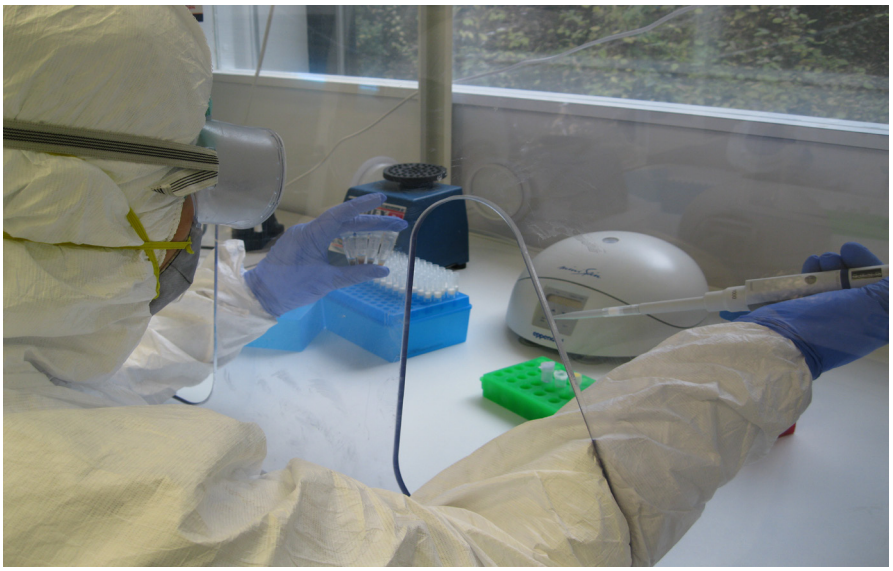
University of Zurich[UZH]

Institut für Evolutionäre Medizin
Institute of Evolutionary Medicine
Newsletter No. 7 - December 2014

IEMNews



Giada Ferrari extracting DNA from mummified tissue.

Spotlight on the ongoing IEM research:

Molecular Evolution of ancient and historic human pathogens (Giada Ferrari, PhD student)

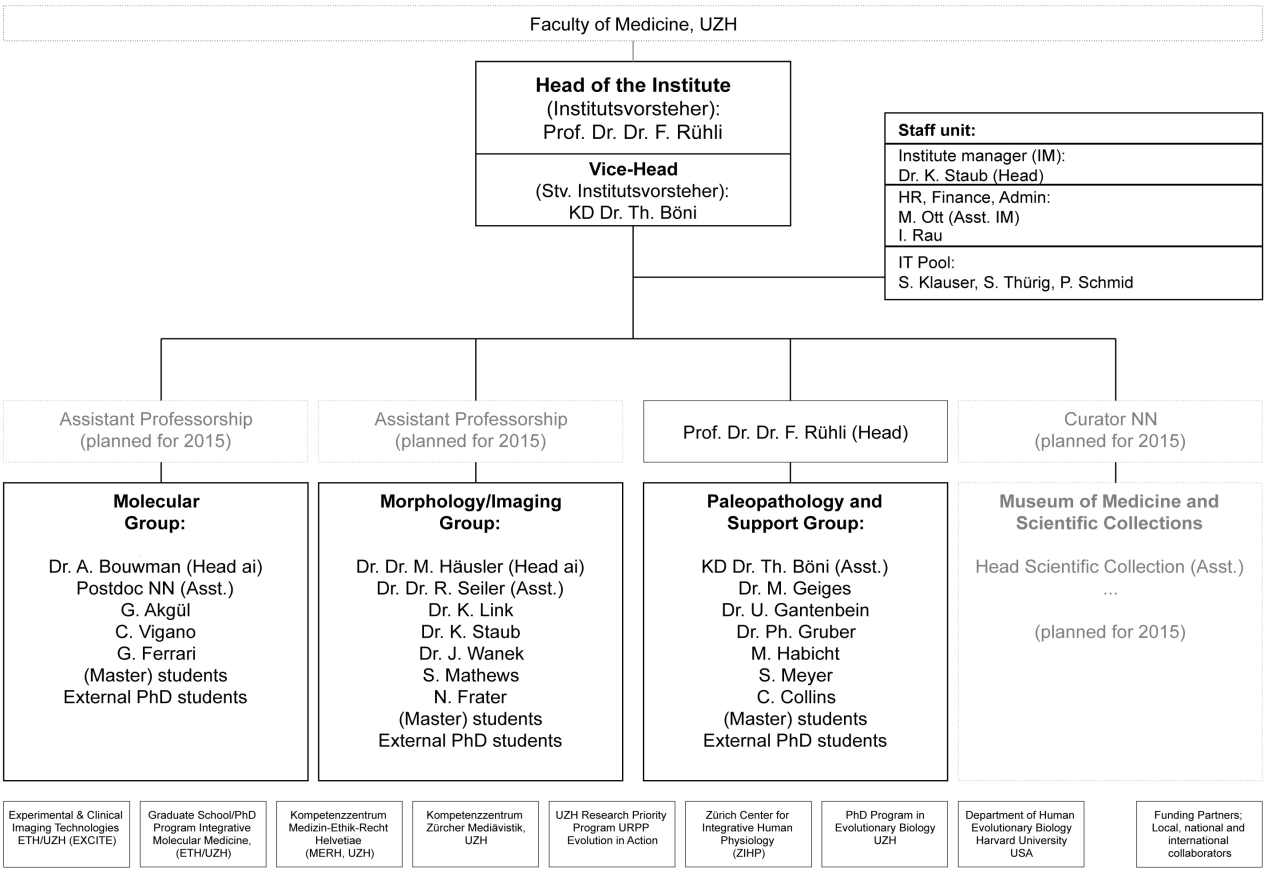
The focus of palaeomicrobiology is the study of past human infections, more specifically the detection, identification and characterisation of microorganisms in ancient remains. This allows the reconstruction of the epidemiology of past infectious diseases and plays a fundamental role in the study of the evolutionary genetics of the infectious agents as well as host-pathogen co-evolution. Understanding the epidemiology and host-pathogen interactions of past infections, and how virulence has evolved is of particular relevance in the context of the emergence and re-emergence of infectious diseases.

