



Agrobacterium

Agrobacterium

- *Agrobacterium* spp. su poznate kao predstavnici zemljišne mikroflore koji zaražavaju dikotiledone zeljaste i drvenaste biljke iz 140 rodova i preko 60 familija, uključujući ekonomski značajne vrste voćaka, vinovu lozu i ukrasne biljke (ruža, dalia, hrizantema).

Agrobacterium

- Po ostvarenju infekcije nekim sojevima *Agrobacterium* sp., dolazi do genetske transformacije biljne ćelije što dovodi do njenog pojačanog umnožavanja (hiperplazija) pri čemu dolazi do formiranja tumora (rak korena) ili stimulisanja razvoja adventivnih korenova (kosmatost korena). Kao posledica nekontrolisanog razvoja biljnog tkiva može doći i do poremećaja u transportu vode i hranljivih materija i pojave zastoja u porastu biljaka.

Agrobacterium

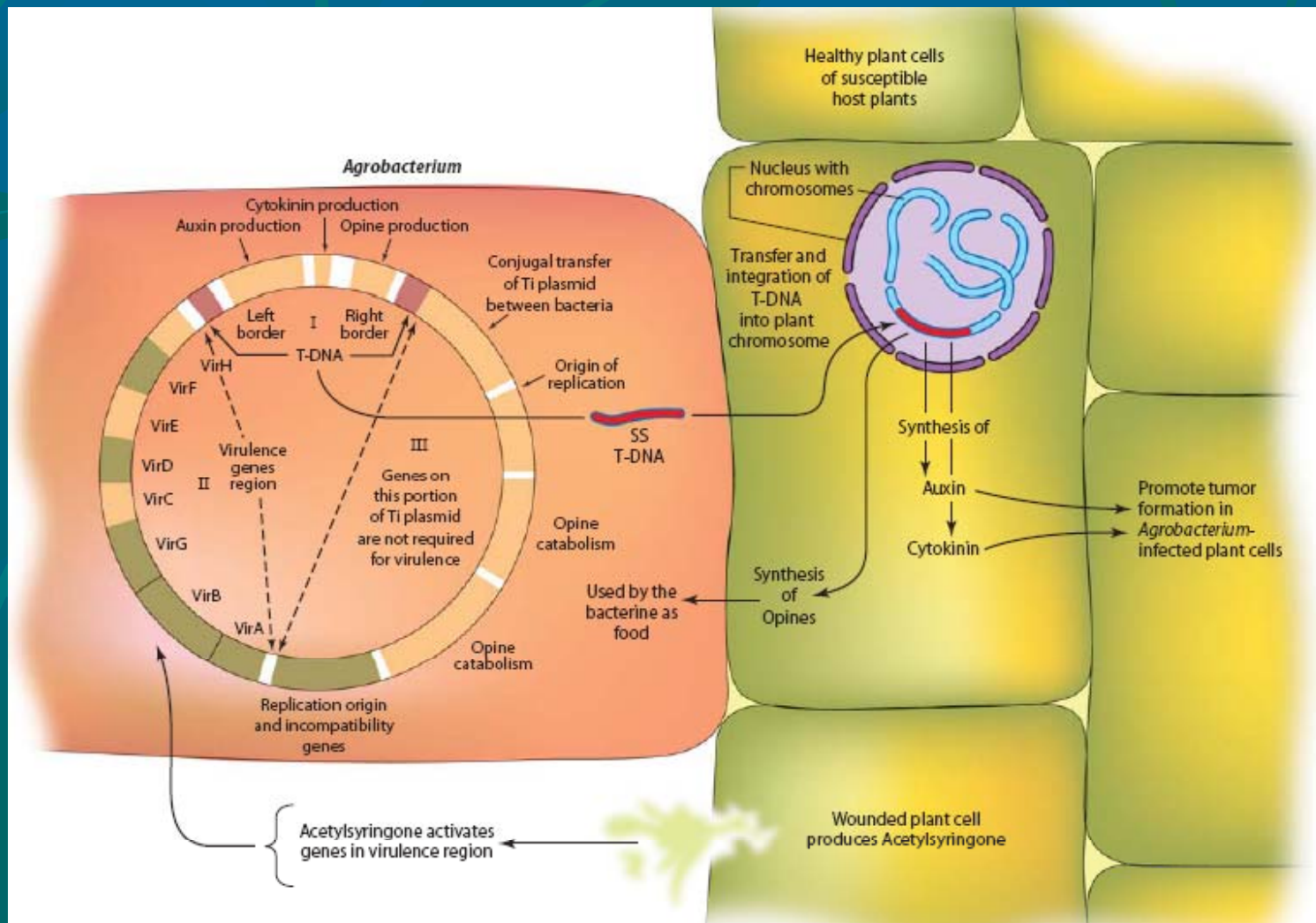
Patogeni sojevi *Agrobacterium* poseduju zajedničku karakteristiku da sadrže najmanje jedan veliki plazmid: Ti (tumor-inducing) ili Ri (root-inducing) plazmid.

