BIOGRAPHICAL SKETCH

NAME Ido Amit	POSITION TITLE Professor, Department of Immunology, Weizmann Institute of Science
eRA COMMONS USER NAME : IDOAMIT	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Bar-Ilan University, Ramat-Gan, Israel	M.Sc	2000-2002	Biology
Weizmann Institute of Science, Rehovot, Israel	PhD	2002-2007	Biology/System Biology
Broad Institute of MIT and Harvard, Cambridge MA	Postdoctoral fellow	2007-2011	Genomics/Immunology

A. Personal Statement

The immune system is a complex, dynamic and plastic ecosystem composed of various interacting cell types that are constantly sensing and responding to the tissue's spatial and environmental cues. The immunology field, from very early on, invested great efforts and ingenuity to characterize the immune cell types and elucidate their function. However, accumulating evidence indicates that current technologies and classification schemes are limited in their ability to account for the functional heterogeneity of immune processes. Single cell genomics hold the potential to revolutionize the way we characterize complex immune assemblies and study their spatial organization, clonal distribution, dynamics, pathways and crosstalk. This emerging field of research can greatly affect basic and therapeutic research of the immune system. Prof. Amit is one of the major pioneers of the development of single cell genomics for characterizing the immune system and its interaction with the surrounding tissue/pathology and demonstrated the impact of these studies to understand the underlying cells, pathways, markers and molecules involved in a specific process or disease (Jaitin et al, Science 2014; Paul et al, Cell 2015; Matcovitch et al, Science 2016; Gury et al, Cell 2016; Jaitin et al, Cell 2016; Keren-Shaul et al, Cell 2017; Medaglia et al, Science 2017; Bornstein et al, Nature 2018; Cohen et al, Cell 2018; Ledergor et al, Nature Medicine 2018; Li et al, Cell 2019; Jaitin et al, Cell 2019). Prof. Amit further showed how combining these technologies with human cancer samples and disease models will greatly advance mechanistic understanding of cancer and other immune related diseases. The Amit group is a hub of interdisciplinary technology development and he is convinced that the future challenges in our fields involve continuous integration of experimental and computational innovation leading toward simultaneous analysis of multiple regulatory layers on the single cell level. Prof. Amit is a member of the organizing committee of the HCA (www.humancellatlas.org) and the European LifeTime flagship project (https://lifetime-fetflagship.eu/), both aiming to characterize all cells in the human body in health and disease.

Despite the tremendous improvement in the treatment of multiple myeloma (MM) patients over the last 15 years, MM remains incurable, and almost all MM patients die of their disease - new treatment strategies are urgently needed. Based on our recent work (Ledergor et al., Nature Medicine 2018)

and large collection of unpublished data on single cell analysis of multiple myeloma patients pre-and-post treatment we envision that our proposed research program will lead to a detailed and unprecedented high-resolution atlas of the responsive and unresponsive multiple myeloma patient's plasma cells and tumour microenvironment. Our research will provide tools for predicting tumor response, markers for rapid and effective tumor subtype characterization, identify tumor cells escape mechanism patterns that can lead to identification of novel immune modulatory pathways and further optimization strategies for MM therapy. We will identify genes and pathways that are differentially expressed between groups of patients. Characterization of the immune microenvironment in MM patients, including the marrow niche and the peripheral blood, pre-and-post exposure to therapy would generate new approaches to manipulate the microenvironment. Importantly comparing the responder and non-responder patients will identify novel pathways in the responding and non-responding group, including critical immune checkpoints and regulatory genes. We will use state-of-the-art single cell sequencing technologies, and map the different cancer, immune and stromal populations within the bone marrow microenvironment. We are confident that our proposal will make a great impact on novel multiple myeloma diagnostics and immunotherapies. In this grant, Prof. Amit will lead the entire proposal.

