Stanford

Natalia Gomez-Ospina

Assistant Professor of Pediatrics (Genetics) and of Pediatrics (Stem Cell Transplantation)

Pediatrics - Medical Genetics

CLINICAL OFFICES

- **Medical Genetics**

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Bio

BIO

Dr. Gomez-Ospina was born and raised in Medellin, Colombia. She began her undergraduate studies in petroleum engineering at the Universidad Nacional de Colombia before moving to Colorado. She double majored at the University of Colorado Boulder, completing her bachelor's degree in Molecular Cellular and Developmental Biology as well as Biochemistry. She graduated summa cum laude and wrote an honors thesis entitled "Role of the quiescent center in the regeneration of the root cap in Zea Mays." She then completed her combined MD, PhD at Stanford Medical School, where her PhD work focused on understanding the novel functions of voltage-gated calcium channels. Her PhD thesis, "The calcium channel CACNA1C gene: multiple proteins, diverse functions," was published in Cell. After completion of her dual degrees, she did her preliminary year in internal medicine at Santa Barbara Cottage hospital before starting residency in Dermatology at Johns Hopkins Hospital. She completed residency in Medical Genetics at Stanford Hospital and clinics.

Her post-doctoral research was with Dr. Matthew Porteus in Pediatric Stem Cell transplantation, where she began to develop genome editing-based strategies in stem cells as a therapies for metabolic diseases. She is currently an Assistant Professor in the Department of Pediatrics. For her clinical practice she sees patients with suspected genetic disorders, and is also in charge of the enzyme replacement service for lysosomal storage disorders at Lucile Packard Children's hospital. She has been the lead author in research studies in The New England Journal of Medicine, Cell, Nature Communications, and American Journal of Medical Genetics.

CLINICAL FOCUS

- Clinical Genetics
- Rare diseases
- Lysosomal Storage Diseases
- Hematopoietic Stem Cell Transplantation for Metabolic Diseases

ACADEMIC APPOINTMENTS

- Assistant Professor, Pediatrics - Medical Genetics
- Assistant Professor, Pediatrics - Stem Cell Transplantation
- Member, Bio-X

- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- William K. Bowes Jr. Award in Medical Genetics, Partners HealthCare Personalized Medicine (2019)
- Young Investigator Award, 14th annual WORLDSymposium on lysosomal storage diseases (2018)
- Mentored Clinical Scientist Research Career Development Award (K08), NIH, National Institute of Neurological Diseases and Stroke (2017-2022)
- Center of Excellence in Diversity in Medical Education Fellowship, Center of Excellence in Diversity in Medical Education (COEDME), Stanford Medicine (2016)
- Tashia and John Morgridge Endowed Postdoctoral Fellow in Pediatric Translational Medicine, Child Health Research Institute (2015-2016)
- Mead Johnson Award. Novel form of neonatal cholestasis due to mutations in FXR, Western Society of Pediatric Research. Carmel, CA (2015)
- Mead Johnson Award. Respiratory involvement in Costello syndrome, Western Society of Pediatric Research. Carmel, CA (2014)

PROFESSIONAL EDUCATION

- Board Certification: Clinical Genetics, American Board of Medical Genetics and Genomics (2015)
- Residency: Stanford Hospital and Clinics (2015) CA
- Residency: Johns Hopkins Hospital (2013) MD
- Internship: Santa Barbara Cottage Hospital (2012) CA
- Ph.D., Stanford School of Medicine , Chemical and Systems Biology (2011)
- Medical Education: Stanford University Medical School (2011) CA

COMMUNITY AND INTERNATIONAL WORK

- Fiesta Educativa, Mayfair Community Center, San Jose

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Dr. Gomez-Ospina is a physician scientist and medical geneticist with a strong interest in the diagnosis and management of genetic diseases.