Predstavnici ovog roda prouzrokuju bolesti tipa raka korena i korenovog vrata i kosmatosti korena.

- Rak korena i korenovog vrata prouzrokuju sojevi koji poseduju tumor-inducing (Ti) plazmid
- Kosmatost korena prouzrokuju sojevi koji sadrže root inducing (Ri) plazmid

Agrobacterium

- U inficiranoj biljnoj ćeliji dolazi do poremećaja u stvaranju biljnih hormona (auksin, citokinin) što dovodi do nekontrolisanog uvećavanja i umnožavanja ćelija. Odnos auksina i citokinina određuje tip tumora.



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Table 1. Poređenje nove i stare nomenklature vrsta roda *Agrobacterium*

Nova taksonomija*

Stara taksonomija

A. tumefaciens

A. tumefaciens biovar 1

A. radiobacter biovar 1

A. rhizogenes biovar 1

A. rhizogenes

A. tumefaciens biovar 2

A. radiobacter biovar 2

A. rhizogenes biovar 2

A. vitis

A. tumefaciens biovar 3

A. radiobacter biovar 3

A. rubi

A. rubi

A. larrymoorei

*Individual strains in the species may be tumorigenic, rhizogenic, or nonpathogenic

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Zajedničke karakteristike:

- Aerobne, Gram-negativne, štapićastog oblika (0.6-1.0 μm X 1.5-3.0 μm)
- Asporogene
- Pokretne pomoću 1-6 peritriho raspoređenih flagela
- Produkuju extraćelijske polisaharide u vidu obilne sluzi na podlozi bogatoj ugljenim hidratima
- Optimalna temperatura 25-28°C
- Katalaza pozitivne
- Uglavnom oksidaza i ureaza pozitivne

