2001; Feb 16;276(7):4747-55.
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72. **Gu H**, Saito K, **Klaman LD, Shen J**, Fleming T, **Wang Y**, Pratt JC, Lin G, Lim B, Kinet JP, **Neel BG**. Essential role for *Gab2* in the allergic response. *Nature* 2001 Jul 12;412(6843):186-190.

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