

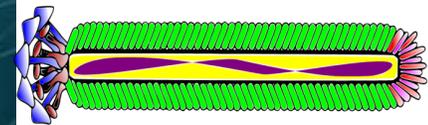
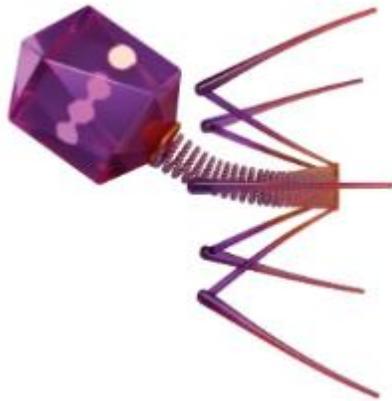
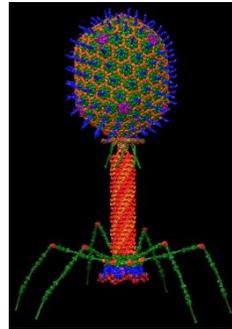
Kuidas bakterid ennast viiruste vastu kaitsevad?

Tanel Tenson

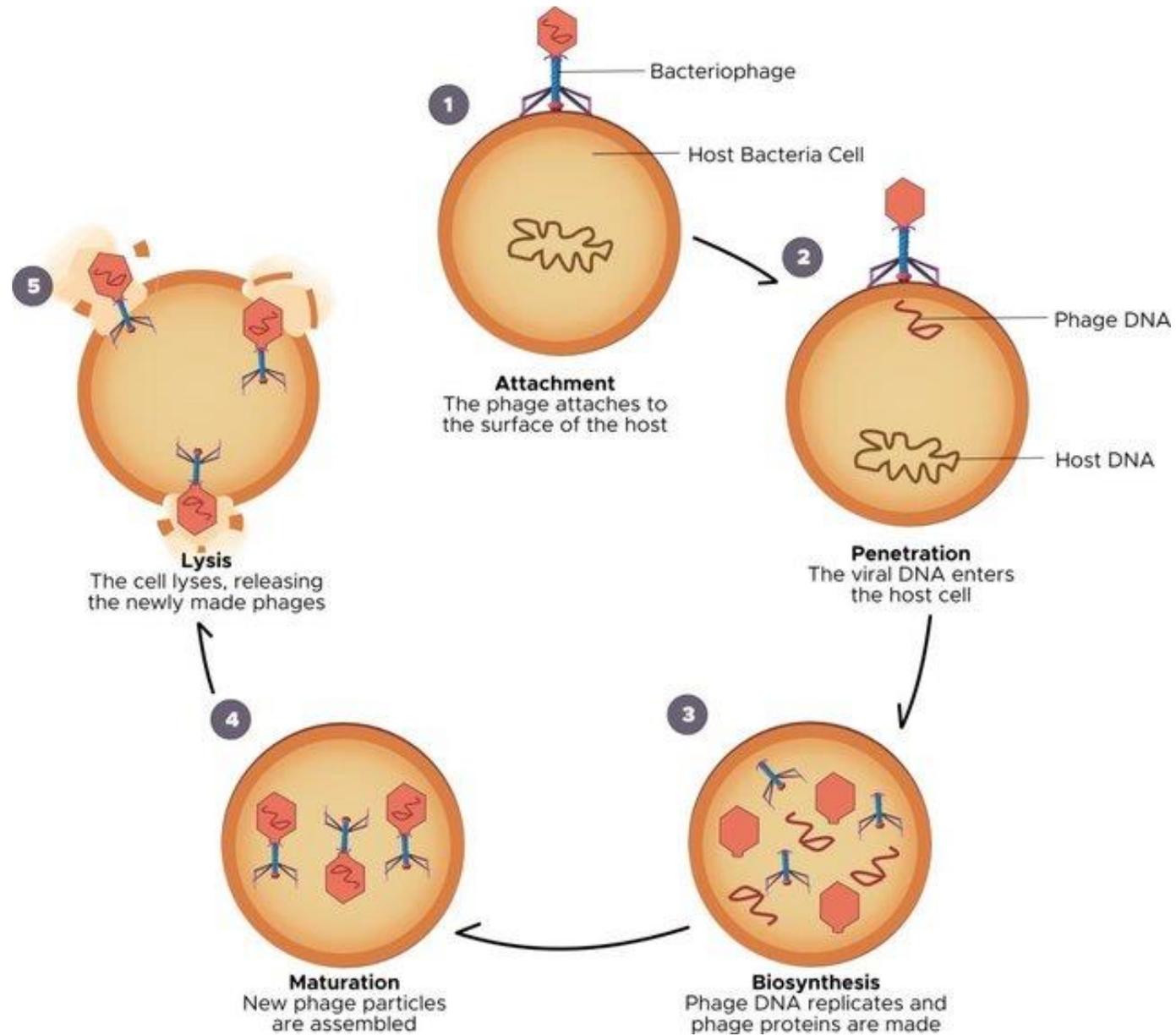
Tartu Ülikooli Tehnoloogiainstituut

Teaduste Akadeemia 2023

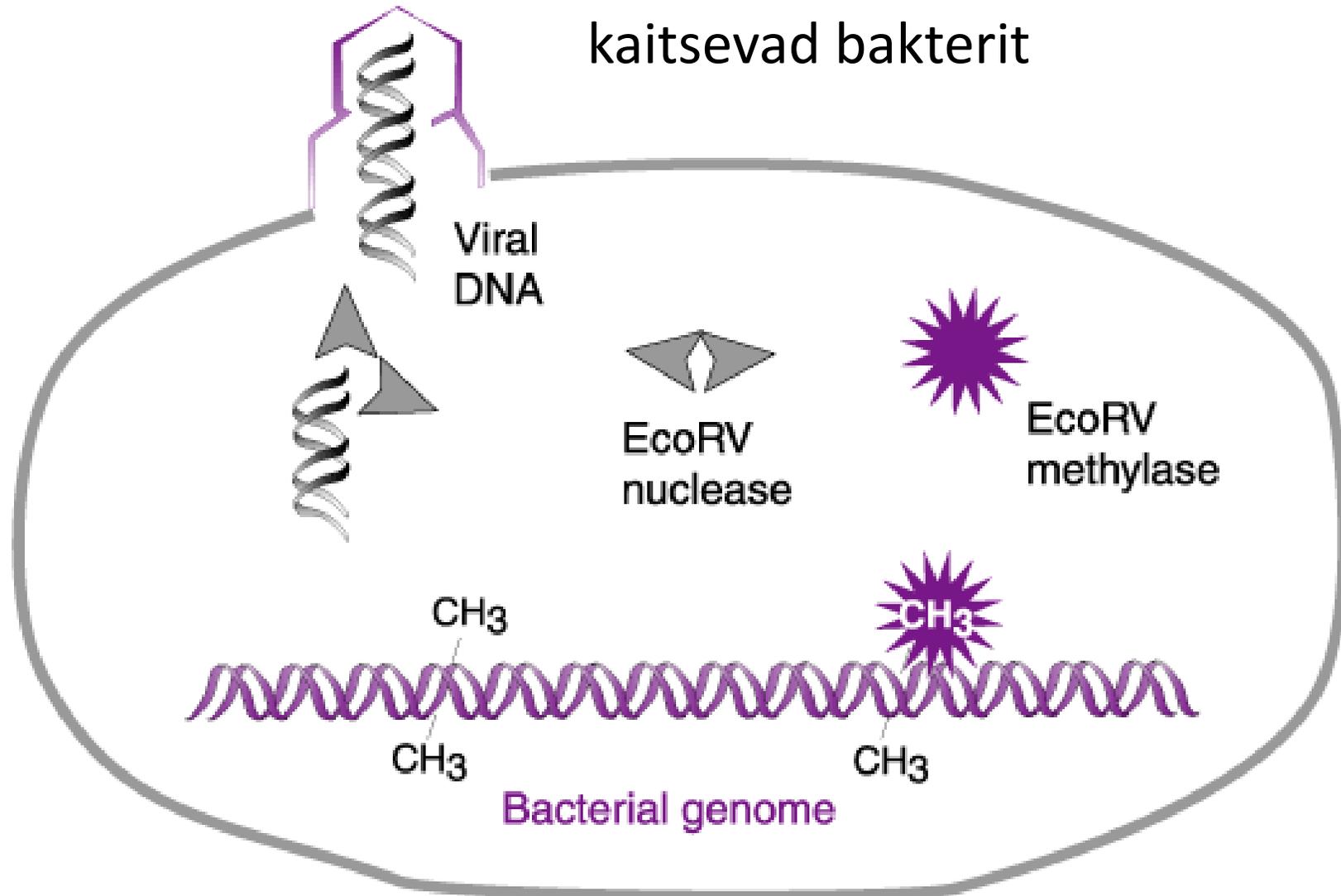
Ka baktereid nakatavad viirused
Selliseid viiruseid nimetatakse bakteriofaagideks

