

1. Neisseriae gonorrhoeae (the gonococcus)

Neisseria gonorrhoeae (the gonococcus)

- Gram-negative diplococcus
- Oxidase positive
- Can ferment glucose but not maltose
- Two serovars, IA and IB. 58 serotypes IA 1-26, and IB 1-32

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2. Encountering *N. gonorrhoeae*

Encountering *N. gonorrhoeae*

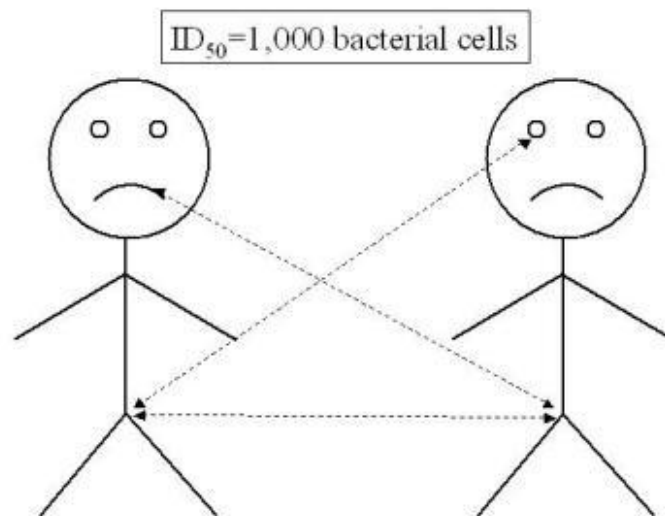
Mixing and mashing of membranes...

- Horizontal spread
- Vertical spread

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3. Horizontal spread of *N. gonorrhoeae*

Horizontal spread of *N. gonorrhoeae*



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4. Entry, multiplication and spread

Entry, Multiplication and Spread

- Mucosal secretions, semen, menstrual blood, inflammatory exudates (pus) - all carry Gc
- Gc can colonize many mucosal surfaces
- Spread: Local, sometimes Systemic

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5. Damage to host

Damage to host

- Damage by Gc:
 - no known exotoxins, but LPS
 - sloughing-off of ciliated cells
- Damage by immune system
 - inflammation

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6. *N. gonorrhoeae* Virulence Factors

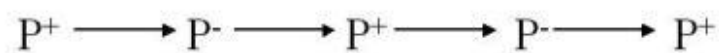
N. gonorrhoeae Virulence Factors

- Pili (receptor is CD46 [MCP])
- Opa proteins
- LPS
- Miscellaneous

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7. Pili phase variation

Pili phase variation



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8. Phase variation occurs

Phase variation occurs by changes in reading-frame of the pilin gene

```
ATG CTC TTC TCT TCT CTT AAA CTA |  
Met leu phe ser ser leu lys leu |
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9. English example of shift

English example of shift in reading-frame

THE BIG RED DOG SAT.
↓ Deletion of letter "B"
causes shift in reading frame
THE IGR EDD OGS AT.

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10. Phase variation

Phase variation occurs by changes in reading-frame of the pilin gene

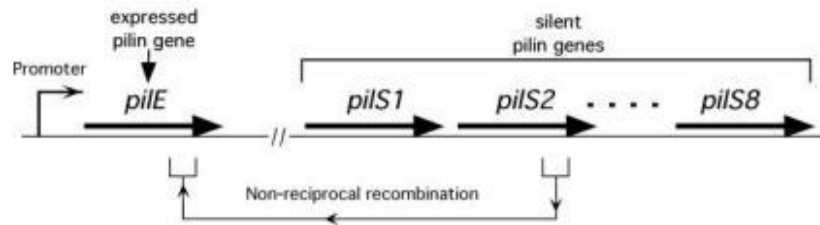
ATG CTC TTC TCT TCT CTT AAA CTA |
Met leu phe ser ser leu lys leu |
↓ Deletion of one repeat
cause shift in reading frame
ATG CTC TTC TCT TAA ACT A |
Met leu phe ser stop

Mytonic dystrophy, Huntington's, Fragile X mental retardation,
Friedreich's ataxia...

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11. Pilin "antigenic" variation

Pilin "antigenic" variation by gene conversion events



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12. Opacity-associated proteins (OPAs)

Opacity-associated proteins (OPAs)

- 11 *opa* genes, but usually only 0-2 are expressed at one time
- Phase variation via changes in the number of tandem 5 bp repeats in each *opa* gene
- Functions
 - adhesion to epithelial cells
 - cell invasion

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13. Lipopolysaccharide (LPS)

Lipopolysaccharide (LPS)

- Phase variation of epitopes
- Molecular mimicry
 - outer core oligosaccharides are identical to ABH blood group antigens
 - Sialylation using host CMP-NANA as donor
- Function
 - adhesion
 - serum resistance

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14. Other virulence factors

Other virulence factors of *N. gonorrhoeae*

- Catalase
- IgA1 proteases
- Iron acquisition
- Intracellular growth?

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15. N. meningitidis

N. meningitidis

- Gram-negative diplococcus
- Oxidase positive
- Can ferment glucose and maltose
- Eight serotypes; A, B, C and W-135 cause majority of meningitis
- Normal flora?

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16. Encountering *N. meningitidis*

Encountering *N. meningitidis*

- Horizontal spread via respiratory droplets
- Peak incidence 6-24 months

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17.

Usual spinal fluid characteristics

Usual Spinal Fluid Characteristics in Various Types of Meningitis

Type	Total Cells (type)	Protein (mg/dl)	Glucose (mg/dl)
Normal	0-5 (mononuclear)	<40	>50*
Bacterial meningitis	high (PMNs) (100-5000)	100-1000	very low (<40)
Tuberculosis meningitis	low (mono) (<500)	100-200	low (<40)
Cryptococcal meningitis	low (mono) (10-200)	50-200	low (<40)
Viral meningitis	low (mono) (10-300)	50-100	normal

*(>50% of simultaneous serum glucose)

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