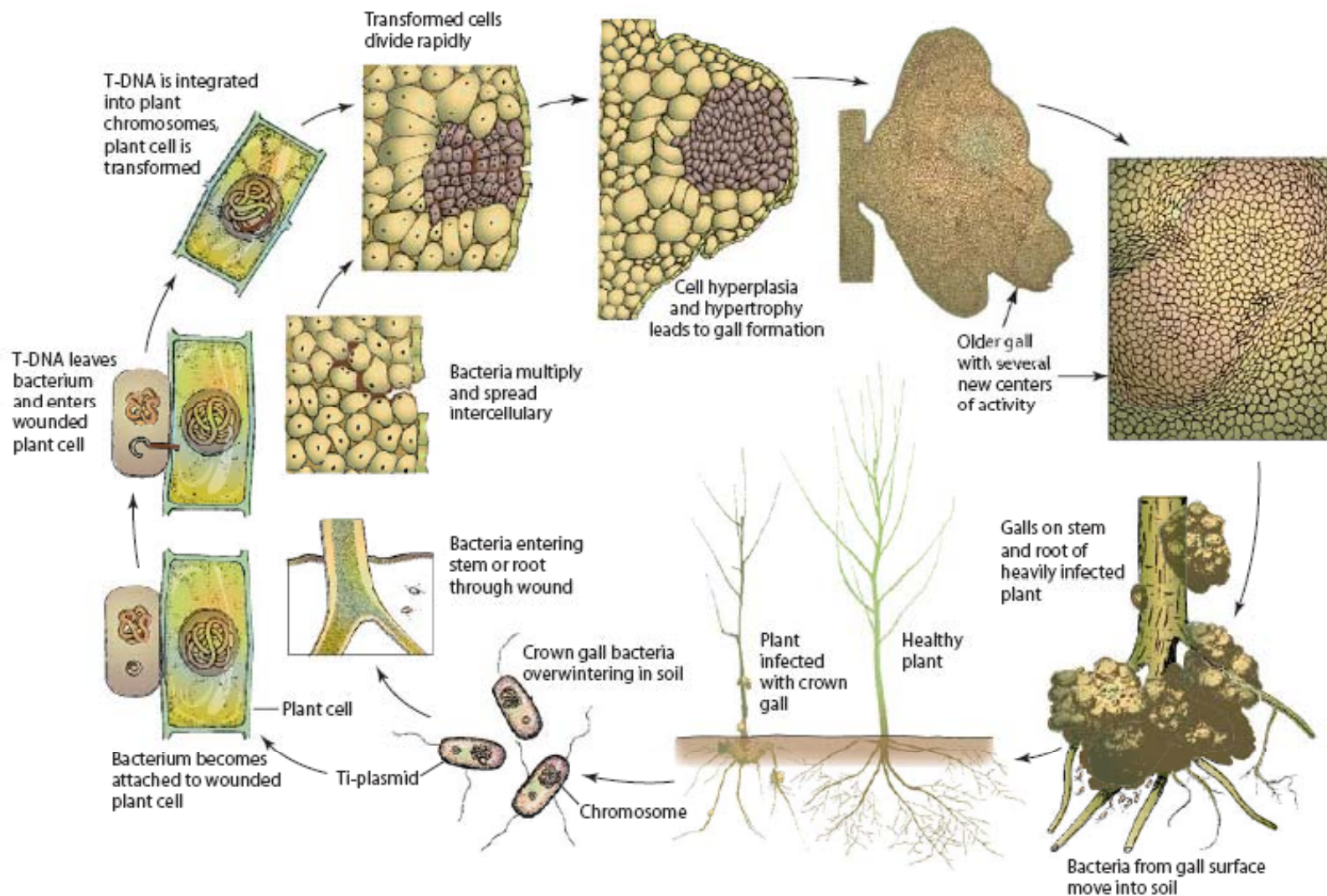


FIGURE 12-36 Disease cycle of crown gall caused by *Agrobacterium tumefaciens*.

Agrobacterium



Agrobacterium tumefaciens (rak korena)

Agrobacterium



Crown gall caused by *Agrobacterium tumefaciens*; note gall at crown of rose plant or just below soil surface.



Crown gall on rose caused by *Agrobacterium tumefaciens*; galls on aerial portion of cane.



Agrobacterium vitis – rak vinove loze



Agrobacterium vitis (rak vinove loze)

Agrobacterium vitis – rak vinove loze



Agrobacterium

- *Agrobacterium rubi*
(rak izdanaka kupine)



Crown gall on black
raspberry cane; young,
fleshy galls caused by
Agrobacterium
tumefaciens.

Agrobacterium



Crown gall of *Ficus benjamina*, caused by *Agrobacterium tumefaciens*.

