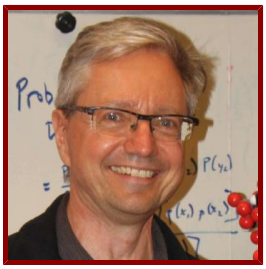
Stanford



Gregory Enns

Professor of Pediatrics (Genetics)

Pediatrics - Medical Genetics

CLINICAL OFFICE (PRIMARY)

- **Pediatric Genetics**

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Bio

CLINICAL FOCUS

- Biochemical Genetics
- Mitochondrial Diseases
- Medical Biochemical Genetics

ACADEMIC APPOINTMENTS

- Professor - University Medical Line, Pediatrics - Medical Genetics
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)

PROFESSIONAL EDUCATION

- Board Certification: Clinical Genetics and Genomics, American Board of Medical Genetics and Genomics (1999)
- Residency: Children's Hospital Los Angeles Pediatric Residency (1995) CA
- Board Certification: Clinical Biochemical Genetics, American Board of Medical Genetics and Genomics (1999)
- Medical Education: University of St Andrews (1990) Scotland
- Fellowship: UCSF Medical Center (1998) CA
- MB, ChB, University of Glasgow , Medicine (1990)
- Diploma, Medical Science, University of St. Andrews , Medicine (1987)
- BA, Pomona College , Biology (1984)

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Research interests include novel means of diagnosing and treating mitochondrial disorders, with an emphasis on antioxidant therapy, lysosomal disorders, and newborn screening by tandem mass spectrometry. Current pursuits include the analysis of glutathione and antioxidant status in patients who have mitochondrial disorders and the development of new techniques for diagnosing these conditions.

CLINICAL TRIALS

- A Phase 1/2 Study of AEB1102 in Patients With Arginase I Deficiency, Recruiting
- Acid Lipase Replacement Investigating Safety and Efficacy (ARISE) in Participants With Lysosomal Acid Lipase Deficiency, Recruiting
- International Collaborative Gaucher Group (ICGG) Gaucher Disease Registry & Pregnancy Sub-registry, Recruiting
- Mucopolysaccharidosis I (MPS I) Registry, Recruiting
- North American Mitochondrial Disease Consortium Patient Registry and Biorepository (NAMDC), Recruiting
- Safety and Efficacy Study of EPI-743 in Children With Leigh Syndrome, Recruiting
- EPI-743 for Mitochondrial Respiratory Chain Diseases, Not Recruiting
- Responses to Influenza Vaccine in Patients With Mitochondrial Disorders (MELAS), Not Recruiting
- Short-Term Outcome of N-Carbamylglutamate in the Treatment of Acute Hyperammonemia, Not Recruiting

Teaching

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Genetics (Phd Program)

Publications

PUBLICATIONS

- **Efficacy and safety of pegzilarginase in arginase 1 deficiency (PEACE): a phase 3, randomized, double-blind, placebo-controlled, multi-centre trial.** *EClinicalMedicine*
  Russo, R. S., Gasperini, S., Bubb, G., Neuman, L., Sloan, L. S., Diaz, G. A., Enns, G. M.
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- **Efficacy and Safety of Elamipretide in Individuals With Primary Mitochondrial Myopathy: The MMPOWER-3 Randomized Clinical Trial.** *Neurology*
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- **The Present and Future of Mitochondrial-Based Therapeutics for Eye Disease.** *Translational vision science & technology*
  Ji, M. H., Kreymerman, A., Belle, K., Ghiam, B. K., Muscat, S. P., Mahajan, V. B., Enns, G. M., Mercola, M., Wood, E. H.
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- **Mitochondrial diseases in North America: An analysis of the NAMDC Registry.** *Neurology. Genetics*
  Barca, E., Long, Y., Cooley, V., Schoenaker, R., Emmanuele, V., DiMauro, S., Cohen, B. H., Karaa, A., Vladutiu, G. D., Haas, R., Van Hove, J. L., Scaglia, F., Parikh, et al
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- **AMP-independent activator of AMPK for treatment of mitochondrial disorders.** *PloS one*
  Moore, T., Yanes, R. E., Calton, M. A., Vollrath, D., Enns, G. M., Cowan, T. M.
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- **Successful liver transplantation in mitochondrial neurogastrointestinal encephalomyopathy (MNGIE).** *Molecular genetics and metabolism*
  Kripps, K. n., Nakayuenyongsuk, W. n., Shayota, B. J., Berquist, W. n., Gomez-Ospina, N. n., Esquivel, C. O., Concepcion, W. n., Sampson, J. B., Cristin, D. J., Jackson, W. E., Gilliland, S. n., Pomfret, E. A., Kueht, et al
  2020

