

Sept 2024

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CONTACT INFORMATION

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EDUCATION AND PROFESSIONAL EXPERIENCE

1/2024-current Co-director, Molecular Therapeutics Initiative (MTI) at UC Berkeley
7/2023-current Permanent member, NIH Cellular Signaling and Regulatory Systems (CSRS)
5/2023-current Scientific Advisory Member, Venetian Institute for Molecular Medicine
12/2022-current Editorial Board Member, Molecular Biology of the Cell
11/2022-current Scientific Committee Member, Fondazione Telethon
1/2021-current Scientific Advisory Board Member and Consultant,
Nine Square Therapeutics
9/2018-current Co-Founder, Scientific Advisory Board Member, and Consultant
Frontier Medicines
7/2023-current Professor of Molecular Therapeutics, Department of Molecular and Cell Biology,
University of California, Berkeley
7/2019-6/2023 Associate Professor of Biochemistry, Biophysics and Structural Biology,
Department of Molecular and Cell Biology, University of California, Berkeley
1/2014-6/2019 Assistant Professor of Biochemistry, Biophysics and Structural Biology,
Department of Molecular and Cell Biology, University of California, Berkeley
8/2008-12/2013 Postdoctoral Fellow in the laboratory of Prof. David Sabatini, Whitehead
Institute for Biomedical Research and Howard Hughes Medical Institute
2001-2008 PhD studies in Neurobiology and Cell Biology with Prof. Pietro De Camilli
Dept of Cell Biology/Howard Hughes Medical Institute at Yale University
School of Medicine.
Thesis title: Control of endocytosis by membrane phosphoinositides in living cells.
1999-2001 Research Fellow, Prof. Pasko Rakic Laboratory, Dept of Neurobiology at
Yale University School of Medicine
1999 B.Sc. ("Laurea") with Honors from University of Pisa, Italy. Undergraduate research
in the laboratory of Prof. Giuseppina Barsacchi, Department of Cell,
Developmental and Evolutionary Biology, University of Pisa (Italy)

AWARDS AND SCHOLARSHIPS

2024 Chan-Zuckerberg Initiative: Metabolism across scales award
2023 NIGMS R35/MIRA award
2021-2023 Pew Innovation Fund Award

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2020-2023	Edward Mallinckrodt, Jr. Foundation Scholarship
2018 & 2020	Ara Parseghian Medical Research Foundation Grant
2017-2019	Shurl & Kai Curci Foundation Faculty Scholarship
2015-2019	Damon Runyon-Rachleff Innovation Award
2015 & 2020	Peder Sather Center for Advanced Studies Grant Award
2014-2018	Pew-Stewart Scholar for Cancer Research
2014-2019	NIH Director's New Innovator Award
2014-2017	Edward Mallinckrodt, Jr. Foundation Grant
2009-2012	Jane Coffin Childs Memorial Fund postdoctoral fellowship
2009-2010	LAM Foundation Pilot Project Award
2005-2006	Kavli Institute for Neuroscience Research fellowship
2003-2005	Boehringer Ingelheim Fonds PhD Scholarship
2003	Bayer Award PhD Scholarship (declined)
2001-2002	Scottish Rite Schizophrenia Research PhD Fellowship
1999	University of Pisa award for outstanding undergraduate thesis

PERSONAL STATEMENT

My background is in the molecular mechanisms of intracellular communication, with emphasis on the signaling roles of metabolites such as amino acids, lipids and sugars, and how these molecules govern cellular growth, metabolism and repair processes through membrane-associated signaling and trafficking processes.

A current major focus of my laboratory is the elucidation of the mechanisms via which how one organelle, the lysosome, senses and buffers variations in cellular nutrient levels by regulating the activity of the master growth regulator, mechanistic Target of Rapamycin Complex 1 (mTORC1) kinase. This topic is of great importance in both cell biology and metabolism research. mTORC1 governs the choice between growth and catabolism by integrating a wide range of physiological inputs, whereas the lysosome is a key mediator of cellular catabolism via its participation in autophagy and other degradative processes. My own research, starting as a postdoctoral fellow at MIT and continuing as an independent investigator at the University of California, Berkeley, has shown that mTORC1 and the lysosome are intimately linked, both physically and functionally. Through my work, mTORC1 and the lysosome are now viewed as a highly integrated system that is essential for the correct execution of a wide range of cellular and organismal processes.