This new discipline is taking great advantage of the improvement in high-throughput sequencing methodologies, which allow researchers to overcome the technical problems of the classical methodologies, and have a much greater sensitivity and resolution power. While initial studies have focused on skeletal remains, other sources are more and more coming into the spotlight, for example, dental calculus and soft tissues such as fixed tissue samples from museums and pathological collections, and mummified remains.

Thanks to the use of high-throughput sequencing technologies on human non-skeletal samples, whole genomes of historic pathogen strains have been sequenced, such as the Spanish flu virus genome from autopsy material of US servicemen killed during the 1918 pandemic and the *Tannerella forsythia* genome from ancient dental calculus.

My research at the IEM focuses on the molecular evolution of ancient and historic human pathogens from soft tissue samples, as well as host-pathogen co-evolution and assessment of past human health. To this end I am using two different high-throughput sequencing approaches. Firstly, a metagenomic sequencing on different types of preserved soft tissues up to 2000 years old and originating from different localities in Europe and America. Secondly, a sequence capture approach for selected human pathogens such as papilloma viruses and mycobacteria.

IEM Organigram



Vision and Mission Statement

We are a leading international and globally connected research, teaching and service institute which is part of the medical faculty at the University of Zurich. We analyse ancient biological material and associated data to better understand modern human health issues and diseases. Due to specialist scientific expertise, excellent infrastructure and state-of-the-art methodologies, we are able to work on various interdisciplinary research questions in the context of the field of Evolutionary Medicine. Our core competencies include:

• In the area of morphology: Clinical Anatomy; Variability and adaptation of body morphology as a function of time (Microevolution), sex, robustness, socio-economic factors etc .; Macroevolution of joint pathologies.

• In the area of imaging: application of modern imaging techniques on historical tissues; Radiological diagnosis of pathologies.

• In the area of ancient DNA: Co-evolution of diseases and the human genome (evolution of human pathogens, microbiome analyses etc.); Service for Archaeology/Historical Anthropology (paternity testing, sex determination).

• Maintain a novel medical museum for the public and a medical history object collection for the scientific community (from 2016).

• Ethical considerations for the research on historical human tissues.

We will increase the recognition of the research field of Evolutionary Medicine and expand academic teaching of the subject within and outside the Faculty of Medicine. This will be of a sustainable value for our stakeholders at the University of Zurich, in the research community of evolutionary medicine and adjacent areas, to the economy and ultimately for society in general.

Words from an international collaborator

Barry Bogin
Professor of Biological Anthropology
Centre for Global Health & Human Development
School of Sport, Exercise & Health Sciences
Loughborough University, UK

My association with the Institute of Evolutionary Medicine (IEM) has been productive and pleasurable. I was honoured to be invited to join the "Centre for Evolutionary Medicine (ZEM)" as an International Collaborator and happy to see the ZEM grow into the IEM. My connection with the IEM started in the mid-1990's when I met Frank Rűhli for the first time and discussed some common research interests. Over the years we crossed paths at professional meetings and I was not surprised by team's growing accomplishments in science and now with the IEM. In addition, Frank knows how to organize very effective teams of scientists.

