

1. General properties of obligately anaerobic bacteria

General properties of obligately anaerobic bacteria

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2. General properties of obligately anaerobic bacteria (cont.)...

General properties of obligately anaerobic bacteria

- Obligate aerobes

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3. General properties of obligately anaerobic bacteria (cont.)...

General properties of obligately anaerobic bacteria

- Obligate aerobes
- Facultative anaerobes
- Obligate anaerobes

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4. Anaerobic Bacteria

- Obligate anaerobes
- can not use molecular oxygen as the terminal electron acceptor when present at high concentration
- sensitive to toxic products of oxygen metabolism (ROS=hydrogen peroxide, superoxide radical)
- require reducing environment-- low Eh, usually obtained by eliminating oxygen
- $Eh < -300\text{mv}$

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5. General properties of obligately anaerobic bacteria (cont.)...

General properties of obligately anaerobic bacteria

- Gram negative anaerobes of medical importance
- Members of the normal human colonic flora
- Anaerobes outnumber facultative bacteria
-

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6. Aerobic Host

How can obligately anaerobic bacteria survive in an aerobic host?

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7. Anaerobic environment

How can obligately anaerobic
bacteria survive in an aerobic host?

FIND AN ANAEROBIC
ENVIRONMENT= THE COLON

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8. Poor aeration

How can obligately anaerobic
bacteria survive in an aerobic host?

Find an anaerobic environment=the
colon

In regions of poor aeration

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9. The abscess

How can obligately anaerobic
bacteria survive in an aerobic host?

Find an anaerobic environment
=the colon

In regions of poor aeration

Create an anaerobic environment
=the abscess

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10. General properties of obligately anaerobic bacteria (cont.)...

General properties of obligately anaerobic bacteria

- Gram negative anaerobes of medical importance
- Oral pathogens- *Porphyromonas gingivalis*,
Prevotella melaninogenicus, *Tannerella*
(*Bacteroides*) *forsythusis*

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11. Infections - female

- Infections of the female urino-genital tract
- *Bacteroides bivius*, *Bacteroides vulgatus*

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12. Opportunistic pathogens

Opportunistic pathogens

- Intestinal *Bacteroides* species
-
- peritonitis
- pelvic inflammatory disease
- appendicitis

- *Bacteroides fragilis*, *Bacteroides thetaiotaomicron*, *Bacteroides vulgatus*

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13. Stages in the establishment of an anaerobic infection *B.frag...*

Stages in the establishment of an anaerobic infection *B.fragilis*

- aerotolerance
- Resist exposure to oxygen =
- destroy toxic O₂ products (ROS)
- catalase and peroxidases H₂O₂, R₂O₂
- superoxide dismutase- destroy
superoxide radical

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14. Stages in the establishment of an anaerobic infection (1)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- prevent phagocytosis
- inactivate complement

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15. Stages in the establishment of an anaerobic infection (2)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- Extracellular polysaccharide capsule controlled by promoter switching
- Attach to host cell surfaces

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16. Stages in the establishment of an anaerobic infection (3)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- Attach to host cell surfaces
- Establish anaerobic conditions
 - mixed infection with facultative cells
 - consume residual O₂
 - signal host cells to increase O₂ consumption?

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17. Stages in the establishment of an anaerobic infection (4)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- Attach to host cell surfaces
- Establish anaerobic conditions
- Abscess formation---complex capsule structure stimulates host to 'wall off' the site of infection

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18. Stages in the establishment of an anaerobic infection (5)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- Attach to host cell surfaces
- Establish anaerobic conditions
- Abscess formation---complex capsule
- Obtain nutrients for growth
- glycohydrolases, proteases

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19. Stages in the establishment of an anaerobic infection (6)

Stages in the establishment of an anaerobic infection

- Resist exposure to oxygen=aerotolerance
- Evade host defense mechanisms
- Attach to host cell surfaces
- Establish anaerobic conditions
- Abscess formation---complex capsule
- Obtain nutrients for growth
- glycohydrolases, proteases

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20. Stages in the establishment of an anaerobic infection (7)

Stages in the establishment of an anaerobic infection

- Establish anaerobic conditions
- Abscess formation---complex capsule
- Obtain nutrients for growth
- **Resist antibiotic treatment**
- **intrinsic resistance to penicillin**
- **acquired resistance to clindamycin, carbapenems, metronidazole**
-

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21. Stages in the establishment of an anaerobic infection (8)

Stages in the establishment of an anaerobic infection

- **Resist antibiotic treatment**
- **intrinsic resistance to penicillin**
- **acquired resistance to clindamycin, carbapenems, metronidazole**
- **transposons, plasmids, conjugation**

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