B. Positions and Honors

Positions and Employment

Graduate student, Weizmann Institute of Science, Rehovot, Israel
2002-2007
Postdoctoral fellow, Broad Institute of MIT and Harvard
2007-2011
Associate Professor Department of Immunology Weizmann Institute
2011-2016
Professor Dept. of Immunology, Weizmann Institute of Science
2016-present

Selected awards & Honors

- Recipient of a Consolidator award by the European Research Council (2018)
- HHMI International Research Scholars award (2017)
- Helen and Martin Kimmel award for innovative investigation (2016)
- Rappaport Prize for Excellence in Biomedical Research (2016)
- EMBO Gold Medal award (2015)
- Morris L. Levinson Prize in Biology from the Weizmann Institute's Scientific Council (2015)
- Ernest and Bonnie Beutler Research Program of Excellence in Genomic Medicine (2015)
- Krill Prize for Excellence in Scientific Research (2015)
- EMBO Young Investigator Award (2013)
- Yigal Alon Foundation Scholar – Program for distinguished junior faculty in Israel (2012)
- Recipient of a Starting Scientist Award by the European Research Council (2012)
- HFSP Career Development Award (2011)
- Claire and Emanuel G. Rosenblatt Fellowship Award (2009)
- HFSP Long Term Fellowship (2008)
- J. F. Kennedy award for Ph.D research (2007)

C. Contributions to Science

Prof Amit pioneered the development of single cell genomics for characterizing the immune system. His studies demonstrated that current technologies and classification schemes are limited in their ability to account for the functional heterogeneity of the immune system (Jaitin et al, Science 2014; Paul et al, Cell 2015; Matcovitch et al, Science 2016; Gury et al, Cell 2016; Jaitin et al, Cell 2016; Keren-Shaul et al, Cell 2017; Medaglia et al, Science 2017; Bornstein et al, Nature 2018; Cohen et al Cell 2018; Ledergor et al, Nature Medicine 2018; Li et al, Cell 2019). These publications demonstrated how single cell genomics can revolutionize the way we characterize complex immune assemblies and study their pathways, spatial organization, clonal distribution, dynamics, crosstalk, epigentics and function, in both physiological and pathological contexts. The emerging single cell genomics field that Prof. Amit is one of its major pioneers, is already dramatically impacting basic and therapeutic research of the immune system in neurodegeneration and cancer.

Selected Peer-reviewed Publications (Included are 15 selected publications)

All publications can be found in the following URL:
http://www.ncbi.nlm.nih.gov/pubmed/?term=amit+ido

1. Jaitin DA, Kenigsberg E, Keren-Shaul H, Elefant N, Paul F, Zaretsky I, Mildner A, Cohen N, Jung S, Tanay A, **Amit I**. Massively parallel single-cell RNA-seq for marker-free decomposition of tissues into cell types. **Science**, 2014 Feb 14:776-9.

2. Lavin Y, Winter D, Blecher-Gonen R, David E, Keren-Shaul H, Merad M, Jung S, **Amit I**. Tissue-resident macrophage enhancer landscapes are shaped by the local microenvironment. **Cell**, 2014 Dec 5.

3. Paul F, Arkin Y, Giladi A, Adhemar Jaitin D, Kenigsberg E, Keren-Shaul H, Winter D, Lara-Astiaso D, Gury M, Weiner A, David E, Cohen N, Kathrine-Bratt-Lauridsen F, Haas S, Schlitzer A Mildner A, Ginhoux F, Jung S, Trumpp A, Torben Porse B, Tanay A, **Amit I**. Transcriptional heterogeneity and lineage commitment in myeloid progenitors. **Cell,** 2015 Dec 14.

4. Matcovitch-Natan O, Winter DR, Giladi A, Vargas Aguilar S, Spinrad A, Sarrazin S, Ben-Yehuda H, David E, Zelada González F, Perrin P, Keren-Shaul H, Gury M, Lara-Astaiso D, Thaiss CA, Cohen M, Bahar Halpern K, Baruch K, Deczkowska A, Lorenzo-Vivas E, Itzkovitz S, Elinav E, Sieweke MH, Schwartz M, **Amit I**. Microglia development follows a stepwise program to regulate brain homeostasis. **Science**,2016 Jun 23).

5. Gury-BenAri M, Thaiss CA, Serafini N, Winter DR, Giladi A, Lara-Astiaso D, Levy M, Salame TM, Weiner A, David E, Shapiro H, Dori-Bachash M, Pevsner-Fischer M, Lorenzo-Vivas E, Keren-Shaul H, Paul F, Harmelin A, Eberl G, Itzkovitz S, Tanay A, Di Santo JP, Elinav E, **Amit I**. The Spectrum and Regulatory Landscape of Intestinal Innate Lymphoid Cells Are Shaped by the Microbiome. **Cell**, 2016 Aug 25.