- **Targeting ferroptosis: A novel therapeutic strategy for the treatment of mitochondrial disease-related epilepsy** *PLOS ONE*
  Kahn-Kirby, A. H., Amagata, A., Maeder, C. I., Mei, J. J., Sideris, S., Kosaka, Y., Hinman, A., Malone, S. A., Bruegger, J. J., Wang, L., Kim, V., Shrader, W. D., Hoff, et al
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- **Biallelic Mutations in ATP5F1D, which Encodes a Subunit of ATP Synthase, Cause a Metabolic Disorder** *AMERICAN JOURNAL OF HUMAN GENETICS*

Olahova, M., Yoon, W., Thompson, K., Jangam, S., Fernandez, L., Davidson, J. M., Kyle, J. E., Grove, M. E., Fisk, D. G., Kohler, J. N., Holmes, M., Dries, A. M., Huang, et al

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- **Patient care standards for primary mitochondrial disease: a consensus statement from the Mitochondrial Medicine Society** *GENETICS IN MEDICINE*

  Parikh, S., Goldstein, A., Karaa, A., Koenig, M., Anselm, I., Brunel-Guitton, C., Christodoulou, J., Cohen, B. H., Dimmock, D., Enns, G. M., Falk, M. J., Feigenbaum, A., Frye, et al

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- **Glutathione as a Redox Biomarker in Mitochondrial Disease-Implications for Therapy.** *Journal of clinical medicine*

  Enns, G. M., Cowan, T. M.

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- **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

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- **A Phase 3 Trial of Sebelipase Alfa in Lysosomal Acid Lipase Deficiency** *NEW ENGLAND JOURNAL OF MEDICINE*

  Burton, B. K., Balwani, M., Feillet, F., Baric, I., Burrow, T. A., Camarena Grande, C., Coker, M., Consuelo-Sanchez, A., Deegan, P., Di Rocco, M., Enns, G. M., Erbe, R., Ezgu, et al

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- **Diagnosis and management of mitochondrial disease: a consensus statement from the Mitochondrial Medicine Society.** *Genetics in medicine*

  Parikh, S., Goldstein, A., Koenig, M. K., Scaglia, F., Enns, G. M., Saneto, R., Anselm, I., Cohen, B. H., Falk, M. J., Greene, C., Gropman, A. L., Haas, R., Hirano, et al

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- **Treatment of methylmalonic acidemia by liver or combined liver-kidney transplantation.** *journal of pediatrics*

  Niemi, A., Kim, I. K., Krueger, C. E., Cowan, T. M., Baugh, N., Farrell, R., Bonham, C. A., Concepcion, W., Esquivel, C. O., Enns, G. M.

  2015; 166 (6): 1455-61 e1

- **Mutations in NGLY1 cause an inherited disorder of the endoplasmic reticulum-associated degradation pathway** *GENETICS IN MEDICINE*

  Enns, G. M., Shashi, V., Bainbridge, M., Gambello, M. J., Zahir, F. R., Bast, T., Crimian, R., Schoch, K., Platt, J., Cox, R., Bernstein, J. A., Scavina, M., Walter, et al

  2014; 16 (10): 751-758

- **Mutations in NGLY1 cause an inherited disorder of the endoplasmic reticulum-associated degradation pathway.** *Genetics in medicine*

  Enns, G. M., Shashi, V., Bainbridge, M., Gambello, M. J., Zahir, F. R., Bast, T., Crimian, R., Schoch, K., Platt, J., Cox, R., Bernstein, J. A., Scavina, M., Walter, et al

  2014; 16 (10): 751-758

- **Degree of Glutathione Deficiency and Redox Imbalance Depend on Subtype of Mitochondrial Disease and Clinical Status** *PLOS ONE*

  Enns, G. M., Moore, T., Le, A., Atkuri, K., Shah, M. K., Cusmano-Ozog, K., Niemi, A., Cowan, T. M.

