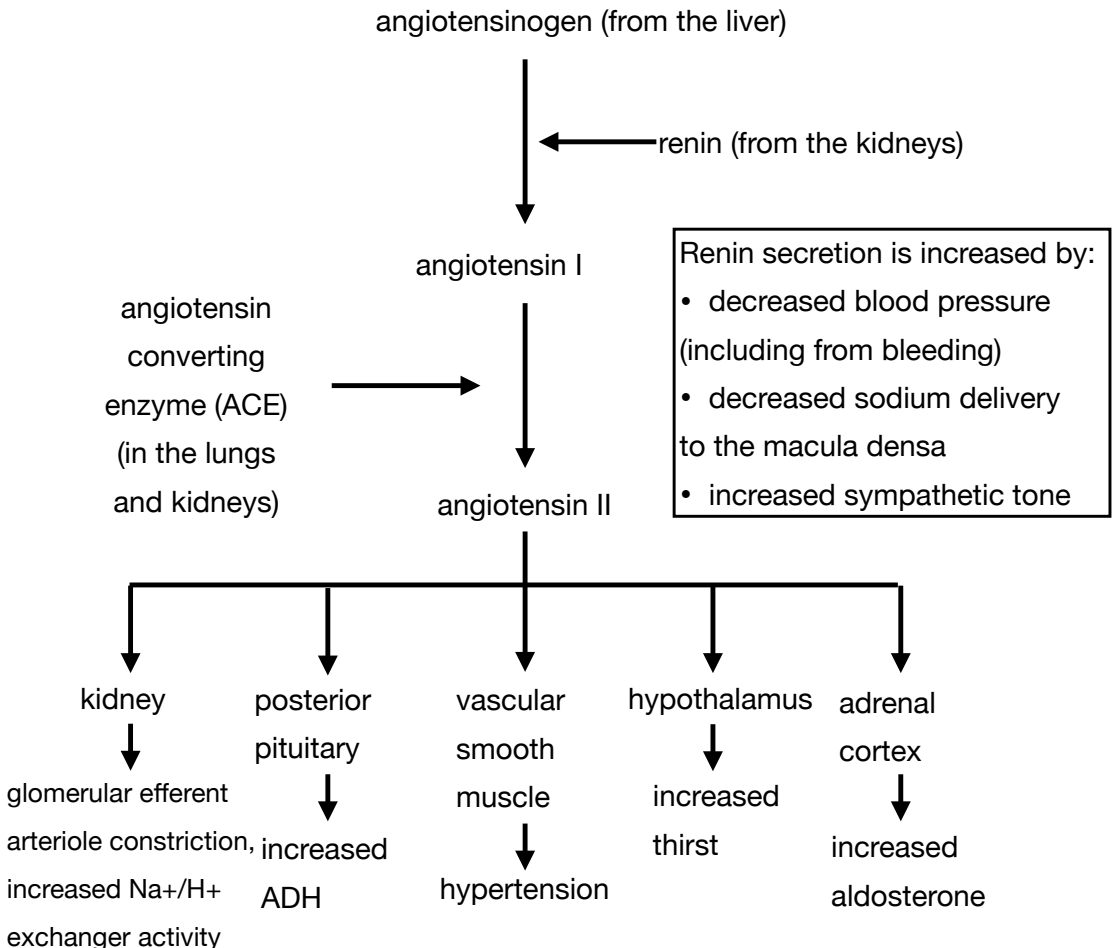


Renin Angiotensin Aldosterone System and ACE Inhibitors

Renin Angiotensin Aldosterone System



purpose: to increase blood pressure

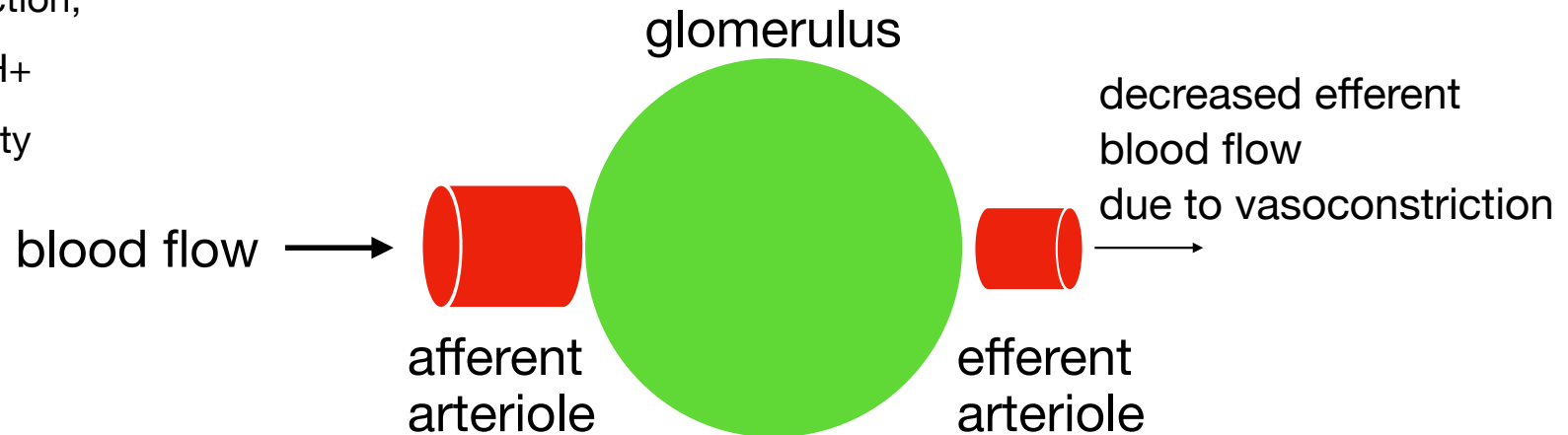
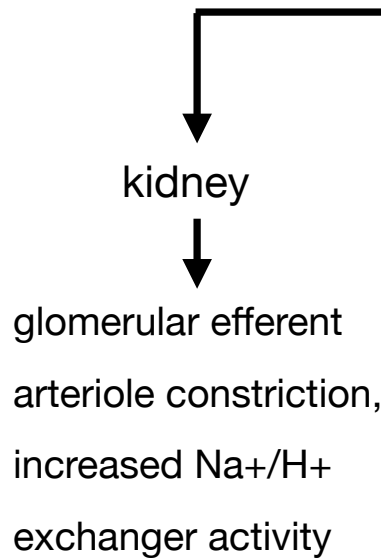
- useful during hypotension
- dehydration
 - hemorrhage

Effect of Angiotensin II on the Kidneys

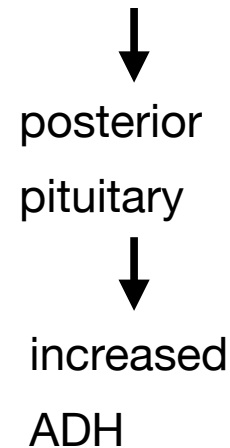
- increases GFR
- increases Na⁺ reabsorption

