

CURRICULUM VITAE

PART I: General Information

DATE PREPARED: March 14, 2005

Name: Heung Bae Kim

Office Address: Children's Hospital Boston
300 Longwood Avenue
Fegan 3, Pediatric Surgery
Boston, MA 02115

E-Mail: heung.kim@childrens.harvard.edu

Phone: 617-355-8544

FAX: 617-730-0475

Place of Birth: Seoul, South Korea

Education:

1989	B.A. Yale University
1993	M.D. Albert Einstein College of Medicine

Postdoctoral Training:

1993-1994	Intern, General Surgery Hospital of the University of Pennsylvania, Philadelphia, PA
1994-1996	Resident, General Surgery Hospital of the University of Pennsylvania, Philadelphia, PA
1996-1998	Fellow in Pediatric General Surgery Research The Children's Hospital of Philadelphia, Philadelphia, PA
1998-2000	Resident, General Surgery Hospital of the University of Pennsylvania, Philadelphia, PA
2000-2001	Associate Chief Resident in Pediatric Surgery Children's Hospital, Boston, MA
2001-2002	Chief Resident in Pediatric Surgery Children's Hospital, Boston, MA
2002-2004	Fellow in Liver Transplantation Lahey Clinic Medical Center, Burlington, MA

Licensure and Certification:

1993	Advanced Trauma Life Support
1994	Diplomate of the National Board of Medical Examiners
1996-2000	Pennsylvania State Medical License, MD
2000-	Massachusetts State Medical License

2001-2012 American Board of Surgery
 2002-2004 DEA
 2004-2013 American Board of Surgery, Pediatric Surgery Certificate
 2004 Children's Hospital Program in Responsible Research

Academic Appointments:

1994-2000 Assistant Instructor in Surgery, University of Pennsylvania School of
 Medicine, Philadelphia, PA
 1996-1998 Post Doctoral Research Fellow, The University of Pennsylvania,
 Philadelphia, PA
 2000-2002 Clinical Fellow in Surgery, Harvard University, Boston, MA
 2002- Instructor in Surgery, Harvard Medical School, Boston, MA

Hospital or Affiliated Institution Appointments:

1994-2000 Assistant Instructor in Surgery, Hospital of the University of
 Pennsylvania, Philadelphia, PA
 1996-1998 Pediatric Trauma Resident, The Children's Hospital of Philadelphia,
 Philadelphia, PA
 2002-2004 Assistant in Surgery, Lahey Clinic, Burlington, MA
 2002- Assistant in Surgery, Children's Hospital, Boston, MA
 2002- Pediatrician, Affiliate Staff, Brigham and Women's Hospital, Boston, MA
 2004-2006 Consultant, Hepatobiliary/General Surgery, Lahey Clinic, Burlington, MA

Other Professional Positions and Major Visiting Appointments:

2002- Visiting Fellow, Miniature Swine Transplantation Laboratory,
 Transplantation Biology Research Center, Massachusetts General Hospital

Hospital and Health Care Organization Service Responsibilities:

Major Administrative Responsibilities:

2004- Surgical Director, Liver, Intestine, and Multivisceral Transplantation
 Center, Children's Hospital, Boston

Major Committee Assignments:

1999-2000 Resident Selection Committee, Department of Surgery, Hospital of the
 University of Pennsylvania
 2001-2002 CPR Committee, Children's Hospital, Boston, MA

Professional Societies:

1997-2002 American College of Surgeons, Candidate Group
 2003-2004 American College of Surgeons, Associate Fellow
 2002- Association for Academic Surgery, Member
 2002- International Pediatric Transplantation Association, Member
 2004- American Pediatric Surgical Association, Candidate Member

- 2004- American Society of Transplantation, Member
- 2004- American College of Surgeons, Fellow, #03027668
- 2004- Massachusetts Chapter of the American College of Surgeons, Member
- 2004- The Transplantation Society, Member
- 2005- American Society of Transplant Surgeons, Member

Community Service Related to Professional Work:

Editorial boards:

- 2002 Ad hoc reviewer, Xenotransplantation
- 2004- Ad hoc reviewer, Journal of Pediatric Surgery
- 2004- Ad hoc reviewer, Transplantation

