

Carlos A. Castañeda, Ph.D.

Assistant Professor, Departments of Biology & Chemistry
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Research Interests: Post-translational modifications of proteins in neurodegenerative and neuromuscular diseases, structural biology, protein dynamics

EDUCATION

- 2009-2014 **Postdoc. in Biochemistry and Structural Biology, University of Maryland, College Park**
- Advisor: David Fushman
- 2008 **Ph.D. in Molecular and Computational Biophysics, Johns Hopkins University**
- Dissertation: Determinants of electrostatic energies and pK_a values in proteins
 - Dissertation Advisor: Bertrand García-Moreno E.
- 2001 **B.A. in Chemistry, Biochemistry and Mathematics, La Salle University (2001)**
- Graduated maxima cum laude with General University Honors

GRANTS & FELLOWSHIPS

- 2015 Nappi Family Research Grant (co-PI) (\$100,000 total, \$50,000 to CAC)
- 2015 Internal SU Research Grant (co-PI) (\$11,250)
- 2014 Shimadzu Instrumentation Grant for triple-quad mass spectrometer (\$100,000)
- 2009-2011 National Science Foundation Postdoctoral Fellowship in Biology (\$120,000)
- 2002-2007 Burroughs Wellcome Predoctoral Fellowship
- 2001 ACS Philadelphia Section Scholastic Achievement Award
- 2000 ACS Analytical Chemistry Award

PUBLICATIONS

Syracuse University

1. Ha JH, Karchin JM, Walter-Kopp N, Castañeda CA, Loh SN. (2015) Engineered domain swapping as an on/off switch for protein function, **Chemistry and Biology**. 10: 1384-1397.
2. Castañeda CA et al. (2016) Linkage via K27 bestows ubiquitin chains with unique properties among polyubiquitins. **Structure**. *accepted*.

Postdoctoral - University of Maryland College Park

3. Castañeda CA, Chaturvedi A, Camara C, Curtis J, Krueger S, Fushman D. (2015) Linkage-specific conformational ensembles of non-canonical polyubiquitin chains. **Phys. Chem. Chem. Phys.** DOI:10.1039/C5CP04601G
4. Burke MC, Wang Y, Lee AE, Dixon EK, Castañeda CA, Fushman D, Fenselau C. (2015) Unexpected trypsin cleavage at ubiquitinated lysines. **Anal Chem**. 87: 8144-8148.
5. Nowicka U, Zhang D, Walker O, Krutauz D, Castañeda CA, Chaturvedi A, Chen TY, Reis N, Glickman MH, Fushman D. (2015) DNA-damage-inducible 1 protein (Ddi1) contains an uncharacteristic ubiquitin-like domain that binds ubiquitin. **Structure**. 23: 542-557.
6. Yu Z, Livnat-Levanon N, Kleifeld O, Mansour W, Nakasone MA, Castañeda CA, Dixon EK, Fushman D, Reis N, Pick E, Glickman MH. (2015) Base-CP proteasome can serve as a platform for stepwise lid formation. **Biosci. Rep.** 35: e00194.

