Developmental Challenges of Xenoestrogens on Cardiac Development

* Endocrine System
  + Role in organismal physiology
    - Nervous system
    - Cardiovascular system
    - Reproduction
    - Immune System
    - Interaction of systems
      * Ex) Nervous System and Cardiovascular System
  + Role in development
    - Cell Growth
    - Cell Proliferation
    - Cell differentiation
* EDCs and Development
  + Regulation and production of hormones
* Molecular Pathways of Androgens
* Molecular Pathways of Thyroid
  + - Molecular Pathways of Estrogens
      * ER alpha and ER beta
        + Gene regulation
      * GPER
        + cAMP and Calcium modulation
      * Interaction between different proteins
* Development
  + Basic zebrafish developmental periods
    - Describe the 6 developmental period of zebrafish development (zygote-hatch)
  + Cardiovascular development
    - Both structural and molecular events that occur during development
* Zebrafish as a model organism
  + Using zebrafish as a model to study cardiovascular system
    - Advantages and possible limitations
      * Microscopy
        + *cmlc*2::GFP transgenic zebrafish
        + Fli1:GFP/GATA1:dsRed double transgenic zebrafish
      * Genetic tools
  + Using zebrafish as a model to study endocrine disruption
    - Advantages and possible limitations
* Endocrine Disruptors
  + Overview of endocrine disruption
    - Examples of natural and synthetic EDC
  + Xenoestrogens
    - Distribution in the environment
    - Potential exposure mechanism
    - Mechanism of transformation (biotic and abiotic)
    - Known effects of Xenoestrogens
      * Cell physiology
        + Known molecular targets that affect cell biology for example disruption in the cell cycle
      * Reproduction
        + Known targets that affect different aspects of reproduction such as inhibition of egg maturation
      * Development
        + Known targets that affect normal development of an embryo
* Future Research Needs
  + Characterize the role of estrogen receptors during development
    - Example- GPER’s role during embryogenesis
  + Further explore the molecular pathway for cardiovascular toxicity of xenoestrogens during early development
  + To match the molecular events of toxicity to a specific time point in the very complex timeline of development