Awards and Honors:

- 1989 Cum Laude, Yale University
- 1990 American Cancer Society Scholarship
- 1993 Alpha Omega Alpha, Albert Einstein College of Medicine
- 1998 Travel Award, The Third International Symposium on In Utero Stem Cell Transplantation and Gene Therapy
- 2000 Penn Pearls Teaching Award, University of Pennsylvania School of Medicine
- 2000 The Keith Reemstma Surgical Resident of the Year Award, Hospital of the University of Pennsylvania
- 2000 Von L. Meyer Fellowship Fund Award, Children's Hospital, Boston
- 2002 Sidney Farber Housestaff Award, Children's Hospital, Boston
- 2002 Resident Research Award - 8 minute presentation, Section on Surgery of the American Academy of Pediatrics

PART II: Research, Teaching, and Clinical Contributions.

A. Narrative report of Research, Teaching and Clinical Contributions.

My research interests have developed as a direct response to some of the most difficult clinical problems I have encountered throughout my surgical training. These include immunologic tolerance induction for pediatric solid organ transplantation and the surgical management of short bowel syndrome to avoid the need for intestinal transplantation.

Based on earlier work I performed in a mouse model of in utero hematopoietic cell transplantation for tolerance induction, I became interested in applying this methodology to a preclinical large animal model. Dr. David Sachs at the Massachusetts General Hospital is the mentor for my K08 award that is focused on the induction of transplantation tolerance using in utero bone marrow transplantation. We have successfully developed a pig model of in utero bone marrow transplantation across a full MHC barrier and have achieved both stable multilineage hematopoietic chimerism as well as tolerance to postnatal kidney transplantation without immunosuppression of any kind. I plan to continue this collaborative effort over the duration of my grant and further define the requirements for tolerance in this model. This preclinical model will eventually be used to support the application of this method to human clinical trials of tolerance.

Another more recent focus of research has been the development of a new operation to lengthen the intestine of children who suffer from short bowel syndrome. During my Pediatric Surgery fellowship, I described a new operation called the Serial Transverse Enteroplasty (STEP) that I was able to test in a porcine model. This allowed us to examine the technical considerations of this new procedure before we applied it successfully in the first human case. The STEP has subsequently been adopted as the standard operation for intestinal lengthening in children with short bowel syndrome with at least twenty cases performed to date around the world. We have performed five procedures here at Children's Hospital, Boston, and have recently developed an internet-based international registry to help determine the long-term outcome after the STEP procedure. In subsequent laboratory studies, we have shown that the STEP objectively improves intestinal function and absorption in a porcine model of short bowel syndrome. In order to continue our research into the mechanisms of this improved intestinal function, I plan to submit an R01 in response to an NIH-RFA for short bowel syndrome.

In order to provide optimal transplantation care for children, I recently completed a fellowship in liver transplantation with Dr. Roger Jenkins and his group at the Lahey Clinic. With my interest in the surgical management of short bowel syndrome, it became apparent that the management of these difficult patients must include the option for intestinal transplantation. Therefore, I have helped to develop the first intestinal transplant program in New England devoted exclusively to children. This has been accomplished with hospital administrative support and in close collaboration with Dr. Craig Lillehei, the director of the solid organ transplant program, and Dr. Tom Jaksic, the director of the short bowel clinic. As the Surgical Director of our newly established Liver, Intestine, and Multivisceral Transplantation Center, I am now able to offer the full range of surgical options for children with liver diseases as well as short bowel syndrome including both bowel lengthening procedures as well as transplantation.

Finally, throughout my training, I have been actively involved in educating surgical residents both clinically and in the laboratory. Currently, I participate in the pediatric surgery resident lecture series as well as the clinical training of our two pediatric surgery fellows and the numerous residents and medical students that rotate through Children's from affiliated hospitals. I also plan to participate in a new series of lectures to be given to third year Harvard medical students during the core surgery clerkship.