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- **CORRELATION OF GLUTATHIONE REDOX POTENTIAL WITH MITOCHONDRIAL DISEASE ETIOLOGY AND CLINICAL SEVERITY**

  Enns, G. M., Moore, T., Le, A., Atkuri, K., Shah, M. K., Cusmano-Ozog, K., Nierni, A., Cowan, T. M.

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- **Degree of glutathione deficiency and redox imbalance depend on subtype of mitochondrial disease and clinical status.** *PloS one*

  Enns, G. M., Moore, T., Le, A., Atkuri, K., Shah, M. K., Cusmano-Ozog, K., Niemi, A., Cowan, T. M.

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- **A new LC-MS/MS method for the clinical determination of reduced and oxidized glutathione from whole blood.** *Journal of chromatography. B, Analytical technologies in the biomedical and life sciences*

  Moore, T., Le, A., Niemi, A., Kwan, T., Cusmano-Ozog, K., Enns, G. M., Cowan, T. M.

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  Cox, R., Platt, J., Chen, L. C., Tang, S., Wong, L., Enns, G. M.
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  Shieh, J. T., Berquist, W. E., Zhang, Q., Chou, P., Wong, L. C., Enns, G. M.
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- **Mapping Gene Associations in Human Mitochondria using Clinical Disease Phenotypes** *PLOS COMPUTATIONAL BIOLOGY*
  Scharfe, C., Lu, H. H., Neuenburg, J. K., Allen, E. A., Li, G., Klopstock, T., Cowan, T. M., Enns, G. M., Davis, R. W.
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- **Survival after treatment with phenylacetate and benzoate for urea-cycle disorders** *NEW ENGLAND JOURNAL OF MEDICINE*
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- **Molecular-clinical correlations in a family with variable tissue mitochondrial DNA T8993G mutant load** *MOLECULAR GENETICS AND METABOLISM*
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- **Mitochondrial respiratory chain complex I deficiency with clinical and biochemical features of long-chain 3-hydroxyacyl-coenzyme A dehydrogenase deficiency** *JOURNAL OF PEDIATRICS*
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  Peña, L. D., Burrage, L. C., Enns, G. M., Esplin, E. D., Harding, C., Mendell, J. R., Niu, Z. N., Scharfe, C., Yu, T., Koeberl, D. D.
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- **A Phase 1 Study of Oral Vitamin D3 in Boys and Young Men With X-Linked Adrenoleukodystrophy.** *Neurology. Genetics*
  Van Haren, K. P., Cunanan, K., Awani, A., Gu, M., Peña, D., Chromik, L. C., Považan, M., Rossi, N. C., Goodman, J., Sundaram, V., Winterbottom, J., Raymond, G. V., Cowan, et al
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  Tise, C. G., Verscaj, C. P., Mendelsohn, B. A., Woods, J., Lee, C. U., Enns, G. M., Stander, Z., Hall, P. L., Cowan, T. M., Cusmano-Ozog, K. P.
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- **Outcomes after liver transplantation in MPV17 deficiency: A rebuttal.** *Pediatric transplantation*
  Huang, A. C., Ebel, N. H., Romero, D., Enns, G. M., Esquivel, C. O., Bonham, C.
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- **BIOCHEMICAL, MOLECULAR, AND CLINICAL CHARACTERISTICS OF PEROXISOMAL DISORDERS DETECTED BY CALIFORNIA NEWBORN SCREENING (NBS) PROGRAM**
  Beltran, C., Abdenur, J., Chang, R., Barrick, R., Spongberg, R., Tise, C. G., Niehaus, A. D., Enns, G.
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- **Validation of a targeted metabolomics panel for improved second-tier newborn screening.** *Journal of inherited metabolic disease*
  Mak, J., Peng, G., Le, A., Gandotra, N., Enns, G. M., Scharfe, C., Cowan, T. M.
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- **Fractionated plasma N-glycan profiling of novel cohort of ATP6AP1-CDG subjects identifies phenotypic association.** *Journal of inherited metabolic disease*
  Alharbi, H., Daniel, E. J., Thies, J., Chang, I., Goldner, D. L., Ng, B. G., Witters, P., Aqul, A., Velez-Bartolomei, F., Enns, G. M., Hsu, E., Kichula, E., Lee, et al
  2023

