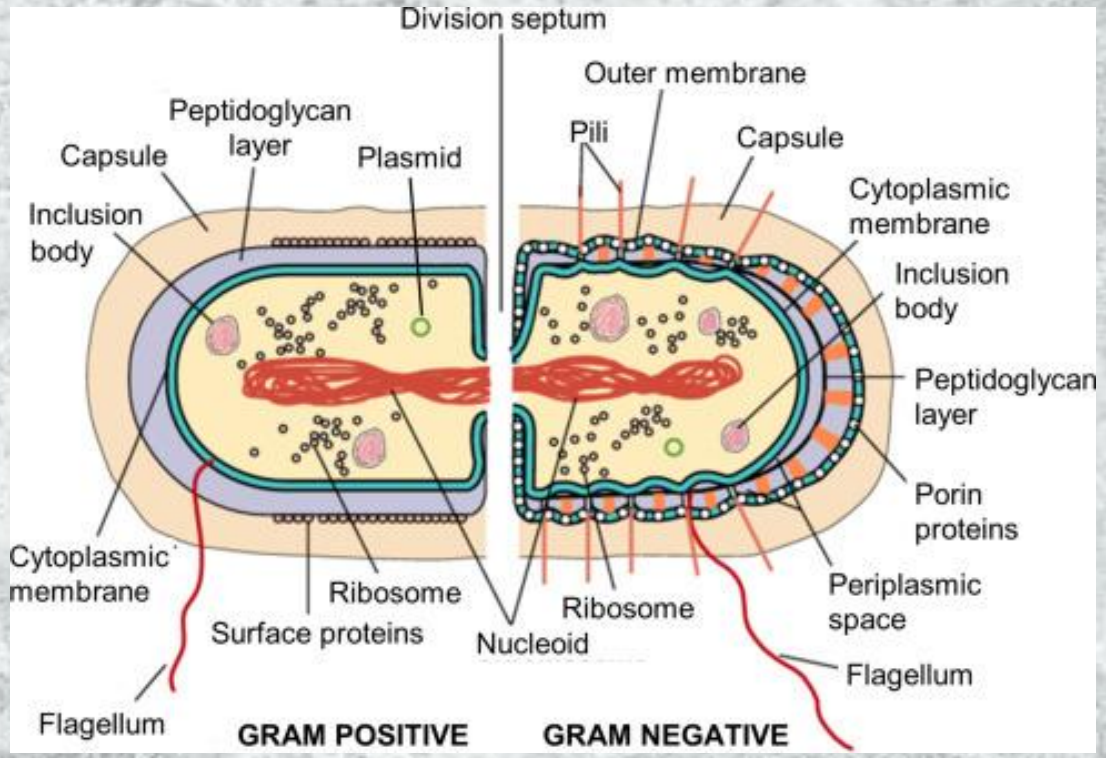
Unutrašnja struktura bakterijske ćelije

Spore

Prof. dr Andrea Radalj

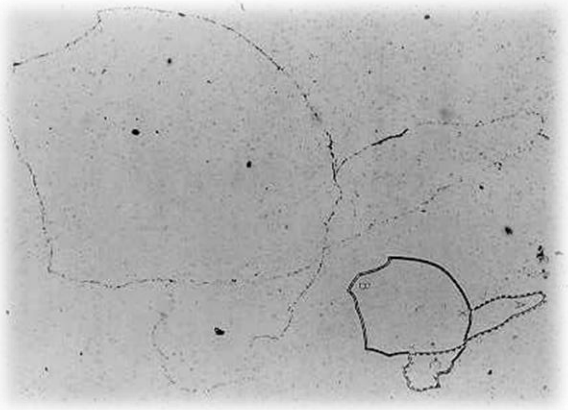
Citoplazma

- Supstanca unutar citoplazmatske membrane
  - 80 % voda
  - Proteini
  - Ugljeni hidrati
  - Lipidi
  - Neorganski joni
- Odsustvo citoskeleta



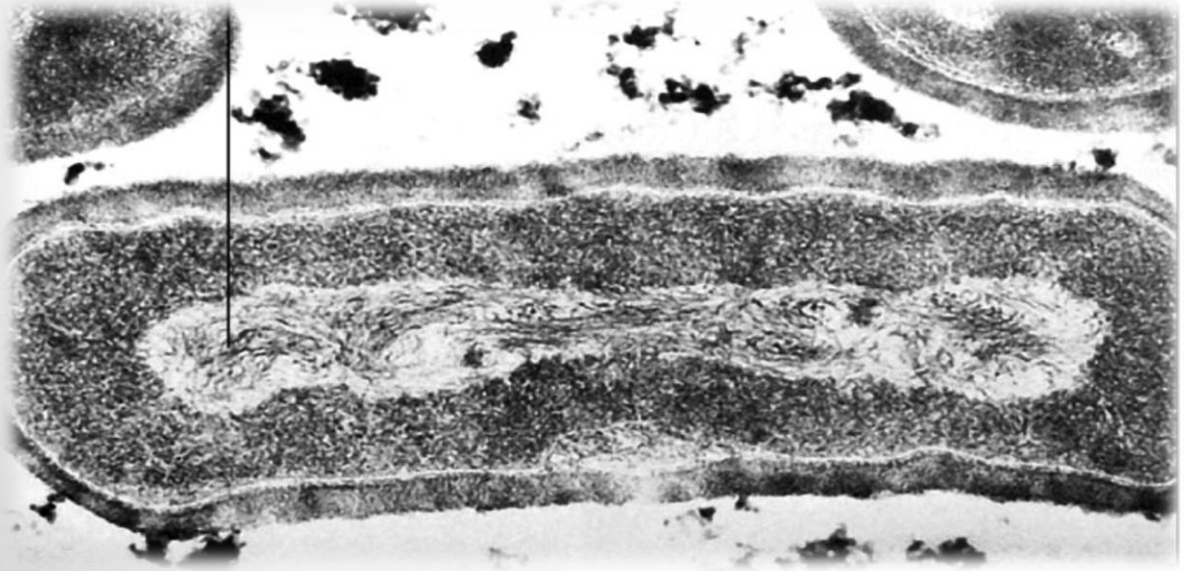
Murray PR, Rosenthal KS and Pfaller MA (2015) *Medical Microbiology*. Philadelphia: Elsevier, pp. 107.

