Curriculum Vitae

Name: Ferrante Jr, Anthony W
Position Title: Tilden-Weger-Bieler Professor of Medicine

Education/Training

Institution and Location	Degree	Completion Date	Field of Study
Yale University	B.A.	1985	Physics
Albert Einstein College of Medicine	M.S.	1990	Developmental Biology
Albert Einstein College of Medicine	Ph.D.	1994	Developmental Biology
Albert Einstein College of Medicine	M.D.	1995	Medicine
Columbia University		1998	Residency - Medicine
Columbia University		2003	Fellowship - Medicine

A. Personal Statement. I devote 90% of my time to basic research and mentoring students, residents and post-doctoral fellows within the Department of Medicine, the Institute of Human Nutrition and the Naomi Berrie Diabetes Center. The two areas of focus in my laboratory are how the immune and metabolic systems interact and how body weight is regulated in mammals. My laboratory originally found that changes in metabolic state (obesity, fasting, weight loss) activate the immune system in adipose tissue, altering systemic immune function and helped establish the field of immunometabolism. These studies are focused on understanding how the immune system contributes to metabolic health and disease, including diabetes and non-alcoholic fatty liver disease. These efforts have revealed the importance of lipid catabolism by macrophages, identified different subpopulations of macrophages based on the metabolic profile and identified a novel lipid vesicle released by adipocytes, especially during states of overnutrition. The other area of focus has explored how adipose tissue mass is regulated and specifically developed a model to study the neuroendocrine systems that defend against weight gain. Our most recent studies found post-oral sensing of macronutrients by the gut contributes to regulating food intake and obesity. Beyond science I serve several administrative roles with the two aims of furthering the education and career of young scientists and building technical and intellectual infrastructure to enhance research in metabolic disease at Columbia. I serve as Co-Director of the Naomi Berrie Diabetes Center and Associate Director of the NY Obesity Nutrition Research Center, and I lead the Mouse Phenotyping Core of the Columbia University Diabetes Research Center. I am director of Preventive Medicine & Nutrition, including responsibility to oversee the fellowship in clinical nutrition. I am deeply involved in training at Columbia and have mentored more than twenty trainees. As Co-Director of the Doctoral Program in Nutritional and Metabolic Biology I work with Dr. Lori Zeltser and the Training Committee to oversee the pedagogical development of the program,

follow the progress of our students and implementing the training of our students, and I work with the Dean of the Graduate School to ensure we meet all programmatic requirements so that our student earn the PhD in a timely fashion. I will provide Krista with the expertise in adipose tissue and metabolic biology, meeting with her at least quarterly. In addition to scientific advice, I will also provide career guidance and feedback at these meeting and both tracking her progress and productivity.

B. Ongoing projects and support that I would like to highlight include:

R01 DK066525
Ferrante (PI)
Adipose tissue macrophage phenotype and function
9/2003 – 5/2023

SalzFerr
Ferrante, Salzman (MPI)
Systems that regulate body weight
11/2020 – 10/2023

C. Positions, Scientific Appointments and Honors

Current Positions

Clinical:

2014-Present	Chief of Preventive Medicine & Nutrition
2011-Present	Attending, New York-Presbyterian Hospital, NY

Educational:

2021-Present	Member - CUIMC Committee on Wellness
2020-Present	Member - CUIMC Committee to Address Structural Racism
2019-Present	Leader - LGBTQ+ Faculty Committee
2014-Present	Co-Director Doctoral Program - Institute of Human Nutrition (IHN)
2014-Present	Director - Enrichment Program of the New York Nutrition Obesity Research Center
2013-Present	Executive Advisory Committee - Columbia Medical Scientist Training Program
2010-Present	DeWitt Goodman Lecture Selection Committee (Chair 2014-Present)
2009-Present	Training Committee - IHN
2006-Present	Doctoral Faculty - IHN, Program in Cellular, Molecular, and Biomedical Studies

Research :

2022-Present	Co-Director - Naomi Berrie Diabetes Center
2017-Present	Tilden-Weger-Bieler Professor of Medicine
2015-Present	Associate Director - New York Obesity Nutrition Research Center
2008-Present	Director - Mouse Phenotype and Functional Core, Columbia Diabetes Research Center
2008-Present	NIH Study Sections standing and special emphasis panels