Summary of research accomplishments. Since starting my independent group at the University of California, Berkeley in 2014, I have made major contributions to the understanding of mTORC1 regulation and lysosomal biology. As detailed below, in the past five years we made discoveries in distinct but complementary areas. 1- we identified a completely new nutrient input to mTORC1, cholesterol, and have begun to delineate the molecular players involved in its sensing (*Science*, 2017; *Science*, 2022). 2- we delineated key mechanisms for lysosomal recruitment and substrate engagement by mTORC1 (*Nature Cell Biology*, 2018; *Science*, 2019). 3- we identified a role for faulty lysosomal mTORC1 signaling in neurodegenerative diseases, particularly Niemann-Pick type C (*Nature Cell Biology*, 2019) and determine its effects on organelle homeostasis (*Developmental Cell*, 2021).

Critical to these discoveries was our ability to develop new tools and approaches, including in vitro reconstitution of mTORC1 activation, lysosomal binding and substrate engagement; techniques for the high-purity immunoprecipitation and mass spectrometry-based analysis of lysosomal composition; implementation of structural biology (cryo-EM) to achieve an atomic-level understanding of key steps in the mTORC1 activation cascade (collaboration with James Hurley lab; screening of covalent chemical libraries for molecules that interfere with specific steps in mTORC1 activation cascade (collaboration with Daniel Nomura lab).

Service to the scientific community. I am a permanent member of the NIH **Cell Signaling and Regulatory Systems** (CSRS) study section, as well as permanent member of the **Telethon Foundation** Scientific Board (Italy). I have served on NIH study sections as ad-hoc reviewer on multiple occasions: **MBPP** (Feb 2016; Jun 2016 and Jun 2019); **CSRS** (Feb 2020, Jan 2021, Jun 2022). I have also served on **TCB** (Oct 2020, Feb 2022) and on **Special Emphasis Panel ZRG1 CB-L (02)** (Mar 2021).

I also serve as reviewer for non-NIH agencies, including the European Research Council (ERC), the Agence Nationale de la Recherche (France), the Swiss National Science Foundation, the Biotechnology and Biological Sciences Research Council (UK). I am an Editorial Board member for *Molecular Biology of the Cell* (MBoC).

INVITED TALKS

1. Lake Como School of Neuroscience Meeting, Como, Italy Oct 2024
2. 'Awesome Lysosome' meeting at Telethon Institute for Genetics and Medicine, Naples, Italy Sept 2024
3. Ara-Parseghian Conference on Niemann-Pick type C, Tucson, AZ June 2024
4. University of Illinois Urbana-Champaign Biochemistry Seminar, Urbana, IL May 2024