- **Outcomes after liver transplantation in MPV17 deficiency (Navajo neurohepatopathy): A single-center case series.** *Pediatric transplantation*
  Huang, A. C., Ebel, N. H., Romero, D., Martin, B., Jhun, I., Brown, M., Enns, G. M., Esquivel, C., Bonham, C.
  2022: e14274

- **Response to triheptanoin therapy in critically ill patients with LC-FAOD: Report of patients treated through an expanded access program.** *Molecular genetics and metabolism*
  Vockley, J., Enns, G. M., Ramirez, A. N., Bedrosian, C. L., Reineking, B., Lu, X., Ray, K., Rahman, S., Marsden, D.
  2022

- **SUCCESSFUL CARDIAC TRANSPLANTATION AND LONG-TERM FOLLOW-UP IN DNAJC19-ASSOCIATED DILATED CARDIOMYOPATHY WITH ATAXIA**
  Tahata, S., Tise, C., Floyd, B., Cusmano-Ozog, K., Ruzhnikov, M., Enns, G.
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- **PEGZILARGINASE IN ARGINASE 1 DEFICIENCY: RESULTS OF THE PEACE PIVOTAL PHASE 3 CLINICAL TRIAL**
  Enns, G. M., Russo, R., Bradford, E., Bubb, G., Sloan, L. S., Gasperini, S., Diaz, G. A.
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- **NEUROIMAGING FINDINGS IN INBORN ERRORS OF METABOLISM: ATYPICAL FINDINGS FROM FIVE CASES AFFECTED BY SMALL MOLECULE DISORDERS**
  Morales, J., Dahmoush, H., Enns, G.
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- **Biochem for the Win! The added value of biochemical genetic testing for diagnosis and variant interpretation in the genomic era**
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- **Variable clinical severity in TANGO2 deficiency: Case series and literature review.** *American journal of medical genetics. Part A*
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2021

- **Diagnostic challenges and disease management in patients with a mild Zellweger spectrum disorder phenotype.** *Molecular genetics and metabolism*
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- **Profound neonatal lactic acidosis and renal tubulopathy in a patient with glycogen storage disease type IX#2 secondary to a de novo pathogenic variant in PHKA2.** *Molecular genetics and metabolism reports*
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- **Compound heterozygous KCTD7 variants in progressive myoclonus epilepsy.** *Journal of neurogenetics*
  Burke, E. A., Sturgeon, M., Zastrow, D. B., Fernandez, L., Prybol, C., Marwaha, S., Frothingham, E. P., Ward, P. A., Eng, C. M., Fresard, L., Montgomery, S. B., Enns, G. M., Fisher, et al
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- **A resource of lipidomics and metabolomics data from individuals with undiagnosed diseases** *SCIENTIFIC DATA*
  Kyle, J. E., Stratton, K. G., Zink, E. M., Kim, Y., Bloodsworth, K. J., Monroe, M. E., Bacino, C. A., Bacino, C. A., Hanchard, N. A., Lewis, R. A., Rosenfeld, J. A., Scott, D. A., Tran, et al
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- **Unexpected diagnoses in patients with abnormal newborn screening**
  Tise, C., Velez-Bartolomei, F., Morales, J., Lee, C., Bernstein, J., Enns, G.
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- **Clinical outcomes of major clinical events and emergency triheptanoin use in critically ill patients with long-chain fatty acid oxidation disorders**
  Enns, G., Marsden, D., Ramirez, A., Bedrosian, C., Reineking, B., Lu, X., Rahman, S., Vockley, J.
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- **Tailoring the ACMG/AMP sequence variant interpretation guidelines to the unique aspects of germline ACADVL variants**
  Flowers, M., Weaver, M., Baudet, H., Pasquali, M., Enns, G., Feigenbaum, A., Lyon, E., Miller, M., Graham, B., Spector, E., Racacho, L., McLachlan, M., Sadre-Bazzaz, et al
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- **Retrospective study of the disease course in pediatric patients with severe MMA caused by MMUT mutations: design and baseline characteristics**
  Enns, G., Baker, P., Li, H., Morgan, T., Vockley, J.
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- **Refining ClinGen loss of function variant recommendations for the phenylalanine hydroxylase (PAH) gene: the PAH variant curation expert panel's experience**
  Groopman, E., Weaver, M., Zastrow, D., Enns, G., Feigenbaum, A., Lichter-Konecki, U., Lyon, E., Pasquali, M., Caldovic, L., Ross, J., Craigen, W.
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- **Aicardi-Goutières syndrome may present with positive newborn screen for X-linked adrenoleukodystrophy.** *American journal of medical genetics. Part A*
  Tise, C. G., Morales, J. A., Lee, A. S., Velez-Bartolomei, F. n., Floyd, B. J., Levy, R. J., Cusmano-Ozog, K. P., Feigenbaum, A. S., Ruzhnikov, M. R., Lee, C. U., Enns, G. M.
  2021

