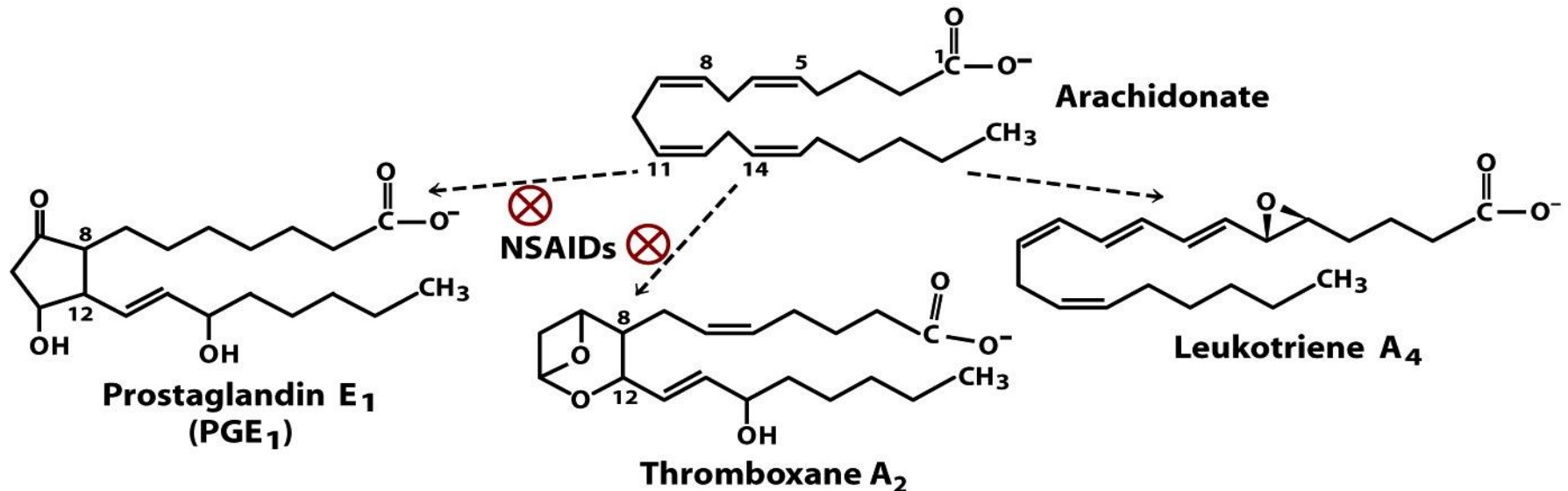


# UNIT-I

Structure and functions of prostaglandins

# Eicosanoids

- Are derived from Arachadonic Acid 20:4( $\Delta^{5,8,11,14}$ )
- NSAIDs (Aspirin and ibuprofen) block production of Prostaglandiins and thromboxanes
- Prostaglandins - C8-C12 bond generates 5 membered ring. Stimulate adenylyl cyclase
- Thromboxanes - C8 -C12 bond + Oxygen in heterocyclic ring
- Leukotrienes involved in asthma and other processes



# Unsaturated fatty acids eicosanoids



## Eicosanoids

- All are unsaturated.
- All have twenty carbons.
- Some are Essential Fatty Acids.  
Can't be produced by the body.  
examples: linolenic and linoleic acids

