Microm 410 Fall 2009: Myxo & Rhizo
Dr.Matt Parsek

The Myxobacteria

1. Gram negative rod shaped cells without a flagellum
2. Lives in soil- exists as a predator and saprophyte
3. Engages in many social behaviors- swarming motility, intercellular communication, and the formation of fruiting bodies
4. Some of the largest prokaryotic chromosomes
5. Fruiting bodies are filled with myxospores

Table 15.20 Classification of the fruiting myxobacteria[a]

Characteristics	Genus/DNA (mol% GC)
Vegetative cells tapered:	
Spherical or oval myxospores, fruiting bodies usually soft and slimy without well-defined sporangia or stalks	*Myxococcus* (68–71)
Rod-shaped myxospores: Myxospores not contained in sporangia, fruiting bodies without stalks	*Archangium* (67–68)
Myxospores embedded in slime envelope:	
Fruiting bodies without stalks	*Cystobacter* (68)
Stalked fruiting bodies, single sporangia	*Melittangium* (—)
Stalked fruiting bodies, multiple sporangia	*Stigmatella* (68–69)
Fruiting bodies are dark-brown clusters consisting of tiny spherical or disclike sporangia with an outer wall	*Angiococcus* (—)

[a] Phylogenetically, those species examined fall into the delta subdivision of the Proteobacteria (see Table 12.1).

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Table 15.20 Classification of the fruiting myxobacteria[a]

Characteristics	Genus/DNA (mol% GC)
Vegetative cells not tapered (blunt, rounded ends); myxospores resemble vegetative cells; sporangia always produced:	
Fruiting bodies without stalks; myxospores rod-shaped	*Polyangium* (69)
Fruiting bodies without stalks; myxospores oval; highly cellulolytic	*Sorangium* (—)
Fruiting bodies without stalks; myxospores coccoid	*Nannocystis* (70–72)
Stalked fruiting bodies	*Chondromyces* (69–70)

[a] Phylogenetically, those species examined fall into the delta subdivision of the Proteobacteria (see Table 12.1).

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Hans Reichenbach

Figure 12-46a Brock Biology of Microorganisms 11/e
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Hans Reichenbach

Figure 12-46c Brock Biology of Microorganisms 11/e
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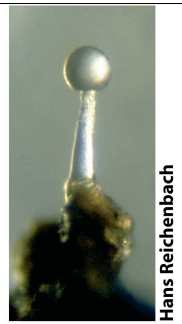
Hans Reichenbach

Figure 12-46b Brock Biology of Microorganisms 11/e
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Fruiting body development is a complex process that involves:

1) Intercellular communication

"A Signaling"

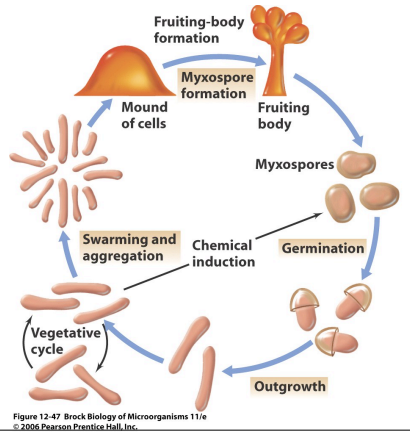
"C Signaling"

2) Two forms of motility

"Social Motility"

"Adventerous Motility"

A cartoon of *Myxococcus xanthus* fruiting body development:



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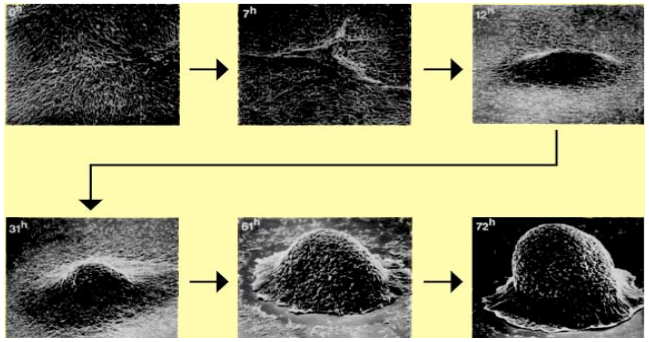

Fruiting body formation under starvation conditions (~100,000 cells).
Cells on the inside of the structure develop into spores.