2007-2010 &
2017- Present Consulting Editor – Journal of Clinical Investigation

Honors

2021 Michael Wohl Lecture – Temple University
2018 Association of American Physicians
2017 Leonard Lecture – University of Washington
2016 Taft Diabetes Lecture – East Carolina University
2014 American Society of Clinical Investigation – New Member Lectureship
2014 Visiting Professor Diabetic Cardiovascular Disease Center - Washington University
2011 Lewis Katz Prize for Cardiovascular Research – Columbia University
2011 Outstanding Research Paper (JCI 120: 3466-3479) Science Unbounded Foundation
2010 Harold Lamport Research Award – Columbia University
2010 Dean's Lecture – SUNY Downstate Medical Center
2009 John Loeb Lecture – Columbia University
2006 Dorothy and Daniel Silberberg Endowed Chair in Medicine
2006 Gunnar Birke Lecture – Karolinska Institute
2006 Gill Cardiovascular Center Visiting Professor – University of Kentucky
2006 Nature Medicine - Notable Advances in Metabolism (JCI 112; 1796-1808 [2003])
2003 > 250 Invited Lectures
2001 Naomi Berrie Diabetes Research Award
1998 Certified – American Board of Internal Medicine
1998 Affymetrix Academic User Award (Declined)
1998 Lucille P. Markey Charitable Trust Fellowship
1995 Alpha Omega Alpha, Albert Einstein College of Medicine
1985 Fellow's Prize of Saybrook College, Yale University

D. Contribution to Science

1) Developmental biology of tyrosine kinases. My work as a graduate student focused on tyrosine kinase signaling in development. My first project identified the molecular defect in the osteopetrotic mouse. We suspected that there was a mutation in the gene encoding the growth factor M-CSF/CSF-1. I carried out the molecular studies and indeed did find a mutation that leads to the absence of M-CSF/CSF-1. I spearheaded a second project focused on identifying tyrosine kinases in Drosophila melanogaster. I identified more than ten novel kinases and characterized one that we named Shark and found it to be important in regulating gastrulation. Our work on the osteopetrotic mouse confirmed that osteoclasts are authentic macrophage lineage cells and helped to open a therapeutic area of developing agents that impair osteoclast development to treat osteoporosis.

A. Wiktor-Jedrzejczak W, Bartocci A, Ferrante AW Jr, Ahmed-Ansari A, Sell KW, Pollard JW, Stanley ER. Total absence of colony-stimulating factor-1 in the macrophage-deficient osteopetrotic (op/op) mouse. Proc Natl Acad Sci U S A 1990 Jun;87 (12):4828-4832. PMID: 2191302. PMCID: PMC54211.

B. Ferrante AW Jr, Reinke R, Stanley ER. Shark, a Src homology 2, ankyrin repeat, tyrosine kinase, is expressed on the apical surfaces of ectodermal epithelia. Proc Natl Acad Sci U S A 1995 Mar 14;92(6):1911-19115. PMID: 7892198. PMCID: PMC42392.

2) Metabolism regulates immune cells in key metabolic organs. Along with another group at Millenium/Takeda, my laboratory discovered that obesity induces the accumulation of macrophages in adipose tissue. In lean animals and humans, macrophage constitute ~ 4-7% of cells but in the most obese individuals and animals more than 50% of cells in a fat depot are macrophages. We showed that a similar process occurs in other tissues including the liver and that a key regulator of macrophage accumulation is the chemokine receptor CCR2. We also discovered that the key physiologic regulator of macrophage number in adipose tissue is lipolysis. Our findings were important in establishing the field of immunometabolism and have provided the basis for several areas of clinical investigation.

A. Weisberg SP, McCann DP, Desai M, Rosenbaum M, Leibel RL, Ferrante AW Jr. Obesity is associated with macrophage accumulation in adipose tissue J Clin Invest 2003 Dec;112:1796–1808. PMID: 14679176. PMCID: PMC296995.
B. Weisberg SP, Hunter D, Huber R, Lemieux J, Slaymaker S, Vaddi K, Charo I, Leibel RL, Ferrante AW Jr. CCR2 modulates inflammatory and metabolic effects of high fat feeding. J Clin Invest 2006 Jan;116:115-124. PMID: 16341265. PMCID: PMC1307559.
C. Obstfeld AE, Sugaru E, Thearle MS, Francisco AM, Gayet C, Ginsberg HN, Ables EV, Ferrante Jr AW C-C chemokine receptor 2 (CCR2) regulates the hepatic recruitment of myeloid cells that promote obesity-induced hepatic steatosis. Diabetes 2010 Apr;59(4):916-925. PMID: 20103702. PMCID: PMC2844839
D. Kosteli A, Sugaru E, Haemmerle G, Martin JF, Lei J, Zechner R, Ferrante Jr AW. Weight loss and lipolysis promote a dynamic immune response in murine adipose tissue. J Clin Invest. 2010 Oct;120(10):3466-3479. PMID:20877011. PMCID: PMC2947229.