## Three groups

Prostaglandins, leukotrienes, thromboxanes

# Prostaglandins

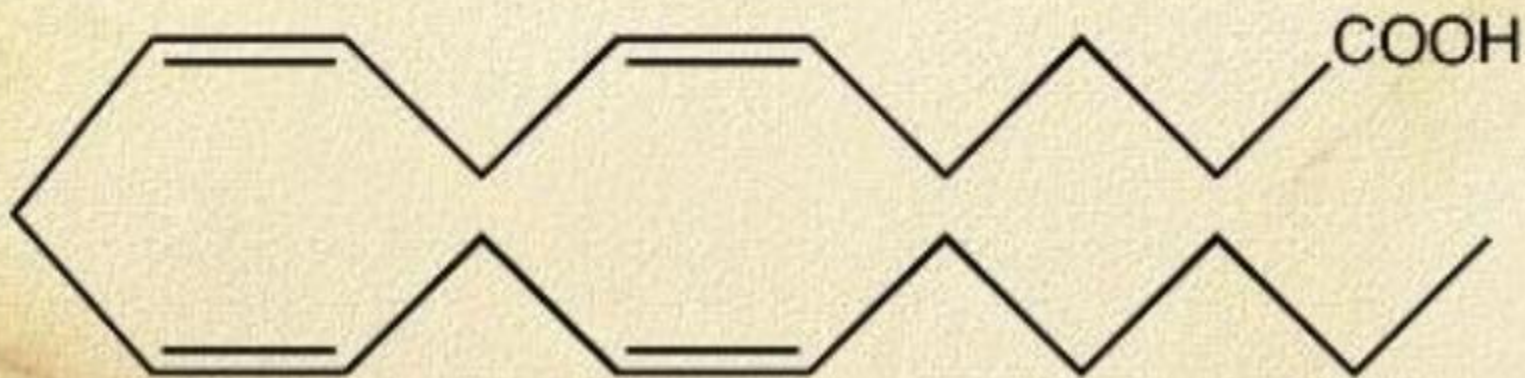
- They are family of fatty acids which have hormonal or regulatory nature.
- The best known prostaglandins are PGE<sub>1</sub>, PGF<sub>1a</sub>, PGF<sub>2a</sub>
- The prostaglandins differ from each other with respect to their biological activity, although all show at least some activity in lowering blood pressure and inducing muscles to contract



