

Jane E. Johnson, Ph. D.

Professor, Dept of Neuroscience, UT Southwestern Medical Center • 5323 Harry Hines Blvd, Dallas, TX 75390-9111
• Phone: 214-648-1870 • Fax: 214-648-1801 • E-Mail: Jane.Johnson@utsouthwestern.edu

Research Interests

- Molecular control balancing progenitor cell maintenance with neuronal differentiation in the vertebrate central nervous system__implications for tumor progression in neural and neuroendocrine cancers.
- Generation of neuronal diversity and circuit formation through defining the molecular control of neuronal subtype specification particularly in somatosensation circuitry in the dorsal spinal cord.
- Transcriptional control of these processes through studying the regulation and function of the bHLH factors Ascl1 (Mash1), Atoh1 (Math1), Ptf1a, Neurog1 (Ngn1), and Neurog2 (Ngn2).
- Currently using genome wide target analysis of the bHLH transcription factors to identify novel target genes. Determining the function of the targets for their roles in neuronal differentiation and generation of neuronal circuitry.

Education/Training

Postdoctoral training: California Institute of Technology with David Anderson, Ph. D. (1988-1992)

Ph.D. Department of Biochemistry, University of Washington, Seattle (1988)
(Thesis Advisor: Stephen Hauschka, Ph. D.)

B.S. Magna Cum Laude, Chemistry, University of Washington, Seattle (1983)

Experience

- Assistant Professor, Center for Basic Neuroscience, Departments of Cell Biology and Pharmacology, University of Texas Southwestern Medical Center 1993-2000
- Associate Professor, Center for Basic Neuroscience, Departments of Cell Biology and Pharmacology, University of Texas Southwestern Medical Center 2000-2006
- Chair, Neuroscience Graduate Program, University of Texas Southwestern Medical Center 2001-2008
- Professor, Department of Neuroscience, with secondary appointment in Department of Pharmacology, University of Texas Southwestern Medical Center 2006-present
- Interim Chair, Department of Neuroscience, University of Texas Southwestern Medical Center 2008-2009
- Vice-chair, Department of Neuroscience, University of Texas Southwestern Medical Center 2007-present
- Member, Harold C. Simmons Comprehensive Cancer Center, Cancer and Development Scientific program. 2011-present

Administrative Experience

- Institutional Animal Care and Use Committee 1994-2006

• Graduate Student Advisory Committee	1997-2007
• Graduate School Curriculum Committee	1999-2006
• Women in Science and Medicine Advisory Committee	2000-2002
• Chair, Neuroscience Graduate Program	2001-2008
• Steering Committee, Division of Biological Sciences Graduate Prog	2001-2008
• Graduate Executive Council	2001-2008
• Postdoctoral Advisory Committee	2004-present
• Medical Scientist Training Program, Admissions Committee	2005-present
• Institutional Promotions and Tenure Committee	2006-present
• Vice-Chair, Department of Neuroscience	2007-present
• Interim Chair, Department of Neuroscience	2008-2009
• Search Committee for Chair of Neurology	2008-2010
• Search Committee for Neuroscience Dept Faculty	2008-present
• Institutional Conflict of Interest Review Committee	2010-present

Fellowships/Honors/Awards

• Muscular Dystrophy Association Postdoctoral Fellowship	1989-1991
• Neurofibromatosis Foundation Young Investigator Award	1991-1993
• Established Investigator of the American Heart Association	1995-2000
• The Nichole Silversteen Research Chair	2008-2011
• Excellence in Postdoctoral Mentoring Award from the Postdoctoral Association at UT Southwestern	2011

