

CURRICULUM VITAE

RAVIKUMAR BALASUBRAMANIAN

Name: RAVIKUMAR BALASUBRAMANIAN

Office Address: Reproductive Endocrine Unit
Massachusetts General Hospital
55 Fruit Street, Bartlett Hall Extension, Floor 5
Boston, MA 02114 United States

Education:

1996	M.B.B.S.	Medicine	Dr. MGR Medical University, Chennai, India
1999	M.R.C.P.	Internal Medicine	Royal College of Physicians, United Kingdom
2008	Ph.D.	Medical Sciences	Newcastle University, Newcastle upon Tyne, UK (Advisor: Dr. Roy Taylor)

Postdoctoral Training

02/97 – 08/97	Resident	Emergency Medicine	Wansbeck Hospital, Ashington, UK
08/97 – 04/00	Resident	Internal Medicine	Royal Bolton Hospital & Royal Preston Hospital, Lancashire, UK
04/00 – 12/00	Clinical Fellow	Endocrinology & Diabetes	Yorkshire Deanery Hospitals, Yorkshire, UK
01/01 – 12/01	Clinical Fellow	Endocrinology & Diabetes	Addenbrooke's Hospital, University of Cambridge, UK
12/01 – 01/06	Research Fellow	Endocrinology & Diabetes	Newcastle University, Newcastle, UK
02/06 – 11/08	Clinical Fellow	Endocrinology & Diabetes	Northern Deanery Hospitals, Newcastle, UK
01/09 – 06/09	Research Fellow	Medicine	Massachusetts General Hospital & Harvard Medical School, Boston, MA

Faculty Academic Appointments

07/09 – Present	Instructor	Medicine	Harvard Medical School, Boston, MA
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Appointments at Hospitals or Affiliated Institutions

Past

11/08 – 01/09	Consultant Physician (Locum Appointment)	Medicine Endocrine Division	Bishop Auckland Hospital, Bishop Auckland, UK
07/09 – 10/12	Assistant in Research	Reproductive Endocrine Unit, Dept of Medicine	Massachusetts General Hospital Boston, MA

Current

11/12 – Present	Assistant in Medicine	Reproductive Endocrine	Massachusetts General Hospital
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Major Administrative Leadership Positions

Local

10/06 – 10/07	Associate Tutor/Director, Endocrinology Teaching Program	Royal Victoria Hospital, Newcastle, UK
07/09 – 06/13	Clinical Conference Coordinator Reproductive Endocrine Unit	Massachusetts General Hospital, Boston, MA
07/09 – Present	Assistant Director, Research Education Harvard Reproductive Sciences Center	Massachusetts General Hospital, Boston, MA

Professional Societies

2006 – 2008	Diabetes UK	Professional Member
2006 – Present	The Endocrine Society	Professional Member
2009 – Present	American Federation for Medical Research	Professional Member
2010 – 2011	American Federation for Medical Research	Chair, Eastern Region
2010 – 2012	American Federation for Medical Research	Member, National Council
2010 – 2013	American Federation for Medical Research	Member, Abstract Selection Committee
2014 – 2015	The Endocrine Society	Member, Abstract Selection Committee

Grant Review Activities

2013-2014	Scientific Research in Biomedicine 2013 Ad-hoc Reviewer	Foundazione Cariplo, Italy
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Editorial Activities

Ad-hoc Reviewer

Diabetic Medicine
Diabetes Research and Clinical Practice
Clinical Endocrinology
Journal of Clinical Endocrinology & Metabolism
Scientific Reports

Honors and Prizes

1993	Distinction Certificate,	Kilpauk Medical College, India	Medical Education
1994	Distinction Certificate	Kilpauk Medical College, India	Medical Education
2006	Dewar Prize	Association of Physicians (Northern Region), UK	Research
2007	Myre-Sim Prize	Royal College of Physicians Edinburgh, UK	Research