Water follows sodium.

- Increased Na⁺ reabsorption leads to increased water reabsorption.
→ increased blood volume and pressure



Effect of Angiotensin II on the Posterior Pituitary Gland



ADH = antidiuretic hormone

- acts on V2 receptors in the collecting duct
- increases the number of aquaporins in the collecting duct, leading to increased water reabsorption

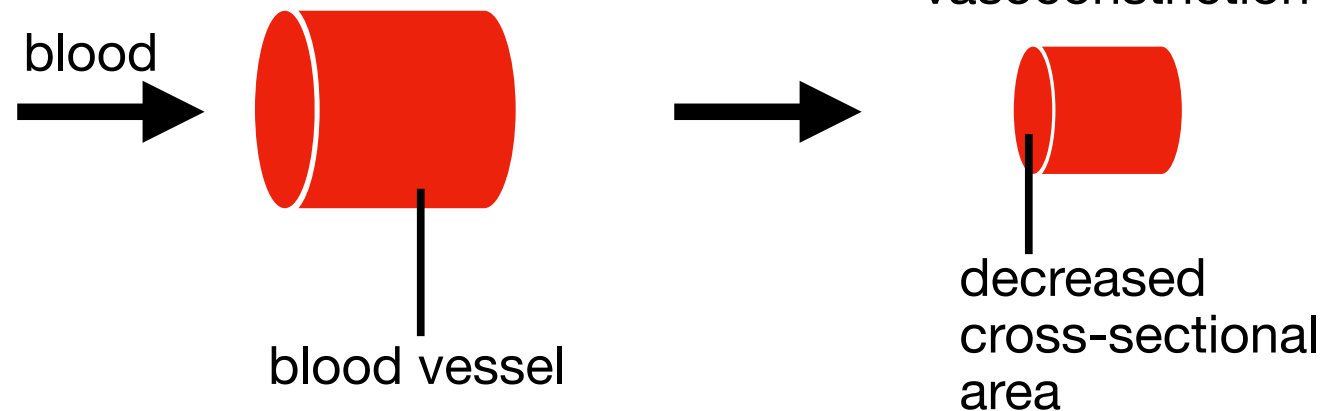
Effects of Angiotensin II on Vascular Smooth Muscle