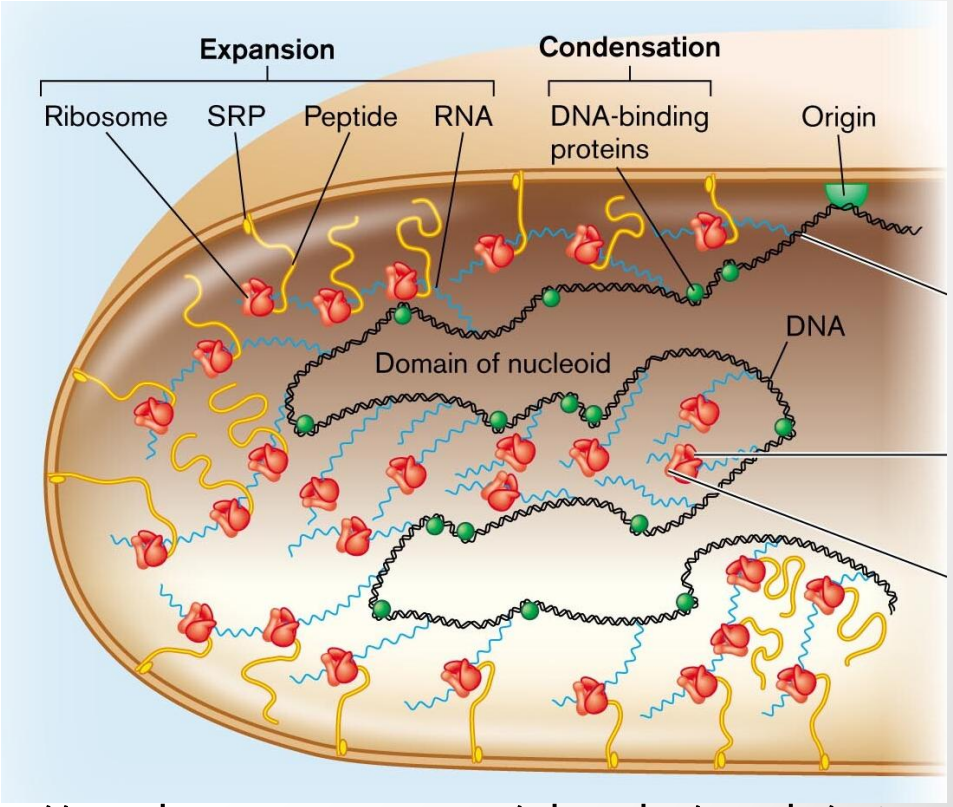
Bakterije – prokariote nemaju jedro



- Bakterije su haploidne ćelije - imaju samo jedan hromozom u okviru NUKLEOIDA

  Većina gena prisutna u hromozomu (konstitutivni i privremeni)
- Hromozom bakterija je cirkularni molekul DNK - samoreplikujući genetski element.