Report of Funded and Unfunded Projects

Funding Information

Past

- 2004-2006** Is the defective postprandial suppression in type 2 diabetes reversible by reduction in intrahepatic triglyceride content?
Diabetes Research and Wellness Foundation, United Kingdom
PI (\$150,000)
The major goal of this project was to evaluate the effect of a combination treatment with peroxisome- proliferator activated receptor- γ and peroxisome-proliferator activated receptor- α in subjects with type 2 diabetes.
- 2010** The role of prokineticin 2 pathway on glucose homeostasis in humans
Boston Area Diabetes and Endocrinology Pilot/Feasibility Grant
PI (\$70,000)
The major goal of this project was to evaluate the role of prokineticin 2 signaling on glucose homeostasis in humans

Current

- 2014 – 2019** Biologic roles of axonal guidance genes in the ontogeny of GnRH neurons
NICHD/K23 HD077043
PI (\$685,200)
The major goal of this project is to investigate the role of three novel axonal guidance genes in the etiology of human isolated GnRH deficiency

Report of Local Teaching and Training

Teaching of Students in Courses:

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| 2004-2008 | Endocrine Diseases
[Chronic disease, disability and rehabilitation course]
3 rd and 4 th year medical students | Newcastle University, UK
1-hr session/week for 8 wks |
| 2006 | Endocrine Cases
Foundations of Clinical Practice
4 th year medical students | Newcastle University, UK
1-hr session/week for 16 wks |

Formal teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

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| 2005 | Metabolic investigations in humans
Postgraduate lecture for Research Fellows
British Society for Endocrinology | Newcastle, UK
2-hour lecture |
| 2009 – Present | Clinical Conference Series
(Reproductive Endocrinology)
1 st and 2 nd year Endocrine Fellows | MGH
Boston, MA
1-hr session x 6 lectures/yr |

Clinical Supervisory and Training Responsibilities

2009 – Present	Reproductive Endocrine Associates Clinic Clinical Fellows in Endocrinology	MGH One-half day per week
2014 – Present	Attending Physician, Endocrinology Service Clinical Fellows in Endocrinology	MGH 2 weeks a year

Laboratory and Other Research Supervisory and Training Responsibilities

2010 – 2013	Supervision of post-doctoral fellows/ Reproductive Endocrine Unit	Daily mentorship for 24 months for each fellow
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Formally Supervised Trainees

2010-2011	Hilana Lewkowitz-Shpuntoff (Medical Student, Albert Einstein Medical School) Biomedical Research Career Award Student Published one first-author manuscript; AFMR Eastern Regional Scholar Award
2012-2013	Edward Horton (Medical Student, University of Pennsylvania Medical School) Biomedical Research Career Award Student AFMR Eastern Regional Scholar Award

Formal Teaching of Peers

No presentations below were sponsored by outside entities

2010 – Present	Management of Hypogonadism in males Harvard MGH Endocrine Course	One-hour lecture/year Boston, MA
2010 – Present	Case management Seminar (Reproductive Endocrinology) Harvard MGH Endocrine Course	One-hour workshop Boston, MA

Local Invited Presentations

No presentations below were sponsored by outside entities

2010	Puberty that comes and goes Endocrine Grand Rounds, Endocrine Division, MGH
2011	Reproductive Endocrinology Clinical Case Conference Endocrine Grand Rounds, Endocrine Division, MGH
2012	Reversal of GnRH Deficiency Endocrine Grand Rounds, Endocrine Division, MGH
2013	Insights into GnRH neuronal ontogeny from syndromic GnRH deficiency Endocrine Grand Rounds, Endocrine Division, MGH

Regional, National and International Invited Teaching and Presentations

Regional

No presentations below were sponsored by outside entities

- 2006 Blood pressure control in type 2 diabetes: Are we meeting NICE targets?
Northern Region (UK) Diabetes Audit Group, Durham, UK
- 2008 Thyrotoxicosis in pregnancy
Northern Region (UK) Diabetes Audit Group, Durham, UK
- 2008 Debate: Newer agents will revolutionize the treatment of diabetes-Against the motion
Northern Regional CME, Newcastle upon Tyne, UK
- 2012 Management of male hypogonadism
Medical Grand Rounds, St. Elizabeth's Medical Center (Tufts University)
Brighton, MA
- 2014 Insights into the ontogeny of GnRH neurons from syndromic presentations of
idiopathic hypogonadotropic hypogonadism,
Endocrine Rounds, Tufts Medical Center, Boston, MA

