Current status of treatments for cardiovascular aging: are statins a good option?
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Introduction
Cardiovascular (CV) aging involves all the changes that occur in the structure and functions of this system over the years resulting in well-defined phenotypic changes which render this system prone to disease. The prevalence of age-related pathologies, such as cardiovascular disease (CVD), is increasing with the rising average age population constituting one of the facts causes of mortality. In consequence, better knowledge of the effect of aging on the CV system is needed for developing new and effective treatments in order to prevent or delay these alterations. Investigations targeting the arteries are bringing interesting results that may end in new treatments to prevent CV aging and, consequently, CVD.

Aging in the Cardiovascular System

Main Changes in the Cardiovascular System with Aging
- Loss of myocytes and hypertrophy of the remaining ones
- Reduction in the number of peacemaker cells
- Diastolic dysfunction
- ↑ maximal heart rate, maximal cardiac output and maximal VO

Mechanisms Involved in Arterial Aging

1. Endothelium changes: important role in arterial aging. Endothelial cell turnover and oxidative stress induce thrombore shortening and, consequently, cell senescence.
2. Oxidative stress: the free radical theory of aging states that organisms age because of the production of intracellular reactive oxygen species (ROS) over time because there is an imbalance between the oxidative and anti-oxidative system. The two main causes of decreased expression of eNOS (endothelial nitric oxide synthase) are:
   - ↑ degradation of L-arginine, a major eNOS substrate, by arginase II.
   - ↑ degradation of tetrahydrobiopterin (BH4), an important cofactor for eNOS activity, by oxidative stress.
3. "Inflammaging": upregulation of the inflammatory response with progressing old age → vasculature is more susceptible to atherosclerosis. It also stimulates the rupture of atherosclerotic plaques.

Therapeutic Strategies Targeting Arterial Aging

Strategies Targeting Arterial Aging
Arterial system is considered as a suitable target for anti-aging strategies because it connects all the organs in the body. Middle-aged individuals already present age-related reversible arterial wall changes that progress with aging, underlying the development of CVD.

Evidence of the Use Of Statins in Arterial Aging

- Main use: plasma cholesterol reduction → HMG CoA-reductase inhibitors
- Other beneficial pleiotropic effects

Future Perspectives
Additional animal and human studies, especially long term prospective and larger studies, are required to confirm if statins administered preventively are able to:
- Reduce CV aging through improving arterial stiffness
- Reduce the incidence of CV events

Conclusions
- Search of treatments targeting CV aging is of great importance for public health.
- Even though mechanisms of CV aging are almost fully understood, an even better understanding of the arterial aging process is needed.
- Reduction in arterial stiffness → decrease in arterial age → reduction in CV mortality and morbidity.
- There are still controversies about the use of statins or arterial aging and the mechanisms involved in their action.

References