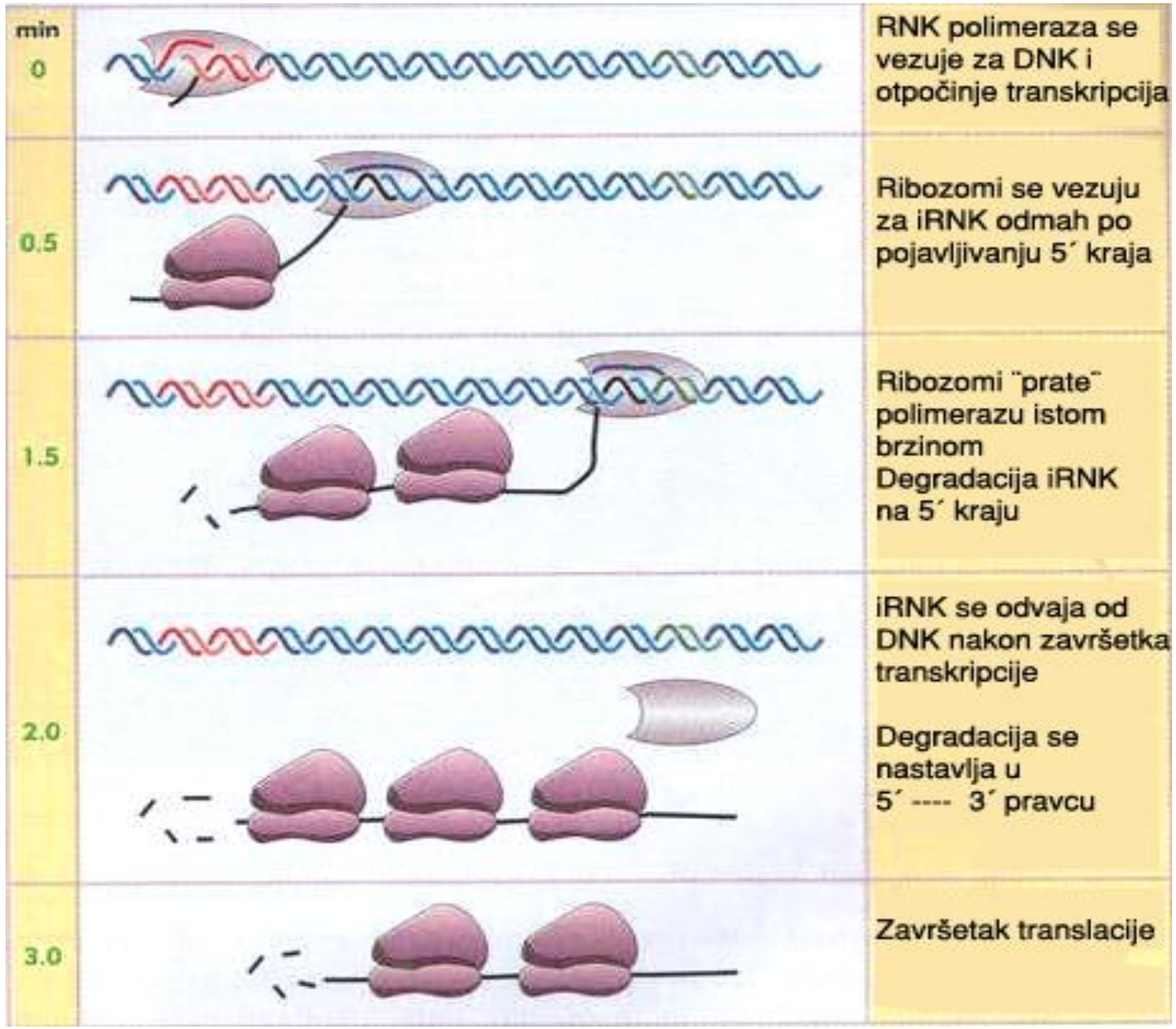




https://nerd.wwnorton.com/ebooks/epub/microbio6/EPUB/content/3.4-chapter03.xhtml

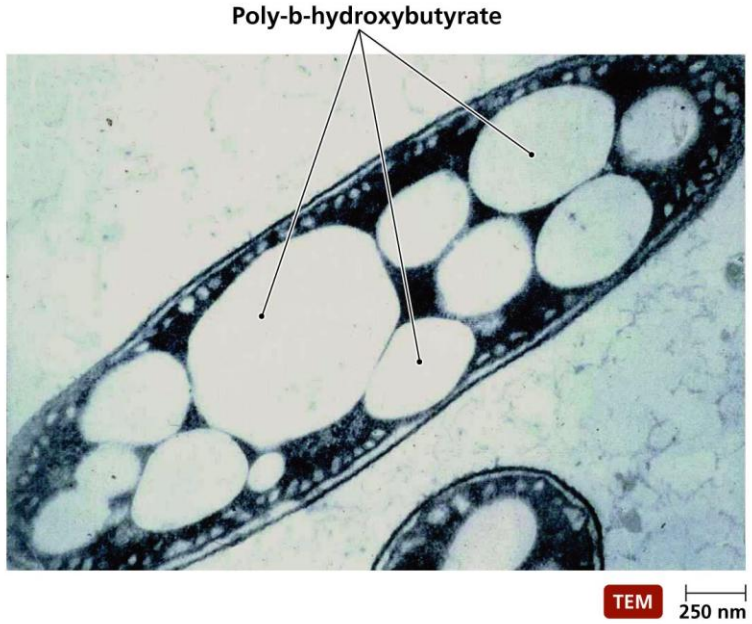
Organele

- Ribozomi – sinteza proteina
  - 70 S – dve subjedinice 50 S i 30 S



Organele

- Inkluzije – rezervne materije, nisu prisutne kod svih vrsta
  - Metahromatske granule – neorganski fosfat
  - Inkuzije sa glikogenom, skrobom, lipidima, sumporom



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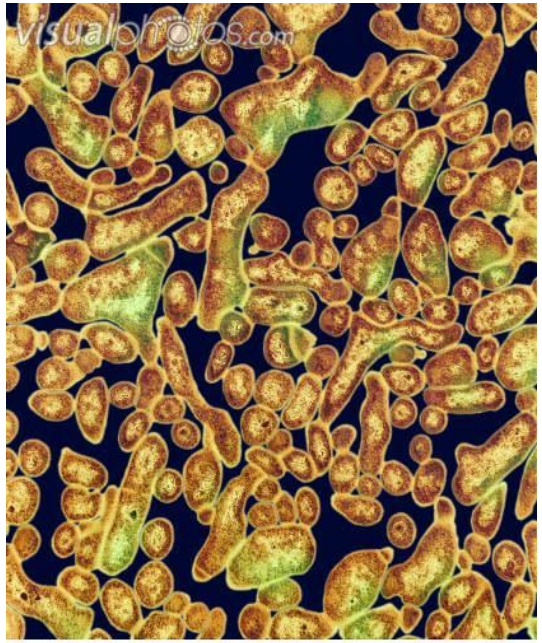