1) Lysosomal storage diseases:

Her research program is on developing better therapies for a large class of neurodegenerative diseases in children known as lysosomal storage disorders. Her current focus is on developing genome editing of hematopoietic stem cells as a therapeutic approach for these diseases beginning with Mucopolysaccharidosis type 1 and Gaucher disease. She established a genetic approach where therapeutic proteins can be targeted to a single well-characterized place in the genome known as a safe harbor. This approach constitutes a flexible, “one size fits all” approach that is independent of specific genes and mutations. This strategy, in which the hematopoietic system is commandeered to express and deliver therapeutic proteins to the brain can potentially change the current approaches to treating childhood neurodegenerative diseases and pave the way for alternative therapies for adult neurodegenerative disorders such as Alzheimer’s and Parkinson’s disease

2) Point of care ammonia testing

She also works in collaboration with other researchers at Stanford to develop point-of-care testing for serum ammonia levels. Such device will greatly improve the quality of life of children and families with metabolic disorders with hyperammonemia.

3) Gene discovery

Dr Gomez-Ospina lead a multi-institutional collaboration resulting in the discovery of a novel genetic cause of neonatal and infantile cholestatic liver disease. She collaborated in the description of two novel neurologic syndromes caused by mutations in DYRK1 and CHD4.

Teaching

STANFORD ADVISEES

Postdoctoral Faculty Sponsor

Marc Francois Philippe Gastou

Postdoctoral Research Mentor

Marc Francois Philippe Gastou

Publications

PUBLICATIONS

- **Monocyte lineage-specific glucocerebrosidase expression in human hematopoietic stem cells: A universal genome editing strategy for Gaucher disease**
  Gomez-Ospina, N., Scharenberg, S. G., Lucot, K. L., Sheikali, A., Porteus, M. H.
  ACADEMIC PRESS INC ELSEVIER SCIENCE.2020: S64–S65

- **Genome Editing for Mucopolysaccharidoses.** *International journal of molecular sciences*
  Poletto, E., Baldo, G., Gomez-Ospina, N.
  2020; 21 (2)

- **Successful liver transplantation in mitochondrial neurogastrointestinal encephalomyopathy (MNGIE).** *Molecular genetics and metabolism*
  Kripps, K., Nakayuenyongsuk, W., Shayota, B. J., Berquist, W., Gomez-Ospina, N., Esquivel, C. O., Concepcion, W., Sampson, J. B., Cristin, D. J., Jackson, W. E., Gilliland, S., Pomfret, E. A., Kueht, et al
  2020

- **DYRK1A-related intellectual disability: a syndrome associated with congenital anomalies of the kidney and urinary tract.** *Genetics in medicine : official journal of the American College of Medical Genetics*
  Blackburn, A. T., Bekheirnia, N., Uma, V. C., Corkins, M. E., Xu, Y., Rosenfeld, J. A., Bainbridge, M. N., Yang, Y., Liu, P., Madan-Khetarpal, S., Delgado, M. R., Hudgins, L., Krantz, et al
  2019

- **CRISPR/Cas9 Genome Engineering in Engraftable Human Brain-Derived Neural Stem Cells.** *iScience*
  Dever, D. P., Scharenberg, S. G., Camarena, J., Kildebeck, E. J., Clark, J. T., Martin, R. M., Bak, R. O., Tang, Y., Dohse, M., Birgmeier, J. A., Jagadeesh, K. A., Bejerano, G., Tsukamoto, et al
  2019; 15: 524–35

- **Genome Edited Human Hematopoietic Stem Cells Correct Lysosomal Storage Disorders: Proof-of-Concept and Safety Studies for Mucopolysaccharidosis Type I and Gaucher Disease**
  Gomez-Ospina, N., Scharenberg, S., Mostrel, N., Raj, N., Attardi, L., Khan, S., Tomatsu, S., Lee, C., Bao, G., Porteus, M. H.
  CELL PRESS.2019: 329

- **Identification of preexisting adaptive immunity to Cas9 proteins in humans.** *Nature medicine*
  Charlesworth, C. T., Deshpande, P. S., Dever, D. P., Camarena, J., Lemgart, V. T., Cromer, M. K., Vakulskas, C. A., Collingwood, M. A., Zhang, L., Bode, N. M., Behlke, M. A., Dejene, B., Cieniewicz, et al
  2019