B. Funding Information:

1996-1998	F32 HL09692-02, NRSA, NIH/NHLBI - \$60,000 - PI "Xenograft Tolerance Through Fetal Stem Cell Transplant"
1997-1999	Association for Academic Surgery/Sherwood-Davis & Geck Research Fellowship Award - \$30,000 - PI
2003-2008	K08 HL075262-01, NIH/NHLBI - \$540,000 - PI "In Utero Tolerance Induction in Miniature Swine"

C. Report of Current Research Activities

In Utero Tolerance Induction in Miniature Swine – PI

We have developed a fully MHC mismatched porcine model of in utero bone marrow transplantation. Using partially T-cell depleted bone marrow from the genetically defined herd of MHG miniature swine as a donor source, we have been able to induce stable multilineage hematopoietic chimerism after a single injection of cells at mid gestation. Surviving chimeric animals have accepted donor matched kidneys without immunosuppression for over 100 days without evidence for graft-versus-host disease. To our knowledge, this is the first demonstration of kidney allograft tolerance across a full MHC barrier in a large animal model without the use of immunosuppression. Future studies will examine differences in donor cell sources as well as the role of MHC matching in chimerism and tolerance.

Serial Transverse Enteroplasty (STEP) – PI

The first description of the STEP procedure was in a porcine model of dilated intestine. Although this demonstrated the simplicity and safety of the procedure, it was not performed in a short bowel model. Subsequent experiments have shown that the STEP procedure improves intestinal function in a porcine model of short bowel syndrome. I am currently preparing an R01 in response to an RFA for "short bowel syndrome" that will aim to determine the mechanisms of improved intestinal function following the STEP procedure. Clinically, we continue to follow our STEP patients and have recently developed an internet-based registry to prospectively track STEP patients around the world.

D. Report of Teaching:

1. Local Contributions

Lectures

- 2002 **Medical Grand Rounds, Children's Hospital, Boston**
 "Serial Transverse Enteroplasty: A Novel Bowel Lengthening Procedure"
 (Lecturer, 3 hours preparation, 1 hour contact)
- 2003 **Resident Teaching Conference, Children's Hospital, Boston**
 "Fetal Surgery" (Lecturer, 3 hours preparation, 1 hour contact)
 "Transplantation" (Lecturer, 3 hours preparation, 1 hour contact)
- Advanced Fetal Care Center, Children's Hospital, Boston**
 "In Utero Bone Marrow Transplantation"
 (Lecturer, 3 hours preparation, 1 hour contact)
- 2004 **Medical Grand Rounds, Children's Hospital, Boston**
 "Current Medical and Surgical Management for Short Bowel Syndrome"
 (Lecturer, 3 hours preparation, 1 hour contact)
- Resident Teaching Conference, Children's Hospital, Boston**
 "Newborn Surgical Emergencies" (Lecturer, 3 hours preparation, 1 hour
 contact)
 "Fetal Surgery" (Lecturer, 3 hours preparation, 1 hour contact)
 "Biliary Atresia and Choledochal Cysts" (Lecturer, 3 hours preparation, 1
 hour contact)
 "Newborn Surgical Emergencies" (Lecturer, 3 hours preparation, 1 hour
 contact)
- 2005 **Resident Teaching Conference, Children's Hospital, Boston**
 "Newborn Surgical Emergencies" (Lecturer, 3 hours preparation, 1 hour
 contact)
Nephrology Conference, Children's Hospital, Boston
 "Living Donor Kidney Transplantation" (Lecturer, 3 hours preparation, 1
 hour contact)

Advisees and trainees

- | | | |
|-----------|------------------------|--|
| 2001-2003 | Jennifer Garza, M.D. | Surgical Resident, St. Louis University |
| 2001-2003 | Robert Chang | Surgical Resident, Yale University |
| 2002-2004 | Patricia Lee, M.D. | Surgical Resident, Georgetown University |
| 2002-2004 | Patrick Javid, M.D. | Surgical Resident, Brigham and Womens Hospital |
| 2004- | Humberto Azpurua, M.D. | |

2. Regional, national, or international contributions

- 1998 Invited Speaker, The Third International Symposium on In Utero Stem Cell
 Transplantation and Gene Therapy, Portland, Oregon

3. Description of teaching awards received

2000 Penn Pearls Teaching Award, University of Pennsylvania School of Medicine
(Selected by University of Pennsylvania graduating medical school class)