- **PERIOPERATIVE MANAGEMENT AND POST-LIVER TRANSPLANTATION OUTCOMES IN UREA CYCLE DISORDERS, MAPLE SYRUP URINE DISEASE AND ORGANIC ACIDEMIAS: 20 YEARS' EXPERIENCE**
  Ebel, N., Vuong, P., Baker, C., Brubaker, A., Than, P., Enns, G., Esquivel, C. O.
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- **PERIOPERATIVE MANAGEMENT AND POST-LIVER TRANSPLANTATION OUTCOMES IN METHYLMALONIC ACIDEMIA, PROPIONIC ACIDEMIA AND UREA CYCLE DISORDERS: OUR 20 YEAR EXPERIENCE**
  Vuong, P., Ebel, N., Baker, C. V., Brubaker, A., Than, P., Enns, G., Esquivel, C. O.

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- **Reducing False-Positive Results in Newborn Screening Using Machine Learning.** *International journal of neonatal screening*
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  Diaz, G. A., Schulze, A. n., McNutt, M. C., Leão-Teles, E. n., Merritt, J. L., Enns, G. M., Batzios, S. n., Bannick, A. n., Zori, R. T., Sloan, L. S., Potts, S. L., Bubb, G. n., Quinn, et al
  2020

- **Hypoglycemia in CDG patients due to PMM2 mutations: Follow up on hyperinsulinemic patients.** *JIMD reports*
  Moravej, H., Altassan, R., Jaeken, J., Enns, G. M., Ellaway, C., Balasubramaniam, S., De Lonlay, P., Coman, D., Mercimek-Andrews, S., Witters, P., Morava, E.
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  Rius, R., Van Bergen, N. J., Compton, A. G., Riley, L. G., Kava, M. P., Balasubramaniam, S., Amor, D. J., Fanjul-Fernandez, M., Cowley, M. J., Fahey, M. C., Koenig, M. K., Enns, G. M., Sadedin, et al
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- **De novo and inherited variants in ZNF292 underlie a neurodevelopmental disorder with features of autism spectrum disorder.** *Genetics in medicine : official journal of the American College of Medical Genetics*
  Mirzaa, G. M., Chong, J. X., Piton, A., Popp, B., Foss, K., Guo, H., Harripaul, R., Xia, K., Scheck, J., Aldinger, K. A., Sajan, S. A., Tang, S., Bonneau, et al
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- **Case series of sebelipase alfa hypersensitivity reactions and successful sebelipase alfa rapid desensitization.** *JIMD reports*
  Huffaker, M. F., Liu, A. Y., Enns, G. M., Vijay, S., Amor, A. J., Adkinson, N. F.
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