National

No presentations below were sponsored by outside entities

- 2003 Resting energy expenditure is elevated in type 2 diabetes,
Diabetes UK Annual Professional Conference, Glasgow, UK
- 2005 Postprandial uptake of triglyceride in liver and skeletal muscle is up regulated
in type 2 diabetes. Diabetes UK Annual Professional Conference, Glasgow, UK

International

No presentations below were sponsored by outside entities

- 2004 Postprandial trafficking of dietary fat in skeletal muscle and liver *in vivo* in humans
European Association for Study of Diabetes (EASD), Munich, Germany

Report of Clinical Activities and Innovations

Current Licensure and Certifications

- 05/2000 – present Full Licensure, General Medical Council (GMC), UK
11/2008 – present Completion of Specialist Training (Diabetes & Endocrinology), GMC, UK
06/2012 – present Full Licensure, Massachusetts Board of Registration in Medicine

Practice Activities

- 2012 – Present Ambulatory Care Reproductive Endocrine Associates One-half session/wk
MGH, Boston, MA
- 2014 – Present Attending Physician Massachusetts General Hospital, Two weeks/year
Endocrinology Service Boston, MA

Educational Material for Patients and the Lay Community

Patient Educational Material

No educational materials below were sponsored by outside entities

2009-Present	Isolated Gonadotropin-Releasing Hormone Deficiency	Co-author	Gene Reviews® Online
2012-Present	Kallmann Syndrome	Co-author	Rare Disease Database Report

Report of Scholarship

[§]Until 2009, my name in publications appeared as Ravikumar B. Upon acquiring British citizenship, my name appears as Balasubramanian R. to reflect my current official name.

Peer Reviewed Original Publications in print or other media

Research Investigations

1. **Ravikumar B[§]**, Carey PE, Snaar JE, Deelchand DK, Cook DB, Neely RD, English PT, Firbank MJ, Morris PG, Taylor R. Real-time assessment of postprandial fat storage in liver and skeletal muscle in health and type 2 diabetes. *Am J Physiol Endocrinol Metab.* 2005 Apr;288(4):E789-97
2. Savage DB, Zhai L, **Ravikumar B[§]**, Choi CS, Snaar JE, McGuire AC, Wou SE, Medina-Gomez G, Kim S, Bock CB, Segvich DM, Solanky B, Deelchand D, Vidal-Puig A, Wareham NJ, Shulman GI, Karpe F, Taylor R, Pederson BA, Roach PJ, O'Rahilly S, DePaoli-Roach AA. A prevalent variant in PPP1R3A impairs glycogen synthesis and reduces muscle glycogen content in humans and mice. *PLoS Med.* 2008 Jan 29;5(1):e27
3. **Ravikumar B[§]**, Gerrard J, Dalla Man C, Firbank MJ, Lane A, English PT, Cobelli C, Taylor R. Pioglitazone decreases fasting and postprandial endogenous glucose production in proportion to decrease in hepatic triglyceride content. *Diabetes.* 2008 Sep;57(9):2288-95.
4. Jovanovic A, Leverton E, Solanky B, **Ravikumar B[§]**, Snaar JE, Morris PG, Taylor R. The second meal phenomenon is associated with enhanced muscle glycogen storage in humans. *Clin Sci (Lond)* 2009 Aug;117(3):119-27
5. **Balasubramanian R**, Gerrard J, Dalla Man C, Firbank MJ, Lane A, English, PT, Cobelli C, Taylor R. Combination peroxisome proliferator-activated receptor γ and α agonist treatment in type 2 diabetes prevents the beneficial pioglitazone effect on liver fat content. *Diabet. Med.* 2010 Feb;27:150–156
6. Lewkowitz-Shpuntoff HM, Hughes VA, Plummer L, Au MG, Doty RL, Seminara SB, Chan YM, Pitteloud N, Crowley WF, **Balasubramanian R**. Olfactory phenotypic spectrum in idiopathic hypogonadotropic hypogonadism: pathophysiologic and genetic implications. *J Clin Endocrinol Metab.* 2012 Jan;97(1):E13644.
7. Avbelj M, Jeanpierre M, Sykiotis GP, Young J, Quinton R, Abreu AP, Plummer L, Au