BG6326 [RM] © www.visualphotos.com

Spore bakterija

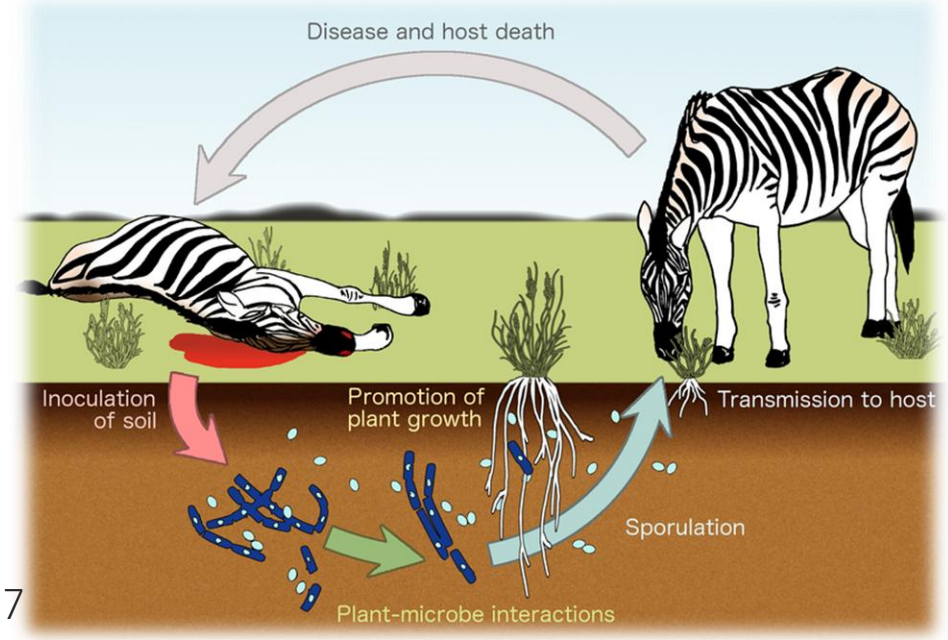
Sitna ovalna telašca

Neke vrste Gram-pozitivnih bakterija

Npr. *Bacillus* i *Clostridium*

Veoma otporne i metabolički neaktivne

Opstanak u nepovoljnim uslovima sredine



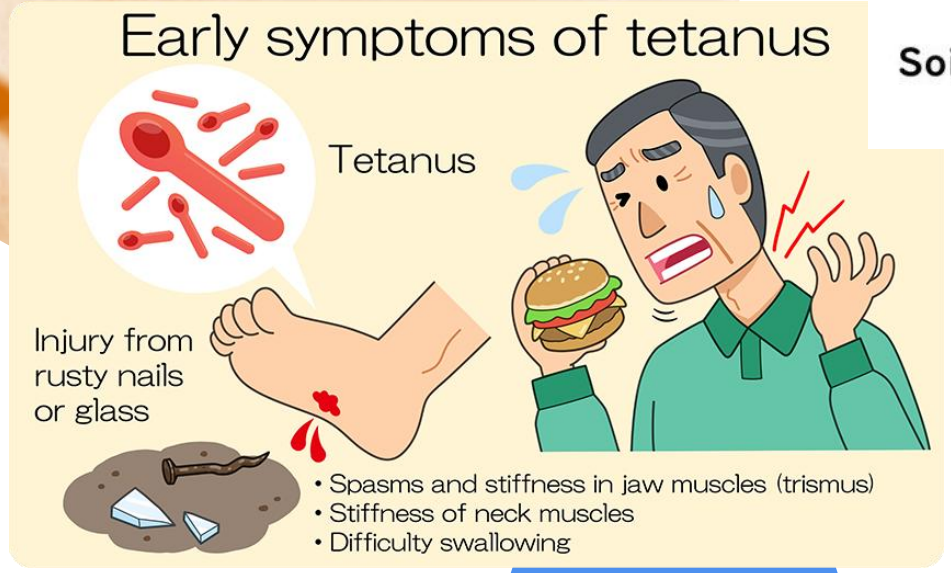
Ilustracija - Kelsey Wood.
doi:10.1371/journal.pntd.0002903.g007

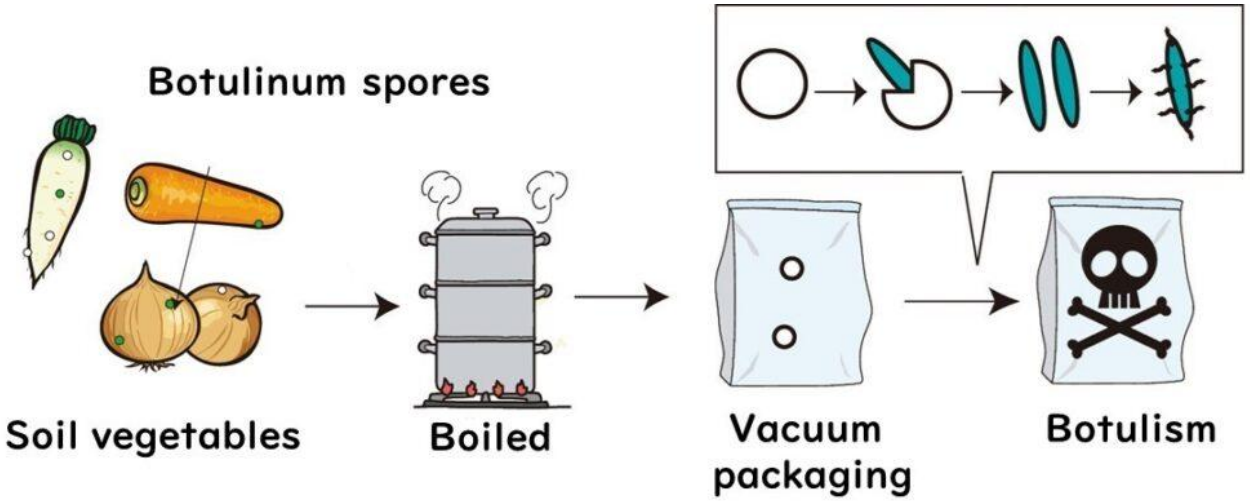
Bakterije se ne razmnožavaju sporama!