I visited the IEM in November 2011 to present a lecture, "!Kung nutritional status and the original "affluent society" – a new analysis." My lecture was based on an article by the same title published in Anthropologischer Anzeiger: Journal of Biological and Clinical Anthropology (68/4, pp. 349–366, 2011). It was good to meet many members and associates of the IEM, including my long-time colleague Prof Carel van Schaik.

Through the IEM I met Dr Kaspar Staub, Senior Research Assistant at the IEM. Kaspar and I have enjoyed many lively discussions about human growth in relation to historical, economic and political contexts. Our discussion lead to the article, "Edouard Mallet's early and almost forgotten study of the average height of Genevan conscripts in 1835" (Kaspar Staub, Frank J. Rűhli, Barry Bogin, Ulrich Woitek, Christian Pfister, Economics and Human Biology 9 438–442, 2011).

Currently, I am very much looking forward to my next visit to the IEM for the "Evolutionary Medicine Conference: Interdisciplinary Perspectives on Human Health and Disease", taking place July 30 – August 1, 2015. I hope to see many of the readers of this newsletter at this conference.

Sincerely, Barry Bogin

A message from the director of the institute

Dear Reader

We are very happy and thankful that in September 2014 the former "Centre for Evolutionary Medicine (ZEM)" was upgraded to become the new "Institute of Evolutionary Medicine (IEM)". The IEM is a leading international and globally connected research, teaching and service institute which is part of the Medical faculty at the University of Zurich and thus unique. For example, medical students can choose evolutionary medicine as an elective as part of their curriculum. Researchers at the IEM analyse ancient biological material, such as mummies, and associated data to better understand modern human diseases and other health issues. Evolutionary aspects of human pathogens, morphology and genetics are investigated. This newsletter shall present to you some of our on-going activities and research ideas. For further information please also check our website or follow us on twitter and facebook.

Starting in 2015 the IEM will also incorporate the upcoming "Museum of Medicine" of the University of Zurich and shall curate a large collection of historic medical objects. Finally, at the end of July 2015 the IEM will organise the international 'Evolutionary Medicine Conference: Interdisciplinary Perspectives on Human Health and Disease' at the University of Zurich. The IEM with its own code of ethics also favours a continuous reflection to the ethical dilemmas that arise from dealing with historical remains. The whole IEM team would like to thank all the supporters, collaborators, members of the advisory board and of the honorary committee of the former ZEM - and most especially the Mäxi foundation - without their support we would not have made our high-reaching goals during the last four ZEM years a reality! Please feel free to contact us anytime for any suggestions, feedbacks etc.

Sincerely, Frank Rühli

IEM-Publications (Selected publications since last ZEM News 6/2014)

Böni T, Ulrich-Bochsler S (2014). Unspezifische Osteomyelitis an einem frühmittelalterlichen Kinderskelett aus Ins / BE. Bulletin der Schweizerischen Gesellschaft für Anthropologie, 20(1):5-20.

Campana MG, Robles GN, Rühli FJ, Tuross N (2014). False positives complicate ancient pathogen identifications using high-throughput shotgun sequencing. BMC Research Notes, 7(111):1-15.

Dageförde KL, Vennemann M, Rühli FJ (2014). Evidence based palaeopathology: Meta-analysis of Pubmed®-listed scientific studies on pre-Columbian, South American mummies. HOMO Journal of Comparative Human Biology, 65(3):214-231.

Grantham JP, Staub K, Rühli FJ, Henneberg M (2014). Modern diet and metabolic variance – a recipe for disaster? Nutrition Journal, 13(1):15.

Habicht M (2014). Anubis. In: Cardin, M. Mummies around the World: An Encyclopedia of Mummies in History, Religion and Popular Culture. Santa Barbara, CA, USA, Epub ahead of print. ISBN 978-1-61069-419-3.

Hermanussen M, Aßmann C, Groth D, Staub K (2014). Final height, target height and the community. Georgian Medical News, (230):30-34.

Hermanussen M, Aßmann C, Staub K, Groth D (2014). Physical connectedness and body height. Anthropologia, (2):4-9.

Hermanussen M, Meitinger T, Veldhuis JD, Low MJ, Pfäffle R, Staub K et al. (2014). Adolescent growth: genes, hormones and the peer group. Proceedings of the 20th Aschauer Soiree, held at Glücksburg castle, Germany, 15th to 17th November 2013. Pediatric Endocrinology Reviews, 11(3):341-353.

