

Normal Microbial Flora and • Innate Immune System of Respiratory Tract

• By

• Dr. Syed Yousaf Kazmi

• Assist Prof Microbiology

• OBJECTIVES

- Describe innate immune defense mechanisms of respiratory tract
- Identify normal microbial flora of upper respiratory tract

- Discuss beneficial role & disease causing ability of normal flora of respiratory tract

- INTRODUCTION

- 8,500 L air is conveyed daily by the airway
- Inhaled air contains inorganic substances e.g. smoke and soot as well as organic particles e.g.

pollen, fungi, viruses and
bacteria

□ Structurally and
functionally two main
compartments:

- Conducting part (nasal cavity, naso-pharynx, larynx, trachea, bronchi and bronchioles)
- Respiratory part (terminal bronchial tree & alveoli)

- **INTRODUCTION**

□ **UPPER RESPIRATORY
TRACT**

– Nose, Sinuses, Pharynx

LOWER RESPIRATORY
TRACT

– Larynx, Trachea, Bronchi,
Bronchiole, Alveoli

Most imp portal of entry of
infections into body

Very efficient defense
mechanism

- **INNATE IMMUNITY OF RESP
TRACT**

- Nonspecific host defense not acquired through contact with an antigen e.g. intact skin etc.

- Characteristics of innate immunity

- Resistance that exists prior to exposure
- Readily available
- Non specific
- Does not improve on repeated exposures
- There is no immunologic memory

- Innate immunity of resp tract has following mech

- ANATOMICAL
- PHYSIOLOGICAL

- BIOCHEMICAL
- MICROBIOLOGICAL
- **ANATOMICAL BARRIERS**

- Hair follicles in anterior nares

- Filter large dust / other large airborne particles etc.

- Nasal conchae/ nasal meatus

- Wet surfaces– trap airborne particles

- Mucus blanket–prevents attachment

- Cilia in resp epithelium– dislodge pathogens

- **PHYSIOLOGICAL**

- Cough Reflex

- Helps propel sputum from LRT

- Sneeze Reflex

- Helps expels irritant out from URT

- Mucociliary Escalator

- Constant movement of mucus
from LRT towards pharynx

- Extremely important mech

- Damage to this causes many
infective diseases of LRT

- **MUCO-CILIARY ESCALATOR**

VIDEO

- BIOCHEMICAL &
CELLULAR COMPONENTS

- UPPER RESP TRACT

- Nasal fluid contains

- Lysozyme
- Lactoferrin
- IgA antibodies

- LOWER RESP TRACT

- No cilia

- Alveolar fluid

- Lysozyme
- IgG antibodies

- Alveolar macrophages
(phagocytosis)
 - Neutrophils
- Inflammatory response

- MICROBIOLOGICAL

- Mainly URT
 - LRT is devoid of microbiota
 - Anterior Nostrils
- *Staph aureus*; 20% persistent, 20% non carriers & 60% intermittent carriers
- *Corynaebacterium*,
Propionibacterium
- Nasopharynx

– *Streptococci, Neisseria spp,*
Haemophilis

Oropharynx

– *Ns. meningitidis, S. pneumoniae, S.*
pyogenes, H. influenzae, Candida

- BENEFICIAL ROLE OF
MICROBIOTA

Inhibits attachment of
pathogens

Covers the receptor sites

Physical competition for
nutrients

Create adverse environment
for pathogen by

- Mutual inhibition by metabolic or toxic products
- Mutual inhibition by antibiotic materials or bacteriocins
- Other mechanisms

- **HARMFUL EFFECTS OF
RESPIRATORY FLORA**

ENDOGENOUS INFECTIONS

- URT infections by viruses, smoking etc.–ciliary damage
- Acute bacterial meningitis (*Ns. Meningitidis*)

- Acute lobar pneumonia
(*Streptococcus pneumoniae*)
- Extension of resp flora to sinuses
 - Acute sinusitis
- Nasal packing in epistaxis–
Infective endocarditis (Viridans
Streptococci)

- **HARMFUL EFFECTS OF
RESPIRATORY FLORA**

- Use of antimicrobials
 - Thrush (*Candida*)
- Immune suppression results in
overgrowth of flora

- Acute esophagitis (Candida) in HIV

EXOGENOUS INFECTION/

NOSOCOMIAL INFECTIONS

Surg site infection in hosp by *Staph aureus*

Usually source is healthcare provider

MRSA outbreaks in ITCs/ wards from poor hand hygiene