Prenošenje bolesti

Teškoće kod sterilizacije

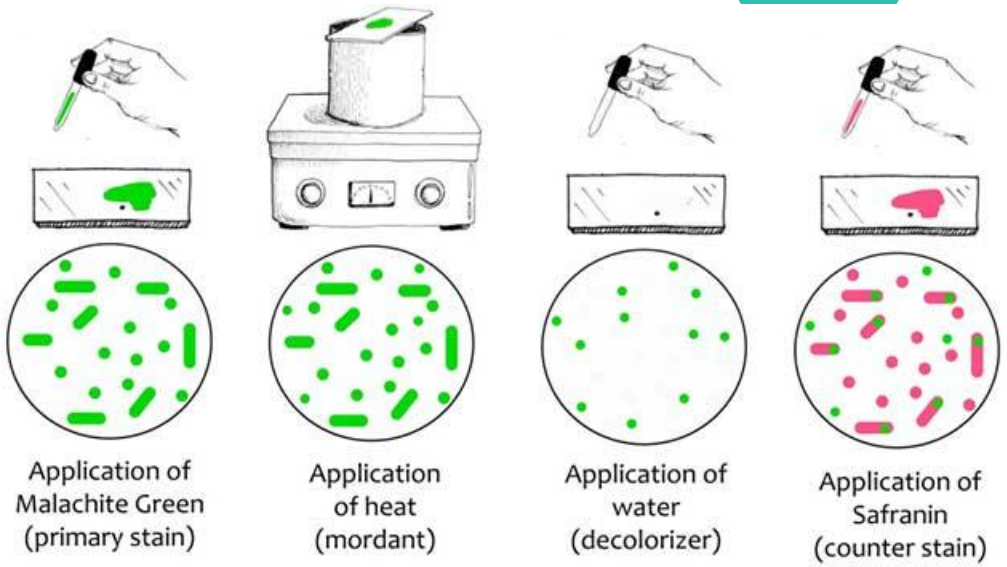
Priprema hrane - konzerve

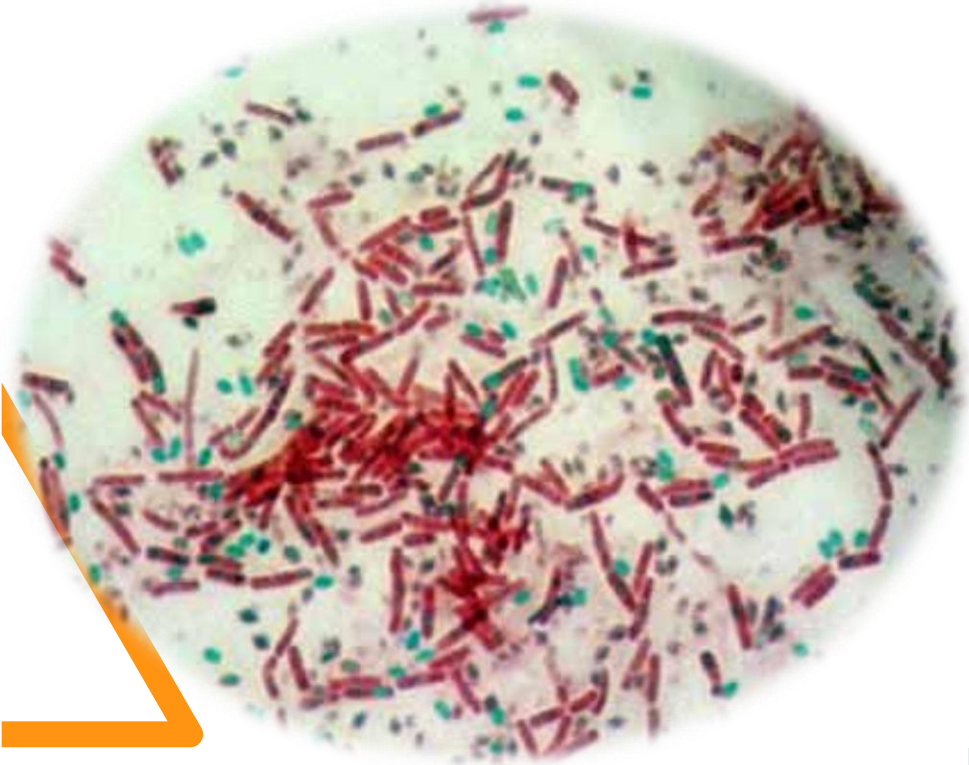


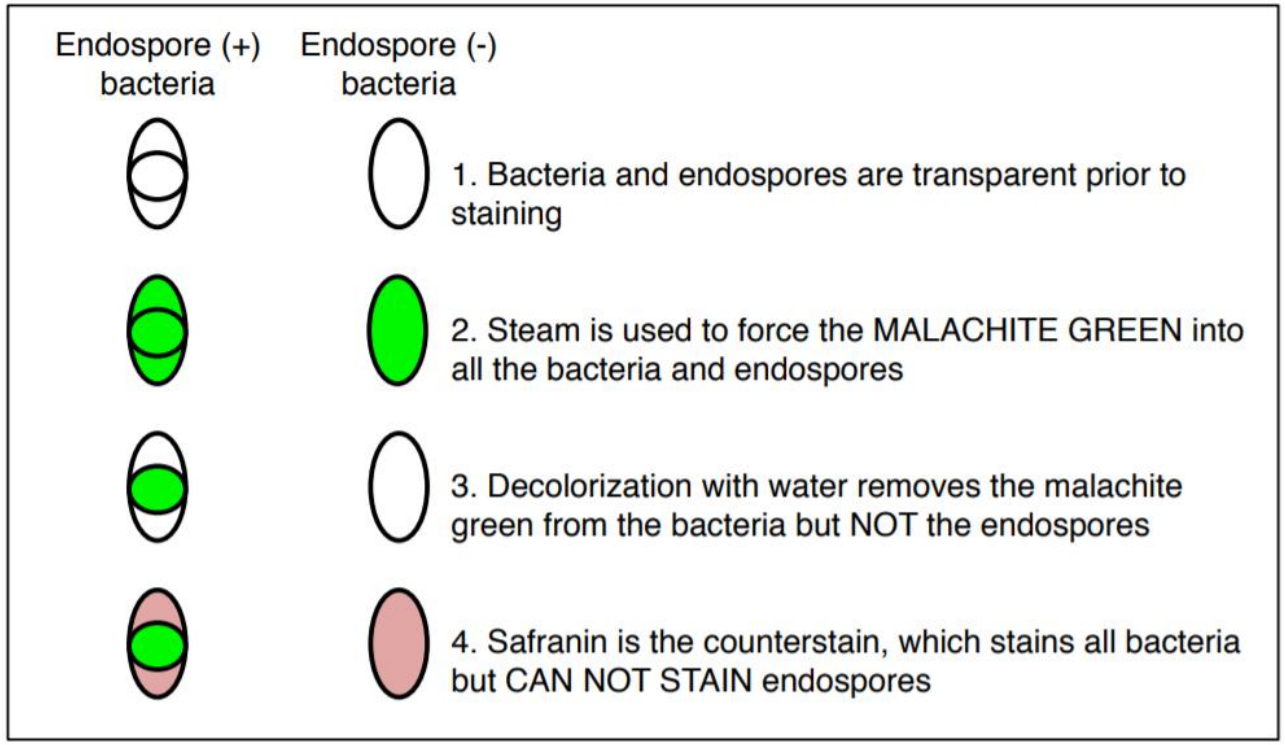


https://foodmicrobe-basic.com/clostridium-botulinum/

- **Sporulacija** – proces stvaranja spora
- 1 bakterija – 1 spora
- Ostatak tela bakterije – **sporangija**
- Spore teško primaju boje – specijalna bojenja (po Wirtzu)