causes vasoconstriction

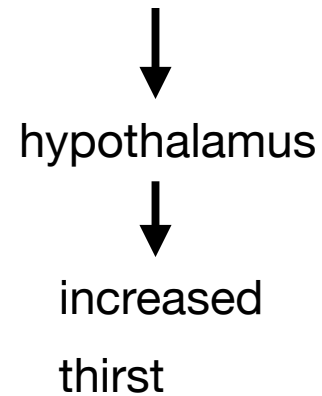
→ Blood pressure increases due to a decrease in the cross-sectional area of the blood vessels.

pressure = force/area

↓
vascular
smooth
muscle
↓
hypertension

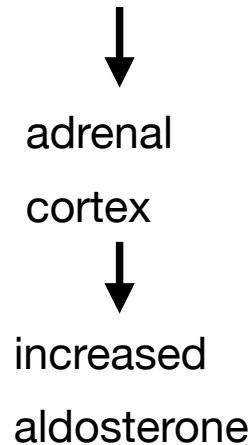


Effect of Angiotensin II on the Hypothalamus



Increased thirst results in increased water intake.
→ increased blood volume and pressure

Effects of Angiotensin II on the Adrenal Cortex

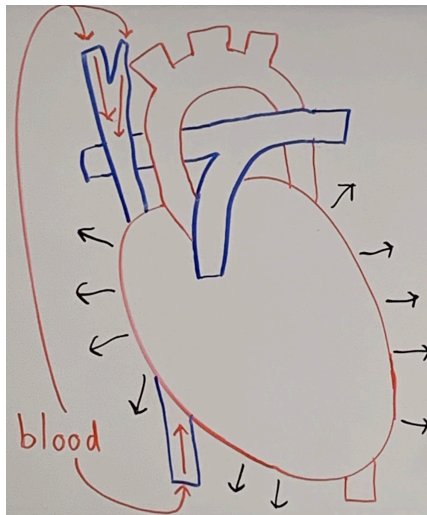


- causes increased aldosterone production
- Aldosterone increases Na^+ reabsorption and K^+ secretion in the principal cells of the distal convoluted tubule and collecting duct.
- Aldosterone increases H^+ secretion in the alpha intercalated cells.
- Increased Na^+ reabsorption leads to increased water reabsorption.
→ increased blood volume and pressure

Renin Angiotensin Aldosterone System Regulation

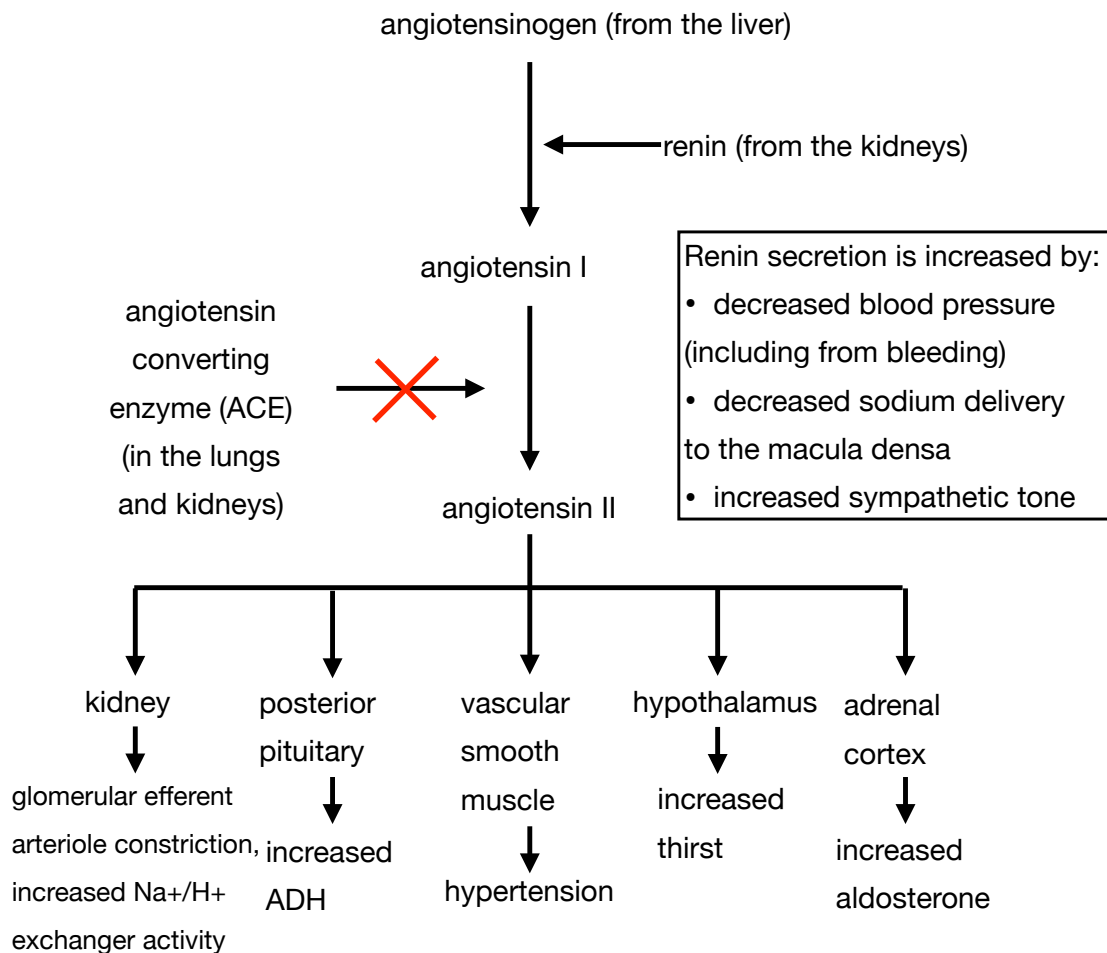
atrial natriuretic peptide (ANP)
from the heart