Agrobacterium larrymoorei (rak fikusa)

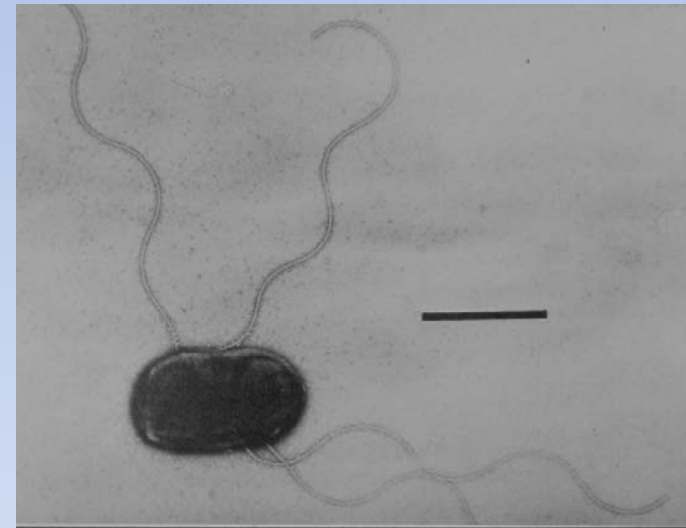
Causal agent of disease

- ***Agrobacterium vitis* (Ti)** (Ophel and Kerr, 1990)



Host-specific to grapevine

- Gram negative
- Nonsporeforming
- Rod-shaped (0.6–1.0 × 1.5–3.0 μm)
- Occurring singly or in pairs
- Motile by 1–4 peritrichous flagella
- Aerobic



- *A. tumefaciens* (biovar I) (Ti)
- *A. rhizogenes* (biovar II) (Ti)



Broad host range pathogens

Economic significance

- Reduces vigor and yield of grapevines
- Severe disease may cause partial or complete death of infected plants
- High losses occur especially in nurseries where different graft combinations with visible symptoms are unmarketable and must be discarded