Publications

1. Jaynes JB, Chamberlain JS, Buskin JN, **Johnson JE** and Hauschka SD (1986). Transcriptional regulation of the muscle creatine kinase gene and regulated expression in transfected mouse myoblasts. **Mol Cell Biol** 6:2855-2864.
2. Jaynes JB, **Johnson JE**, Buskin JN, Gartside CL and Hauschka SD (1988). The muscle creatine kinase gene is regulated by multiple upstream elements including a muscle-specific enhancer. **Mol Cell Biol** 8:62-70.
3. **Johnson JE**, Gartside CL, Jaynes JB and Hauschka SD (1989). Expression of a transfected mouse muscle-creatine kinase gene is induced upon growth factor deprivation of myogenic but not of non-myogenic cells. **Dev Biol** 134:258-262.
4. **Johnson JE**, Wold BJ and Hauschka SD (1989). Muscle creatine kinase sequence elements regulating skeletal and cardiac muscle expression in transgenic mice. **Mol Cell Biol** 9:3393-3399.
5. **Johnson JE**, Birren SJ and Anderson DJ (1990). Two rat homologues of *Drosophila achaete-scute* specifically expressed in neuronal precursors. **Nature** 346:858-861.

6. Lo L-C, **Johnson JE**, Wuenschell CW, Saito T and Anderson DJ (1991). Mammalian *achaete-scute* homolog 1 is transiently expressed by spatially-restricted subsets of early neuroepithelial and neural crest cells. **Genes and Development** 5: 1524-1537.
7. **Johnson JE**, Zimmerman K, Saito T and Anderson DJ (1992). Induction and repression of mammalian *achaete-scute* homologue (MASH) gene expression during neuronal differentiation of P19 embryonal carcinoma cells. **Development** 114: 75-87.
8. **Johnson JE**, Birren SJ, Saito T and Anderson DJ (1992). The MASH genes encode transcriptional regulators that can activate expression of muscle creatine kinase, but do not induce myogenesis. **Proc Natl Acad Sci USA** 89: 3596-3600.
9. Guillemot FG, Lo L, **Johnson JE**, Auerbach A, Anderson DJ and Joyner AL (1993). Mammalian *achaete-scute* homolog 1 is required for the early development of olfactory and autonomic neurons. **Cell** 75: 463-476.
10. Verma-Kurvari S, Savage T, Gowan K and **Johnson JE** (1996). Lineage specific regulation of the neural differentiation gene *Mash1*. **Dev Biol** 180: 605-617.
11. Kim P, Helms AW, **Johnson JE** and Zimmerman K (1997). *XATH1*, a vertebrate homolog of *Drosophila atonal*, induces neuronal differentiation within ectodermal progenitors. **Dev Biol** 187: 1-12.
12. Verma-Kurvari S and **Johnson JE** (1997). Identification of an *achaete-scute* homolog, *Fash1*, from *Fugu rubripes*. **Gene** 200: 145-148.
13. Ikeya M, Lee SMK, **Johnson JE**, McMahon AP and Takada S (1997). Wnt signalling required for expansion of neural crest and CNS progenitors. **Nature** 389: 966-970.
14. Helms AW and **Johnson JE** (1998). Progenitors of dorsal commissural interneurons are defined by MATH1 expression. **Development** 125: 919-928.
15. Verma-Kurvari S, Savage T, Smith D and **Johnson JE** (1998). Multiple elements regulate *Mash1* expression in the developing CNS. **Dev Biol** 197: 106-116.
16. Tuttle R, Nakagawa Y, **Johnson JE** and O'Leary D (1999). Misguidance of thalamocortical projections in Mash1 mutant forebrains. **Development** 126, 1903-1916.
17. Horton S, Meredith A, Richardson JA, and **Johnson JE** (1999). Correct coordination of neuronal differentiation events in ventral forebrain requires the bHLH factor MASH1. **Mol Cell Neurosci** 14, 355-369.
18. Nakagawa Y, **Johnson JE** and O'Leary DDM (1999). Graded and areal expression patterns of regulatory genes and Cadherins in embryonic neocortex independent of thalamocortical input. **J. Neurosci** 19, 10877-10885.
19. Helms AW, Abney A, Ben-Arie N, Zoghbi HY and **Johnson JE** (2000). Autoregulation and multiple enhancers control *Math1* expression in the developing nervous system. **Development** 127, 1185-1196.
20. Meredith A and **Johnson JE** (2000). Negative autoregulation of the MASH1 promoter in neural development. **Dev Biol** 222, 336-346.
21. Simmons A, Horton S, Abney A and **Johnson JE** (2001) *Neurogenin2* expression in ventral and dorsal spinal neural tube progenitor cells is regulated by distinct enhancers. **Dev Biol** 229, 327-339.
22. Wang S, Sdrulla A, **Johnson JE**, Yokota Y and Barres BA (2001) A role for the helix-loop-helix protein Id2 in the control of oligodendrocyte development. **Neuron** 29, 603-614.
23. Timmer J, **Johnson J** and Niswander L (2001) The use of *in ovo* electroporation for the rapid analysis of neural-specific murine enhancers. **Genesis** 29, 123-132.