Holloway KL, Staub K, Rühli FJ, Henneberg M (2014). Lessons from history of socioeconomic improvements: a new approach to treating multi-drug-resistant tuberculosis. Journal of Biosocial Science, 46(05):600-620.

Krüttli A, Bouwman A, Akgül G, Della CP, Rühli FJ, Warinner C (2014). Ancient DNA Analysis Reveals High Frequency of European Lactase Persistence Allele (T-13910) in Medieval Central Europe. PLoS ONE, 9(1):e86251.

Panczak R, Zwahlen M, Woitek U, Rühli FJ, Staub K (2014). Socioeconomic, Temporal and Regional Variation in Body Mass Index among 188,537 Swiss Male Conscripts Born between 1986 and 1992. PLoS ONE, 9(5):e96721.

Rühli FJ, Ikram S (2014). Purported medical diagnoses of Pharaoh Tutankhamun, c. 1325 BC-. HOMO Journal of Comparative Human Biology, 65(1):51-63.

Scheffler C, Gniosdorz B, Staub K, Rühli FJ (2014). Skeletal robustness and bone strength as measured by anthropometry and ultrasonography as a function of physical activity in young adults. American Journal of Human Biology, 26(2):215-220.

Schiess, Regula; Böni, Thomas; Rühli, Frank J; Häusler, Martin (2014). Revisiting scoliosis in the KNM-WT 15000 Homo erectus skeleton. Journal of Human Evolution, 67:48-59.

Shved N, Haas C, Papageorgopoulou C, Akguel G, Paulsen K, Bouwman A, Warinner C, Rühli F (2014). Post mortem DNA degradation of human tissue experimentally mummified in salt. PLoS One, (10):e110753

Staub K, Floris J, Woitek U, Rühli FJ (2014). From left-skewness to symmetry: how body-height distribution among Swiss conscripts has changed shape since the late 19th century. Annals of Human Biology:1-8.

Staub K, Rühli FJ (2014). Der Body Mass Index der Schweizer Stellungspflichtigen 2013 im Lichte der historischen Entwicklung. Koordinierter Sanitätsdienst : Informationsschrift über den KSD in der Schweiz, (2):39-44.

Staub K, Rühli F (2014). Weitere Stabilisierung von Übergewicht und Adipositas. Schweizerische Ärztezeitung, 2014/48.

Warinner C, Rodrigues JF, Matias V, Rounak TC, Shved N, Grossmann J et al. (2014). Pathogens and host immunity in the ancient human oral cavity. Nature Genetics, 46(4):336-344.

Warinner C, Hendy J, Speller C, Cappellini E, Fischer R, Trachsel C, [...] , Rühli FJ (2014). Direct evidence of milk consumption from ancient human dental calculus. Scientific Reports, 4:7104.

Upcoming dates with IEM participation

- March 19-21, 2015. The International Society for Evolution, Medicine & Public Health Inaugural Meeting, Arizona, USA
- March 25-28, 2015, The American Association of Physical Anthropologists (AAPA) 84th Annual Meeting, St. Luis, USA
- July 30 - August 1, 2015: Evolutionary Medicine Conference 2015. Organized by the IEM, University of Zürich, Switzerland.

New MSc/PhD students

The IEM is happy to welcome the following new students to the group:

- Stella Ionnou (Adelaide University, Australia, PhD co-supervised by Frank Rühli)
- Jolandie Myburgh (University of Pretoria, South Afrika, PhD co-supervised by Frank Rühli)
- Corinne Minder (IEM Morphology/Imaging Group, Zürich)
- Ruth Hangartner (IEM Morphology/Imaging Group, Zürich)
- Marcel Bruggisser (Master of Public Health Program, Swiss Armed Forces)
- Todd Engeland (Adelaide University, Australia, PhD co-supervised by Frank Rühli)

Selected IEM media and press reports

Print/Online:

- Neue Zürcher Zeitung, 21. March 2014
- Tagesanzeiger, 6. May 2014
- Blick, 6. May 2014
- Paris Match, 7. May 2014
- Süddeutsche Zeitung, 28. May 2014
- Berliner Zeitung, 19. June 2014
- Bündner Tagblatt, 17. June 2014
- Spiegel, 12. November 2014
- Bauernzeitung, 27. November 2014
- Discover Magazine, 6. December 2014
- Sonntagsblick, 7. December 2014

Television:

- SRF Fernsehen, 29. April 2014
- BR, Bayerisches Fernsehen, 23. May 2014
- ARTE TV, 18. October 2014

Radio:

- SRF 1, 19. February 2014
- Deutschlandsradio, 19. June 2014

Editorial:
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