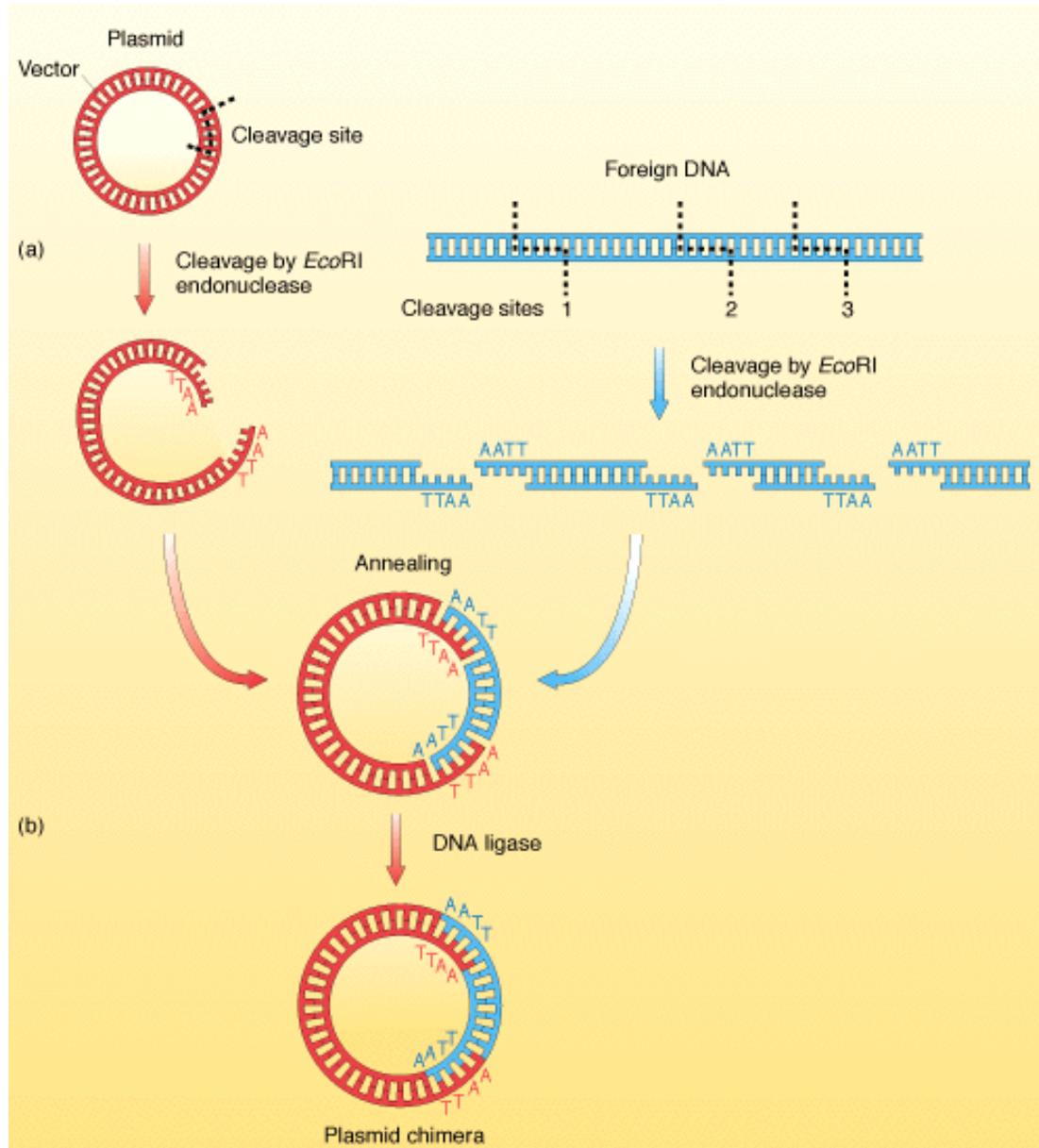


Bakteriofaagi elutsükkel



Restriksiooni – modifikatsioonisüsteemid kaitsevad bakterit



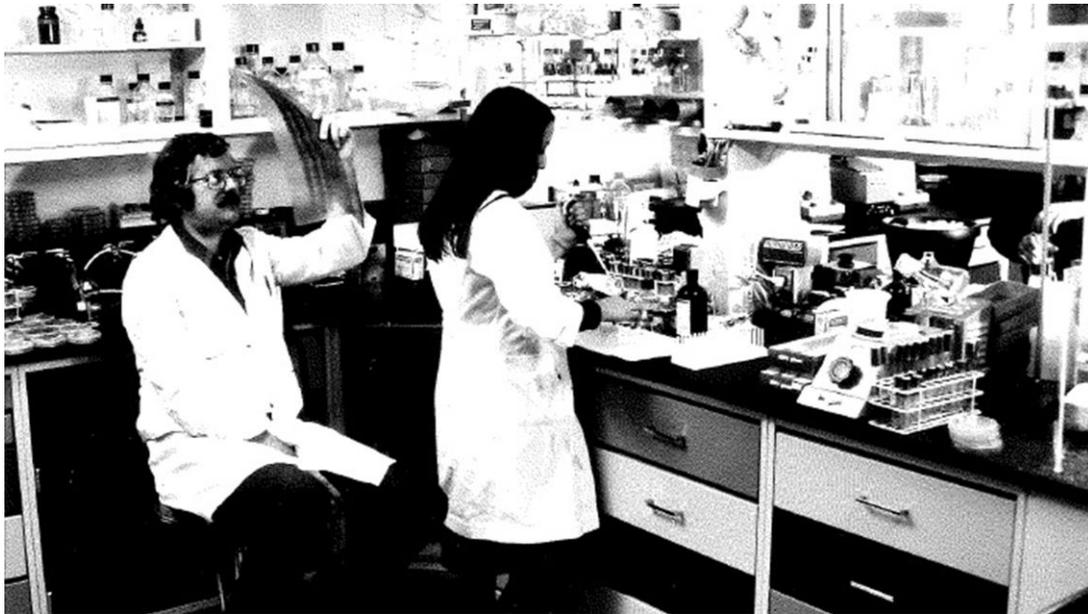


Restriksioonisüsteemid – insenergeneetika sünd

Insuliin – esimene insenergeneetika abil valminud toode