24. Helms AW, Gowan K, Abney A, Savage T and **Johnson JE** (2001) Overexpression of MATH1 disrupts the coordination of neuronal differentiation in cerebellum development. **Mol Cell Neurosci** 17, 671-682.
25. Gowan K, Helms AW, Hunsaker T, Collisson T, Ebert PJ, Odom R and **Johnson JE** (2001) Crossinhibitory Activities of Ngn1 and Math1 Allow Specification of Distinct Dorsal Interneurons. **Neuron** 31, 219-232.
26. Chen P, **Johnson JE**, Zoghbi HY and Segil N (2002). The role of Math1 in inner ear development: uncoupling the establishment of the sensory primordium from hair cell fate determination. **Development** 129, 2495-2505.
27. Yun K, Fischman S, **Johnson JE**, Hrabe de Angelis M, Weinmaster G and Rubenstein JLR (2002). Modulation of the Notch signaling by *Mash1* and *Dlx1/2* regulates sequential specification and differentiation of progenitor cell types in the subcortical telencephalon. **Development** 129, 5029-5040.
28. Wu H-H, Murray RC, Jaramillo S, Ivkovic S, Lyons KM, **Johnson JE** and Calof AL (2003). Negative autoregulation of neurogenesis by GDF11. **Neuron** 37, 197-207.
29. Ebert PJ, Timmer JR, Nakada Y, Helms AW, Parab PB, Liu Y, Hunsaker T and **Johnson JE** (2003). *Zic1* represses *Math1* expression via interactions with the Math1 enhancer and modulation of *Math1* autoregulation. **Development** 130, 1949-1959.
30. Lumpkin EA, Collisson T, Parab P, Omar-Abdalla A, Haeberle H, Chen P, Doetzlhofer A, White P, Groves A, Segil N and **Johnson JE** (2003). Math1-driven GFP expression in the developing nervous system of transgenic mice. **Gene Expression Patterns** 3, 389-395.
31. Nakada Y, Hunsaker TL, Henke RM and **Johnson JE** (2004). Distinct domains within *Mash1* and *Math1* are required for function in neuronal differentiation versus neuronal cell-type specification. **Development** 131, 1319-1330.
32. Liu Y, Helms AW and **Johnson JE** (2004). Distinct activities of *Msx1* and *Msx3* in dorsal neural tube development. **Development** 131, 1017-1028.
33. Nakada Y, Parab P, Simmons A, Omer-Abdalla A and **Johnson JE** (2004). Separable enhancer sequences regulate the expression of the neural bHLH transcription factor Neurogenin1. **Dev Biol** 271, 479-487.
34. Doetzlhofer A, White PM, **Johnson JE**, Segil N and Groves AK (2004). A requirement for EGF and periotic mesenchyme in the growth and differentiation of mammalian sensory hair cell progenitors. **Dev Biol** 272, 432-447.
35. Parras CM, Galli R, Britz O, Soares S, Galichet C, Battiste J, **Johnson JE**, Nakafuku M, Vescovi A and Guillemot F (2004). *Mash1* specifies neurons and oligodendrocytes in the postnatal brain. **EMBO** 23, 4495-4505.
36. Saba R, **Johnson JE**, and Saito T (2005). Commissural neuron identity is specified by a homeodomain protein, MBH1, directly downstream of *Math1*. **Development** 132, 2147-2155.
37. Helms AW, Battiste J, Henke RM, Nakada Y, Simplicio N, Guillemot F and **Johnson JE** (2005). Sequential roles for *Mash1* and *Ngn2* in the generation of dorsal spinal cord interneurons. **Development** 132, 2709-2719.
38. Lee A, Kaiser JD, Read TA, Kaiser C, Corbeil D, Huttner WB, **Johnson JE** and Wechsler-Reya RJ (2005). Isolation of neural stem cells from the postnatal cerebellum. **Nature Neurosci** 8, 723-729.
39. Klein C, Butt S, Machold R, **Johnson JE**, and Fishell G (2005). Cerebellar- and forebrain-derived stem cells possess intrinsic regional character. **Development** 132, 4497-4508.
40. Glasgow S, Henke RM, Wright C, MacDonald R and **Johnson JE** (2005). PTF1a determines GABAergic over glutamatergic neuronal cell fate in the spinal cord dorsal horn. **Development** 132, 5461-5469.