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5. Memorial Sloan Kettering Cancer Center seminar, New York, NY April 2024
6. University of Pittsburgh Aging Center seminar, Pittsburgh, PA April 2024
7. Columbia University Cancer Center seminar, New York, NY March 2024
8. Gordon Research Conference on Autophagy (session leader), Barga, Italy March 2024
9. Amgen seminar on lysosomal biology, Amgen, Thousand Oaks, CA Feb 2024
10. CZI-Metabolism meeting, Chan-Zuckerberg Initiative, Reedwood City, CA Feb 2024
11. ASCB Special Session on Academia-Industry interactions in Neurodegeneration, Boston Dec 2023
12. Chilean Society for Cell Biology Meeting, Puerto Varas (Chile) Nov 2023
13. Duke University Dept of Pharmacology seminar, Durham, NC Nov 2023
14. EMBO Workshop on Endocytosis, Venice (Italy) Sept 2023
15. Altos Labs (South San Francisco), Jun 2023
16. University of California Irvine Dept of Pharmaceutical Sciences Seminar, Irvine, CA May 2023
17. Cold Spring Harbor Laboratory Meeting on Metabolic Signaling, CSHL, NY May 2023
18. Cold Spring Harbor Laboratory Meeting on Ubiquitin & Autophagy, CSHL, NY April 2023
19. Weill Institute for Cell & Molecular Biology of Cornell University, Ithaca, NY Jan 2023
20. Keystone Symposium on Tumor Metabolism, Keystone, CO Sept 2022
21. Gordon Research Conference on Lysosomes and Endocytosis, Andover, NH Jun 2022
22. Keystone Symposium on Mechanisms of Neurodegeneration, Keystone, CO Jun 2022
23. Gordon Research Conference on Autophagy in Stress, Development and Disease, Ventura, CA Mar
24. Northwestern University BMG seminar, Chicago, IL Mar 2022
25. University of Colorado Boulder MCDB seminar, Boulder, CO Nov 2021
26. University of Pennsylvania Dept of Biology online seminar, Oct 2021
27. University of Milan, Italy, online seminar March 2021
28. University of Leeds, UK, online seminar Feb 2021
29. Autophagy India Network EMBO online symposium, Oct 2020
30. Aging Science Talks online seminar, May 2020
31. Univ. of California, San Francisco Biomedical Sciences Seminar, San Francisco, CA Feb 2020
32. University of Cincinnati Cancer Center Retreat, Cincinnati, OH Nov 2019
33. Baylor College of Medicine, Molecular & Human Genetics Dept Seminar, Houston, TX Oct 2019
34. University of Geneva Dept of Biochemistry seminar: Geneva, Switzerland, September 2019
35. Gordon Research Conference on Molecular Membrane Biology, Andover NH July 2019
36. Guest Lecturer at the Marine Biological Laboratory Physiology Course, Woods Hole, MA June 2019
37. Des Treilles Conference on Nutrient Sensing and Metabolic Control of Cell Growth, Fondation Des Treilles, France June 2019
38. World Molecular Engineering Network Meeting, Los Cabos, Mexico, May 2019
39. Sloan Kettering Institute Cell Biology program (dept seminar): New York, NY, April 2019
40. Nature Conference on Cellular Metabolism Meeting, Xiamen, China, April 2019
41. Gordon Research Conference on Lysosomal Diseases, Galveston, TX March 2019
42. Keystone Symposium on Autophagy, Santa Fe, NM Feb 2019
43. Cold Spring Harbor Laboratory meeting on Nutrient Signaling, CSH, NY, Oct 2018
44. Banbury meeting on Autophagy and Cancer, CSH, NY, Oct 2018
45. FASEB meeting on GTPase in Trafficking, Autophagy and Disease: Leesburg, VA, Sept 2018
46. Max Planck Institute of Molecular Cell Biology and Genetics seminar, Dresden, Germany Sept 2018
47. EMBO meeting on Lysosomes in Metabolism, Naples, Italy, May 2018
48. Keystone Symposium on Selective Autophagy, Kyoto, Japan Apr 2018
49. NCI Lysosomes in cancer Workshop. Frederick, MD, Apr 2018
50. EMBO Conference on Endocytic Trafficking in Health and Disease, Serock, Poland, Sept 2017
51. Gordon Research Conference on Organelle Channels and Transporters, Mt Snow, VT, Aug 2017
52. University of Utrecht Medical Center, Dept of Cell Biology, Utrecht, The Netherlands June 2017
53. International Symposium on Protein Trafficking in Health and Disease, Hamburg, Germany June 2017
54. Ara Parseghian Medical Research Conference on Niemann-Pick Disease, Tucson, AZ June 2017
55. Cold Spring Harbor Laboratory meeting on Mechanisms of Metabolic Signaling, CSH, NY, May 2017
56. Washington University School of Medicine, Diabetes Cardiovascular Res Ctr, St Louis MO Jan 2017
57. FASEB meeting on GTPase in Trafficking, Autophagy and Disease: West Palm Beach, FL, Sept 2016
58. EMBO Workshop on Inter-organelle Contacts, Chia (Italy), Sept 2016
59. Gordon Research Conference on Protein Processing, Trafficking and Secretion: Andover, NH, July 2016