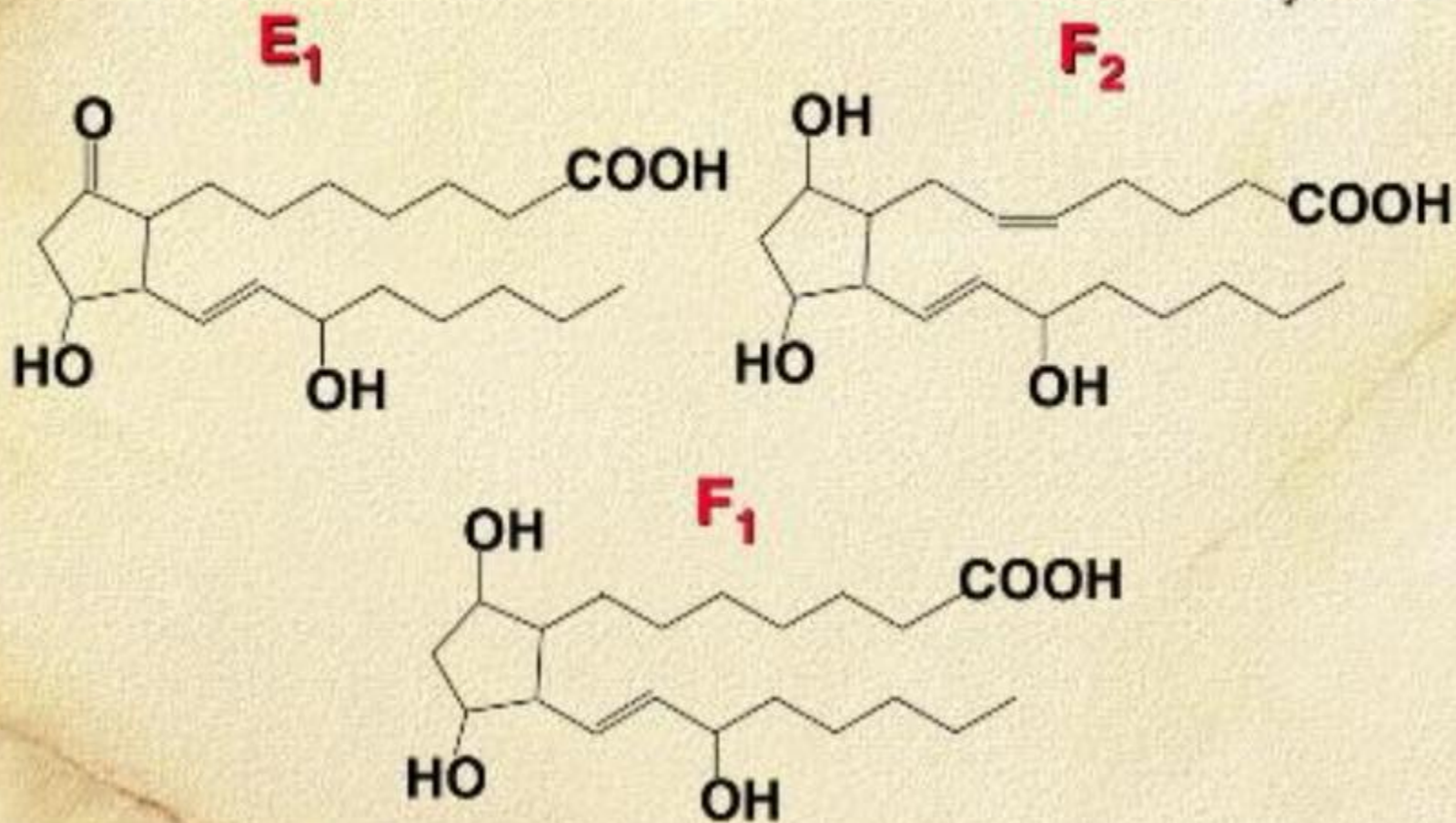
# Prostaglandins

Originally isolated from seminal fluid.

All are derived from arachidonic acid.



# Prostaglandins





# Prostaglandins

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## Biological effects

- Stimulation of smooth muscles
- Regulation of steroid production
- Inhibition of gastric secretion
- Inhibition of hormone-sensitive lipases
- Inhibition / stimulation of plate aggregation
- Regulation of nerve transmission
- Sensitization to pain
- Mediation of inflammatory response



# Smooth muscle contractions



Prostaglandins stimulate contractions in the reproduction system – uterine contractions

## Dysmenorrhea

- Painful menstruation.
- Evidence shows that this may result from an excess of prostaglandins.
- Physicians often order Motrin (Ibuprofen) for this.



# Gastrointestinal tract



## Prostaglandins will:

Inhibit the secretion of hydrochloric acid in the stomach.

Increase secretion of mucus layer.

Protects mucosa from acid invasion.

Aspirin inhibits prostaglandin production  
Extended use can result in ulceration of the stomach lining. **Why?**



# Blood clotting

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## Thromboxane A<sub>2</sub>

Produced by platelets in blood.  
Stimulates constriction of blood vessels.  
Aggregation of platelets.

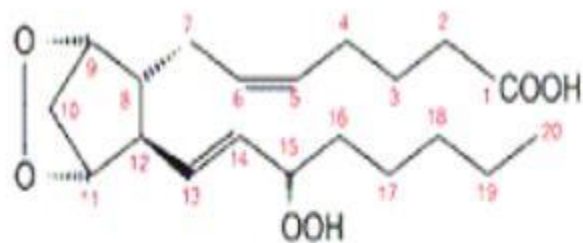
## Prostacyclin

Produced by cells that line blood vessels.  
Reverses effects of Thromboxane A<sub>2</sub>.

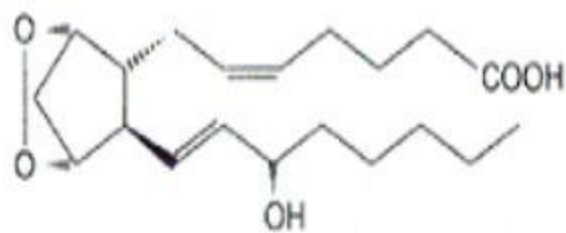
## Aspirin therapy

(1/day) following strokes or MI. Acts as  
anticoagulant – antiplatelet aggregation.