41. Battiste J., Helms AW, Kim EJ, Savage TK, Lagace DC, Mandyam CD, Eisch AJ, Miyoshi G, and **Johnson JE** (2007). *Ascl1* defines sequentially generated lineage restricted neuronal and oligodendrocyte precursor cells in the spinal cord. **Development** 134, 285-293.
42. Raft S, Koundakjian EJ, Quiñones HI, Jayasena CS, Goodrich LV, **Johnson JE**, Segil N, and Groves AK (2007). Cross-regulation of *Ngn1* and *Math1* coordinates the production of neurons and sensory hair cells during inner ear development. **Development** 134, 4405-4415.
43. Imondi R, Jevince AR, Helm AW, **Johnson JE** and Kaprielian Z (2007). Mis-expression of *L1* on pre-crossing spinal commissural axons disrupts pathfinding at the ventral midline. **Mol Cell Neurosci** 36, 462-471.
44. Kim EJ, Leung CT, Reed RR and **Johnson JE** (2007). In vivo analysis of *Ascl1* defined progenitors reveals distinct developmental dynamics during adult neurogenesis and gliogenesis. **J. Neurosci** 27, 12764-12774.
45. Hori K, Cholewa-Waclaw J, Nakada Y, Glasgow S M, Masui T, Henke RM, Wildner H, Martarelli B, Beres TM, Epstein JA, Magnuson MA, MacDonald RJ, Birchmeier C, and **Johnson JE** (2008). A non-classical bHLH-Rbpj transcription factor complex is required for specification of GABAergic neurons independent of Notch signaling. **Genes Dev** 22, 166-178.
46. Kim EJ, Battiste J, Nakagawa Y and **Johnson JE** (2008). *Ascl1* (*Mash1*) lineage cells contribute to discrete cell populations in CNS architecture. **Mol Cell Neurosci** 38, 595-606.
47. Masui T, Swift GH, Hale MA, Meredith DM, **Johnson JE** and MacDonald RJ (2008). Transcriptional autoregulation controls pancreatic *Ptf1a* expression during development and adulthood. **Mol Cell Biol** 28, 5458-5468.
48. Reeber S, Sakai N, Nakada Y, Dumas J, **Johnson JE** and Kaprielian Z (2008). Manipulating *Robo* expression in vivo perturbs commissural axon pathfinding in the chick spinal cord. **J. Neurosci** 28, 8698-8708.
49. Henke RM, Meredith DM, Borromeo MD, Savage TK, and **Johnson JE** (2009). *Ascl1* and *Neurog2* form novel complexes and regulate *Delta-like3* (*Dll3*) expression in the neural tube. **Dev Biol** 328, 529-540.
50. Henke RM*, Savage TK*, Meredith DM, Glasgow SM, Hori K, Dumas J, MacDonald RJ and **Johnson JE** (2009). *Neurog2* is a Direct Downstream Target of the *Ptf1a*-Rbpj Transcription Complex in Dorsal Spinal Cord. **Development** 136, 2945-2954.
51. Meredith DM, Masui T, Swift GH, MacDonald RJ and **Johnson JE** (2009). Multiple Transcriptional Mechanisms Control *Ptf1a* Levels During Neural Development Including Autoregulation by the PTF1-J Complex. **J. Neurosci** 29, 11139-11148.
52. Miyoshi G, Hjerling-Leffler J, Karayannis T, Sousa VH, Butt SJB, Battiste J, **Johnson JE**, Machold RP and Fishell G (2010). Genetic fate mapping reveals that the caudal ganglionic eminence produces a large and diverse population of superficial cortical interneurons. **J Neurosci** 30, 1582-1594.
53. Quinones HI, Savage TK, Battiste J, and **Johnson JE** (2010). *Neurogenin 1* expression in the ventral neural tube is mediated by a distinct enhancer and preferentially marks ventral interneuron lineages. **Dev Biol** 340, 283-292.
54. Kim EJ, Hori K, Wyckoff A, Dickel LK, Koundakjian EJ, Goodrich LV and **Johnson JE** (2011). The spatiotemporal fate map of *Neurogenin1* (*Neurog1*) lineages in the central nervous system. **J Comp Neurol** 519, 1355-1370.
55. Kim EJ, Ables JL, Dickel LK, Eisch AJ, and **Johnson JE** (2011). *Ascl1* (*Mash1*) defines cells with long term neurogenic potential in subgranular and subventricular zones in adult mouse brain. **PLoS One** 6, e18472. (<http://dx.plos.org/10.1371/journal.pone.0018472>).