7. Lee AE, Castañeda CA, Wang Y, Fushman D, Fenselau C. (2014) Preparing to read the ubiquitin code: a middle-out strategy for characterization of all lysine-linked diubiquitins, **J. Mass Spectrom.** 49: 1272-1278.
8. Robinson AC, Castañeda CA, Schlessman JL, García-Moreno E B. (2014) Structural and thermodynamic consequences of burial of an artificial ion pair in the hydrophobic interior of a protein, **Proc. Nat. Acad. Sci. USA** 111: 11685-11690.
9. Lee SY, Pullen L, Virgil DJ, Castañeda CA, Abeykoon D, Bolon DNA, Fushman D. (2014) Alanine scan of core positions in ubiquitin reveals links between dynamics, stability and function, **J. Mol. Biol.** 426: 1377-1389.
10. Berlin K, Castañeda CA, Schneidman-Duhovny D, Sali A, Nava-Tudela A, Fushman D. (2013) Recovering a representative conformational ensemble from underdetermined macromolecular structural data, **J. Am. Chem. Soc.** 135: 16595-16609.
11. Haj-Yahya N, Haj-Yahya M, Castañeda CA, Spasser L, Hemantha HP, Jbara M, Penner M, Ciechanover A, Fushman D, and Brik A. (2013) Modifying the vicinity of the isopeptide bond revealed differential behavior of ubiquitin chains with interacting proteins: Organic chemistry applied to synthetic proteins. **Angew Chem. Int. Ed. Engl.** 52: 11149-11153.
12. Castañeda CA, Kashyap TR, Nakasone MA, Krueger S, Fushman D. (2013) Unique structural, dynamical, and functional properties of K11-linked polyubiquitin chains. **Structure.** 21: 1168-1181.
 - a. Featured in commentary by Cunningham CN, Corn JE. (2013) Decoding a Chain Letter for Degradation. **Structure.** 21: 1068-1070.
13. Castañeda CA, Dixon E, Kashyap TR, Wang Y, Fushman D. (2013) Nonenzymatic assembly of branched polyubiquitin chains for structural and biochemical studies. **Bioorg. Med. Chem.** 21: 3421-3429.
14. Lange A, Castañeda CA, Hoeller D, Lancelin JM, Fushman D, Walker O. (2012) Evidence for cooperative and domain-specific binding of the signal transducing adaptor molecule 2 (STAM2) to Lys63-linked diubiquitin. **J. Biol. Chem.** 287: 18687-18689.
15. Castañeda CA, Liu J, Chaturvedi A, Nowicka U, Cropp TA, Fushman D. (2011) Nonenzymatic assembly of natural polyubiquitin chains of any linkage composition and isotopic labeling scheme. **J. Am. Chem. Soc.** 133: 17855-17868.
16. Castañeda CA, Spasser L, Bavikar SN, Brik A, Fushman D. (2011) Segmental isotopic labeling of ubiquitin chains to unravel monomer-specific molecular behavior. **Angew Chem. Int. Ed. Engl.** 50: 11210-11214.
17. Castañeda CA, Liu J, Kashyap TR, Singh RK, Fushman D, Cropp TA. (2011) Controlled enzymatic synthesis of natural-linkage, defined-length polyubiquitin chains using lysines with removable protecting groups. **Chem Commun (Camb)** 47: 2026-2028.
18. Liu J, Castañeda CA, Wilkins BJ, Fushman D, Cropp TA. (2010) Condensed E. coli cultures for highly efficient production of proteins containing unnatural amino acids. **Bioorg. Med. Chem. Lett.** 20: 5613-5616.

Graduate - Johns Hopkins University

19. Isom DG, Castañeda CA, Cannon BR, García-Moreno E B. (2011) Large shifts in pKa values of lysine residues buried inside a protein. **Proc. Nat. Acad. Sci. USA** 108: 5260-5265.
20. Chimenti MS, Castañeda CA, Majumdar A, García-Moreno E B. (2011) Structural origins of high apparent dielectric constants experienced by ionizable groups in the hydrophobic core of a protein. **J. Mol. Biol.** 405: 361-377.
21. Isom DG, Castañeda CA, Cannon BR, Velu PD, García-Moreno E B. (2010) Charges in the hydrophobic interior of proteins, **Proc. Nat. Acad. Sci. USA** 107: 16096-16100.
22. Castañeda CA, Fitch CA, Majumdar A, Khangulov V, Schlessman JL, García-Moreno E B. (2009) NMR spectroscopy study of molecular determinants of pKa values of carboxylic groups in Staphylococcal nuclease, **Proteins: Struct. Funct. Bioinf.** 77: 570-588.
23. Harms MJ, Castañeda CA, Schlessman JL, Sue GR, Isom DG, Cannon BR, García-Moreno E B. (2009) The pKa values of acidic and basic residues buried at the same internal location in a protein are governed by different factors, **J Mol. Biol.** 389: 34-47.

24. Takayama Y, Castañeda CA, Chimenti M, García-Moreno E B, Iwahara J. (2008) Direct evidence for deprotonation of a lysine side chain buried in the hydrophobic core of a protein. **J. Am. Chem. Soc.** 130: 6714-6715.
25. Isom DG, Cannon BR, Castañeda CA, Robinson AC, García-Moreno E B. (2008) High tolerance for ionizable residues in the hydrophobic interior of proteins. **Proc. Nat. Acad. Sci. USA** 105: 17784-17788.

Pre-Graduate School - Wistar Institute

26. Riethman H, Ambrosini A, Castañeda CA, Finklestein J, Hu X, Mudunuri U, Paul S, Wei J. (2004) Mapping and initial analysis of human subtelomeric sequence assemblies. **Genome Res.** 14: 18–28.