E. Report of Clinical Activities:

1. Description of clinical practice - I have developed an active clinical practice in pediatric surgery which involves office as well as hospital based patient care. I cover pediatric surgery call as part of our 10 person group and perform the full range of pediatric surgical procedures. In addition, I have obtained fellowship training in liver transplantation and am the current Surgical Director of the Liver, Intestine, and Multivisceral Transplantation Center at the Children's Hospital, Boston. In addition, I am a member of the kidney transplantation program and perform both donor and recipient operations. As part of a national trend towards minimally invasive donor nephrectomy, I have introduced a recently described procedure known as the "mini-nephrectomy" which is performed through a very small incision with equivalent results to both the laparoscopic as well as the standard open approach. I am also involved in the lung transplantation program as the lung procurement surgeon.
2. Patient load – I cover equal call with my 11 partners in our pediatric surgery practice. In addition, I am always on call for liver, intestinal, and lung transplants and split kidney call with two other surgeons. I perform about 300 operative cases per year including the full range of complex general pediatric surgery cases as well as transplants.
3. Clinical contributions – I first described the Serial Transverse Enteroplasty (STEP) procedure for the treatment of short bowel syndrome during my fellowship. We have performed six STEP procedures at Children's Hospital, Boston, to date with promising results. In addition, I have personally advised several other surgeons around the nation on the technical aspects of the procedure and to the best of my knowledge, the STEP procedure has become the predominant intestinal lengthening procedure across the country. An internet-based registry has been developed to follow these patients long-term.
4. Other relevant information – I have traveled to Miami and Pittsburgh to observe the two largest intestinal transplant programs as part of the development of a new intestinal transplantation program at our institution. With full hospital administrative support and as a member of the New England Consortium for Intestinal Transplantation, we have recently opened our intestinal transplantation program. This involved hospital-wide educational lectures for many of the involved parties including the anesthesia staff, OR nursing, ICU staff, ICU nursing, pharmacy, transplant nursing, and radiology. In August of 2004, we performed the first successful multivisceral transplant in New England.

PART III: Bibliography**Original Articles**

1. Kim HB, Gregor MB, Boley SJ, Kleinhaus S: Digitally assisted laparoscopic drainage of multiple intraabdominal abscesses. *J Laparoendoscopic Surgery* 3:477-9, 1993.
2. Kim HB, Raghavendran K, Kleinhaus S: Management of an abdominal cerebrospinal fluid pseudocyst using laparoscopic techniques. *Surgical Laparoscopy & Endoscopy* 5:151-4, 1995.
3. Kim HB, Hebra A, Davidoff A, Buzby M, Maller E, Hoffman MA: Orthotopic liver transplant for inflammatory myofibroblastic tumor of the liver hilum. *Journal of Pediatric Surgery* 31:840-2, 1996.
4. Kim HB, Shaaban AF, Yang EY, Liechty KW, Flake AW: Microchimerism and tolerance after in utero bone marrow transplantation in mice. *Journal of Surgical Research* 77:1-5, 1998.
5. Milner R, Shaaban A, Kim HB, Fichter C, Flake AW. Postnatal booster injections increase engraftment after in utero stem cell transplantation. *Journal of Surgical Research*. 83:44-7, 1999.
6. Kim HB, Shaaban AF, Milner R, Fichter C, Flake AW: In utero bone marrow transplantation induces donor-specific tolerance by a combination of clonal deletion and clonal anergy. *Journal of Pediatric Surgery* 34:726-730, 1999.
7. Yang EY, Kim HB, Shaaban AF, Milner R, Adzick NS, Flake AW: Persistent postnatal transgene expression in both muscle and liver after fetal injection of recombinant adenovirus. *Journal of Pediatric Surgery* 34:766-773, 1999.
8. Shaaban AF, Kim HB, Milner R, Fichter C, Flake AW: A kinetic model for the homing and migration of prenatally transplanted marrow. *Blood* 94:3251-3257, 1999.
9. Liechty KW, Kim HB, Adzick NS, Crombleholme TM: Fetal wound repair results in scar formation in Interleukin-10 (IL-10) deficient mice in a syngeneic murine model of scarless fetal wound repair. *Journal of Pediatric Surgery* 35:866-873, 2000.
10. Ng E, Kim HB, Lillehei CW, Seefelder C: Life threatening tension pneumoperitoneum from intestinal perforation during air reduction of intussusception. *Paediatric Anaesthesia*, 12:798-800, 2002.
11. Kim HB, Fauza D, Garza J, Oh JT, Nurko S, Jaksic T: Serial Transverse Enteroplasty (STEP): A novel bowel lengthening procedure. *Journal of Pediatric Surgery*, 38:425-429, 2003.
12. Myers LB, Bulich LA, Mizrahi A, Barnewolt, C, Estroff J, Benson C, Kim HB, Jennings R: Ultrasonographic guidance for location of the Trachea during the EXIT procedure for cervical teratoma. *Journal of Pediatric Surgery*, 38:E12-E14, 2003.
13. Kim HB, Lee PW, Garza J, Duggan C, Fauza D, Jaksic T: Serial Transverse Enteroplasty (STEP) for short bowel syndrome: A case report. *Journal of Pediatric Surgery*, 38:881-885, 2003.