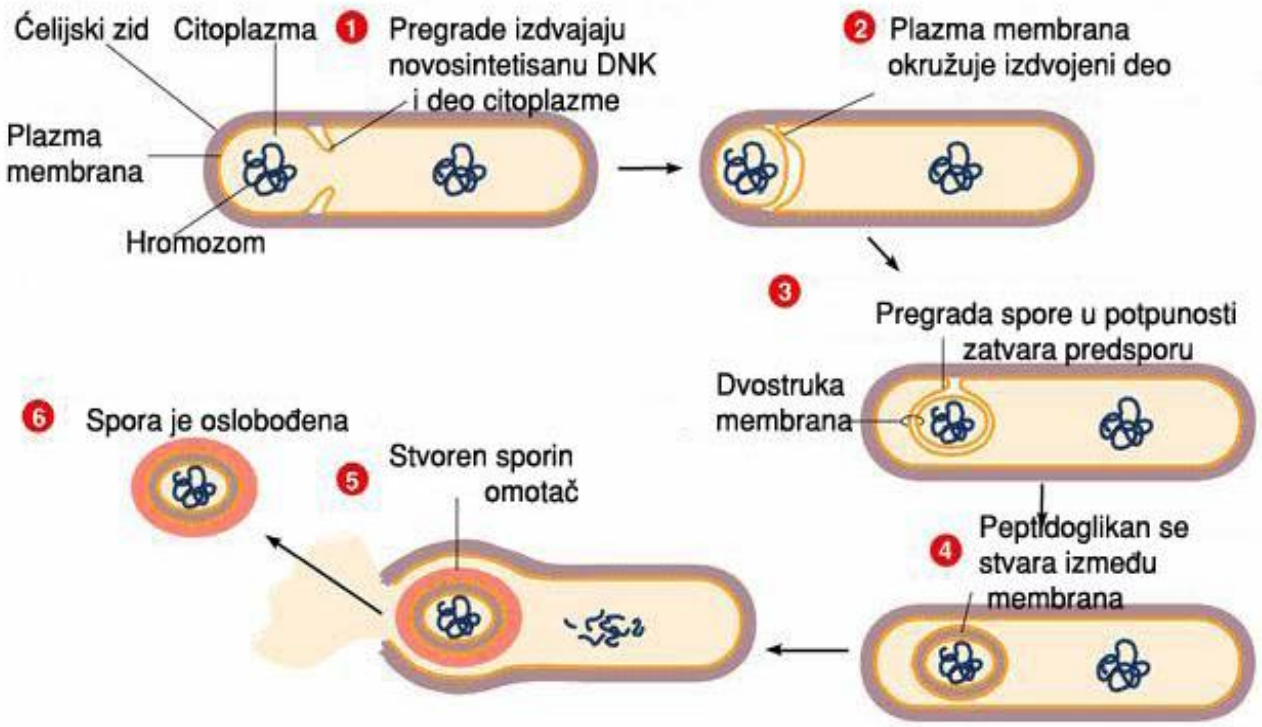




https://laboratoryintern.com/endospore-staining-procedure-principle/
https://microbiologyinfo.com/endospore-staining-principle-reagents-procedure-and-result/

Sporulacija - prestaje sinteza DNK, traje 6-10 h

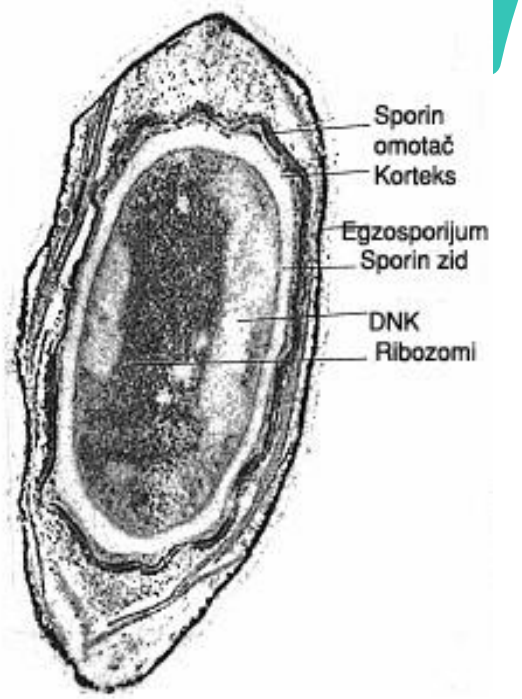
- Jedan deo nukleoida se skuplja zajedno sa dehidrisanom citoplazmom i ribozomima
- Centralno ili bliže jednom kraju
- Invaginacija citoplazmatske membrane – pregrada – **predspora**
- + još dva sloja od peptidoglikana i modifikovanog peptidoglikana - **korteks spore**
- Stvaranje omotača spore sa keratinom

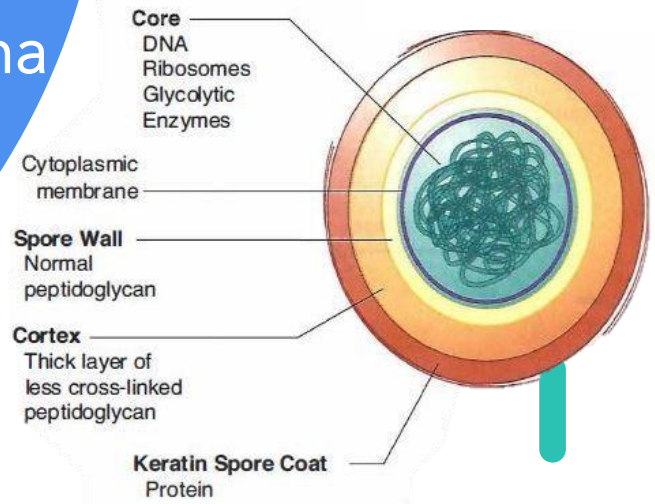


Spore mogu ostati unutar bakterije ili je napuštaju nakon pucanja ćelijskog zida

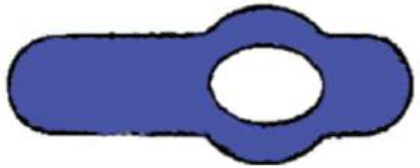
Delovi spore

- Srž spore – centralni deo
- Citoplazmatska membrana
- Sporin zid (peptidoglikan)
- Korteks (modifikovani peptidoglikan)
- Spoljašnja fosfolipidna membrana
- Sporin omotač (pedeset različitih proteina + sličan keratinu)
- *Egzosporijum (samo neke)

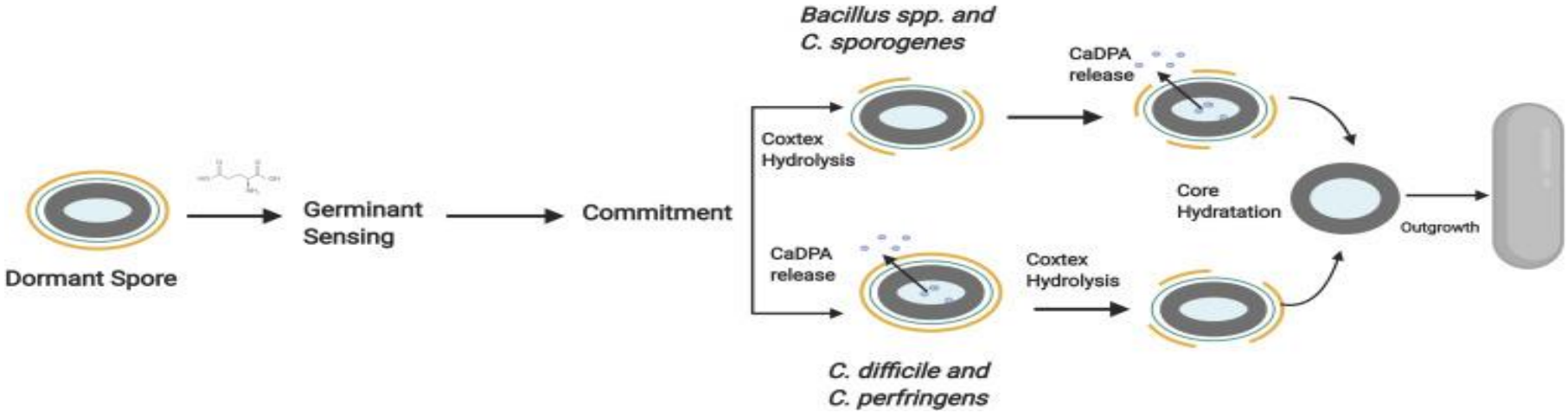




Odnos spora - sporangija

Pozicija spore u sporangiji	Spora manja od sporangije	Spora veća od sporangije i deformiše je
Centralno postavljena spora		
Supterminalno postavljena spora		
Terminalno postavljena spora		