MG, **Balasubramanian R**, Dwyer AA, Florez JC, Cheetham T, Pearce SH, Purushothaman R, Schinzel A, Pugeat M, Jacobson-Dickman EE, Ten S, Latronico AC, Gusella JF, Dode C, Crowley WF Jr., Pitteloud N. An Ancient Founder Mutation in PROKR2 Impairs Human Reproduction. *Hum Mol Genet.* 2012 Oct 1;21(19):4314-24.

8. Chew S, **Balasubramanian R**, Chan W, Kang PB, Andrews C, Webb BC, MacKinnon SE, Oystreck DT, Rankin J, Crawford TO, Geraghty M, Pomeroy SL, Crowley WF Jr., Jabs EW, Hunter DG, Ellen Grant P, Engle EC. A novel syndrome caused by the E410K amino acid substitution in the neuron-specific β -tubulin TUBB3. *Brain.* 2013 Feb;136(Pt 2):522-35

9. Costa-Barbosa F*, **Balasubramanian R***, Keefe K, Choi JC, Al-Tassan N, Plummer L, Dwyer AA, Buck C, Seminara SB, Quinton R, Meyer B, Pitteloud N, Crowley WF Jr., Comparative Analysis of Reproductive and Non-reproductive Phenotypes in Isolated GnRH Deficient Subjects Harboring Mutations in Genes Affecting GnRH Neuronal Migration. *J Clin Endocrinol Metab.* 2013 May;98(5):E943-53.

*Contributed equally as first authors

10. Santhakumar A, **Balasubramanian R**, Miller M, Quinton R. Reversal of Isolated Hypogonadotropic Hypogonadism: long-term integrity of hypothalamo-pituitary-testicular axis in two men is dependent on intermittent androgen exposure. *Clin Endocrinol (Oxf).* 2013 Oct 7. doi: 10.1111/cen.12347

11. **Balasubramanian R**, Cohen DA, Klerman EB, Pignatelli D, Dwyer AA, Czeisler CA, Pitteloud N, Crowley WF. Absence of Circadian Pacemaker abnormalities in Humans with Loss of Function Mutations in Prokineticin 2. *J Clin Endocrinol Metab.* 2014 Mar;99(3):E561–E5661

12. Sidhoum VF, Chan YM, Lippincott MF, **Balasubramanian R**, Quinton R, Plummer L, Dwyer A, Pitteloud N, Hayes FJ, Hall JE, Martin KA, Boepple PA, Seminara SB. Reversal and Relapse of Hypogonadotropic Hypogonadism: Resilience and Fragility of the Reproductive Neuroendocrine System. *J Clin Endocrinol Metab.* 2014 Mar;99(3):861–870

13. Xiao L, Zhang C, Li X, Gong S, Hu R, **Balasubramanian R**, Crowley WF Jr, Hastings MH, Zhou QY. Signaling role of prokineticin 2 on the estrous cycle of female mice. *PLoS ONE.* 2014 Mar;9(3): e90860. doi:10.1371/journal.pone.0090860

14. **Balasubramanian R***, Choi J-H*, Francescato L*, Willer J, Horton ER, Asimacopoulos E, Stankovic KM, Plummer L, Buck CL, Quinton R, Nebesio TD, Meriq V, Merino PM, Meyer BF, Monies D, Gusella JF, Al Tassan N, Katsanis N, Crowley WF. Functionally compromised CHD7 alleles in patients with isolated GnRH deficiency. *Proc Natl Acad Sci U S A.* 2014 Dec 16;111(50):17953-8.

