
BIOGRAPHICAL SKETCH

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NAME Anirban Maitra	POSITION TITLE Associate Professor of Pathology and Oncology		
eRA COMMONS USER NAME (credential, e.g., agency login) amaitra1			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	MM/YY	FIELD OF STUDY
All India Institute of Medical Sciences, New Delhi, India	M.B.B.S.	1990-1996	Medicine

A. Personal Statement

The objective of this developmental project is to develop an *in vivo* strategy for imaging the pancreatic cancer "desmoplastic" stroma. I am an R01 funded researcher in the area of pancreatic cancer. We have generated one of the largest compendia of patient derived pancreatic cancer xenografts for experimental therapeutics, and have also contributed to the generation of the first transgenic mouse model of pancreatic cancer that recapitulates the multistep progression of the cognate human disease. Our laboratory has demonstrated the role of "stromal collapse" in ensuring increased bioavailability of chemotherapeutics to the pancreatic cancer milieu, thereby increasing efficacy. This proposal will utilize second harmonic generation (SHG) based imaging of stromal collagen in pancreatic cancer, and its "collapse" following treatment with nanoparticle nanb-paclitaxel and Hedgehog small molecule inhibitors. This project segues into a clinical trial (NCT01088815) that will be conducted at Hopkins based on our concept of "stromal collapse" in pancreatic cancer, and therefore has immediate translational relevance.

B. Position and Honors

Positions and Employment

1996-98	Residency in Anatomic Pathology, Univ. of Texas Southwestern Medical Center, Dallas
1998-99	Fellowship, Molecular Pathology, Univ. of Texas Southwestern Medical Center, Dallas
1999-00	Fellowship, Pediatric Pathology, Univ. of Texas Southwestern Medical Center, Dallas
2000-01	Residency in Anatomic Pathology, Univ. of Texas Southwestern Medical Center, Dallas
2001-02	Fellowship, Gastrointestinal Pathology, Johns Hopkins Univ. School of Med, Baltimore
2002-03	Instructor, Gastrointestinal Pathology, Johns Hopkins Univ. School of Med, Baltimore
2002	Affiliate, McKusick-Nathans Institute of Genetic Medicine, Johns Hopkins Univ., Baltimore
2003-05	Assistant Prof, Gastrointestinal Pathology, Johns Hopkins Univ. School of Med, Baltimore
2003-05	Assistant Prof, Oncology, Johns Hopkins Univ. School of Med, Baltimore
2005	Graduate Faculty, Pathobiology Program, Johns Hopkins Univ. School of Med, Baltimore
2006	Assoc. Professor, Gastrointestinal Pathology, Johns Hopkins Univ. School of Med, Baltimore.
2006	Assoc. Professor, Oncology, Johns Hopkins Univ. School of Med, Baltimore.

Other Experience and Professional Memberships

1997	Member, United States and Canadian Academy of Pathology
2000-06	Associate Editor, Current Molecular Medicine
2002	Member, American Society for Investigative Pathology
2003	Member, American Association for Cancer Research
2006	Section Editor, Laboratory Investigation
2006	Editor-in-Chief, Current Molecular Medicine

Honors

1997	Texas Society of Pathologists John D Rainey Memorial Award
1997	Society for Pediatric Pathology Gordon Vawter Award
1999	American Society of Cytopathology Warren R Lang Award

2000	Society for Pediatric Pathology Lotte Strauss Award
2001	Society for Pediatric Pathology Harry Neustein Award
2004	United States and Canadian Academy of Pathology Benjamin Castleman Award
2004	AACR-PanCAN Career Development Award in Pancreatic Cancer Research
2006	Maryland Outstanding Young Scientist Award (Allan C. Davis Medal)
2007	Eugene Di Magno Presidential Award for Junior Faculty, American Pancreatic Association
2008	Ramzi Cotran Young Investigator Award, United States and Canadian Academy of Pathology