14. Peranteau WH, Hayashi S, Kim HB, Shaaban AF, and Flake AW: In Utero Hematopoietic Cell Transplantation: What are the Important Questions? *Fetal Diagnosis and Therapy*, 19:9-12, 2004.
15. Fishman SJ, Jennings RW, Johnson SM, and Kim HB: Contouring buttock reconstruction after sacrococcygeal teratoma resection. *Journal of Pediatric Surgery*, 39:439-441, 2004.
16. Downard CD, Kim HB, Laningham F, and Fishman SJ: Esophageal atresia, duodenal atresia, and unilateral lung agenesis: a case report. *Journal of Pediatric Surgery*, 39:1283-1285, 2004.
17. DiLuozzo G, Kim HB, Boiselle PM, Colin A, Fishman SJ. Congenital absence of the right upper lobe bronchus with double segmented tracheal bronchi. *Ann Thorac Surg*, in press.
18. Jonas MM, Krawczuk LE, Kim HB, Lillehei CW, and Perez-Atayde A. Rapid recurrence of nonalcoholic fatty liver disease after transplantation in a child with hypopituitarism and hepatopulmonary syndrome. *Liver Transplantation* 2005, in press.
19. Lee PW, Cina RA, Randolph MA, Goodrich J, Rowland H, Arellano R, Kim HB, Sachs DH, and Huang CA. Stable multilineage chimerism in a large animal model of *in utero* bone marrow transplantation. *Experimental Hematology*, in press.
20. Lee PW, Cina RA, Randolph MA, Arellano R, Goodrich J, Rowland H, Huang CA, Sachs DH, and Kim HB. In utero bone marrow transplantation induces kidney allograft tolerance across a full MHC barrier in swine. *Transplantation*, in press.

Proceedings of Meetings

1. Kim HB, Shaaban AF, Yang EY, Milner R, Flake AW: Donor specific tolerance in a murine model of in utero stem cell transplantation requires hematopoietic microchimerism and is dependent on donor cell source. *Blood* 90(10) Supp 1: 363a, 1997.
2. Shaaban AF, Kim HB, Yang EY, Flake AW, Zanjani E: A murine model of prenatal hematopoietic homing. *Blood* 90(10) Supp 1: 94a, 1997.
3. Shaaban AF, Kim HB, Liechty KW, Milner R, Flake AW: Blockade of α_4 or β_1 integrins impairs homing of prenatally transplanted allogeneic marrow to the fetal liver. *Blood* 90(10) Supp 1: 488a, 1997.
4. Kim HB, Shaaban AF, Milner R, Fichter C, Flake AW: In utero stem cell transplantation induces donor specific tolerance by a combination of clonal deletion and clonal anergy. *Pediatrics* 102(3) Pt 2: 792, Abstract 16, 1998.
5. Shaaban AF, Kim HB, Milner R, Fichter C, Flake AW: Pretreatment of prenatally transplanted allogeneic marrow with VEGF and SCF prevents early allograft rejection in chimeric mice. *Pediatrics* 102(3) Pt 2: 796, Abstract P1, 1998.