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60. Gordon Research Conference on Lysosomes and Endocytosis: Andover, NH, June 2016
61. Gordon Research Seminar on Lysosomes and Endocytosis: Andover, NH, June 2016 (keynote speaker)
62. Ara Parseghian Medical Research Conference on Niemann-Pick Disease, Tucson, AZ June 2016
63. Keystone Symposium on Tumor Metabolism, Banff (Alberta, CA), February 2016
64. UCSF Diabetes Center Seminar Series, San Francisco, CA January 2016
65. Tufts University School of Medicine department seminar, Boston, MA Oct 2015
66. EMBO Meeting on Autophagy, Chia (Italy), September 2015
67. Gordon Research Conference on Molecular Membrane Biology: Andover, NH, July 2015
68. Gordon Research Conference on Bioenergetics: Andover, NH, June 2015
69. Keystone Symposium on Autophagy: Breckenridge, CO, June 2015
70. German Research Foundation Symposium on V-ATPase in Cancer: Milan, Italy, April 2015
71. Sloan Kettering Institute Cell Biology program (dept seminar): New York, NY, Oct 2014
72. Lysosomal Biology Meeting, Salvador, Brazil, August 2014
73. EMBO workshop: 'Protein and lipid function in secretion and endocytosis', Goldegg am see, Austria Jan14-19 2014

PROFESSIONAL SERVICE

Journal Service

Reviewer for Nature, Nature Cell Biology, Nature Metabolism, Nature Communications, Nature Aging, Science, Science Signaling, Cell, Molecular Cell, Developmental Cell, Cell Reports, Structure, Genes and Development, eLIFE, EMBO journal, Proceedings of the National Academy of Sciences, the Journal of Cell Biology, Autophagy, Biochemical Journal, Molecular Biology of the Cell, Biochimica et Biophysica Acta, Traffic. Member of the Editorial Board for Molecular Biology of the Cell.

Grant reviewing

Scientific Committee member, Telethon Foundation (Italy); Permanent and ad-hoc reviewer for the NIH Cellular Signaling and Regulatory Systems (CSRS) study section. Ad-hoc reviewer for the NIH Membrane Biology and Protein Processing (MBPP) and Tumor Cell Biology (TCB) study sections; the Michal J Fox Foundation 'Aligning Science Across Parkinson's (ASAP)'; European Molecular Biology Organization, the European Research Council, the Medical Research Council (UK), the Biotechnology and Biological Sciences Research Council (UK), the Swiss National Science Foundation; the Agence Nationale de la Recherche (France), and the Telethon Scientific Foundation (Italy).

Meeting organization

1. American Society for Biochemistry and Molecular Biology 2022 meeting, co-chair for Interest Group in Signal Transduction
2. 2021 Michael, Marcia, And Christa Parseghian Scientific Conference for Niemann-Pick Type C Research.
3. American Society for Biochemistry and Molecular Biology 2021 meeting, co-chair for Interest Group in Signal Transduction
4. 2020 Michael, Marcia, And Christa Parseghian Scientific Conference for Niemann-Pick Type C Research, Tucson, AZ 5-31-2019
5. 2019 American Society for Cell Biology Meeting, Washington, DC Dec 8-11 2019
Co-chair of the minisymposium: 'Autophagy, Protein turnover and Quality Control'
6. 2014 American Society for Cell Biology Meeting, Philadelphia, PA Dec 6-10 2014
Co-chair of the minisymposium: 'Organelle dynamics and cross talk in health and disease'
7. UC Berkeley MCB/CDB symposium on Autophagy in (Spring 2015): co-organizer.

