Sex Differences in Inflammation

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Sex vs. Gender

**Sex** = biologic sex differences
i.e., sex hormones

**Gender** = biologic sex differences + social/cultural factors
NIH new rules in 2016

• Consideration of Sex as a Biological Variable in NIH funded research
  • NOT-OD-15-102
  • Sex and gender play a role in how health and disease processes differ across individuals, and consideration of these factors in research studies informs the development and testing of preventive and therapeutic interventions in both sexes.
  • Accounting for sex as a biological variable begins with the development of research questions and study design. It also includes data collection and analysis of results, as well as reporting of findings. Consideration of biological sex differences may be critical to the interpretation, validation, and generalizability of research findings. Adequate consideration of both sexes in experiments and disaggregation of data by sex allows for sex-based comparisons and may inform clinical interventions.
Sex differences affect research

- Sex steroids act as “growth hormones” on organs/tissues/cells and so there are sex differences in basic physiology.
- All chronic inflammatory diseases display sex differences... (i.e., incidence, diagnosis, pathogenesis, severity, risk factors, drug metabolism, outcome, etc.)
- The largest influence on inflammation & remodeling is the “inducer” (i.e., virus, damage, chemical) & sex hormones (and other hormones)
- X and Y chromosomes also affect inflammation and basic physiology
Examples of Translational Research in My Lab

• Myocarditis, dilated cardiomyopathy, PPCM, heart failure, hypertension/PAH, etc.- sex differences in Biomarkers (i.e., ST2)

• Endocrine disruptors effect on inflammation and disease (i.e., BPA, BPS)

• Relationship between autoimmune diseases and CVD (why do women with ADs have higher CVD?)

• Regenerative medicine (effect of sex hormones)

• Sex differences in vitamin D and inflammation
  – CVD
  – kidney stone disease
sST2 increased in Sera of patients with HF

Chen W-C et al. 2010 Heart 96:314-320
Januzzi JL et al. 2007 J Am Coll Cardiol 50:607-613

Dyspnea patients (trouble breathing) +/- HF: sera collected at hospital visit predicting death 1yr later

Rheman SU et al. 2008 JACC 52:1458-1465
Sera sST2 increased in men with myocarditis ($n$)

Unpublished data: Fairweather D, et al.
sST2 increased in men with HF according to EF and NYHA class

Unpublished data: Fairweather D, et al.
sST2 increased in sera of male mice & associated with poor heart function by echo during CVB3 myocarditis

Unpublished data: Fairweather D, et al.
ST2 protects M&F mice from myocarditis

Unpublished data: Fairweather D, et al.

$n = 30$/group