

MAHMOUD NASR

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EDUCATION & CREDENTIALS

EDUCATION

- **Harvard University**, Department of Biological Chemistry and Molecular Pharmacology Postdoctoral research fellow 11/13-current
- **Yale University**, School of Medicine, Department of Cellular and Molecular Physiology Postdoctoral research fellow 3/13- 10/13
- **Northeastern University**, Pharmaceutical Sciences Department, Boston, MA PhD in Pharmaceutical Sciences (Drug Development and Medicinal Chemistry) 2008-2012
- **Northeastern University**, Pharmaceutical Sciences Department, Boston, MA Master of Science in Biomedical Sciences 2002-2004
- **Suez Canal University**, Faculty of Pharmacy, Ismailia, Egypt Bachelor of Pharmacy (BPharm) 1996-2001

LICENSURE & CERTIFICATION

- Massachusetts Pharmacist License
- Ohio Pharmacist License
- North American Pharmacist Licensure Examination (NAPLEX)

ACADEMIC HONORS & AWARDS

- Young Investigator's Talk, Protein Society Conference, Barcelona, Spain 2015
- Ruth L. Kirschstein National Research Service Award (NRSA), 2015
- 2012 GBMSDG/MASSEP First Place Award at the annual advances in separation science and mass spectrometry symposium, Boston 2012.
- 2011 International Cannabinoid Research Society (ICRS) Pre-doctoral Research Award.
- Provost's Outstanding Student Research Award, Northeastern University 2011.
- Honor's List, Suez Canal University, Egypt 2001.
- Ideal Student Award (highest academic and extracurricular record), Suez Canal University, Egypt 2000.
- Suez Canal University President's Award in Art, Egypt 1999

TEACHING EXPERIENCE

- **Course Instructor**, Harvard Medical School, Boston, MA Fall 2014
Taught medical pharmacology course (medical student course)
- **Teaching Assistant**, Northeastern University, Boston, MA Spring 2011
Directed laboratory sections for pharmaceutical sciences lab (graduate level)
- **Teaching Assistant**, Massachusetts College of Pharmacy, Pharmacy School, Boston, MA Fall 2005
Directed laboratory and interactive discussion sections for organic chemistry course

RESEARCH EXPERIENCE

Department of Biological Chemistry and Molecular Pharmacology, Harvard Medical School, Boston.
11/2013 –present (Wagner lab)

- Engineered covalently circularized nanodiscs (cND) of different sizes ranging from 8-80 nm in diameter.
- Developed a novel DNA-belted nanodisc as large as 120 nm in diameter.
- I have successfully incorporated various membrane proteins into cNDs for NMR and Cryo-EM studies, these proteins include several GPCRs (CCR5, Neurotensin receptor 1, CB2 receptors, β 2 receptor), G protein heterotrimer, BAX, VDAC-1 and CD155, CD4, HIV gp145, TCR/CD3 complex.
- In collaboration with Hogle's lab (Harvard Medical School), I was able to place the poliovirus receptor CD155 into 15 and 50 nm cNDs and use them as a host membrane surrogate to study poliovirus cell entry and RNA translocation using negative-stain and Cryo-EM.
- In collaboration with Ellis Reinherz lab at the Dana Farber Cancer Institute, I engineered several constructs of the membrane-proximal region of HIV gp41 that can be inserted into cNDs and tested the potential as HIV vaccine.
- I have transferred intact complexes and difficult membrane proteins directly from native membranes into nanodiscs and prepared homogenous samples for Cryo-EM studies. These proteins include the intact TCR/CD3 complex and gp160.
- I have developed a DNA-nanoswitch for membrane proteins in collaboration with Wesley Wong lab.

Department of Physiology, Yale School of Medicine, New Haven, CT. 03/2013 -10/2013

- Purified serotonin and leucine transporters using different chromatographic methods to enable structural and functional studies.
- Developed protocols for incorporating different neurotransmitter transporters into phospholipid bilayer nanodiscs to enable single molecule studies.
- Performed hydrogen-deuterium exchange mass spectrometry (HX-MS) for Leucine transporter incorporated into nanodiscs to study dynamics in presence and absence of different ligands.
- Developed a new radioligand binding assays (SPA, LSC) for serotonin and leucine transporters in nanodiscs.
- Performed Crystallization trials for leucine transporters in detergent and in nanodisc.

Center for Drug Discovery, Northeastern University, Boston, MA. 2008-2012 (Makriyannis lab)

- Performed ligand-assisted characterization of the catalytic sites of FAAH and MGL enzymes by MALDI TOF/TOF and Q-TOF mass spectrometry.
- Identified covalent ligand-protein/peptide complexes using novel cannabinergic ligands synthesized at the center for drug discovery.
- Developed fluorescence-based screening assays to study the interactions of cannabinergic ligands with the enzymes involved in the deactivation of the endocannabinoids.
- Performed wide-angle X-ray scattering (WAXS) and small-angle X-ray scattering (SAXS) studies of membrane proteins/nanodiscs complexes at Argonne and Brookhaven national labs.
- Performed hydrogen-deuterium exchange mass spectrometry analysis (HX-MS) of native membrane proteins incorporated into phospholipid bilayer nanodiscs.
- Developed functional assays for different membrane proteins incorporated into nanodiscs.
- Developed a protocol for Cannabinoid Receptor 2 (CB2) isolation and purification using nanodiscs.
- Performed in vitro assays to determine different kinetic parameters including, K_{inact} , K_i , K_{obs} , K_m , IC_{50} for different enzyme inhibitors.

