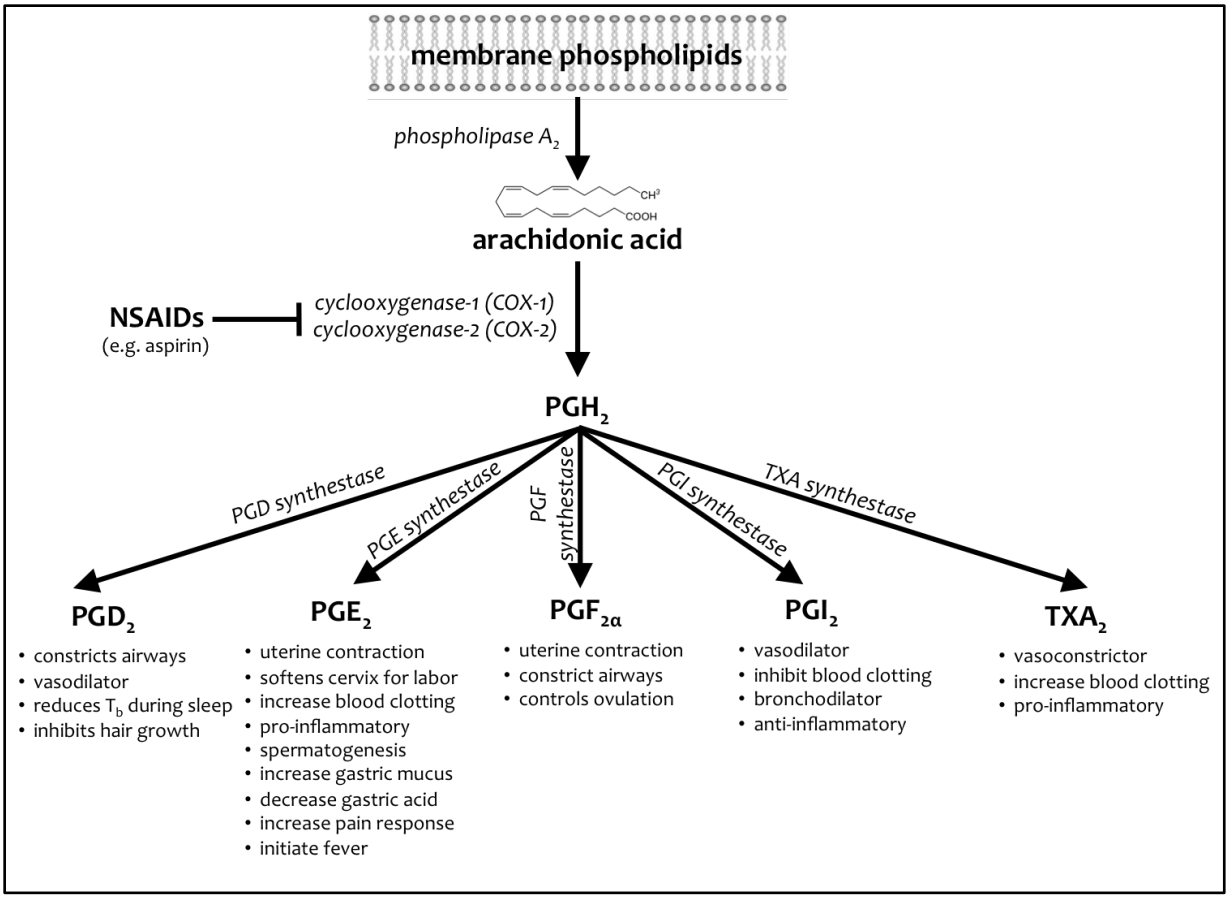
Prostaglandin – Local effects but ubiquitous functions

Prostaglandins (PG) are derivatives of long-chain fatty acids that are produced by nearly all tissues of the body and control many different processes. They act locally to affect neighboring cells and are broken down before they can affect far-off locations. PGs all start from the precursor molecule, arachidonic acid, which is a type of membrane phospholipid. Numerous different enzymes (*italicized* in figure) are then used to synthesize unique categories of PGs (e.g. PGI_2), each with their own specific functions (sometimes even conflicting functions with other categories of PGs). PGs carry out these functions by binding to one of eight different PG receptors, which themselves are only present in specific tissues.

1. **In the above paragraph, highlight the traits that allow PGs to have diverse functions, tissue-specific responses, and localized effects of their actions.**



Many (but not all) of the functions of PGs are to signal injury/illness and assist in the healing process. In healthy individuals, baseline levels of the various PGs help the body function normally and are synthesized from arachidonic acid first by the enzyme *cyclooxygenase-1* (*COX-1*), and then subsequent enzymes produce the different categories of PGs. When the body is wounded, however, *cyclooxygenase-2* (*COX-2*) is activated, thereby producing extra PGH_2 to allow for the production of specific PGs needed at the site of damage to respond to the injury.

2. **Using the figure above, predict what functions each of the above categories of PGs would likely be synthesized at an increased rate if you cut your finger while cooking dinner, then detail why each of their functions will be beneficial in this scenario.**

Nonsteroidal anti-inflammatory drugs (NSAIDs) are a group of drugs that inhibit the actions of both *COX-1* and *COX-2* enzymes. The most prominent examples of NSAIDs include aspirin, ibuprofen, and naproxen. Although NSAIDs are widely available over-the-counter medicines, their use has some serious risks associated with it due to the numerous functions of PGs and people with specific conditions are warned against taking it to avoid suffering from unintentional consequences.

3. **For each scenario listed below, use the figure above and any previous knowledge you might have to: a) Determine whether the use of NSAIDs is suggested and b) Identify the benefits or negative side effects NSAIDs might have to justify your answer.**

    - A middle-aged man at high-risk for a heart attack

    - A woman 32 weeks pregnant with a headache

    - An elderly woman diagnosed with rheumatoid arthritis

    - A young man suffering from a painful peptic ulcer

    - A child diagnosed with severe asthma

4. **What general advice would you give to others about using NSAIDs? What factors need to be considered in regard to whether NSAIDs are recommended for a given person?**

5. **Knowing what you do know, compare and contrast how paracrine agents are similar to and different from hormones. Why is it important that these differences exist?**