56. Lai HC, Tiemo JK, Roberts R, Zoghbi HY and **Johnson JE** (2011). In vivo neuronal subtype-specific targets of Atoh1 (Math1) in dorsal spinal cord. **J. Neurosci** 31, 10859-10871.
57. Zhou J, Shrikhande G, Xu J, McKay R M, Burns DK, **Johnson JE** and Parada, LF (2011). Tsc1 mutant neural stem/progenitor cells exhibit migration deficits and give rise to subependymal lesions in the lateral ventricle. **Genes Dev** 25, 1595-6000.
58. Brezinski JA, Kim EJ, **Johnson JE**, and Reh TA (2011). Ascl1 expression defines a subpopulation of lineage-restricted progenitors in the mammalian retina. **Development** 138, 3519-3531.
59. Gokoffski KK, Wu H-H, Beites CL, Kim J, Kim EJ, Matzuk MM, **Johnson JE**, Lander AD and Calof AL (2011). Activin and GDF11 collaborate in integral feedback control of neuroepithelial stem cell proliferation and fate. **Development** 138 4131-4142.

Invited Reviews:

1. Helm AW and **Johnson JE** (2003). Specification of dorsal spinal cord interneurons. **Curr Op in Neurobiology** 13, 42-49.
2. **Johnson JE** (2003). Numb and Numbl like control cell number during vertebrate neurogenesis. **Trends Neurosci.** 26:395-6.
3. Lai HC and **Johnson JE** (2008). Neurogenesis or neuronal specification: phosphorylation strikes again! **Neuron** 58, 3-5.
4. Glasgow SM and **Johnson JE** (2009). "Helix-loop-helix (bHLH) proteins, proneural" in **Encyclopedia of Neuroscience**, Elsevier Limited, Oxford, England, Pg 1067-1072. Selected for inclusion in **Developmental Neurobiology**, edited by G. Lemke, Aug 2009, Elsevier Limited.
5. **Johnson JE** and MacDonald RJ (2011). "Notch-independent Functions of CSL" in **Current Topics in Developmental Biology**, Elsevier Limited, Oxford, England.
6. Lai HC, Meredith DM and **Johnson JE** (2012). "bHLH Factors in Neurogenesis and Neuronal Sub-type Specification" in **Comprehensive Developmental Neuroscience Encyclopedia**, Elsevier Limited, Oxford, England (in production)