PUBLICATIONS

- Hagn F, **Nasr ML**, Wagner G “Assembly of phospholipid nanodiscs of controlled size for structural studies of membrane proteins by NMR” (*Nature protocols, accepted*).
- Obayashi E, Luna R, Nagata T, Marcos, P, Hiraishi H, Erzberger JP, Zhang F, Arthanari H, Morris J, Pellarin R, Moore C, Tang L, Thompson B, Papadopoulos E, Yoshida H, **Nasr ML**, Unzai S, Harmon I, Hustak S, Dagraca E, Ananbandam A, Gao P, Urano T, Hinnebusch A, Wagner G, Asano K. “Molecular Landscape of the Ribosome Pre-initiation Complex during mRNA Scanning: Structural Role for eIF3c and Its Control by eIF5” *Cell Rep*. 2017, 18 (11) 2651-2663.
- **Nasr ML**, Baptista D, Strauss M, Grigoriu S, Hagn F, Stauder S, Walz T, Hogle J, Wagner G “Covalently circularized nanodiscs for studying membrane proteins and viral entry” *Nature Methods* 2017, 14(1):49-52 .
- Lee C, He CH, Nour AM, Zhou, Ma B, Park JW, Kim KH, **Nasr ML**, Modis Y, Lee CG, Elias, J. “ TMEM219 and IL-13Ra2 Form a Multimeric Signaling and Effector Complex” *Nature Communications*. 2016; 7:12752.
- **M. Nasr** and S. Singh. “Ligand binding to membrane transporters in nanodiscs by scintillation proximity” *Biochemistry* 2013.
- **M. Nasr**, X. Shi, A. Bowman, M. Johnson, N. Zvonok, D. R. Janero, K. Vemuri, T. Wales, J. R. Engen, A. Makriyannis. “Membrane phospholipid bilayer as a determinant of monoacylglycerol lipase kinetic profile and conformational repertoire” *Protein Sci* 2013, 6 (22) 774-87.
- S. O. Alapafuja, S. P. Nikas, I. Bharatan, V. Shukla, **M. Nasr**, A. Bowman, N. Zvonok, Jing Li, X. Shi, J.R. Engen, A. Makriyannis. “Sulfonyl fluorides inhibitors of fatty acid amide hydrolase” *J Med Chem* 2012, 55 (22), 10074-89.
- V. Naidoo, D. A. Karanian, S. K. Vadivel, J. R. Locklear, J. T. Wood, **M. Nasr**, P. M. Quizon, E. E. Graves, V. Shukla, A. Makriyannis, and B. A. Bahr. "Equipotent inhibition of fatty acid amide hydrolase and monoacylglycerol lipase - Dual targets of the endocannabinoid system to protect against seizure pathology". *Neurotherapeutics* 2012, 9 (4), 801-13.

Abstracts/ Presentations

- **Nasr ML**, Meng Zhang, Wagner G “Covalently circularized nanodiscs for drug discovery and structural determination of membrane proteins. MALSI innovation meeting, 2017, Boston, MA.
- **Nasr ML**, Zhao Z, Sun J, Baptista D, Strauss M, Grigoriu S, Hagn F, Shih W, Hogle J, Wagner G “Covalently circularized nanodiscs: EM and NMR applications. Biophysical Society 61st annual meeting, 2017, New Orleans, LA.
- **Nasr ML**, Strauss, M, Hogle J, Wagner G “Creating large covalently circularized nanodiscs and its application in studying viral entry and genome translocation” The 29th annual symposium of the protein society 2015. Barcelona, Spain. (**Young Investigator Talk**)

- **Nasr ML**, Baptista D, Grigoriu S, Strauss, M, Hagn F, Hagn F, Stauder S, Raschle T, Walz T, Hogle J, Wagner G “Covalently circularized nanodiscs for structural and functional studies of membrane proteins” the 56th experimental nuclear magnetic resonance conference 2015. CA, USA.
- **M. Nasr**, X. Shi, M. Johnson, N. Zvonok, J.R. Engen, L. Makowski, A. Makriyannis. “Conformational analysis of a native membrane protein incorporated into phospholipid bilayer nanodiscs: Implications for drug discovery”. The 14th annual advances in analytical separation and mass spectrometry symposium 2012. Boston, MA. **(1st Place Award)**
- **M. Nasr**, X. Shi, I. Karageorgos, M. Johnson C. Morgan, X. Tian, N. Zvonok, J. Engen, A. Makriyannis. “The dynamic properties of monoacylglycerol lipase in nanodiscs model membrane”. International cannabinoid research society symposium 2011. Chicago, IL. **(1st Place Award)**
- **M. Nasr***, I. Karageorgos*, N. Zvonok, S. Tyukhtenko, K. Vemuri, T.E. Wales, J.R. Engen, A. Makriyannis. “Identifying the mode of MGL inhibition by covalent ligands using mass spectrometry and NMR”. Research expo, Northeastern University 2010. *Equal contribution.