ORAL PRESENTATIONS

- **Invited Talk, 1st Upstate NY Structural Biology and 14th Upstate NY NMR Symposium**, Syracuse, NY (Oct 2015)
"Linkage-specific conformational ensembles of non-canonical polyubiquitin chains from NMR and SANS studies"
- **Invited Talk, Eastern Analytical Symposium**, Somerset County, NJ (Nov 2014)
"Deciphering how non-canonical polyubiquitin chains may signal: Assembly, structural and functional studies"
- **Invited Seminar, Maryland Biophysics Program**, College Park, MD (Apr 2013)
"Noncanonical polyubiquitin chains: Assembly, structural and functional studies"
- **Platform Talk, Biophysical Society**, Philadelphia, PA (Mar 2013)
"Effect of lysine linkage on polyubiquitin chain structure and function"
- **Platform Talk, Gibbs Conference on Biothermodynamics** Carbondale, IL (Sep 2012)
"Deciphering the 'ubiquitin code': Assembly and NMR studies of non-canonical polyubiquitin chains"
- **Platform Talk, Chianti/INSTRUCT Workshop on BioNMR** Montecatini Terme, Italy (June 2012)
"Deciphering the 'ubiquitin code': Assembly and NMR studies of non-canonical polyubiquitin chains"
- **Short Talk, Gibbs Conference on Biothermodynamics** Carbondale, IL (Sep 2010)
"Probing conformational dynamics of polyubiquitin chains"
- **Platform Talk, Johns Hopkins Institute for Biophysical Research Retreat** Baltimore, MD (Sept 2007)
"Electrostatic forces in proteins: NMR spectroscopy study of carboxylic pK_a values"

POSTERS

- **Gibbs Conference**, Carbondale, IL (Oct 2013)
“Effect of different lysine linkages on polyubiquitin chain structure and function”
- **Proteins Gordon Conference**, Holderness, NH (Jun 2013)
“Effect of different lysine linkages on polyubiquitin chain structure and function”
- **Biophysical Society**, Baltimore, MD (Mar 2011)
“NMR spectroscopy studies of interdomain dynamics in K11-linked diubiquitin”
- **Gibbs Conference**, Carbondale, IL (Sep 2010)
“Probing conformational dynamics of polyubiquitin chains using site-directed spin labeling”
- **ICMRBS (International Council on Magnetic Resonance in Biological Systems)**, Cairns, Australia (Aug 2010)
“Probing conformational dynamics of polyubiquitin chains using site-directed spin labeling”
- **Biopolymers Gordon Conference**, Newport, RI (Jun 2008)
“Molecular determinants of the pK_a values of surface Asp and Glu residues in staph. nuclease”
- **Biophysical Society Meeting**, Baltimore, MD (Mar 2007)
“Local fluctuations and dynamics as determinants of carboxylic pK_a values in protein”
- **Gibbs Conference**, Carbondale, IL (Oct 2006)
“Local fluctuations and dynamics as determinants of carboxylic pK_a values in protein”
- **Experimental Nuclear Magnetic Resonance Conference**, Asilomar, CA (Apr 2006)
“Structural and dynamic consequences of ionization of an internal Lys residue”
- **Biophysical Society Meeting**, Long Beach, CA (Feb 2005)
“Location of internal water molecules in proteins: comparison of structure-based calculations with crystallographic observations in staphylococcal nuclease”
- **Gibbs Conference**, Carbondale, IL (Oct 2004)
“Location of internal water molecules in proteins: comparison of structure-based calculations with crystallographic observations in staphylococcal nuclease”

TEACHING at SU

2014 & 2015, Fall BCM 678. Perspectives in Biochemistry (graduate)
2015 & 2016, Spring BCM 476/676, Biochemistry II (undergraduate/graduate)

Pre-SU SERVICE

2013, Apr Audio and Video Material Contributor, Biomolecular Discovery Dome, Maryland Day
2012, Apr Guest Lecturer, 2 lectures, Physical Biochemistry (BCHM 485), UMD
2010, Nov Judge, Bioscience Day Poster Session, UMD
2009, Jan Organizer and Lecturer, Triple Resonance NMR Data Collection and Processing, JHU
2005, Sept Co-organizer, Institute for Biophysical Research Retreat, JHU
2003, Fall Teaching Assistant, “Physical Chemistry of Biological Macromolecules”, JHU