Radical Medicine: Redefining Oxidative Stress

From 2012-08-01 to 2018-07-31, closed project

Objective

Oxidative stress, an excess of radical and other reactive oxygen species (ROS), has been suggested as a major disease mechanism. However, the major clinical trials using anti-oxidants have been failures, even suggesting serious side effects. Here, I propose completely different approaches: First, instead of letting radicals form and then scavenge them we will identify their diseases-relevant sources and prevent their formation or specifically repair the damage caused by ROS. Second, we will differentiate beneficial signalling roles of ROS. In combination, this will result in unprecedented precision and molecular specificity. In 2010, I submitted a somewhat related proposal to the ERC and received a comment as being “too focused on essential hypertension”. This proposal has a much broader focus and impact beyond cardiovascular diseases. In the past months we achieved major breakthroughs by identifying a radical/ROS source (NOX4) as fundamental mechanism in stroke, the fastest growing and soon no 1 cause of death. We are also developing in phase II a radical formation inhibitor for neurotrauma. Moreover, our basic research facilitated the development of drug classes re-activating an oxidatively damaged signalling receptor, now in phase III. Further, we identified angiogenesis as a radical/ROS-dependent and protective (!) signalling event. This proposal is just the beginning: our basic science will open up new fields and leap forward in personalized medicine with groundbreaking technologies and approaches. We will contribute to the diagnosis and early identification of patients at risk and to monitor their successful treatment (in vitro/blood-based); to the localization of disease processes (in vivo/molecular imaging) before the onset of symptoms; and to a new generation of more effective, predictable, and mechanism-based drugs. We also expect to later apply our findings and tools to neurobiology and oncology, where ROS also play physiological and pathological roles.

Related information

Report Summaries

Mid-Term Report Summary - RADMED (Radical Medicine: Redefining Oxidative Stress)
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