Factors important for initiation of fruiting body development:

1. Solid surface
2. Appropriate cell density
3. Must perceive nutrient down shift

The cell uses A signaling and the stringent response

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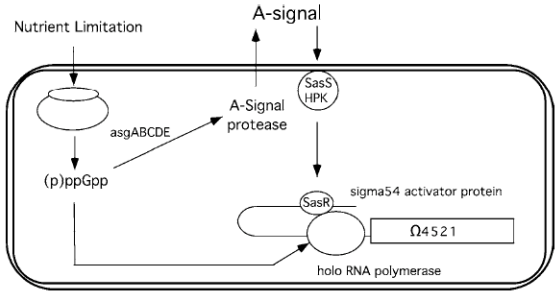
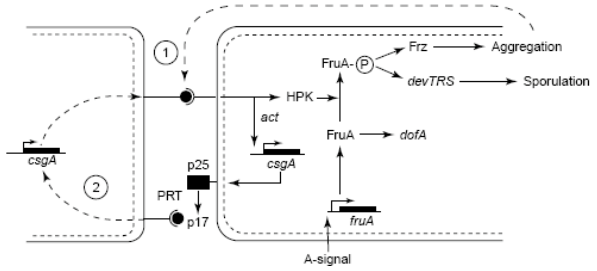
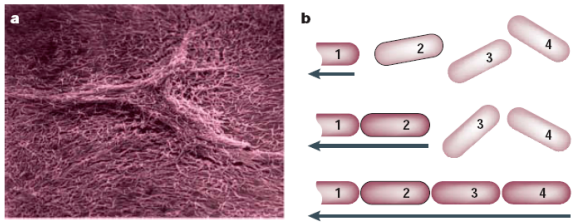
The Basic Model for A-signaling



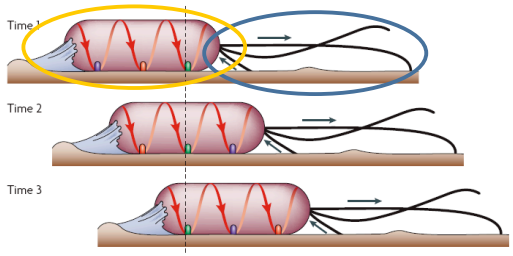
The Basic Model for C-signaling and developmental gene regulation at the aggregation stage



Streaming motility and aggregate formation



Two types of motility are required for fruiting body development



Social Motility
Adventerous Motility

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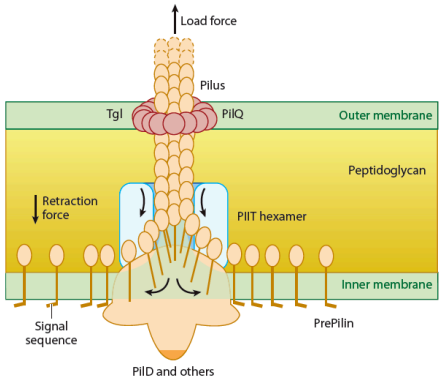
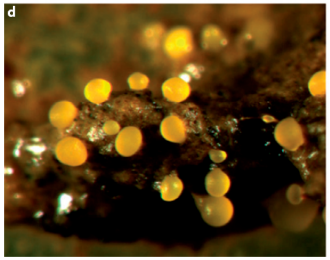
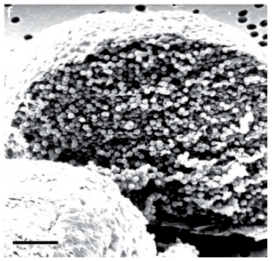
Molecular Model for Type IV Pilus function (S-Motility)