Isklijavanje spora / germinacija



Prelazak spore u vegetativni oblik - oko 90 minuta

Faze: aktivisanje, klijanje i izrastanje vegetativne ćelije

Postepeno se pojačava sinteza proteina

Sporin zid postaje ćelijski zid vegetativne ćelije

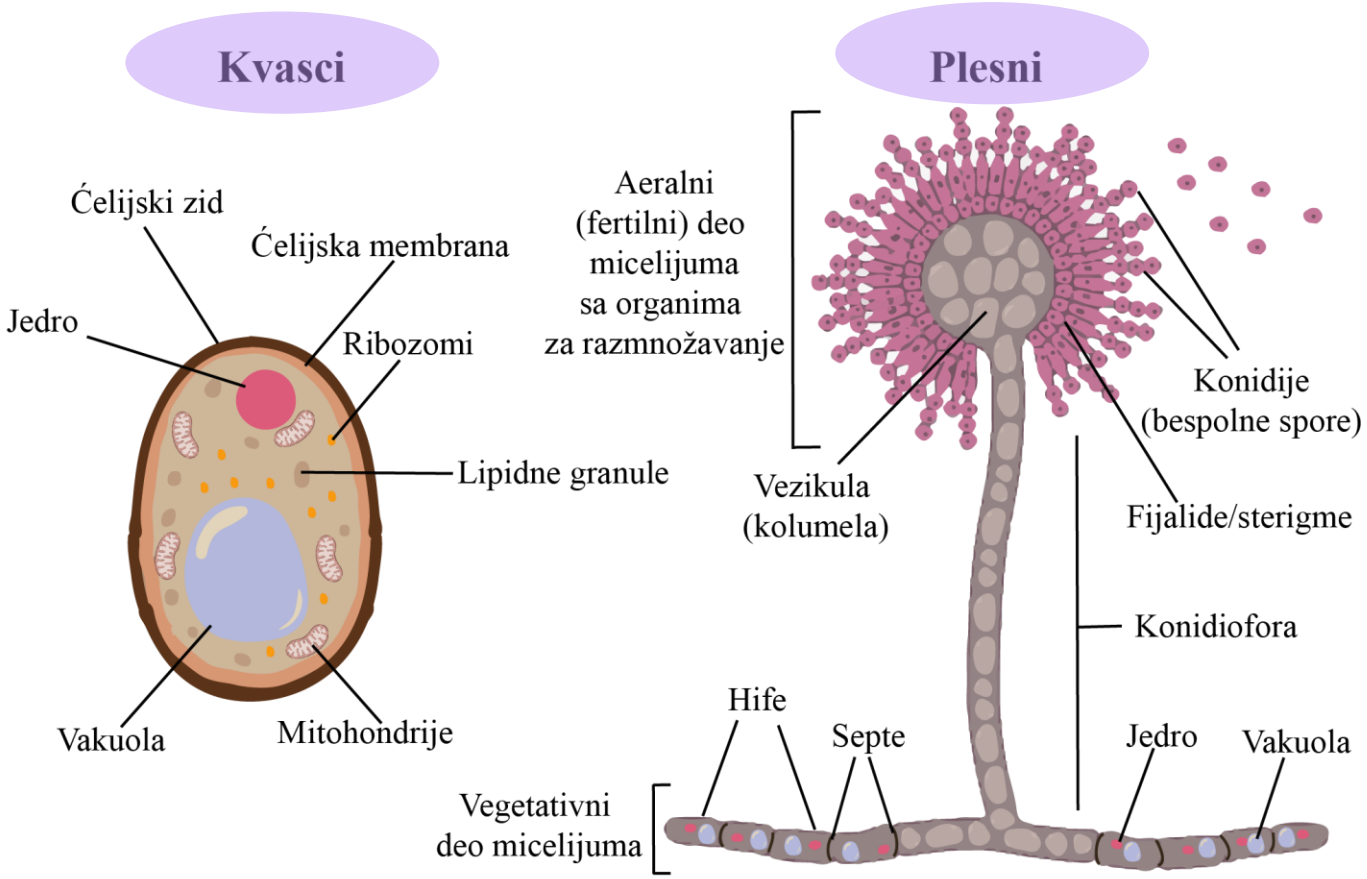
https://www.sciencedirect.com/topics/immunology-and-microbiology/spore-germination

Oblik i građa gljivica

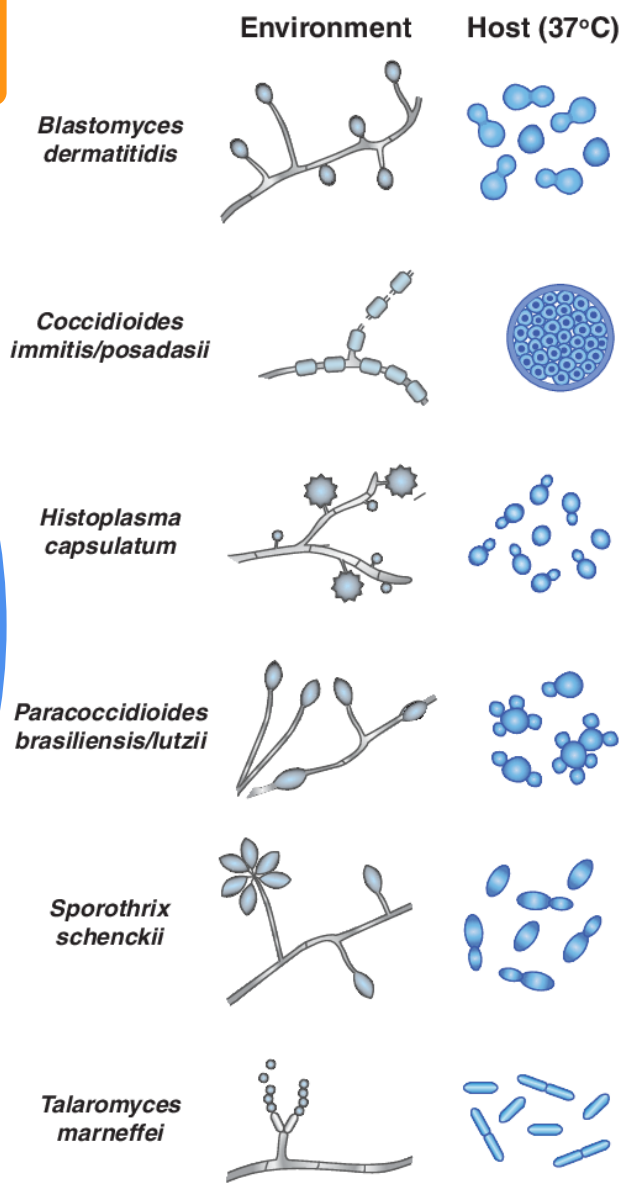
- Jedni od najrasprostranjenijih organizama na planeti
- Carstvo Fungi - preko 1,5 M vrsta, opisano 100 000
- Nauka - MIKOLOGIJA
- Heterotrofna ishrana, hitin u ćelijskom zidu
- Nepokretne su i nemaju sposobnost fotosinteze
- U životinjskom organizmu se kvasci u GIT preživara
- Koriste u prozvodnji hrane i lekova
- Saprofitne, patogene i uslovno patogene vrste (oko 200 vrsta)
- Oboljenja - mikoze
- Bolesti proizrokovane njihovim toksinima - mikotoksikoze