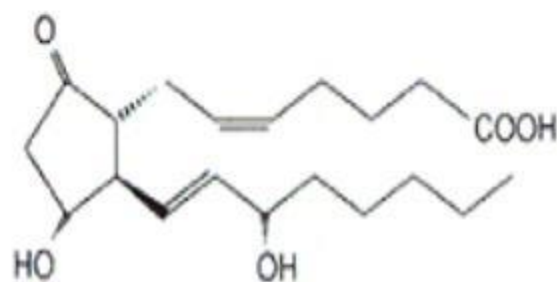




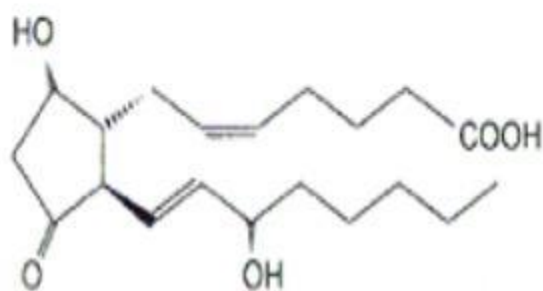
**PGG<sub>2</sub>**



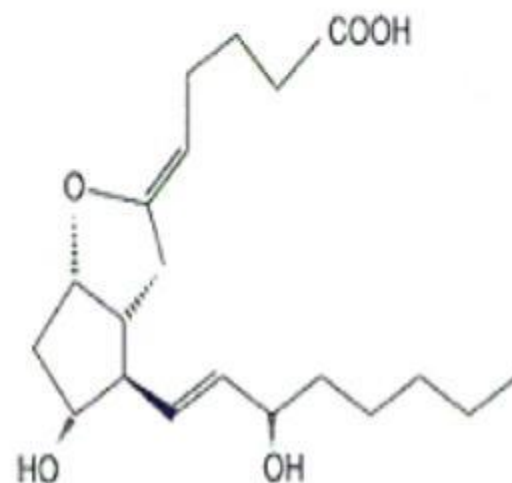
**PGH<sub>2</sub>**



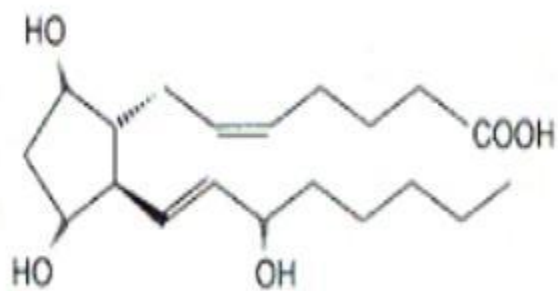
**PGE<sub>2</sub>**



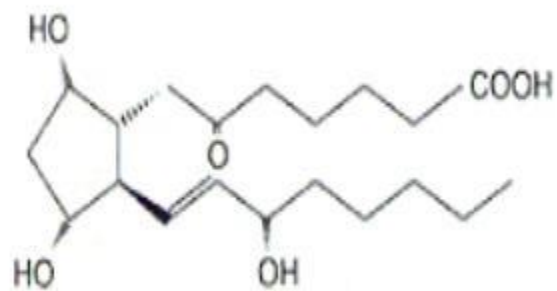
**PGD<sub>2</sub>**



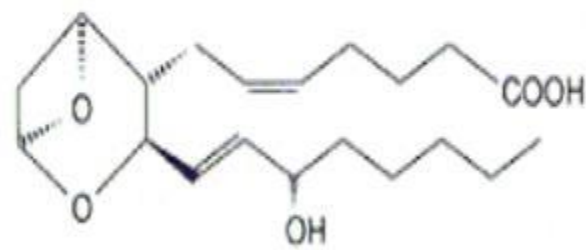
**PGI<sub>2</sub>**



**PGF<sub>2α</sub>**



**6-Keto-PGF<sub>1α</sub>**