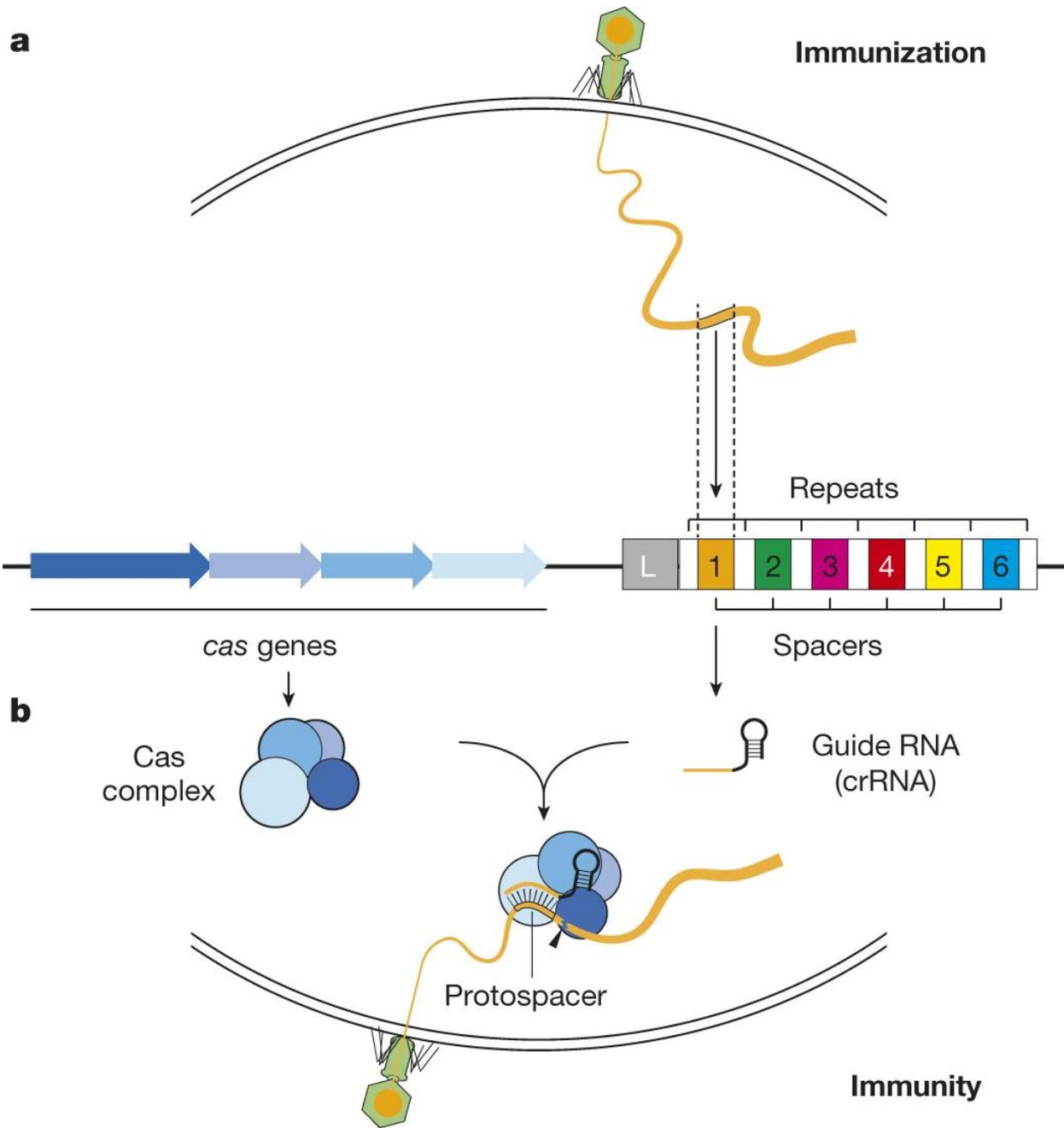
1978

Genentech
A Member of the Roche Group



1982



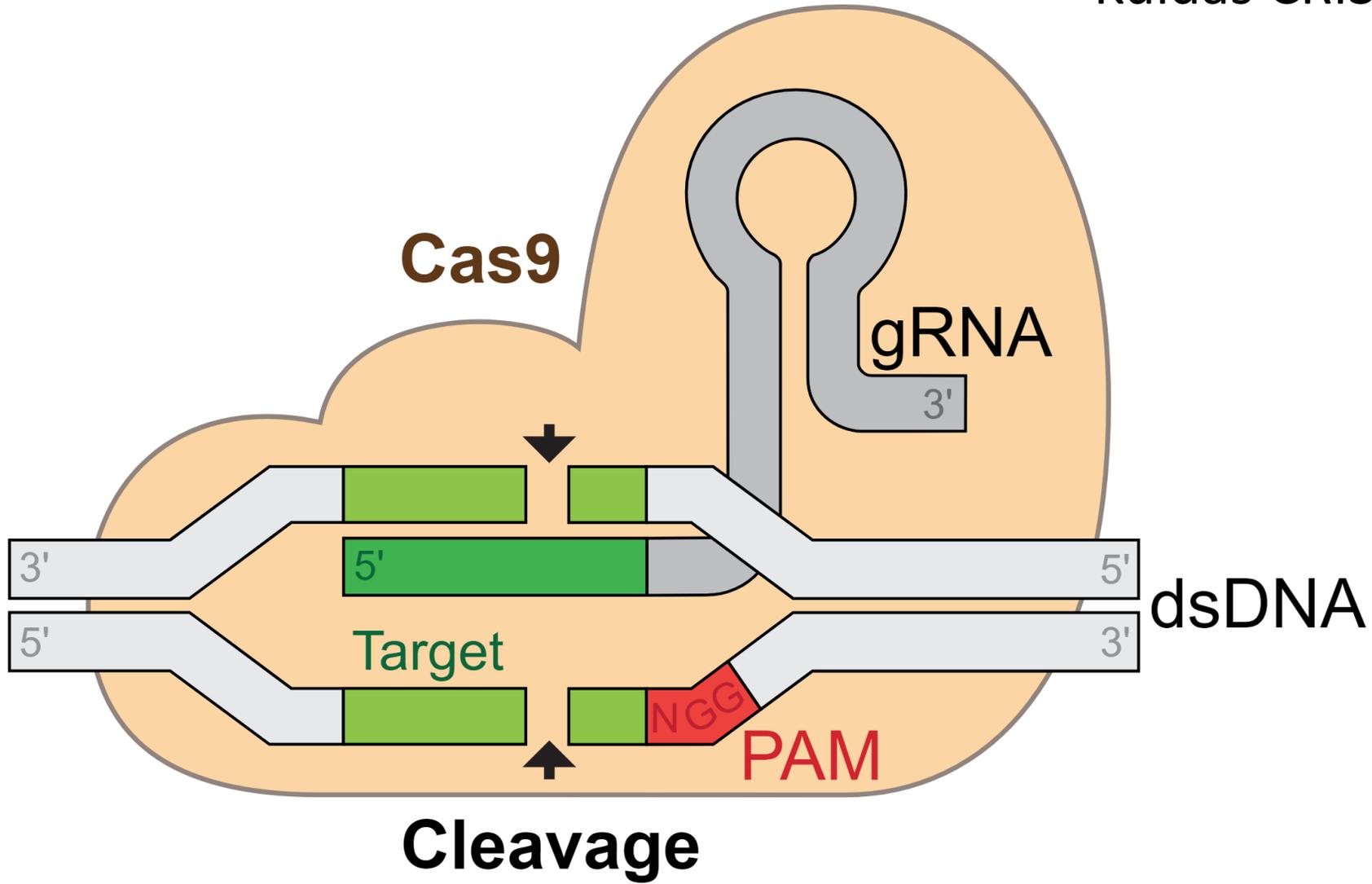


Bakterita immuunsus – CRISPR-Cas

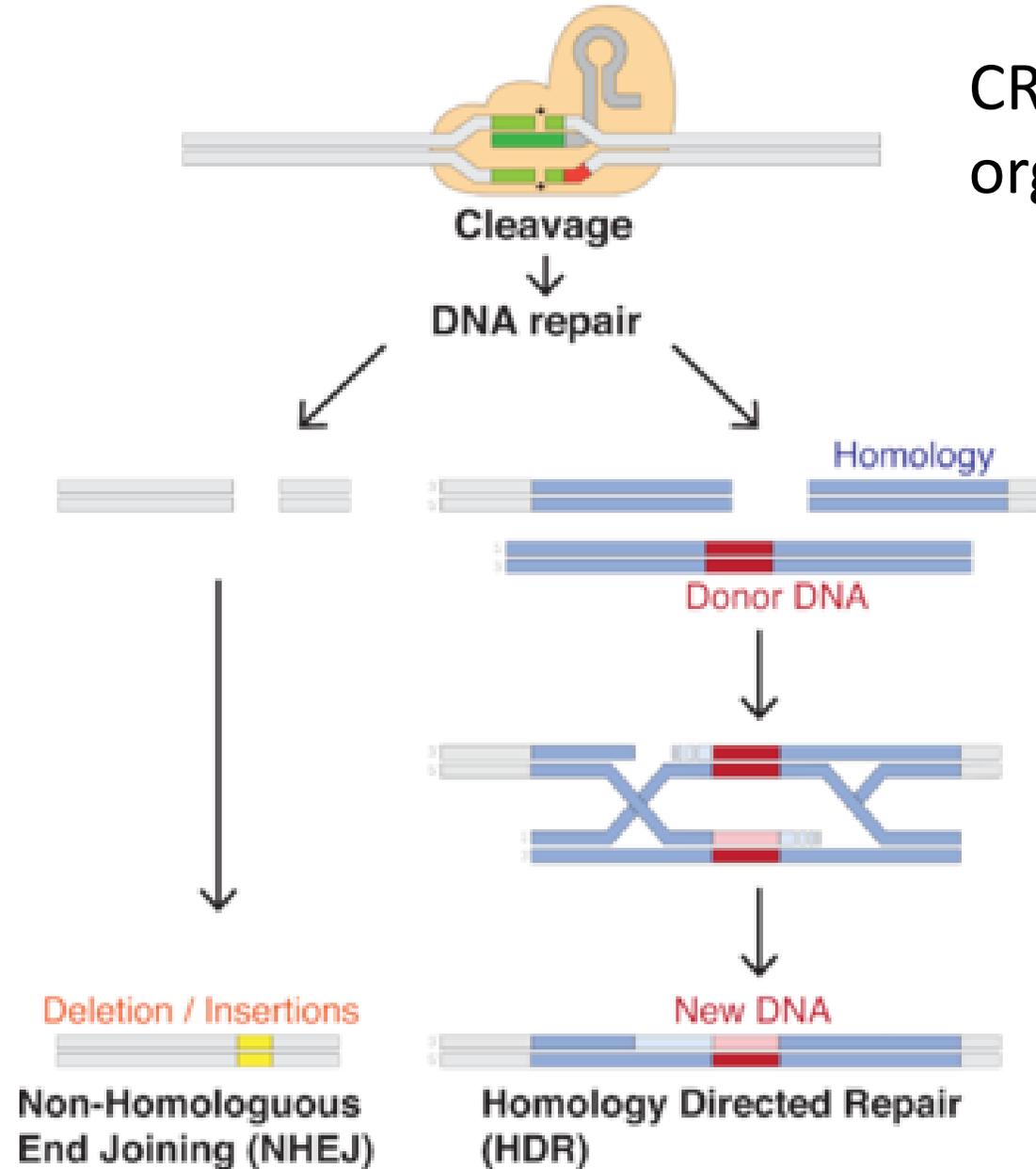
LA Marraffini. *Nature* **526**, 55-61 (2015)