6. Weiner A, Lara-Astiaso D, Krupalnik V, Gafni O, David E, Winter DR, Hanna JH and **Amit I**. Genome-wide characterization of histone mark co-occurrence at single molecule resolution. **Nature Biotechnology**, 2016 Sep 15.

7. Jaitin DA, Weiner A, Lara-Astiaso D, Yofe I, Keren-Shaul H, David E, Tanay A, van Oudenaarden A and **Amit I**. Dissecting immune circuits by linking CRISPR pooled screens with single cell RNA-seq. **Cell**, 2016 Dec 15.

8. Keren-Shaul H, Spinrad A, Weiner A, Matcovitch-Natan O, Dvir-Szternfeld R, Ulland TK, David E, Baruch K, Lara-Astaiso D, Toth B, Itzkovitz S, Colonna M, Schwartz M, **Amit I**. A Unique Microglia Type Associated with Restricting Development of Alzheimer's Disease. **Cell**. 2017 Jun 15.

9. Medaglia C, Giladi A, Stoler-Barak L, De Giovanni M, Salame TM, Biram A, David E, Li H, Iannacone M, Shulman Z, **Amit I**. Science. Spatial reconstruction of immune niches by combining photoactivatable fluorescent reporter and single cell RNA-seq. **Science** 2017 Dec 22;358(6370):1622-1626. Microbiome Influences Prenatal and Adult Microglia in a Sex-Specific Manner.

10. Giladi A, Paul F, Herzog Y, Lubling Y, Weiner A, Yofe I, Jaitin D, Cabezas-Wallscheid N, Dress R, Ginhoux F, Trumpp A, Tanay A, **Amit I**. Single-cell characterization of haematopoietic progenitors and their trajectories in homeostasis and perturbed haematopoiesis. **Nature Cell Biology** 2018 Jul;20(7):836-846.

11. Bornstein C, Nevo S, Giladi A, Kadouri N, Pouzolles M, Gerbe F, David E, Machado A, Chuprin A, Goldberg O, Itzkovitz S, Taylor N, Jay P, Zimmermann VS, Abramson J, **Amit I**. Single-cell mapping of the thymic stroma identifies IL-25-producing tuft epithelial cells. **Nature**. 2018 Jul;559(7715):622-626.

12. Cohen M, Giladi A, Gorki AD, Solodkin DG, Zada M, Hladik A, Miklosi A, Salame TM, Halpern KB, David E, Itzkovitz S, Harkany T, Knapp S, **Amit I**. Lung Single-Cell Signaling Interaction Map Reveals Basophil Role in Macrophage Imprinting. **Cell**. 2018 Nov 1;175(4):1031-1044.

13. Ledergor G, Weiner A, Zada M, Wang SY, Cohen YC, Gatt ME, Snir N, Magen H, Koren-Michowitz M, Herzog-Tzarfati K, Keren-Shaul H, Bornstein C, Rotkopf R, Yofe I, David E, Yellapantula V, Kay S, Salai M, Ben Yehuda D, Nagler A, Shvidel L, Orr-Urtreger A, Halpern KB, Itzkovitz S, Landgren O, San-Miguel J, Paiva B, Keats JJ, Papaemmanuil E, Avivi I, Barbash GI, Tanay A, Amit I. Single cell dissection of plasma cell heterogeneity in symptomatic and asymptomatic myeloma. Nature Medicine. 2018 Dec;24(12):1867-1876.

14. Li H, van der Leun A, Yofe I, Lubling Y, Gelbard Solodkin D, van Akkooi A, van den Braber M, Rozeman L, Haanen J, Blank C, Horlings H, David E, Baran Y, Berkovitz A, Lifshitz A, Schumacher T, Tanay A, **Amit I**. Dysfunctional CD8+ T cells form a proliferative, dynamically regulated compartment within human melanoma. **Cell** 2019 Feb 7;176(4):775-789.

15. Jaitin AD, Adlung L, Thaiss CA, Weiner A, Li B, Descamps H, Lundgren P, Bleriot C, Liu Z, Deczkowska A, Keren-Shaul H, David E, Zmora N, Eldar SM, Lubezky N, Shibolet O, Hill DA, Lazar MA, Colonna M, Ginhoux F, Shapiro H, Elinav E, **Amit I**. Lipid-associated macrophages control metabolic homeostasis in a Trem2-dependent manner. **Cell**. In press