**Clinical note**

**Immotile cilia syndrome**
- Immotility of cilia and flagella; sometimes also dynein deficiency
- Causes male infertility and chronic respiratory tract infections (both sexes)

**Smoking**
- Some sections of epithelial lining from nasal cavity to larynx are stratified squamous – in regions subject to direct airflow or physical abrasion e.g. oropharynx, epiglottis, vocal folds
  - Provides protection from wear and tear
- In smokers, proportion of goblet cells to ciliated cells increases to clear the particulate and gaseous pollutants (e.g. CO2, SO2)
  - Provides rapid clearance
  - BUT reduced cilia means decreased movement of mucus layer - congestion

**Nasal cavities**
- Two components to each nasal cavity
  - External vestibule
  - Internal nasal cavity (fossa)
- External vestibule
  - Skin enters nostrils (nares) sweat glands, sebaceous glands and vibrissae (hairs) to filter out particulate matter
  - Epithelium loses keratinized nature as it gets further into the vestibule and transition to respiratory epithelium
- Nasal cavity
  - Cavernous chambers within the skull separated by osseous nasal septum
  - Conchae: three bony, shelf like projections extending from lateral wall of each nostril (six in total)
    - Superior conchae covered with olfactory epithelium
    - Middle and inferior covered with respiratory epithelium
  - Narrow passage between conchae known as the meatus
    - Increases surface area of the mucous layer for moistening the incoming air and reduces turbulence
    - Located below each conchae
  - Swell bodies: large venous plexuses in the lamina propria of conchae
    - Become engorged with blood every 30 mins, causing distension of the mucosa; airflow is blocked via this nostril so directed via other nostril; allows mucosa to recover from dehydration
• Partly covered by **respiratory epithelium**; numerous seromucous glands underneath
  - Lower folds: **vocal folds/vocal cords**
    - **Stratified squamous epithelium** (protective)
    - Bundles of parallel **elastic fibres** (vocal ligament) and bundles of striated **vocalis muscles**
    - Vocalis muscles regulate tension between the folds and ligaments – variable tension produces different sounds
• Transitions from protective stratified squamous to functional pseudostratified ciliated columnar epithelium (respiratory epithelium)

**Trachea**

• Lined with **respiratory mucosa**; numerous **seromucous** glands in lamina propria produce **watery mucous**
• **C-shaped hyaline cartilage rings** keep lumen open
  - Rings are open on posterior surface against the **oesophagus**, and bridged by **trachealis muscle** (smooth muscle) and **fibroelastic tissue sheet** attached to the perichondrium
  - Prevent collapse- changes in pressure when thorax expands and contract
• Whole trachea surrounded by **adventitia**
• **Trachealis muscle**
  - Relaxes during swallowing to allow oesophagus to bulge into trachea lumen; elastic layer prevents excessive distortion
  - Contracts in cough reflex; narrows tracheal lumen, increased velocity of flow loosens material in the passage

**Bronchial tree and lung**

• At the **hilum** (opening to the lungs), **trachea** divides into two **primary bronchi**
  - Arteries, veins and lymphatic vessels also enter lungs here
• Primary bronchi split into **secondary (lobular) bronchi** – three in right lung and two in left lung
  - Each secondary bronchi supplies a **lobe** of the lungs
• Secondary bronchi divide into **tertiary (segmental) bronchi**
  - Each segmental bronchi and smaller branches comprise a **bronchopulmonary segment** – own connective tissue capsule and blood supply
• Tertiary bronchi divide into smaller bronchi then into **bronchioles**
• Bronchioles enter **pulmonary lobules**
  - Pyramid shaped, apex points to hilum
  - Delimited by thin connective tissue septum
  - Branch to form 5-7 **terminal bronchioles**