*Contributed equally as first authors

15. **Balasubramanian R***, Chew S*, MacKinnon SE, Kang PB, Andrews C, Chan W, Engle EC. Expanding the phenotypic spectrum and variability of endocrine abnormalities associated with TUBB3 E410K Syndrome. (*in press*, *J Clin Endocrinol Metab*; Accepted Dec 2014).

*Contributed equally as first authors

Non-peer reviewed scientific or medical publications/materials in print or other media

Reviews

1. **Balasubramanian R**, Dwyer AA, Seminara SB, Pitteloud N, Kaiser UB and Crowley WF Jr. Human GnRH Deficiency: A prismatic human disease model to study GnRH neuronal ontogeny in humans. *Neuroendocrinology*. 2010;92(2):81-99.
2. Martin C*, **Balasubramanian R***, Dwyer AA, Au MG, Sidis Y, Kaiser UB, Seminara SB, Pitteloud N, Zhou QY, and Crowley WF Jr. The Role of the Prokineticin 2 Pathway in Human Reproduction: Evidence from the Study of Human and Murine Gene Mutations. *Endocr Rev*. 2011 Apr;32(2):225-46.
3. **Balasubramanian R**, Crowley WF Jr. Isolated GnRH deficiency: A disease model serving as a unique prism into the systems biology of the GnRH neuronal network. *Mol Cell Endocrinol*. 2011 Oct 22; 346(1-2):4-12.
4. **Balasubramanian R**, Plummer L, Sidis Y, Pitteloud N, Martin C, Zhou QY, Crowley WF Jr. The puzzles of the prokineticin 2 pathway in human reproduction. *Mol Cell Endocrinol*. 2011 Oct 22; 346(1-2):44-50

Book Chapters

1. **Ravikumar B**[§], Taylor R. Insulin resistance in diabetes. In: *Unstable and Brittle Diabetes*: Gill GV (ed), Martin Dunitz, London 2003
2. **Balasubramanian R**, Crowley WF. Concluding remarks. In: *Kallmann Syndrome and Hypogonadotropic Hypogonadism*: Quinton R (ed), Front Horm Res. Basel, Karger, 2010, vol 39; 168-169.
3. **Balasubramanian R**, Quinton R. Secondary Hypogonadism. In: *Testosterone Deficiency in Men*: Jones H (ed), Oxford, Oxford University Press, 2011
4. **Balasubramanian R**, Quinton R. Male Hypogonadism In: *Oxford Desk Reference, Endocrinology*: Turner H (ed), Oxford, Oxford University Press, 2014 (in press)

Thesis

1. **Ravikumar Balasubramanian**. 'Postprandial metabolism in health and type 2 diabetes'. PhD degree, Newcastle University, UK, 2008

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings

- 2010 **Balasubramanian R**, Hoang X, Dwyer AA, Sykiotis GP, Seminara SB, Pitteloud N, Crowley WF. Fertile eunuch syndrome: Genetics and Natural History. ENDO 2010, June 2010, San Diego, CA
- 2013 Choi J, **Balasubramanian R**, Plummer L, Shi Y, Kottler M, Wolczynski S, Latronico AC, Dode C, Ogata T, Layman LC, Gusella JF, Crowley WF. Two

Ancient Mutations in the GNRHR Gene Expand the Founder Allelic Spectrum in Isolated Gonadotropin-Releasing Hormone (GnRH) Deficiency ENDO 2013, June 2013, San Francisco, CA

- 2014 Cox KH, Oliveira LM, Plummer LC, **Balasubramanian R**, Crowley WF. Heterozygous PROKR2 Mutations in Isolated GnRH Deficiency: False Positives or Dominant Negatives? ENDO 2014, June 2014, Chicago, IL
- 2014 Delaney A, Lalonde FM, Blumenthal JD, Clasen LS, Hicks RL, Denker AH, Giedd JN, Crowley WF, **Balasubramanian R**. Delayed Sex Hormone Exposure during Puberty Is Associated with Differences in Brain Cortical Thickness, Spatial Ability, and Recognition Memory. ENDO 2014, June 2014, Chicago, IL