**TxA<sub>2</sub>**

# Other uses

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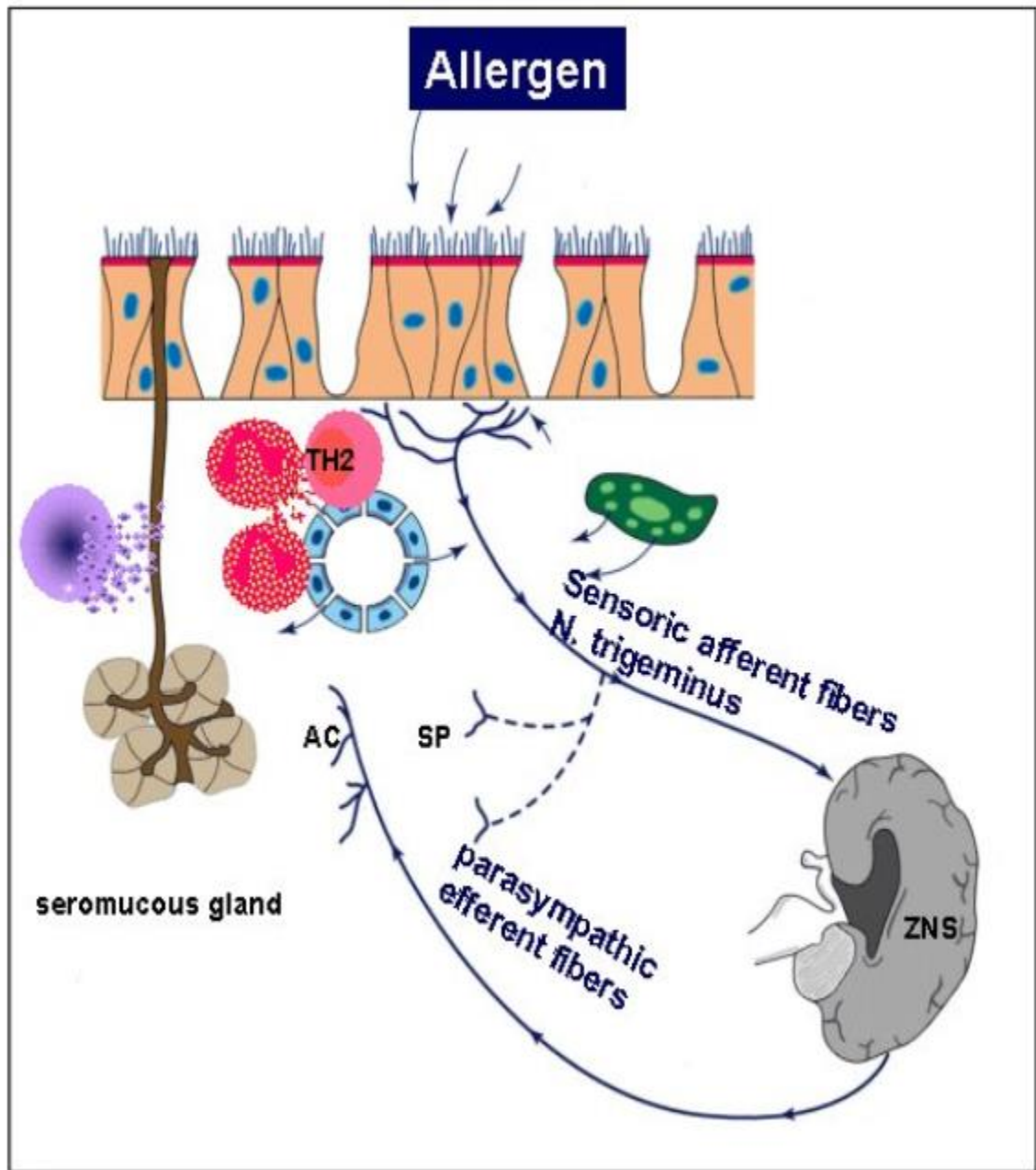
## In the kidneys

- Cause renal blood vessels to dilate.
- Aid in excretion of water and electrolytes.
- 

## In the respiratory tract

- Produced by WBC in lungs – leukotrienes.
- Cause constriction of bronchi – asthma
- Other prostaglandins act as bronchodilators.