PUBLICATIONS

1. Segura-Roman, A., Citron, Y.R., Shin, M., Sindoni, N., Maya-Romero, A., Rapp, S., Goul, C., Mancias, J.D., Zoncu, R., 2024. Autophagosomes coordinate an AKAP11-dependent regulatory checkpoint that shapes neuronal PKA signaling. *BioRxiv* <https://doi.org/10.1101/2024.08.06.606738>
2. Lehmer, M., Zoncu, R., 2024. mTORC1 Signaling Inhibition Modulates Mitochondrial Function in Frataxin Deficiency. *BioRxiv*. <https://doi.org/10.1101/2024.08.06.606942>
3. Goul, C., Peruzzo, R. & Zoncu, R. The molecular basis of nutrient sensing and signalling by mTORC1 in metabolism regulation and disease. *Nat Rev Mol Cell Biol* (2023) doi:10.1038/s41580-023-00641-8.

4. Zoncu, R. & Perera, R. M. Emerging roles of the MiT/TFE factors in cancer. *Trends Cancer* S2405-8033(23)00106–1 (2023) doi:10.1016/j.trecan.2023.06.005.
5. Goul, C. S. & Zoncu, R. PITTching in for lysosome repair. *Dev Cell* **57**, 2347–2349 (2022)
6. Shin, H.R., Citron, Y.R., Wang, L., Tribouillard, L., Goul, C.S., Stipp, R., Sugasawa, Y., Jain, A., Samson, N., Lim, C.-Y., Davis, O.B., Castaneda-Carpio, D., Qian, M., Nomura, D.K., Perera, R.M., Park, E., Covey, D.F., Laplante, M., Evers, A.S., Zoncu, R., 2022. Lysosomal GPCR-like protein LYCHOS signals cholesterol sufficiency to mTORC1. *Science* 377, 1290–1298.
7. Jansen, R.M., Peruzzo, R., Fromm, S.A., Yokom, A.L., Zoncu, R., Hurley, J.H., 2022. Structural basis for FLCN RagC GAP activation in MiT-TFE substrate-selective mTORC1 regulation. *Sci Adv* 8, eadd2926. <https://doi.org/10.1126/sciadv.add2926>
8. Jain A, Zoncu R. Organelle transporters and inter-organelle communication as drivers of metabolic regulation and cellular homeostasis. *Mol Metab.* 2022 Jun;60:101481.
9. Zoncu R, Perera RM. Built to last: lysosome remodeling and repair in health and disease. *Trends Cell Biol.* 2022 Jul;32(7):597–610.
10. Gupta, S., Yano, J., Mercier, V., Htwe, H.H., Shin, H.R., Rademaker, G., Cakir, Z., Ituarte, T., Wen, K.W., Kim, G.E., Zoncu, R., Roux, A., Dawson, D.W., Perera, R.M., 2021. Lysosomal retargeting of Myoferlin mitigates membrane stress to enable pancreatic cancer growth. *Nat Cell Biol* 23, 232–242. <https://doi.org/10.1038/s41556-021-00644-7>
11. Moldavski, O., Zushin, P.-J.H., Berdan, C.A., Van Eijkeren, R.J., Jiang, X., Qian, M., Ory, D.S., Covey, D.F., Nomura, D.K., Stahl, A., Weiss, E.J., Zoncu, R., 2021. 4 β -hydroxycholesterol is a pro-lipogenic factor that promotes SREBP1c expression and activity through Liver X-receptor. *J Lipid Res* 100051. <https://doi.org/10.1016/j.jlr.2021.100051>