3) Immune function in metabolism. A model proposed by Speigelman and Hotamisligil that obesity induces adipose tissue inflammation which in turns contributes to insulin resistance. We discovered that immune cells are the primary source of inflammatory molecules in adipose tissue during the development of obesity. Manipulations that alter macrophage number or inflammatory state modulate insulin sensitivity in mice. In collaboration with Izzy Charo we found that impairing CCR2 function in addition to reducing macrophage content of adipose tissue also improves glucose homeostasis and insulin sensitivity in obese mice. A collaboration with Ajay Chawla's lab found that altering macrophage metabolic and inflammatory functions reduced or increased insulin resistance in mice. Work based on our studies of CCR2 has led to a number of clinical trials that have targeted CCR2 as a treatment for Type 2 Diabetes. Positive results from a phase IIb trial were recently announced and suggest promise for immune modulatory treatments of metabolic disease.

A. Weisberg SP, Hunter D, Huber R, Lemieux J, Slaymaker S, Vaddi K, Charo I, Leibel RL, Ferrante Jr AW. CCR2 modulates inflammatory and metabolic effects of high fat feeding. J Clin Invest. 2006 Jan;116:115-124. PMID: 16341265. PMCID: PMC1307559.
B. *Odegaard JI, *Ricardo-Gonzalez RR, Goforth MH, Morel CR, Subramanian V, Mukundan L, Red Eagle A, Vats D, Brombacher F, Ferrante AW Jr., Chawla A. Macrophage-specific PPARgamma controls alternative activation and improves insulin resistance. Nature 2007 Jun 28;447(7148):1116-1120. PMID: 17515919. PMCID: PMC2587297.
C. *Odegaard JI, *Ricardo-Gonzalez RR, Red Eagle A, Vats D, Morel CR, Goforth MH, Subramanian V, Mukundan L, Ferrante AW Jr., Chawla A. Alternative (M2) activation of Kupffer cells by PPARdelta ameliorates insulin resistance. Cell Metabolism 2008 Jun;7(6):496-507. PMID: 496-507. PMCID: PMC2587370.

4) An intra-adipose tissue lipid cycle. While much effort has focused on characterizing the inflammatory functions of adipose tissue macrophages, we have found that they have important non-inflammatory, adaptive roles. In particular, our laboratory has established that they are critical regulators of lipolysis and lipid release by adipose tissue. Stimulated by lipid release from adipocytes, adipose tissue macrophages uptake and catabolism lipid through a lysosomal dependent pathway. These studies revealed that adipocytes release large amounts of triacylglycerides in extracellular vesicles (AdExos). These AdExos are part of a novel lipid cycling pathway in adipose tissue which is critical for normal adipose tissue function. In addition, we discovered that these lipid-laden AdExos enter the circulation. Their systemic biology and importance remain unknown.

A. Xu X, Grijalva A, Skowronski A, van Eijk M, Serlie MJ, Ferrante AW Jr. Obesity activates a program of lysosomal-dependent lipid metabolism in adipose tissue macrophages independently of classic activation. Cell Metabolism 2013 Dec 3;18 (6):816-30. PMID: 24315368. PMCID: PMC3939841.
B. Flaherty III SE, Grijalva A, Xu X, Ables E, Nomani A, Ferrante AW Jr. A lipase-independent pathway of lipid release and immune modulation by adipocytes. Science 2019 Mar 1(6430);363:989-993. PMID: 30819964. PMCID: PMC6579605

5) Regulation of body weight. We recently reanalyzed data from classic weight perturbations studies and concluded that leptin is not the predicted “satiety factor.” Consistent with others’ proposition that leptin is the signal that protects against weight reduction there is an as yet undiscovered circulating factor that limits weight gain in overfed people and animals and is the satiety factor of Coleman’s classic parabiosis experiments. We proposed a model in which adipose tissue function, rather than mass per se, is monitored by the immune system, and that in response to stress signal that more triglyceride cannot be efficiently stored the immune system releases factors that act centrally to limit adipose tissue expansion. A Berrie Scholar (Y Ravussin) working with a graduate student has established a system to overfeed

mice and study the systems that prevent weight gain. Most recently we have demonstrated that fat in a palatable diet attenuates weight defense via post-oral sensing mechanisms.

A. Ravussin Y, Leibel RL, Ferrante AW Jr. A Missing Link in Body Weight Homeostasis: The Catabolic Signal of the Overfed State. Cell Metabolism 2014 Oct 7;20(4):565-572. PMID: 25295786. PMCID: PMC4191848.
B. Ravussin Y, Edwin E, Gallop M, Xu L, Bartolomé A, Kraakman MJ, LeDuc CA, Ferrante AW Jr. Evidence for a non-leptin system that defends against weight gain in overfeeding. Cell Metabolism 2018 Aug 7;28(2):289-299. PMID: 29937378. PMCID: PMC6082718
C. Gallop MR, Wilson VC, Ferrante AW Jr. Post-oral sensing of fat increases food intake and attenuates body weight defense. Cell Reports 2021 Oct 19;37(3):109845. PMID: 34686319. PMCID: PMC8609494.

Complete List of Published Work in MyBibliography:
https://www.ncbi.nlm.nih.gov/myncbi/anthony.ferrante.1/bibliography/public/