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Sex differences in cardiovascular cells - relevance for translational medicine

Cardiovascular disease (CVD) has different manifestations in women and men and
in male and female rodents. Females develop more physiological myocardial
hypertrophy than males with better metabolic adaptation. Fibrosis, a hallmark of
pathological myocardial hypertrophy, is more prominent in males than in females in
mice and men. In animal and cell culture models of hemodynamic and
neurohormonal stress and in engineered heart tissue, the interaction of the stressors
with sex and sex hormone effects is obvious. Oestrogen is protective in females in
most models, but harmful in males in some conditions. Estrogen receptor alpha and
beta activation have different effects on fibrosis and metabolism in females and
males. Female cells and animals under stress maintain energy metabolism better
than males. Outcome of stem cell therapy for myocardial infarction may depend on
sex. Women with aortic stenosis develop less eccentric myocardial hypertrophy with
less fibrosis compared to men and this is associated with better clinical outcomes.
Adaptation to cardiovascular stress and end organ damage are sex specific and sex
specific approaches to treatment may lead to further benefit.