- **Human genome-edited hematopoietic stem cells phenotypically correct Mucopolysaccharidosis type I.** *Nature communications*
  Gomez-Ospina, N., Scharenberg, S. G., Mostrel, N., Bak, R. O., Mantri, S., Quadros, R. M., Gurumurthy, C. B., Lee, C., Bao, G., Suarez, C. J., Khan, S., Sawamoto, K., Tomatsu, et al
  2019; 10 (1): 4045

- **Building a Professional Identity and an Academic Career Track in Translational Medicine.** *Frontiers in medicine*
  van Dijk, S. J., Domenighetti, A. A., Gomez-Ospina, N., Hunter, P., Lindemans, C. A., Melotte, V., van Rossum, A. M., Rosenblum, N. D.
  2019; 6: 151

- **Gene Editing on Center Stage** *TRENDS IN GENETICS*
  Bak, R. O., Gomez-Ospina, N., Porteus, M. H.
  2018; 34 (8): 600–611

- **A high-fidelity Cas9 mutant delivered as a ribonucleoprotein complex enables efficient gene editing in human hematopoietic stem and progenitor cells.** *Nature medicine*
  Vakulskas, C. A., Dever, D. P., Rettig, G. R., Turk, R., Jacobi, A. M., Collingwood, M. A., Bode, N. M., McNeill, M. S., Yan, S., Camarena, J., Lee, C. M., Park, S. H., Wiebking, et al
  2018; 24 (8): 1216–24

- **Bi-allelic ADPRHL2 Mutations Cause Neurodegeneration with Developmental Delay, Ataxia, and Axonal Neuropathy.** *American journal of human genetics*
  Danhauser, K., Alhaddad, B., Makowski, C., Piekutowska-Abramczuk, D., Syrbe, S., Gomez-Ospina, N., Manning, M. A., Kostera-Pruszczyk, A., Krahn-Peper, C., Berutti, R., Kovács-Nagy, R., Gusic, M., Graf, et al
  2018; 103 (5): 817–25

- **Mutations of AKT3 are associated with a wide spectrum of developmental disorders including extreme megalencephaly.** *Brain : a journal of neurology*
  Alcantara, D., Timms, A. E., Gripp, K., Baker, L., Park, K., Collins, S., Cheng, C., Stewart, F., Mehta, S. G., Saggar, A., Sztriha, L., Zombor, M., Caluseriu, et al
  2017; 140 (10): 2610–22

- **Arylsulfatase A Deficiency**
  Gomez-Ospina, N.
  GeneReviews® [Internet]..
  2017

- **A novel missense variant in the GLI3 zinc finger domain in a family with digital anomalies.** *American journal of medical genetics. Part A*
  Crapster, J. A., Hudgins, L., Chen, J. K., Gomez-Ospina, N.
  2017

- **Molecular and clinical spectra of FBXL4 deficiency.** *Human mutation*
  El-Hattab, A. W., Dai, H., Almannai, M., Wang, J., Faqeih, E. A., Al Asmari, A., Saleh, M. A., Elamin, M. A., Alfadhel, M., Alkuraya, F. S., Hashem, M., Aldosary, M. S., Almass, et al
  2017

- **Expanding the phenotype of hawkinsinuria: new insights from response to N-acetyl-L-cysteine.** *Journal of inherited metabolic disease*
  Gomez-Ospina, N., Scott, A. I., Oh, G. J., Potter, D., Goel, V. V., Destino, L., Baugh, N., Enns, G. M., Niemi, A., Cowan, T. M.
  2016; 39 (6): 821-829

- **De Novo Mutations in CHD4, an ATP-Dependent Chromatin Remodeler Gene, Cause an Intellectual Disability Syndrome with Distinctive Dysmorphisms** *AMERICAN JOURNAL OF HUMAN GENETICS*
  Weiss, K., Terhal, P. A., Cohen, L., Bruccoleri, M., Irving, M., Martinez, A. F., Rosenfeld, J. A., Machol, K., Yang, Y., Liu, P., Walkiewicz, M., Beuten, J., Gomez-Ospina, et al
  2016; 99 (4): 934-941

- **Respiratory System Involvement in Costello Syndrome** *AMERICAN JOURNAL OF MEDICAL GENETICS PART A*
  Gomez-Ospina, N., Kuo, C., Ananth, A. L., Myers, A., Brennan, M., Stevenson, D. A., Bernstein, J. A., Hudgins, L.
  2016; 170 (7): 1849-1857