C. Selected Peer-Reviewed Publications (Selected manuscripts from 223 peer-reviewed publications)

Most relevant to the current application

1. Hingorani, S.R., Petricoin, E.F., Maitra, A., King, C., Jacobetz, M.A., Yoshiya, K., Crawford, H.C., Putt, M.E., Jacks, T., Wright, C.V., Hruban, R.H., Lowy, A.M., Tuveson, D.A. Endogenous KRAS^{G12D} expression induces pancreatic intraepithelial neoplasia (PanIN) in mice with a definable proteomic signature. *Cancer Cell* 2003; 4:437-50.
2. Rubio-Viqueira, B., Jimeno, A., Cusatis, G., Zhang, X., Iacobuzio-Donahue, C., Karikari, C., Shi, C., Danenberg, K., Danenberg, P.V., Kuramochi, H., Tanaka, K., Singh, S., Salimi-Moosavi, H., Bouraoud, N., Amador, M.L., Altiok, S., Kulesza, P., Yeo, C.J., Messersmith, W., Eshleman, J.R., Hruban, R.H., Maitra, A., Hidalgo, M. An *in vivo* platform for translational drug development in pancreatic cancer. *Clin Cancer Res* 2006; 12:4652-61.
3. Feldmann, G., Dhara, S., Fendrich, V., Bedja, D., Beaty, R.M., Mullendore, M., Karikari, C.A., Alvarez, H., Iacobuzio-Donahue, C., Jimeno, A., Gabrielson, K.M., Matsui, W., Maitra, A. Blockade of Hedgehog signaling inhibits pancreatic cancer invasion and metastasis – a new paradigm for combination therapy in solid cancers. *Cancer Res* 2007; 67:2187-96.
4. Zou G-M, Maitra A. Small molecule inhibitor of the APE1/REF-1 E3330 inhibits pancreatic cancer cell growth and migration. *Mol Cancer Ther.* 2008; 7:2012-21. PMC Journal - In Process.
5. Feldmann G, Mishra A, Hong S-M, Bisht S, Strock CJ, Ball DW, Goggins G, Maitra A, Nelkin BD (joint corresponding authors). Inhibiting the cyclin-dependent kinase CDK5 blocks pancreatic cancer formation and progression via suppression of Ras-Ral signaling. *Cancer Res.* 2010 (Epub). PMC Journal - In Process.

Additional recent publications of importance to the field (in chronological order)

1. Rubio-Viqueira, B., Mezzadra, H., Nielsen, M.E., Jimeno, A., Zhang, X., Iacobuzio-Donahue, C., Maitra, A., Hidalgo, M., Altiok, S. Optimizing the development of targeted agents in pancreatic cancer: tumor fine-needle aspiration biopsy as a platform for novel prospective ex vivo drug sensitivity assays. *Mol Cancer Ther* 2007; 6:515-23.
2. Karikari, C.A., Roy, I., Tryggstad, E., Feldmann, G., Pinilla, C., Reed, J., Armour, E.P., Wong, J., Herman, J., Rakheja, D., Maitra A. Targeting the apoptotic machinery in pancreatic cancer using small molecule inhibitors of the X-linked inhibitor of apoptosis protein. *Mol Cancer Ther* 2007; 6:957-66.
3. Chang, T.C., Wentzel, E.A., Kent, O.A., Ramachandran, K., Mullendore, M., Lee, K.H., Feldmann, G., Yamakuchi, M., Ferlito, M., Lowenstein, C.J., Arking, D.E., Beer, M.A., Maitra, A., Mendell, J.T. Transactivation of miR-34a by p53 broadly influences gene expression and promotes apoptosis. *Mol Cell* 2007; 26:745-52.
4. Dong, J., Feldmann, G., Huang, J., Wu, S., Zhang, N., Comerford, S.A., Gayyed, M.F., Anders, R.A., Maitra, A., Pan, D. Elucidation of a universal size-control mechanism in *Drosophila* and mammals. *Cell* 2007; 130:1120-33.
5. Feldmann, G., Habbe, N., Dhara, S., Bisht, S., Alvarez, H., Fendrich, V., Beaty, R., Mullendore, M., Karikari, C., Bardeesy, N., Oullette, M.M., Yu, W., Maitra, A. Hedgehog inhibition prolongs survival in a genetically engineered mouse model of pancreatic cancer. *Gut* 2008 57:1420-30, doi: 10.1136/gut.2008.148189. PMID2707354.
6. Habbe, N., Shi, G., Meguid, R.A., Fendrich, V., Esni, F., Chen, H., Feldmann, G., Stoffers, D.A., Konieczny, S.F., Leach, S.D., Maitra, A. Spontaneous induction of murine pancreatic intraepithelial neoplasia (mPanIN) by acinar cell targeting of oncogenic Kras in adult mice. *Proc Natl Acad Sci U S A*, 2008 Dec 2; 105(48):18913-8. PMID2596215.

7. Koorstra JB, Collins CA, Feldmann G, Bisht S, Leal Rojas P, Offerhaus GJA, Alvarez H, Maitra A. The Axl tyrosine kinase confers an adverse prognostic influence in pancreatic cancer and represents a new therapeutic target. *Cancer Biol Ther*. 2009; 8:618-26. PMID2678175.
8. Mullendore, M.E., Koorstra, J.-B., Li, Y.-M., Offerhaus, G.J., Fan, X., Henderson, C.M., Matsui, W., Eberhart, C.G., Maitra, A., Feldmann, G. Ligand-dependent Notch signaling is involved in tumor initiation and tumor maintenance in pancreatic cancer. *Clin Cancer Res* 2009 Apr 1, 15(7):2291-301. PMID2711441..
9. Habbe, N., Koorstra, J.-B.M., Mendell, J.T., Offerhaus, G.J., Ryu, J.K., Feldmann, G., Mullendore, M.E., Goggins, M.G., Hong, S.-M., Maitra, A. MicroRNA miR-155 is a biomarker of early pancreatic neoplasia. *Cancer Biol Ther* 2009 Mar 3; 8(4):340-6. PMID2692997.
10. Ryu JK, Hong S-M, Karikari CA, Hruban RH, Goggins MG, Maitra A. Aberrant MicroRNA-155 Expression Is an Early Event in the Multistep Progression of Pancreatic Adenocarcinoma. *Pancreatol*. 2010; 10:66-73. PMID2865485.