6. Yang EY, Kim HB, Shaaban AF, Milner R, Adzick NS, Flake AW: Fetal intramuscular delivery of recombinant adenovirus results in persistent postnatal transgene expression in both muscle and liver. *Pediatrics* 102(3) Pt 2: 794, Abstract 23, 1998
7. Kim HB, Shaaban AF, Milner R, Fichter C, Flake AW: In utero hematopoietic stem cell transplantation induces donor-specific tolerance by a combination of clonal deletion and clonal anergy. *Surgical Forum* XLIX:353-4, 1998.
8. Yang EY, Kim HB, Shaaban AF, Milner R, Adzick NS, Flake AW: Fetal intramuscular delivery of recombinant adenovirus results in persistent postnatal transgene expression in both muscle and liver. *Surgical Forum* XLIX:368-9, 1998.
9. Shaaban AF, Kim HB, Milner R, Fichter C, Flake AW: Pretreatment of prenatally transplanted allogeneic marrow with vascular endothelial growth factor and stem cell factor prevents early allograft rejection in chimeric mice. *Surgical Forum* XLIX:380-1, 1998.
10. Milner R, Kim HB, Shaaban AF, Fichter C, Scully M, Asakura T, Flake AW: In utero hematopoietic stem cell transplantation in mice transgenic for human hemoglobinopathy: selective advantage for donor red cells. *Surgical Forum* XLIX:471-2, 1998.
11. Kim HB, Shaaban AF, Milner R, Fichter C, Flake AW: Mechanisms of tolerance after in utero bone marrow transplantation. *Blood* 92(10) Supp 1:719a, 1998.
12. Shaaban AF, Kim HB, Milner R, Radu A, Flake AW: Developmentally related changes in VLA-4, VCAM, and CD44 expression may explain the switch from liver to marrow hematopoiesis. *Blood* 92(10) Supp 1:582a, 1998.
13. Shaaban AF, Kim HB, Milner R, Flake AW: Natural killer cell Ly49 inhibitory receptor expression is influenced by early exposure to foreign antigen – a possible mechanism for developmental natural killer cell regulation. *Blood* 92(10) Supp 1:718a, 1998.
14. Milner R, Shaaban AF, Kim HB, Fichter C, Flake AW: Natural killer cells do not mediate allograft rejection after in utero hematopoietic stem cell transplantation. *Blood* 92(10) Supp 1:288b, 1998.
15. Milner R, Shaaban AF, Kim HB, Fichter C, Scully M, Asakura T, Flake AW: Long term high level expression of donor hemoglobin after in utero HSC transplantation in thalassemic knockout mice – selective advantage for donor red cells. *Blood* 92(10) Supp 1:696a, 1998.
16. Kitano Y, Shaaban AF, Kim HB, Milner R, Liechty KW, Kanai M, Knight AK, Flake AW: Distribution and engraftment of cultured murine marrow stromal cells after in utero transplantation. *Blood* 92(10) Supp 1:719a, 1998.
17. Lee PW, Kim HB, Randolph MA, Cina RA, Arellano R, Goodrich J, Rowland HC, Duggan M, Sachs DH, Huang CA. Stable multilineage hematopoietic engraftment in swine following in utero bone marrow transplantation. *Blood* 102(11):5326a, 2003.

Reviews, Chapters and Editorials

1. Shaaban AF, Kim HB, Milner R, Crombleholme TM. "The Role of Ultrasound in Fetal Surgery and Invasive Fetal Procedures." *Seminars in Roentgenology*, 34:62-77, 1999, W.B. Saunders.
2. Shaaban AF, Kim HB, Flake AW. "Fetal Surgery, Diagnosis and Intervention." In Ziegler MM, Azizkhan RG, Weber TR (eds.): Operative Pediatric Surgery. McGraw-Hill 2003.
3. Jaksic T, Kim HB, Fauza DO, Duggan C. Serial transverse enteroplasty (STEP): a novel bowel lengthening procedure, and serial transverse enteroplasty for short bowel syndrome. [Author reply to Comment by Tannuri, U]. *Journal of Pediatric Surgery*, 38(12): 1845-1846, 2003.