doi:10.1038/nature15386

nature

Kuidas CRISPR-Cas töötab?



CRISPR-Cas võimaldab
organismi genoomi suunatud muuta



CRISPR Plants: New Non-GMO Method to Edit Plants

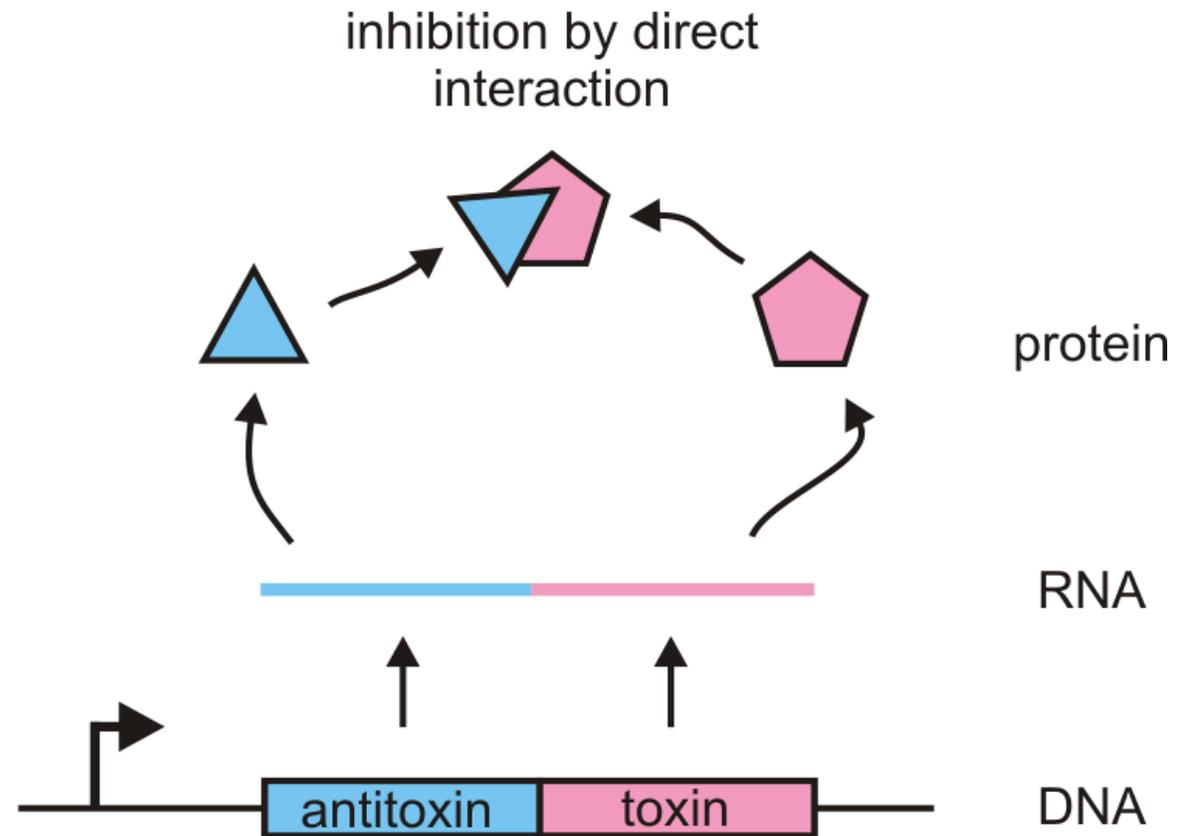
May 11, 2020 | [Mollie Rappe](#) | 4-min. read