Myxococcus xanthus fruiting bodies



A cutaway of a fruiting body showing myxospores

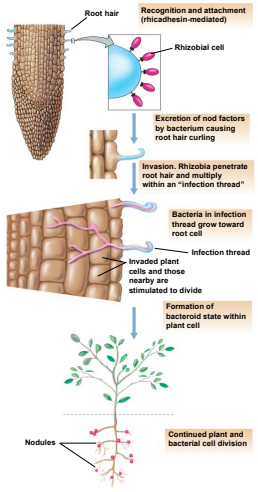
Table 24-7

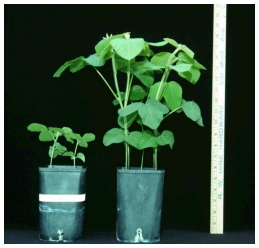
Table 24.7 Major cross-inoculation groups of leguminous plants

Host plant	*Nodulated by*
Pea	*Rhizobium leguminosarum* biovar *viciae*[a]
Bean	*Rhizobium leguminosarum* biovar *phaseoli*[a]
Bean	*Rhizobium tropici*
Lotus	*Mesorhizobium loti*
Clover	*Rhizobium leguminosarum* biovar *trifolii*[a]
Alfalfa	*Sinorhizobium meliloti*
Soybean	*Bradyrhizobium japonicum*
Soybean	*Bradyrhizobium elkanii*
Soybean	*Sinorhizobium fredii*
Sesbania rostrata (a trophical legume)	*Azorhizobium caulinodans*

[a]Several varieties (biovars) of *Rhizobium leguminosarum* exist, each capable of nodulating a different legume.

Fig. 24-45





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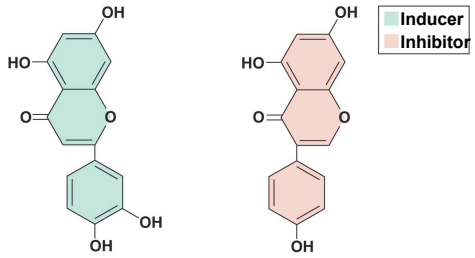
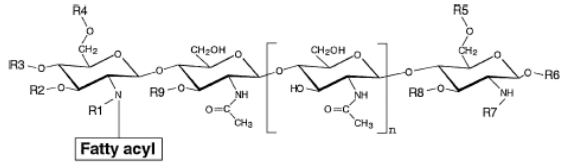
Flavenoids: Signals initiating the symbioses



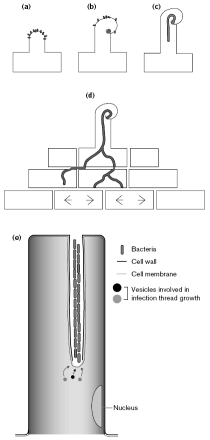
(a) 5, 7, 3′,4′-Tetrahydroxyflavone (b) 5, 7, 4′-Trihydroxyisoflavone

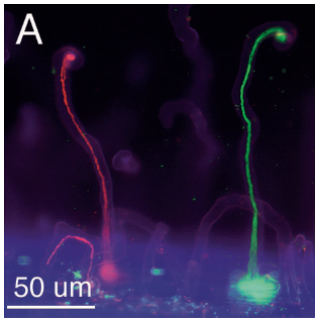
Fig. 24-48

General structure of a Nod factor

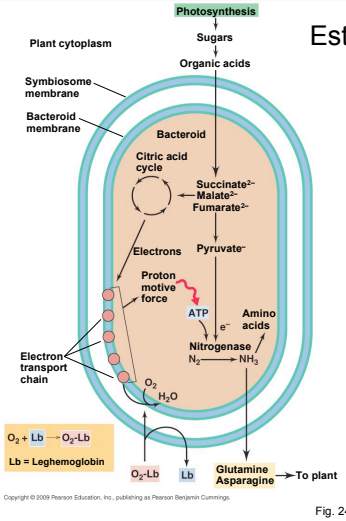


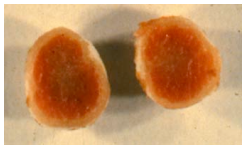
Root infection threads





Establishing the Bacteroid





Cross-section of nodule

Fig. 24-49