D. Ongoing Research Support

2P50CA103175-06A2 (Bhujwalla)

09/22/11 - 07/31/16

NCI JHU ICMIC Program

This center grant funds an *in vivo* Cellular and Molecular Imaging Center at Johns Hopkins. The program consists of four research components, four developmental projects, one career development award and four resources.

2R01 CA113669 (Maitra)

04/01/05-02/28/15

NCI

Developmental Signaling Pathways in Pancreatic Cancer;

The goal of this project is to target the Hedgehog (Hh) and Notch signaling pathways in pancreatic cancer.

2P50 CA062924 (Kern)

07/01/07-06/30/12

NIH

SPORE in Gastrointestinal Cancer (Project 3C)

The goal of this project is to identify the genetics of precursor lesions of pancreatic cancer and develop biomarkers for biological classification and risk stratification in these lesions.

R01 CA134767-01 (Nelkin)

07/01/08-05/31/13

NIH

Targeting CDK5 in Pancreatic Cancer: Mechanistic and Preclinical Development

The goal of this project is to develop CDK5 as a potential therapeutic target for the control of pancreatic cancer.

R01 CA130938 (Eshleman)

09/01/08-07/31/12

NCI

Novel Human Cancer Cell Isolation System

The goal of this project is to make biochemically defective mice that support human cancer growth, but when these cancers are transferred to tissue culture, the mouse cells can be easily eliminated. We plan to demonstrate that the new mice are superior in producing cell lines and recovery of metastases.

P01 CA134292-A1 (Leach)

04/15/09-03/31/14

NCI

Functional Annotation of the Pancreatic Cancer Genome

The goal of Project 3 is to functionally characterize the Hippo signaling pathway in pancreatic cancer using zebrafish and mammalian models.

University of Pennsylvania (Hoff)

07/01/09-06/30/12

AACR - Stand Up To Cancer

The aim of the SU2C umbrella project is to develop new therapies for lethal pancreatic cancer. Project A will target cancer metabolism using a number of small molecule inhibitors, and Project B will develop individualized therapies for pancreatic cancer using an *in vivo* xenograft model.

R25 CA153952 (Wirtz/Maitra)

07/01/10-06/30/15

NIH
Cancer Nanotechnology Training Center at Johns Hopkins University
Objective: to train fellows at the interface between nanotechnology and cancer medicine to develop novel nanoscale therapeutic and diagnostic tools for the detection, treatment and cure of human cancer.

1U54 CA151838 (Searson) 09/01/10-08/31/15
NIH

Center of Cancer Nanotechnology Excellence at Johns Hopkins
The objective of the Center is to integrate nanotechnology-based diagnostic and therapeutic tools for comprehensive cancer care. Through the four inter-related projects described in this proposal, we envision a set of integrated nanotechnology-based solutions for diagnosis, therapy, and post-therapy monitoring. Advances in cancer nanomedicine provide tremendous potential to improve clinical practice.

Completed Projects Within Last Three Years

RC2 CA148346 (Goggins) 09/30/09-08/31/11
NIH

Predicting Pancreatic Cancer Responses for a PARP Inhibitor-Based Clinical Trial
The aim of this project is to treat patients with advanced pancreatic cancer with an orally bioavailable PARP inhibitor and correlate responses with the underlying mutational status of the tumor.

FAMRI 062563_CIA (Maitra) 07/01/08-06/30/11
Flight Attendant Medical Research Institute; Inhibition of Hedgehog Signaling by Cyclopamine Prodrug for Prostate Cancer
The objective is to synthesize PSMA-cleavable cyclopamine prodrugs.

ISC-1000 (Canto) 03/01/10-02/28/11
Pentax Medical Corp.
Multi-Center CEBE Trial
The goal of the project is to demonstrate that EM is an accurate endoscopic technology that will increase the diagnostic yield of mucosal biopsy for diagnosis of IEN in BE patients evaluated with high resolution white light endoscopy (HRE) due to more selective tissue acquisition.

R01 CA119397 (Prasad) 09/01/05-08/31/10
NCI
Multifunctional nanoparticles in diagnosis and therapy of pancreatic cancer
The objective of this project is to develop hybrid ceramic-polymeric nanoparticles that can be utilized for targeted imaging and drug delivery in pancreas cancer

R21 DK072532 (Maitra) 08/01/05-07/31/08
NIDDK
Hedgehog signaling in pancreatic neoplasia
The goal is to determine the role of Hedgehog signaling in exocrine pancreatic injury/repair and neoplasia using a novel transgenic mouse model of ectopic Hedgehog over-expression.

Contract (Maitra) 12/01/06-11/30/08
Merck
Notch inhibitors in Human Pancreatic Cancer
The goal is to determine the therapeutic efficacy of small molecule Notch inhibitors in preclinical xenograft models of pancreatic cancer.