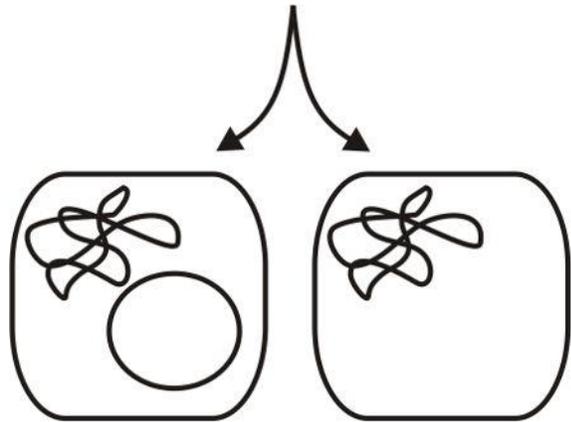
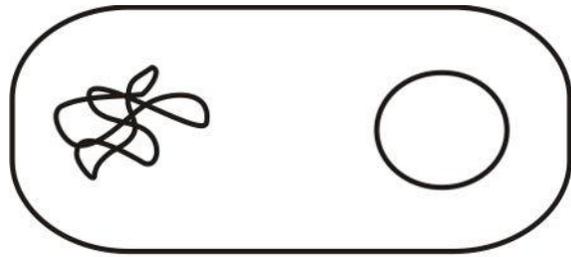
Bakterite toksiin – antitoksiin süsteemid



Toksiin ja antitoksiin moodustavad kompleksi
Selles kompleksis on toksiin inaktiivne



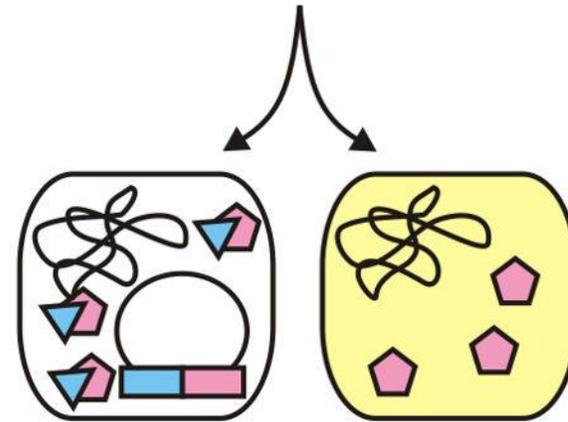
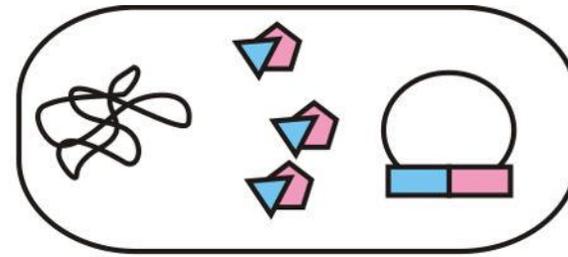
Toksiin – antitoksiin süsteemid ei lase bakteril plasmidi kaotada



growth +

growth +

proliferation of plasmid free cells

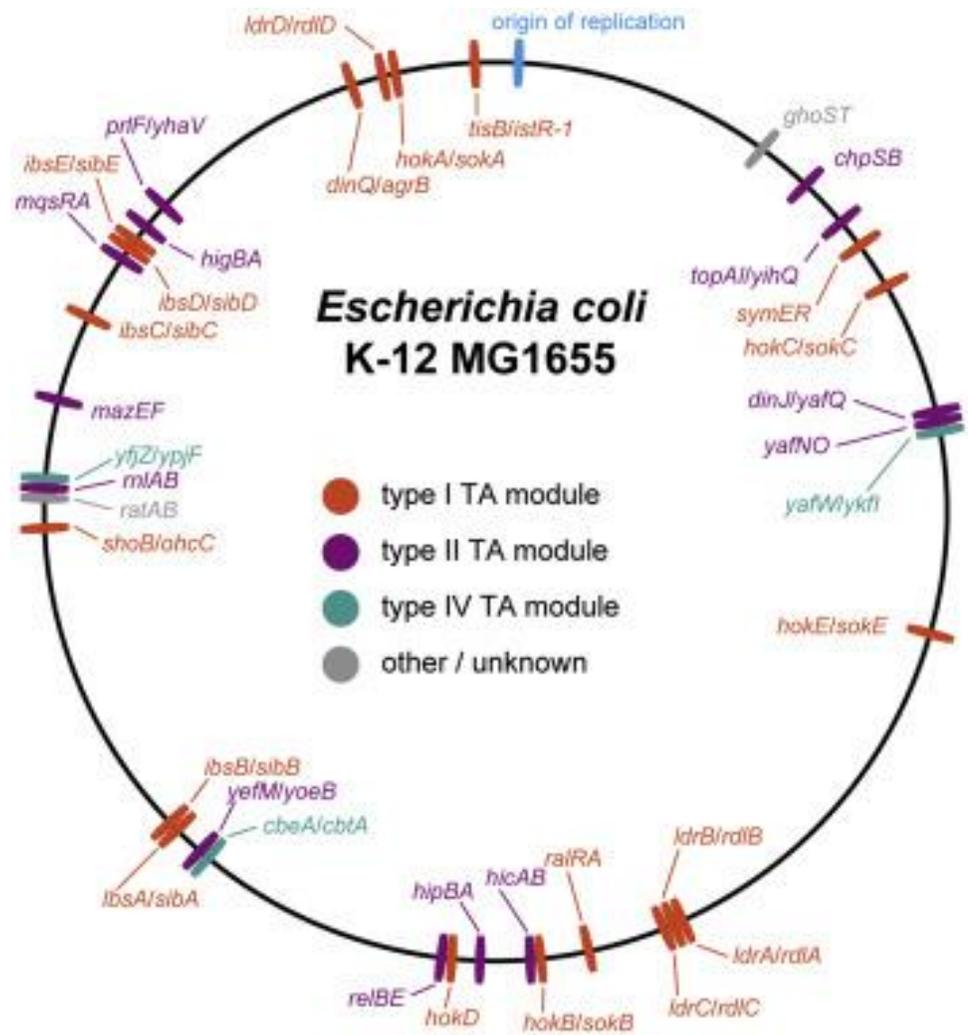


growth +

growth -

maintenance of plasmids

Paljud toksiin – antitoksiinsüsteemid on bakteri kromosoomis. Miks?