- produced by the right atrium in response to stretching due to hypervolemia



- causes afferent arteriole dilation and efferent arteriole constriction in the nephron
- inhibits sodium and water reabsorption in the nephron

ACE Inhibitors: Mechanism of Action and Effects



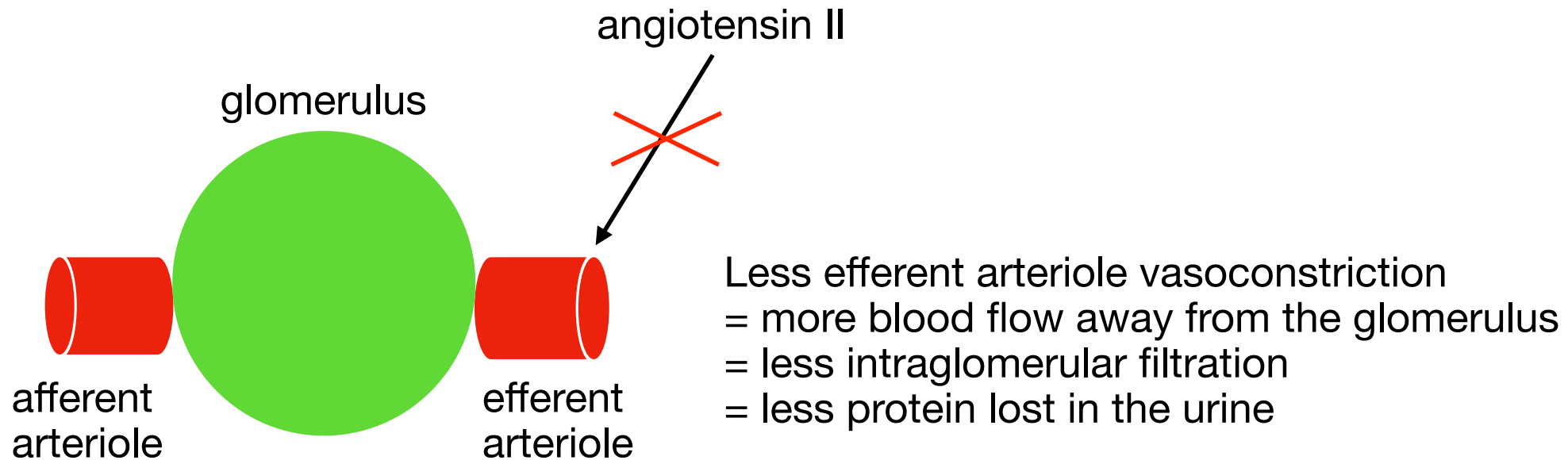
Inhibition of ACE leads to:

- increased renin
- decreased angiotensin II
- decreased effects of angiotensin II