**Effector cells    mediators**

**Mast cells**



histamine  
leukotrien C4  
prostaglandine E2  
tryptase

**Eosinophils**



leukotriene  
prostaglandin E2  
ECP, EDN,  
MBP, MPO  
TGF- $\beta$ , TNF- $\alpha$ ,  
IL-5, IL-4

**T-cell**

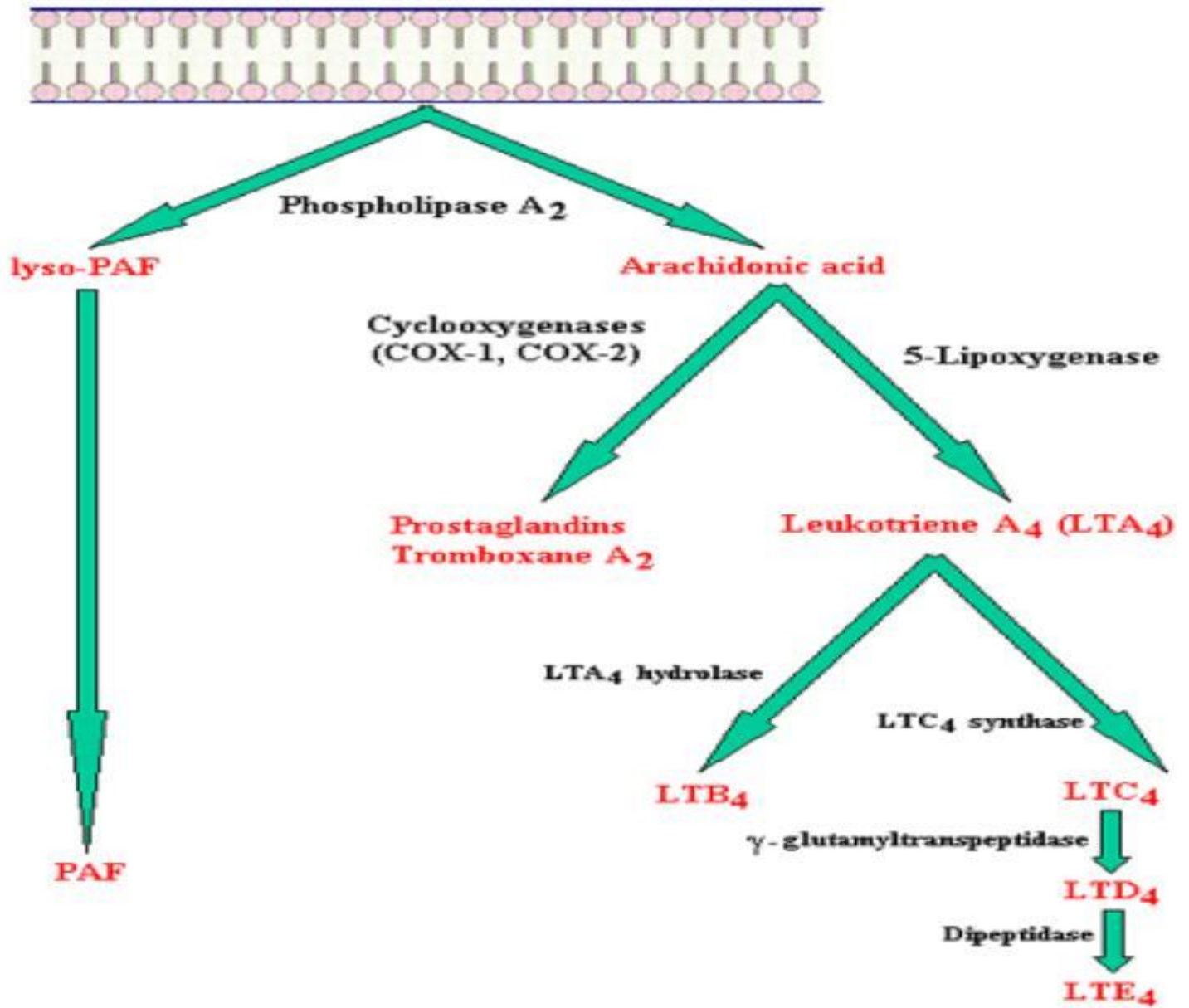


IL-4, IL-5,  
IL-13, IL-10

**basophil**



IL-13  
IL-4  
Histamin





# Inflammatory response



Protective mechanism when tissue is damaged.  
Results in swelling, redness, fever, and pain.  
Prostaglandins promote this response.

## Drugs like aspirin and Ibuprofen

- ❑ Anti-inflammatory
- ❑ Block prostaglandin synthesis.
- ❑ Cause reduction in this response.

Tylenol – analgesic, not an anti-inflammatory