Harms A. *et al.* 2018, Mol. Cell

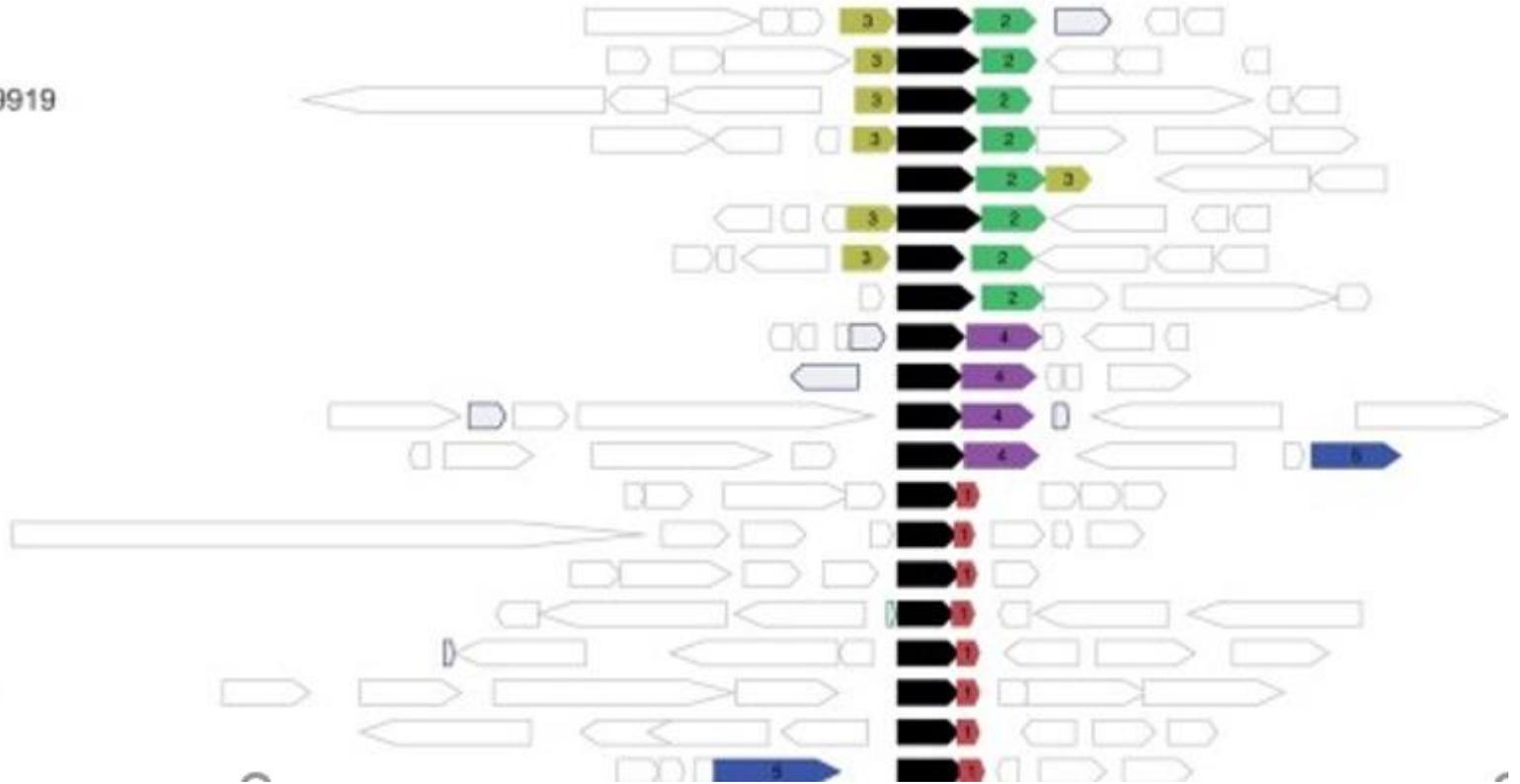
Bakterifüsioloogia regulatsioon
sh edukus antibiootikumitöötlaste üleelamisel

Mis veel?

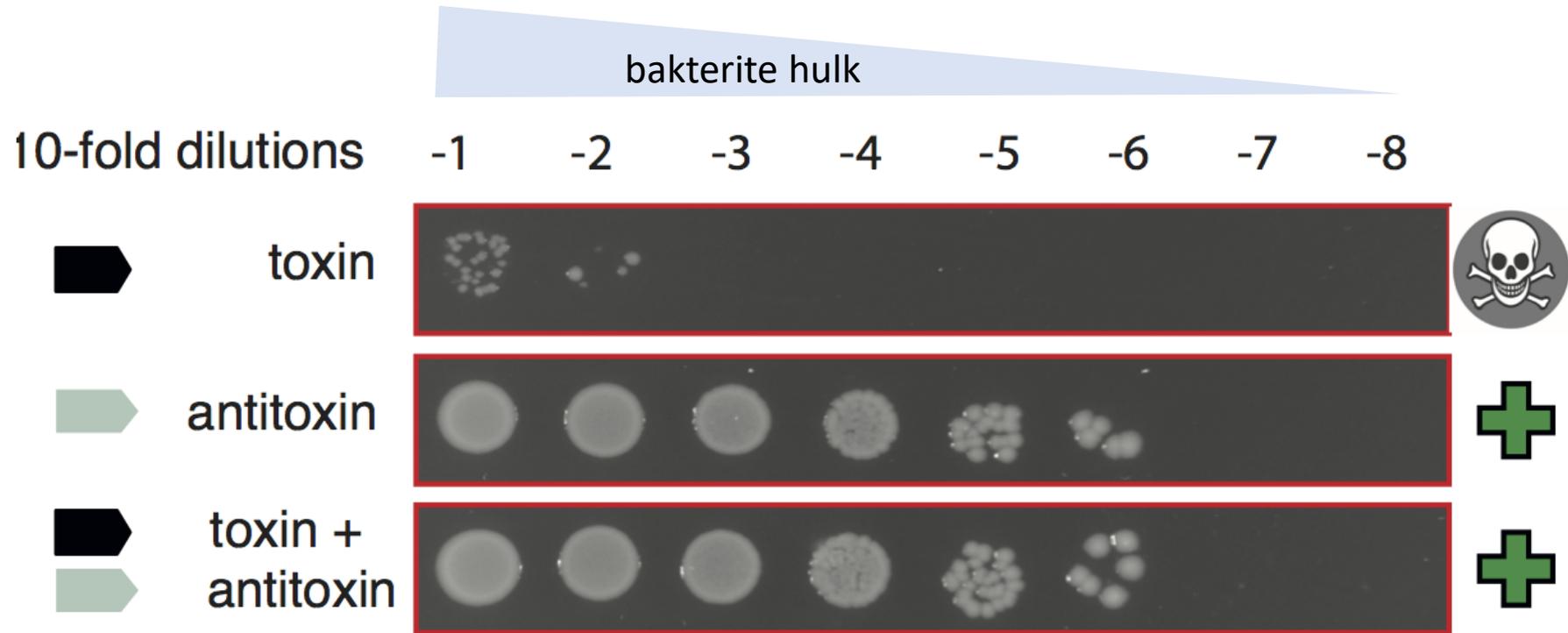
Alustuseks otsime uusi toksiin – antitoksiin süsteeme

Toksiin - antitoksiin võib leida genoomidest üles kahe geeni kõrvuti asetsemise põhjal (mis on konserveerunud)

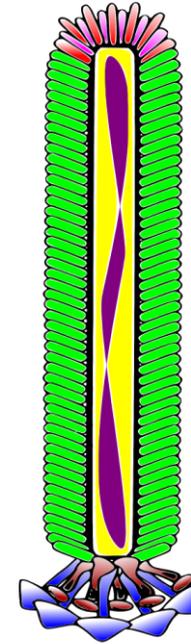
WP_067387525.1#1 *Mycolicibacterium novocastrense*
WP_017831628.1#5 *Microbacterium* sp. UCD-TDU
WP_072816088.1#8 *Rhodococcus zopfii* NBRC 100606 = JCM 9919
WP_090034969.1#6 *Cellulomonas marina*
WP_035770356.1#7 *Arthrobacter castelli* DSM 16402
WP_062951432.1#2 *Brachybacterium* sp. sponge
WP_086991415.1#4 *Agrococcus casei* LMG 22410
WP_070448691.1#3 *Rothia* sp. HMSC08A08
WP_095371136.1#14 *Bacillus kochii*
WP_014623656.1#12 *Streptococcus equi* subsp. equi
WP_057490149.1#9 *Streptococcus orisasini*
WP_036624616.1#10 *Paenibacillus macerans*
WP_009300954.1#16 *Coprobacillus* sp. 3 3 56FAA
WP_072903260.1#17 *Hathewayia proteolytica* DSM 3090
WP_087358601.1#18 *Massilimicrobiota* sp. An80
WP_092250023.1#20 *Butyrivibrio* sp. INlla21
WP_087410551.1#21 *Collinsella* sp. An2
WP_044962527.1#22 *Eubacterium ramulus* ATCC 29099
WP_016219838.1#24 *Dorea* sp. 5-2
WP_016304441.1#25 *Lachnospiraceae* bacterium A2