Široko su rasprostranjene, otporne prema brojnim fizičkim i hemijskim faktorima

- Ishrana – heterotrofna - apsorpcijom već prethodno razgrađenih hranljivih materija u spoljašnjoj sredini
- Vegetativni oblik gljiva može biti **jednoćelijski** ili **višećelijski**
- Gljive su eukariotski organizmi sa jednim ili više jedara u ćeliji - KOENOCITOZA
- Razmnožavanje se odvija polnim ili bespolnim putem stvaranjem spora



Veličina i osnovni oblici gljiva



- Makromicete - krupna plodonosna tela (pečurke)
- Mikromicete - mikroskopske - kvasci i plesni
- Dimorfne gljivice

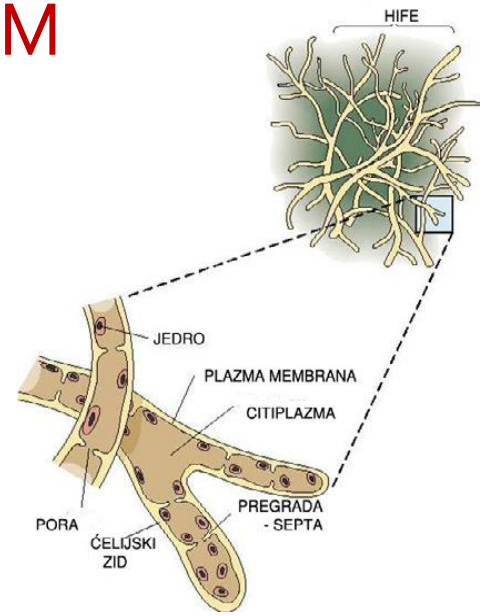
Sil, Anita and Alex Andrianopoulos. "Thermally Dimorphic Human Fungal Pathogens--Polyphyletic Pathogens with a Convergent Pathogenicity Trait." *Cold Spring Harbor perspectives in medicine* 5 8 (2015): a019794 .

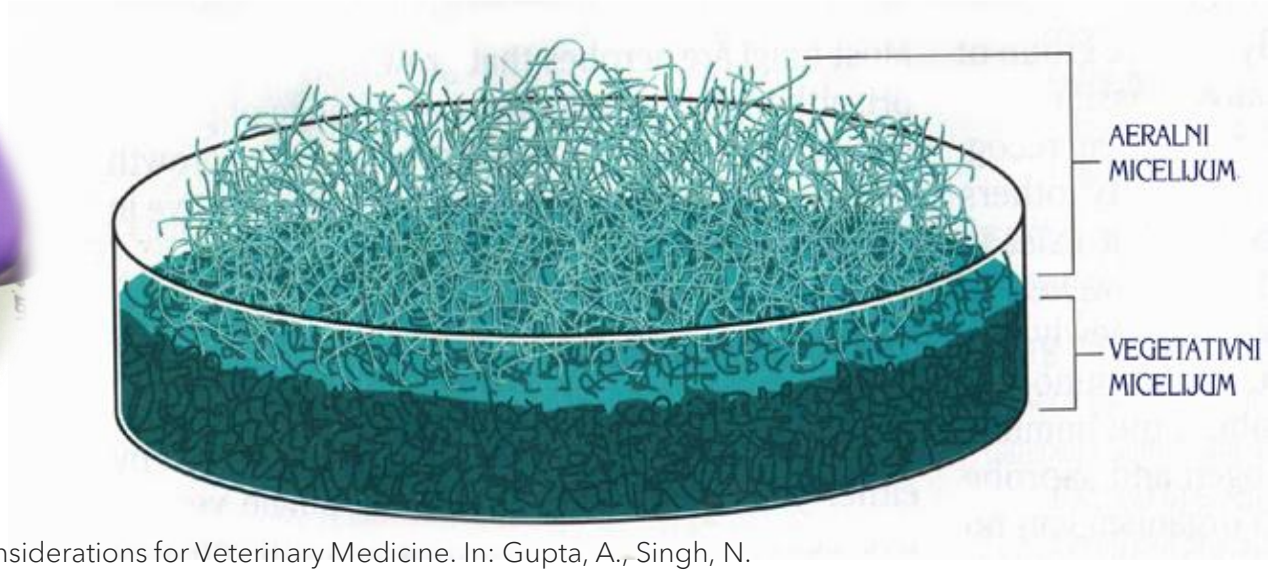
Plesni:
Hife i micelijum

Plesni – filamenti – HIFE – septirane i neseptirane

Klupko hifa – MICELIJUM

supstratni - vegetativni
vazdušni – aeralni (fertilni)





Tell, L.A., Burco, J.D., Woods, L., Clemons, K.V. (2019). Aspergillosis in Birds and Mammals: Considerations for Veterinary Medicine. In: Gupta, A., Singh, N. (eds) Recent Developments in Fungal Diseases of Laboratory Animals. Fungal Biology. Springer, Cham. https://doi.org/10.1007/978-3-030-18586-2_4