Symptoms



Tissue proliferation



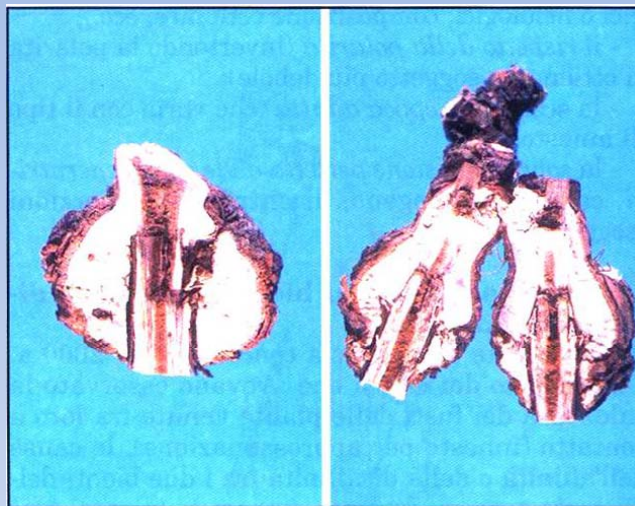
Symptoms

Root decay

Both tumorigenic and nontumorigenic *A. vitis* strains



Symptoms



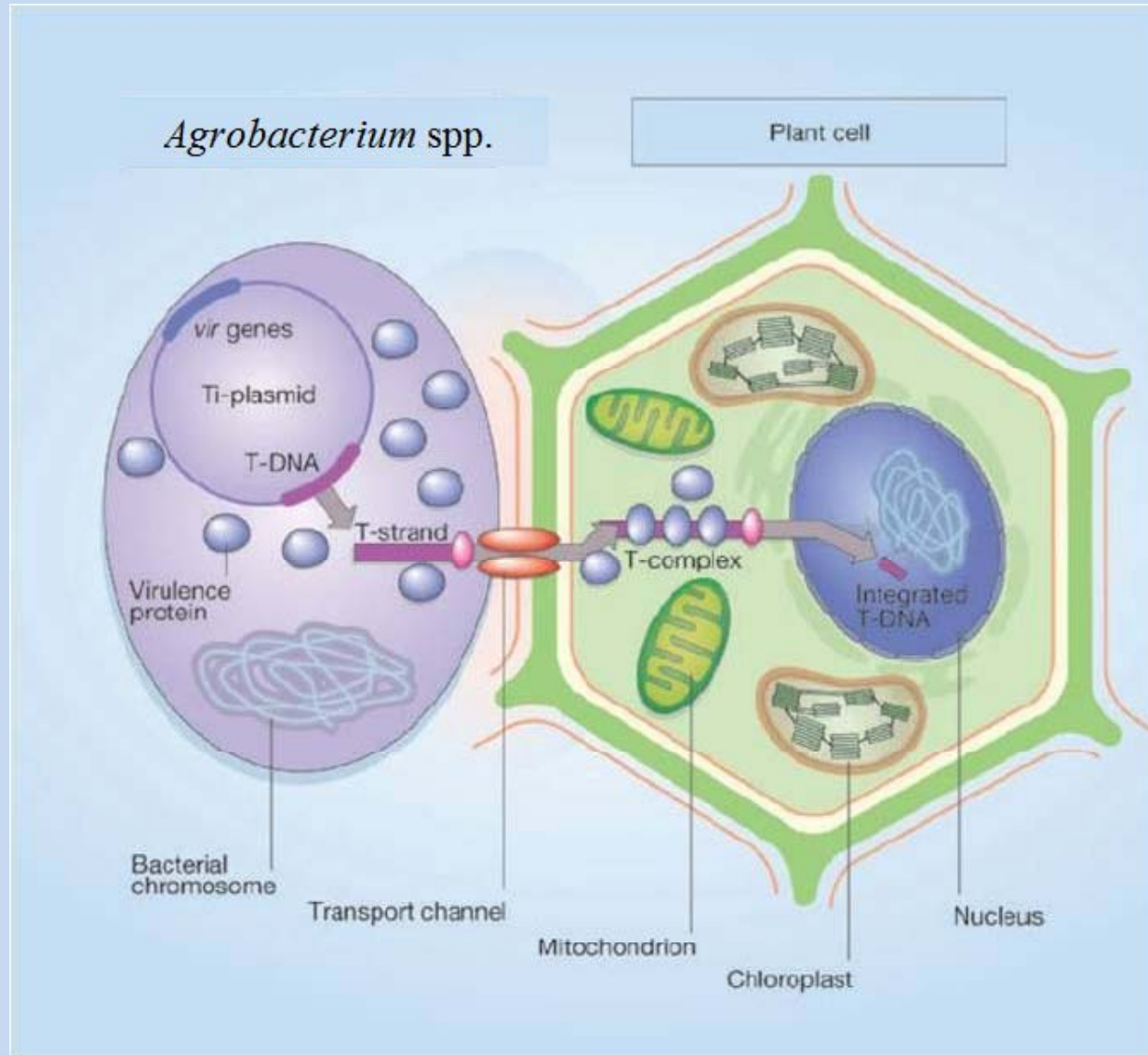
“Big head” phenomenon



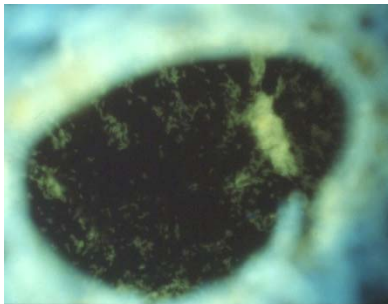
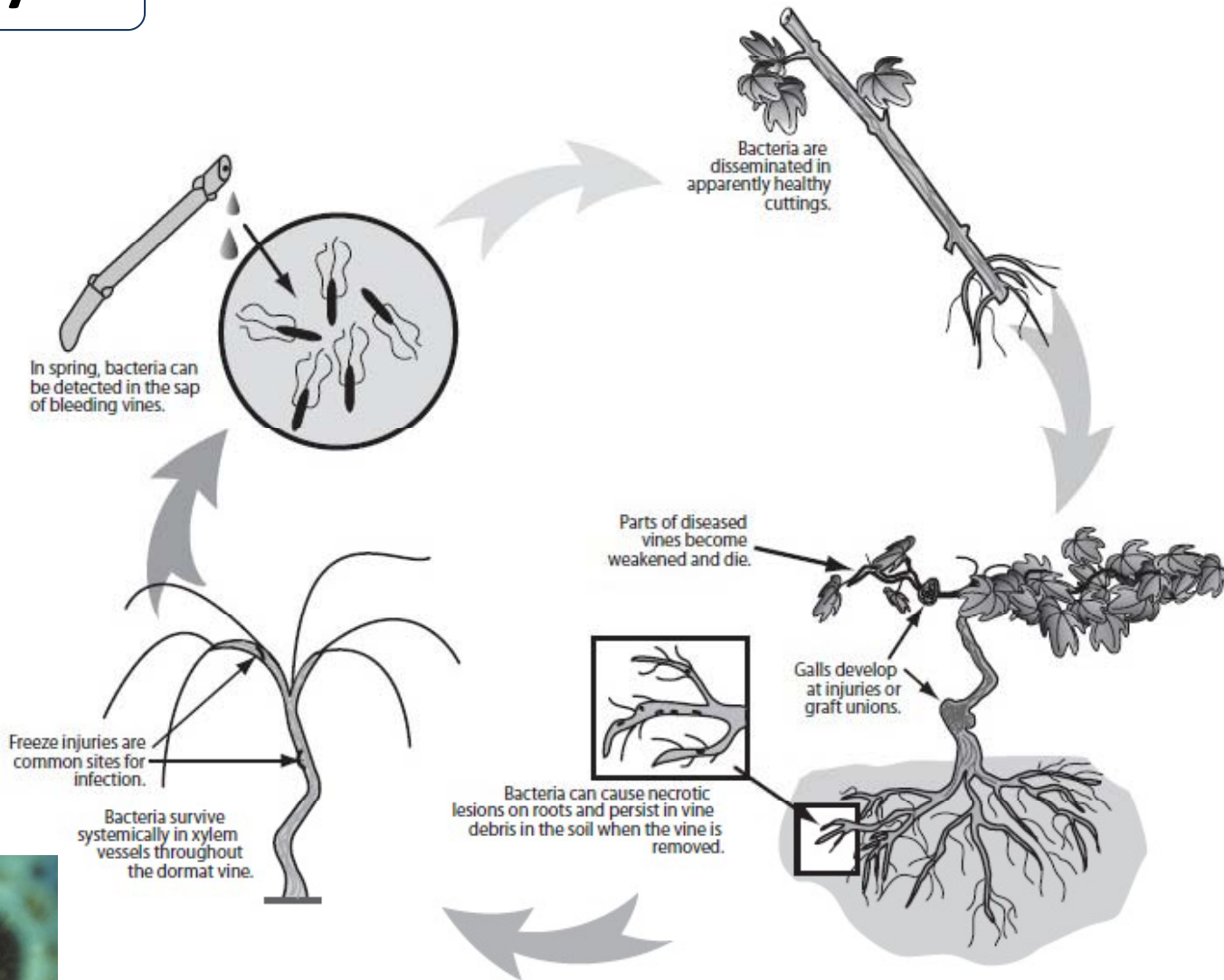
Crown gall



Infection process



Disease cycle



(Burr et al., 1998)

Agrobacterium spp.

Zaštita:

- Sanitarne mere tokom kalemljenja i presađivanja
- Zdrav matični i sadni materijal
- Dezinfekcija supstrata u objektima za proizvodnju sadnog materijala
- Plodored
- Biološka zaštita (soj K-84 *A. radiobacter*)

Biološka zaštita

Biocontrol Products Produced by Bacteria or Fungi and Available Commercially in the USA as of 2003

Name	Source	Target pathogen(s)	Crop(s)	Application
<u>Bacterial</u>				
Galltrol	<i>Agrobacterium radiobacter</i> strain 84	<i>A. tumefaciens</i> crown gall	Fruit and ornamental nursery stock grapes, brambles	Slurry to seeds, seedlings, drench
Nogall	<i>A. radiobacter</i> strain K1026	<i>A. tumefaciens</i> crown gall	Fruit, nut, and ornamental nursery stock	Suspension, drench