12. Davis, O.B., Shin, H.R., Lim, C.-Y., Wu, E.Y., Kukurugya, M., Maher, C.F., Perera, R.M., Ordonez, M.P., Zoncu, R., 2021. NPC1-mTORC1 Signaling Couples Cholesterol Sensing to Organelle Homeostasis and Is a Targetable Pathway in Niemann-Pick Type C. *Dev Cell* 56, 260-276.e7. <https://doi.org/10.1016/j.devcel.2020.11.016>
13. Su, M.-Y., Fromm, S.A., Zoncu, R., Hurley, J.H., 2020. Structure of the C9orf72 ARF GAP complex that is haploinsufficient in ALS and FTD. *Nature* 585, 251–255. <https://doi.org/10.1038/s41586-020-2633-x>
14. Higuchi-Sanabria, R., Shen, K., Kelet, N., Frankino, P.A., Durieux, J., Bar-Ziv, R., Sing, C.N., Garcia, E.J., Homentcovschi, S., Sanchez, M., Wu, R., Tronnes, S.U., Joe, L., Webster, B., Ahilon-Jeronimo, A., Monshietehadi, S., Dallarda, S., Pender, C., Pon, L.A., Zoncu, R., Dillin, A., 2020. Lysosomal recycling of amino acids affects ER quality control. *Sci Adv* 6, eaaz9805. <https://doi.org/10.1126/sciadv.aaz9805>.
15. Shin HR, Zoncu R. The Lysosome at the Intersection of Cellular Growth and Destruction. *Dev Cell.* 2020 Jun 30;
16. Citron YR, Zoncu R. A zinc-sensing protein gives flies a gut feeling for growth. *Nature.* 2020;580(7802):187–8.
17. Bindsbøll, C., Aas, A., Ogmundsdottir, M.H., Pankiv, S., Reine, T., Zoncu, R., Simonsen, A., 2020. NBEAL1 controls SREBP2 processing and cholesterol metabolism and is a susceptibility locus for coronary artery disease. *Sci Rep* 10, 4528. <https://doi.org/10.1038/s41598-020-61352-0>
18. Lawrence, R.E.* , Fromm, S.A.* , Fu, Y., Yokom, A.L., Kim, D.J., Thelen, A.M., Young, L.N., Lim, C.-Y., Samelson, A.J., Hurley, J.H.* , Zoncu, R.* , 2019. Structural mechanism of a Rag GTPase activation checkpoint by the lysosomal folliculin complex. *Science* 366, 971–977. <https://doi.org/10.1126/science.aax0364>
19. Bersuker, K., Hendricks, J., Li, Z., Magtanong, L., Ford, B., Tang, P.H., Roberts, M.A., Tong, B., Maimone, T.J., Zoncu, R., Bassik, M.C., Nomura, D.K., Dixon, S.J., Olzmann, J.A., 2019. The CoQ oxidoreductase FSP1 acts parallel to GPX4 to inhibit ferroptosis. *Nature.* <https://doi.org/10.1038/s41586-019-1705-2>
20. Lim, C.-Y., Davis, O.B., Shin, H.R., Zhang, J., Berdan, C.A., Jiang, X., Counihan, J.L., Ory, D.S., Nomura, D.K., Zoncu, R., 2019. ER-lysosome contacts enable cholesterol sensing by mTORC1 and drive aberrant growth signalling in Niemann-Pick type C. *Nat. Cell Biol.* 21, 1206–1218. <https://doi.org/10.1038/s41556-019-0391-5>.
21. Chung CY, Shin HR, Berdan CA, Ford B, Ward CC, Olzmann JA, Zoncu R, Nomura DK. Covalent targeting of the vacuolar H⁺-ATPase activates autophagy via mTORC1 inhibition. *Nat Chem Biol.* 2019 Aug;15(8):776-785.

