

BIOGRAPHICAL SKETCH

NAME Gagneux, Pascal	POSITION TITLE Associate Professor of Cellular and Molecular Medicine, UC San Diego		
EDUCATION/TRAINING <i>(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)</i>			
INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	YEAR(s)	FIELD OF STUDY
University of Basel, Basel Switzerland	Master's	1993	Biology
University of Basel, Basel Switzerland	PhD	1998	Zoology
University of California San Diego, San Diego, California, USA	Postdoc	1998-2003	Glycobiology

A. Personal Statement

My laboratory is testing the effects of glycan mismatches and circulating anti-glycan antibodies on two different types of gene flow: viral infection and reproduction. I am investigating the evolutionary mechanisms shaping and maintaining glycan diversity. I combine a background in population biology, zoology and evolution with research on sialic acid biology of humans, our close relatives the "great apes" and more distant relatives the new world primates. Nothing is known of the evolutionary mechanisms that led to the strikingly unique sialic acid biology of the human species, namely the fixation of a loss-of function mutation of the *CMAH* gene coding for a sialic acid modifying enzyme. My background in whole organism biology reminds me that a range of simultaneous events ultimately determine differential survival and reproductive success of individuals and thus lead to the population-level changes we call evolution. For this reason, my laboratory focuses on the interplay between *natural selection* exerted by glycan-exploiting pathogens and *sexual selection* through glycan-mediated reproductive compatibility. An explanation for the ubiquitous diversity in animal glycans is likely to involve the level of populations, which harbor glycan polymorphisms within, and different glycan repertoires between species. Polymorphisms, off course are the first step to possibly evolving fixed, separate glycan repertoires, which can then be exploited by immunity to target non-self glycans. This project promises insights into the mechanisms of poorly understood glycan evolution, reproductive compatibility and determinants of cross-species viral infections and how these relate to uniquely human aspects of sialic acid biology.

B. Positions and Honors

Positions and Employment

2003-2006	Scientist, Division of Ecology and Evolution, Center for Reproduction of Endangered Species (CRES), Zoological Society of San Diego.
2006-2007	Assistant Project Scientist, Cellular and Molecular Medicine, University of California San Diego
2008 – present	Associate Director of The Center for Academic Research and Training in Anthropogeny (CARTA)

2007 – 2011	Assistant Professor, Cellular and Molecular Medicine, University of California San Diego
2011 – present	Associate Professor, Cellular and Molecular Medicine, University of California San Diego

Other Experience and Professional Memberships

1998–	Member of Sigma Xi, San Diego Chapter
2000–	American Association for the Advancement of Science
2003–	Union of Concerned Scientists

Honors

2009	Kavli Fellow, Kavli Frontiers of Science program, German-American frontiers
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C. Selected Peer-reviewed Publications

1. Anderson, M., Chapman, S., Videan, E., Fritz, J., Stoinski, T., Dixon, A.F., and Gagneux, P. 2007. Sperm Bioenergetics in Humans and Chimpanzees – Functional Evidence for Sperm Competition. *Am. J. Phys. Anthropol.* 134(2):274-80.
2. Nascimento, J.M, Shi, L.Z., Meyers, S., Gagneux, P., Loskutoff, N.M., Botvinick, E. L., Berns, M.W. 2008. The use of optical tweezers to study sperm competition and motility in primates. *J.R. Soc. Interface.* 5(20):297-302.
3. Bishop., J., Gagneux, P. 2007 Evolution of carbohydrate antigens - microbial forces shaping host glycomes? *Glycobiology* 17(5):23-34.
4. Lewis, A.L., Desaa, N., Hansen, E.E., Knirel, Y., Gordon, J.I., Gagneux, P., Nizet, V., and Varki, A. 2009. Innovations in Host and Microbial Sialic Acid Biosynthesis Revealed by Phylogenomic Prediction of Nonulosonic Acid Structure. *Proc. Natl. Acad. Sci. USA.* 106 (32):13552-13557.
5. Adibekian, A, Stallforth, P., Hecht, M., Werz, D.B., Gagneux, P., and Seeberger, P.H. 2011. Comparative bioinformatics analysis of the mammalian and bacterial glycomes. *Chemical Science.* 2:337-344.
6. Gagneux, P. and Varki, A. 1999. Evolutionary considerations in relating oligosaccharide diversity to biological function. *Glycobiology* 9:747-755.
7. Hayakawa, T., Satta, Y., Gagneux, P., Varki, A., Takahata, N. 2001. Alu-mediated inactivation of the human CMP- N-acetylneuraminic acid hydroxylase gene. *Proc. Natl. Acad. Sci. USA* 98:11399-11404.
8. Tangvoranuntakul, P., Gagneux, P., Diaz, S., Varki, N., Varki, A., and Muchmore, E. 2003. Human Uptake and Incorporation of an Immunogenic Non-human Dietary Sialic Acid. *Proc. Natl. Acad. Sci. USA* 100:12045-50.
9. Martin, M.J., Rayner, J.C., Gagneux, P., Barnwell, J., Varki. 2005. Evolution of human-chimpanzee differences in malaria susceptibility: Relationship to human genetic loss of N-glycolylneuraminic acid. *Proc. Natl. Acad. Sci. USA* 6;102(36):12819-24.
10. Nguyen, D.H., Hurtado-Ziola, N., Gagneux, P., Varki. 2006. Loss of Siglec expression on T-lymphocytes during human evolution. *Proc. Natl. Acad. Sci. USA* 103(20):7765-7770.

11. Varki, A., Freeze, H., Gagneux, P. 2008. Evolution of Glycan Diversity. in: Essentials of Glycobiology. Second Edition, Cold Spring Harbor Press. Cold Spring Harbor.
12. Di Fiore, A., Disotell, T., Gagneux, P., Ayala, F. 2009. Primate Malaria. In: Primate Parasite Ecology: Dynamics and Study of Host-Parasite Relationships. M.A. Huffman and C.A. Chapman, eds. Cambridge University Press. pps 141-182.
13. Dall'Olio, GM., Jassal, B., Montanucci, L., Gagneux, P., Bertranpetit, J., and Laayouni, H. 2011. The annotation of the N-linked Glycosylation pathway in the Reactome pathways database. Glycobiology. 21(11):1395-400.
14. Tao, N., Wu, S., Kim, J., Hinde, K., Powers, M., Gagneux, P., German, JB. and Lebrilla, CB. 2011. Evolutionary Glycomics: Characterization of the Milk Oligosaccharides in Primates. J. Proteome Research 10: 1548-1557.
15. Ghaderi, D., Springer, S., Ma, F., Cohen, M., Secret, P., Taylor, R., Varki, A., and Gagneux, P. 2011. Sexual selection by female immunity against paternal antigens can fix loss of function alleles. Proc. Natl. Acad. Sci. USA. 108(43):17743-8.