Editorial

Gerontology

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Darwinian Gerontology

As a medical gerontologist working on basic aspects of age-related diseases, I have to make a confession: our group is *not* interested in studying or treating clinically manifested diseases of the elderly. We rather try to detect the first molecular and cellular mechanisms that initiate these diseases earlier in life before they become overt pathological conditions at advanced age. The second principle of our research is the notion that the development of all diseases of aging can be contemplated from a Darwinian evolutionary viewpoint [1, 2]. Thus, the fact that *Homo erectus* decided to walk upright in the African savannah 2 million years ago gave them the advantage that they could recognize friend and foe much earlier, carry and protect a baby in front, and use their hands freely, further boosting brain development. The price for this important evolutionary step is lower back pain and arthrosis of the hip and knee joints [3].

Also, in spite of not being perfectly engineered, the human body is an optimal compromise to guarantee reproductive success. Of course, it would be desirable to possess the sonar system of bats allowing for safe manoeuvring in darkness, but this would require a separate responsible region in our brain. There are two theoretical possibilities to cope with this situation: either we have to sacrifice some of our presently available brain regions that are representative of the other five senses, e.g. from the visual cortex (something nobody would want to dispense with), or we would have to enlarge the extension of the whole cortex, leading to a larger head circumference, which would require a larger birth canal.

Another telling example for an evolutionarily explainable disease is benign and malignant prostate hypertrophy. The prostate produces seminal fluid that makes up the volume of the ejaculate and contains nutritive and growth factors that benefit the preservation and propagation of the male genome via healthy and mobile spermatozoa. However, prostate growth factors also act on prostatic parenchymal cells themselves in an autocrine and paracrine fashion, stimulating growth and seminal fluid production. In older age, i.e. beyond the optimal reproductive period with a lower frequency of ejaculations, this parenchymal stimulation together with other factors is 'paid for' by benign prostate hypertrophy and prostate cancer [4].

Scientifically, my group is focussing on atherosclerosis as a paradigmatic age-related disease that starts in youth and becomes manifest in later years. In contrast to pathological and clinical dogma, we have shown that atherosclerosis begins as an autoimmune disease where activated T cells – rather than lipid-laden macrophages, so-called foam cells – are the first invaders of the innermost layer of arteries, the intima, at the known predilection sites for atherosclerotic lesions. This immunologic-inflammatory infiltration can be first observed at arterial branching sites, i.e. those subjected to turbulent rather than laminar shear stress by the blood stream. These initiating T cells are sensitized against certain stress proteins, so-called heat-shock proteins, with a molecular weight of 60 kDa (HSP60). HSP60 expressed both by pro- and eukaryotic cells, is phylogenetically highly conserved. Thus, an over 95% homology exists between HSP60 of different bacterial species, and bacterial and human HSP60 still display a 55% sequence homology on the DNA and protein levels. HSP60 is expressed upon exertion of heat (hence the name) as well as other types of stress by pro- and eukaryotic cells where it acts as a chaperone protecting other cellular proteins from denaturation and malfunctioning. Due to vaccinations and lifelong infections, all human beings mount immunity against microbial HSP60, which constitutes an important protective principle that is not harmful to the body itself.

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However, when we maltreat our arteries with classical atherosclerosis risk factors (hypertension, smoking, high cholesterol levels, diabetes, etc.) in the course of a lifestyle that has not been 'foreseen' by evolution, HSP60 is expressed together with adhesion molecules by arterial endothelial cells that now become targets for the preexisting anti-HSP60 immune reactivity. Due to their lifelong exposure to the higher arterial blood pressure and flow conditions, arterial endothelial cells have a lower threshold for the early stressor effect of risk factors than venous endothelial cells. Of course, we do not deny the well-proven atherogenic effect of classical atherosclerosis risk factors, but we assign a new role to them, i.e. as endothelial stressors in the initial stages of the disease. Therefore, atherosclerosis is, in older age, 'the price we pay for the vigour of youth' when we subject our arteries to an evolutionarily unphysiological lifestyle [5]. Atherosclerosis is also a good example for the fact that cultural evolution by far outpaces biological evolution [6].

As far as our journal is concerned, *Gerontology* again thrived in 2014. Emphasizing the broad scope of *Gerontology*, I am especially impressed by the increasing number of papers that are published in the 'Regenerative and Technological Section', now nearly equalling the original 'Clinical', 'Experimental' and 'Behavioural Science Sections'. This development is, of course, also reflected by the number of citations that now significantly extend into these former two fields. Since all submitted material first goes through my hands, the unique position of *Gerontology* as the oldest journal in the field, combined with the broadest scientific scope, significantly enhances my own gerontology horizons, and I would like to thank all Section Editors, Members of the Editorial Board and reviewers for their support in making each issue interesting and worth reading for experts in very different fields. Special thanks go to the Section Editors and Editorial Board Members rotating off the Editorial Crew at the end of this year – Bertrand Friguet (France), Georg Schett (Germany) and Mike Martin (Switzerland) – while I am looking forward to working with Jan Vijg (USA; new Editor, 'Experimental Section'), Stefan Gravenstein (USA; new Editor, 'Clinical Section') and Julie Henry (Australia; new Editor, 'Behavioural Science Section'). All of them have already successfully served as Editorial Board Members in their respective sections in the past. The new members of our Editorial Board are R.A. Miller, Ann Arbor, USA ('Experimental Section'); J. Zuber, Vienna, Austria ('Experimental Section'); K. Hauer, Heidelberg, Germany ('Clinical Section'); A. Stuck, Bern, Switzerland ('Clinical Section'), and C. Röcke, Zurich, Switzerland ('Behavioural Science Section'). I trust that their input will further strengthen the journal's success in the years to come.

The cooperation with our publishing house, Karger, again ran smoothly and in a friendly and gentle atmosphere. At the Editorial Office in Innsbruck, Günter Lepperdinger, Editor of the 'Regenerative and Technological Section', graciously and competently stepped in for me when I was out of town, and Christine Süss again perfectly mastered all administrative affairs.

I am looking forward to an exciting and stimulating 2015 for *Gerontology*!

G. Wick, Innsbruck

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