- **Clinical, cytogenetic, and molecular outcomes in a series of 66 patients with Pierre Robin sequence and literature review: 22q11.2 deletion is less common than other chromosomal anomalies.** *American journal of medical genetics. Part A*
  Gomez-Ospina, N., Bernstein, J. A.
  2016; 170 (4): 870-880

- **Mutations in the nuclear bile acid receptor FXR cause progressive familial intrahepatic cholestasis.** *Nature communications*
  Gomez-Ospina, N., Potter, C. J., Xiao, R., Manickam, K., Kim, M., Kim, K. H., Shneider, B. L., Picarsic, J. L., Jacobson, T. A., Zhang, J., He, W., Liu, P., Knisely, et al
  2016; 7: 10713-?

- **DYRK1A haploinsufficiency causes a new recognizable syndrome with microcephaly, intellectual disability, speech impairment, and distinct facies** *EUROPEAN JOURNAL OF HUMAN GENETICS*
  Ji, J., Lee, H., Argiropoulos, B., Dorrani, N., Mann, J., Martinez-Agosto, J. A., Gomez-Ospina, N., Gallant, N., Bernstein, J. A., Hudgins, L., Slattery, L., Isidor, B., Le Caignec, et al

2015; 23 (11): 1473-1481

- **State-dependent signaling by Cav1.2 regulates hair follicle stem cell function.** *Genes & development*
  Yucel, G., Altindag, B., Gomez-Ospina, N., Rana, A., Panagiotakos, G., Lara, M. F., Dolmetsch, R., Oro, A. E.
  2013; 27 (11): 1217-1222
- **A Promoter in the Coding Region of the Calcium Channel Gene CACNA1C Generates the Transcription Factor CCAT** *PLOS ONE*
  Gomez-Ospina, N., Panagiotakos, G., Portmann, T., Pasca, S. P., Rabah, D., Budzillo, A., Kinet, J. P., Dolmetsch, R. E.
  2013; 8 (4)
- **Translocation Affecting Sonic Hedgehog Genes in Basal-Cell Carcinoma** *NEW ENGLAND JOURNAL OF MEDICINE*
  Gomez-Ospina, N., Chang, A. L., Qu, K., Oro, A. E.
  2012; 366 (23): 2233-2234
- **The C terminus of the L-type voltage-gated calcium channel Ca(v)1.2 encodes a transcription factor** *CELL*
  Gomez-Ospina, N., Tsuruta, F., Barreto-Chang, O., Hu, L., Dolmetsch, R.
  2006; 127 (3): 591-606
- **Mutations in alpha-tubulin promote basal body maturation and flagellar assembly in the absence of delta-tubulin** *JOURNAL OF CELL SCIENCE*
  Fromherz, S., Giddings, T. H., Gomez-Ospina, N., Dutcher, S. K.
  2004; 117 (2): 303-314
- **Tomographic evidence for continuous turnover of Golgi cisternae in Pichia pastoris** *MOLECULAR BIOLOGY OF THE CELL*
  Mogelsvang, S., Gomez-Ospina, N., Soderholm, J., Glick, B. S., Staehelin, L. A.
  2003; 14 (6): 2277-2291
- **Selective trafficking of non-cell-autonomous proteins mediated by NtNCAPP1** *SCIENCE*
  Lee, J. Y., Yoo, B. C., Rojas, M. R., Gomez-Ospina, N., Staehelin, L. A., Lucas, W. J.
  2003; 299 (5605): 392-396
- **The spindle checkpoint of Saccharomyces cerevisiae responds to separable microtubule-dependent events** *CURRENT BIOLOGY*
  Daum, J. R., Gomez-Ospina, N., Winey, M., Burke, D. J.
  2000; 10 (21): 1375-1378
- **Yeast nuclear pore complex assembly defects determined by nuclear envelope reconstruction** *JOURNAL OF STRUCTURAL BIOLOGY*
  Gomez-Ospina, N., Morgan, G., Giddings, T. H., Kosova, B., Hurt, E., Winey, M.
  2000; 132 (1): 1-5