ACE Inhibitors: Clinical Uses

- hypertension
- decrease mortality from heart failure
- decrease cardiac remodeling in MI
- proteinuria
 - reduce intraglomerular filtration
- diabetic nephropathy

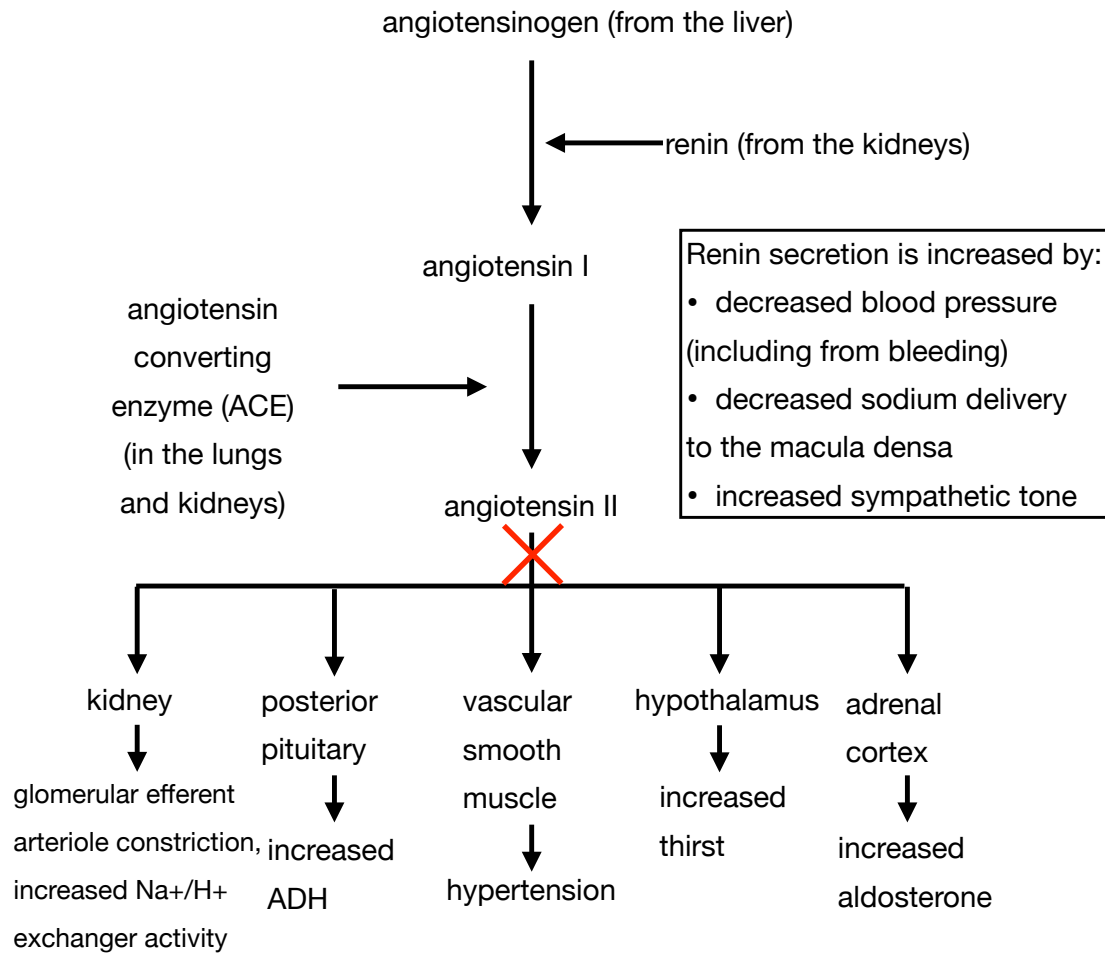
ACE Inhibitors: Clinical Uses (Continued)



ACE Inhibitors: Adverse Effects

- cough
 - most common adverse effect
 - thought to be due to increased bradykinin (normally degraded by ACE)
- angioedema
- hyperkalemia
- hyponatremia
- increased creatinine
- metabolic acidosis
- fetal renal defects

Angiotensin Receptor Blockers (ARBs)



- common alternative to ACE inhibitors
- often used if ACE inhibitors cause a cough

ACE Inhibitors: Contraindications

- C1 esterase inhibitor deficiency
 - predisposition to angioedema
- pregnancy
 - ACE inhibitors can interfere with fetal renal development.
- bilateral renal artery stenosis
 - ACE inhibitors decrease GFR, which can lead to renal failure if bilateral renal artery stenosis is present.