Toksiin – antitoksiin süsteemide katseline tõestamine



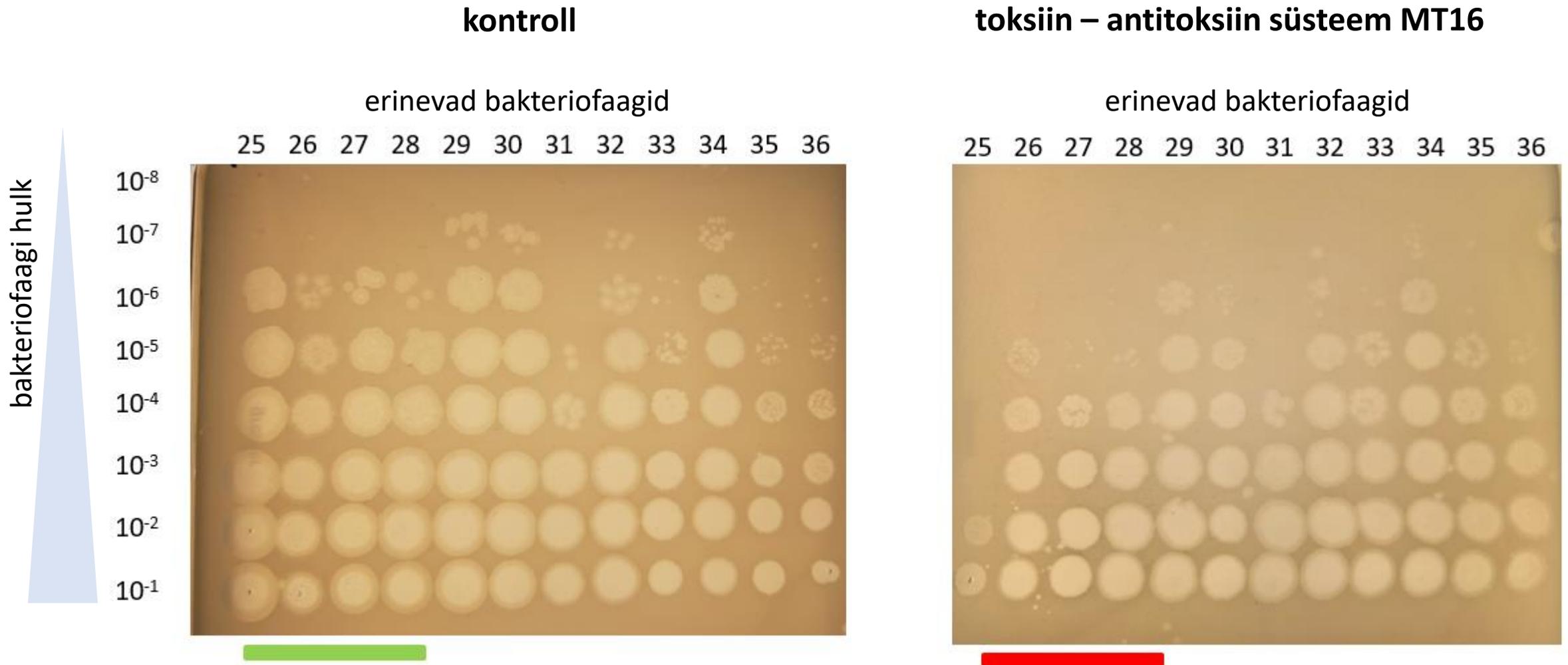
Aga bakteriofaagid?



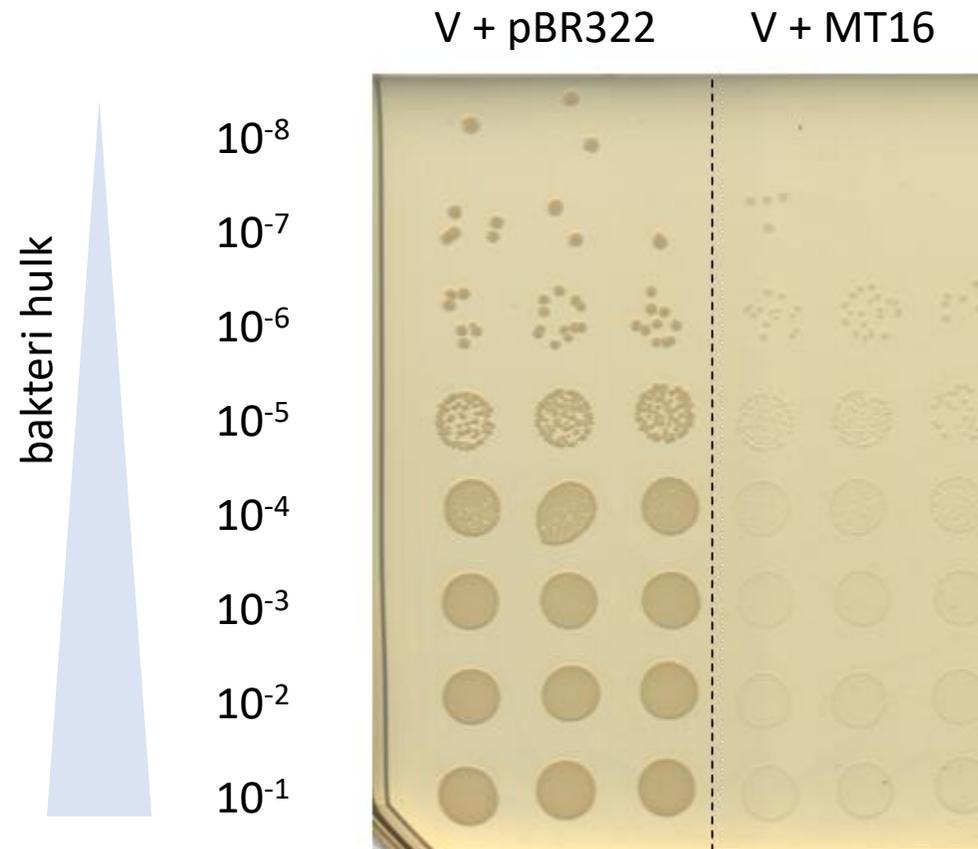
Bakteriofaagide testimine pinnale ühtlaselt külvatud bakterite „murul“



