- Red skin: blood vessel dilation; itchy skin: nerves stimulated; dry skin: skin cells leaking
- In AD + use of detergent - adhesion between cells is lowered - allergens can get in more easily - inflammation
- pH: Alkaline - dry; acidic: oily
- AD: When your body produces an excess amount of sebum and dead skin cells, the two can build up in the hair follicles. They form a soft plug, creating an environment where bacteria can thrive. If the clogged pore becomes infected with bacteria, inflammation results.

**Embyrology**

**Pronephros**: Consist of cells called nephrotomes. They disappear by the end of the fourth week

**Mesonephros**: Comprises a ridge and duct. Duct is lateral to the ridge;

Mesonephric ridge is an ovoid organ on each side of the midline. With the developing gonads on its medial side. Ridge between the mesonephric ridge and gonad - urogenital ridge.

**Metanephros**: Forms the kidneys

a- Metanephric Blastema which gives rise to excretory units

b- Ureteric Bud (from mesonephric duct); gives rise to Collecting System The Ureteric bud → Renal Pelvis → Major Calyces → Minor Calyces and collecting tubules
**Thyroid Endocrinology**

<table>
<thead>
<tr>
<th>Cell type</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Follicle</td>
<td>Contains thyroglobulin rich colloid</td>
</tr>
<tr>
<td>Follicular cells</td>
<td>Produce hormones T3 and T4</td>
</tr>
<tr>
<td>Parafollicular/C cells</td>
<td>Produce calcitonin for Ca2+ homeostasis</td>
</tr>
</tbody>
</table>

**Production of T3 and T4**

1. Iodine is cotransported with sodium from the interstitial fluid into the colloid, where it is oxidised and attached to tyrosine contained in thyroglobulin.

2. T3 and T4 are formed, and T4 is generally converted into T3 (3 iodines).

4. Endocytosis of T3 and T4 into follicle cells and secreted into interstitial lumen.

**Functions of thyroxine**

- Boost metabolism: T3 stimulates carbohydrate absorption from the small intestine and increases fatty acid release from adipocytes. These actions provide energy that helps maintain metabolism at a high rate.
- Growth and development: T3 is required for normal production of growth hormone from the anterior pituitary gland.
Blood testes barrier - Formed by ring of interconnected Sertoli cells

- Prevents the movement of many chemicals from the blood into the lumen of the seminiferous tubule + Retain luminal fluid
- Ensures proper conditions for germ cell development and differentiation in the tubules
- Permits different stages of spermatogenesis to take place in different compartments.

Changes at puberty

- At pubertal age (Trigger not clearly understood)
  - Increased amplitude of GnRH and GHRH
  - Increased levels of FSH, LH and sex steroids
  - Increased levels of growth hormone (GH)

<table>
<thead>
<tr>
<th>Females</th>
<th>Boys</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starts 8-14 yrs old (avg: 11 yrs)</td>
<td>Starts 9-14 yrs old (avg: 12 yrs)</td>
</tr>
<tr>
<td>1st sign - Breast development</td>
<td>1st sign - Testicular enlargement (&gt;5mL)</td>
</tr>
<tr>
<td>Pubic and axillary hair growth</td>
<td>Pubic, axillary and facial hair growth</td>
</tr>
<tr>
<td>Growth spurt</td>
<td>Growth spurt (larger than females)</td>
</tr>
<tr>
<td>Menarche (~2 yrs after start puberty)</td>
<td>Spermatogenesis begins</td>
</tr>
<tr>
<td>Acne, body odour + mood changes</td>
<td>Acne, body odour + mood changes</td>
</tr>
</tbody>
</table>

Menopause

Cessation of menstruation, usually occurring between 48-52 yrs, when ovaries stop releasing eggs.

Mechanism

1. Depletion of primordial follicles (~40yrs) - ↓ follicular estradiol production
2. Gradual ↑ in FSH and LH (due to lack of negative feedback)
3. Decline of inhibin B > further ↑ FSH
   4. ↑FSH > rapid estradiol ↑ from existing follicles - Leads to shorter menstrual cycles
5. As fewer follicles remain, ↑FSH no longer stimulates the secretion of estradiol (6-12 months pre-menopause)
6. Menopause first sign: ↓ Estradiol and lack of ova - Signs
Signs of menopause

<table>
<thead>
<tr>
<th>Short term signs</th>
<th>Long term signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Vasomotor: hot flushes, sweats, palpitations, headaches</td>
<td>• Sexual: Vaginal dryness, dyspareunia, ↓ libido</td>
</tr>
<tr>
<td>• Psychological: irritability, lethargy, panic attacks, depression etc.</td>
<td>• Hair and nails: hair loss/thinning, brittle hair and nails</td>
</tr>
<tr>
<td>• Menstrual changes: shorter cycle, altered blood loss</td>
<td>• Urogenital: diminished urethral seal and loss of compliance</td>
</tr>
<tr>
<td>• Dry skin</td>
<td>• General aches and pains</td>
</tr>
</tbody>
</table>

Continence and micturition

Control of micturition

In the basic micturition reflex, when the bladder is filled with urine, the high pressure stimulates stretch receptors that trigger spinal reflexes; these reflexes lead to contraction of the detrusor muscle, mediated by parasympathetic neurons, and relaxation of both the internal and the external urethral sphincters, mediated by inhibition of the sympathetic neurons to these muscles.

Incontinence is the involuntary release of urine that occurs most commonly in elderly people (particularly women).

Incontinence

- **Stress incontinence** (induced by exercise/coughing and etc) is usually due to a loss of urethral support provided by the anterior vagina.
- Drug e.g. estrogen-replacement therapy to improve vaginal tone, surgery to improve vaginal support of the urethra and bladder.
- **Urge incontinence** (associated with desire to urinate) can be due to irritation to the bladder or urethra (e.g., with a bacterial infection).