Objectives

- To discuss factors that control GFR.
- To address how B.P. can affect GFR & introduce topic of renal suppression.
- To outline the different control mechanisms that influence filtration rates.
- To introduce the renin-angiotensin mechanism to regulate GFR.

Factors affecting GFR

- Total surface area
- Filtration membrane permeability
- NFP changes
  - Kidney diseases (increase NFP)
  - Hemorrhage (decrease NFP)
- Blood Pressure changes (direct correlation)
- Dehydration – inhibits filtrate formation.

Blood Pressure Factors

**Hypotension** – If extreme then glomerular filtration will stop:
- If GBHP = CHP no filtration
- Termed renal suppression.

**Hypertension** – not as significant because the body has stretch receptors that constricts afferent arterioles. Maintains GFR

Control of GFR

**Intrinsic Controls** – Adjusting resistance to blood flow. Maintains a nearly constant GFR when MAP is in the range of 80–180 mm Hg

A. **Myogenic mechanism** – stretching muscles of afferent arterioles

B. **Tubuloglomerular feedback mechanism** – Controls vasodilation or vasoconstriction of the afferent arterioles, located in walls of distal tubules – respond to osmotic signals; senses changes in the juxtaglomerular apparatus

Control of GFR

**Extrinsic Controls** – Maintains systemic BP

A. **Sympathetic nervous system controls** – Release of norepinephrine constrict afferent arterioles and thus decrease filtration formation.

B. **Renin-angiotensin mechanism** –

- Juxtaglomerular cells (JG) cells that sense blood pressure changes in the afferent arteriole release renin. See Fig 25.12
- Renin ultimately raises BP (See pg 16-18 in SG)
Effects of Angiotensin II

1. Constricts arteriolar smooth muscle, causing MAP to rise
2. Stimulates the reabsorption of Na⁺
   - Acts directly on the renal tubules
   - Triggers adrenal cortex to release aldosterone
3. Stimulates the hypothalamus to release ADH and activates the thirst center

4. Constricts efferent arterioles, decreasing peritubular capillary hydrostatic pressure and increasing fluid re-absorption
5. Causes glomerular mesangial cells to contract, decreasing the surface area available for filtration