22. Citron YR, Zoncu R Rhomboids Distort Time and Space: Accelerated Proteolysis through Membrane Disruption. *Biochemistry*. 2019 Apr 23;58(16):2093-2094.
23. Lawrence, R.E, Zoncu, R. The lysosome as a cellular center for signaling, metabolism and quality control. *Nat Cell Biol*. 2019 Feb;21(2):133-142.
24. Lawrence, R.E, Cho, K.F., Rappold, R., Thrun, A.F., Tofaute, M., Kim, D.J., Moldavski, O., Hurley, J.H., and Zoncu, R. (2018). A nutrient-induced affinity switch controls mTORC1 activation by its Ragulator-Rag GTPase scaffold. *Nature Cell Biology* 2018: 1052-1063, doi:10.1038/s41556-018-0148-6.
25. Shin HR, Zoncu R. Finding Sugar in the Pantry: How Galectins Detect and Signal Lysosomal Damage. *Mol Cell*. 2018;70(1):5-7.
26. Thelen AM, Zoncu R. Emerging Roles for the Lysosome in Lipid Metabolism. *Trends Cell Biol*. 2017;27(11):833-50. PMID: PMC5653458.
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30. Di Malta C, Siciliano D, Calcagni A, Monfregola J, Punzi S, Pastore N, Eastes AN, Davis O, De Cegli R, Zampelli A, Di Giovannantonio LG, Nusco E, Platt N, Guida A, Ogmundsdottir MH, Lanfrancone L, Perera RM, Zoncu R, Pelicci PG, Settembre C, Ballabio A. Transcriptional activation of RagD GTPase controls mTORC1 and promotes cancer growth. *Science*. 2017;356(6343):1188-92. PMID: PMC5730647.
31. De Leon JA, Qiu J, Nicolai CJ, Counihan JL, Barry KC, Xu L, Lawrence RE, Castellano BM, Zoncu R, Nomura DK, Luo ZQ, Vance RE. Positive and Negative Regulation of the Master Metabolic Regulator mTORC1 by Two Families of Legionella pneumophila Effectors. *Cell Rep*. 2017;21(8):2031-8. PMID: PMC5726772.
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33. Belyy V, Shih SM, Bandaria J, Huang Y, Lawrence RE, Zoncu R, Yildiz A. PhotoGate microscopy to track single molecules in crowded environments. *Nat Commun*. 2017;8:13978. PMID: PMC5234080.
34. Lim CY, Zoncu R. The lysosome as a command-and-control center for cellular metabolism. *J Cell Biol*. 2016;214(6):653-64. PMID: PMC5021098.
35. Manifava M, Smith M, Rotondo S, Walker S, Niewczasz I, Zoncu R, Clark J, Ktistakis NT. Dynamics of mTORC1 activation in response to amino acids. *Elife*. 2016;5. PMID: PMC5059141.
36. Okosun J, Wolfson RL, Wang J, Araf S, Wilkins L, Castellano BM, Escudero-Ibarz L, Al Seraihi AF, Richter J, Bernhart SH, Efeyan A, Iqbal S, Matthews J, Clear A, Guerra-Assuncao JA, Bodor C, Quentmeier H, Mansbridge C, Johnson P, Davies A, Strefford JC, Packham G, Barrans S, Jack A, Du MQ, Calaminici M, Lister TA, Auer R, Montoto S, Gribben JG, Siebert R, Chelala C, Zoncu R, Sabatini DM, Fitzgibbon J. Recurrent mTORC1-activating RRAGC mutations in follicular lymphoma. *Nat Genet*. 2016;48(2):183-8. PMID: PMC4731318.
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- Sabatini DM. Metabolism. Lysosomal amino acid transporter SLC38A9 signals arginine sufficiency to mTORC1. *Science*. 2015;347(6218):188-94. PMID: PMC4295826.
41. Tooze S, Zoncu R. Control of cellular homeostasis: organelles take the pilot's seat. *Mol Biol Cell*. 2015;26(6):1009-10. PMID: PMC4357499.
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INVENTIONS

1 'mTORC1 modulators' (US Provisional Patent Application Nos. 62/572,234 (2018-025-1), 62/639,431 (2018-025-2) and 62/645,365 (2018-025-3). These patents describe novel technology for specific disruption of protein-protein interactions (PPIs) within the mTORC1 pathway by combining covalent ligand libraries with protein complex reconstitution in vitro.

2 'Methods and Compounds for Targeted Autophagy.' (US Provisional Patent Application No. 62/647569). This patent describes novel technology to enhance the rate of selected autophagic pathway for the targeted elimination of pathogenic proteins.

3 'mTORC1 inhibitors for Activating Autophagy' (US Provisional Application No.: 62/791,655. This patent describes a class of covalent chemicals that activate autophagy by targeting an essential mTORC1 regulator, the vacuolar H⁺-ATPase.