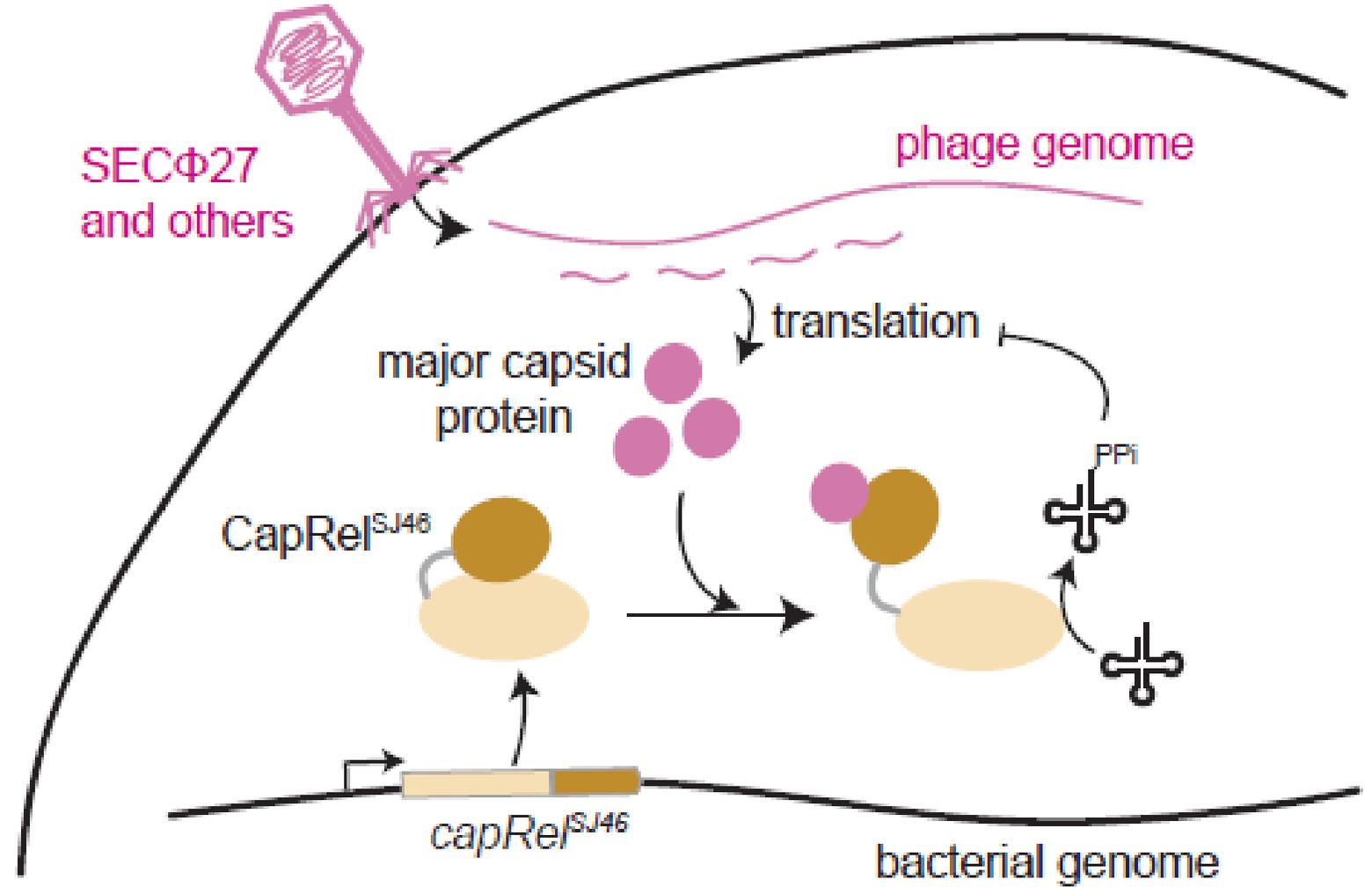
Toksiin – antitoksiin süsteem MT16 annab kaitse *Siphoviridae* perekonna viiruste vastu



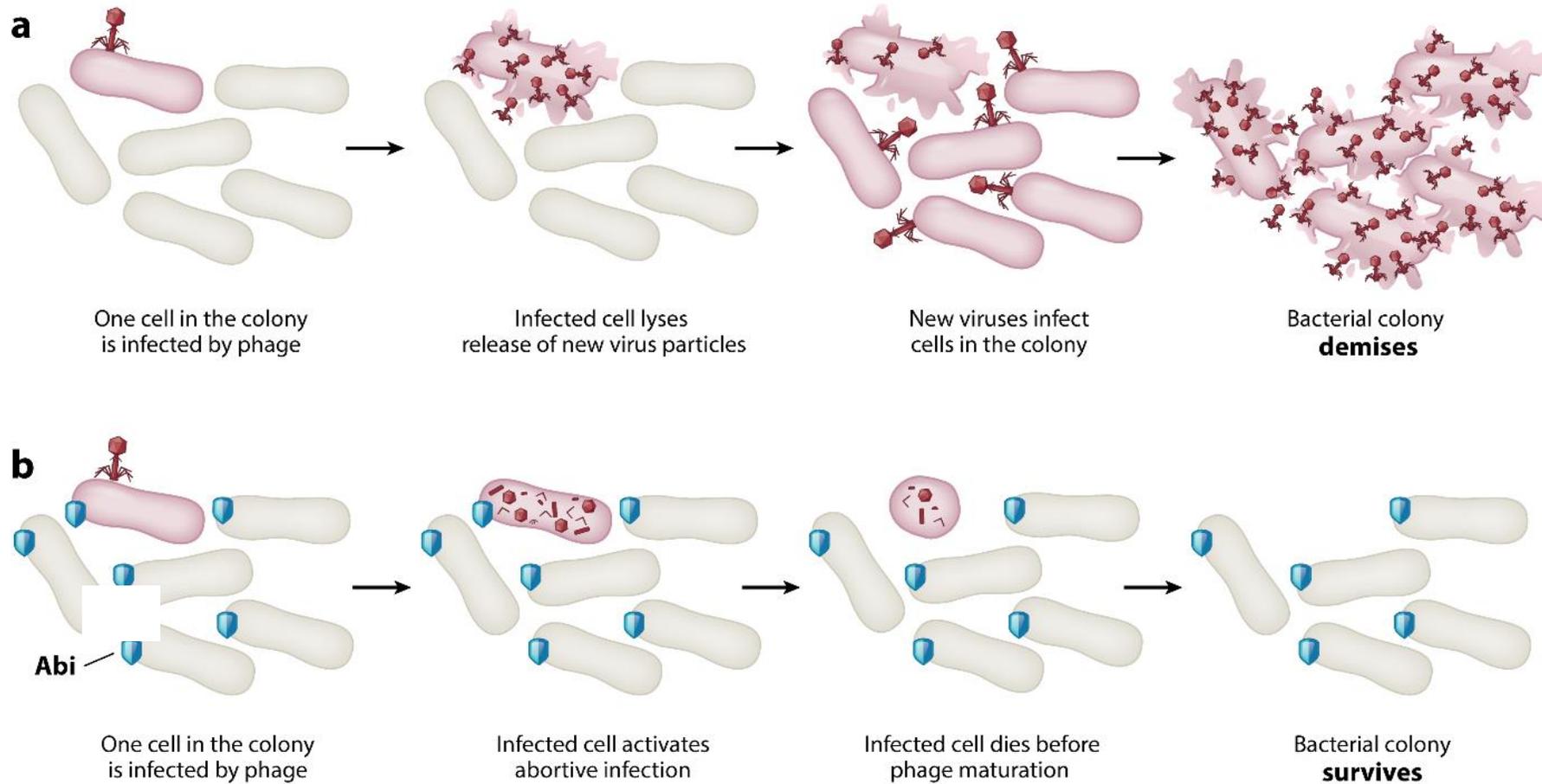
Bakteriofaagi kapsiidivalgu (V) avaldumine iseseisvalt põhjustab toksiin – antitoksiin süsteemi (MT16) vahendatud kasvu peatumise



Kaitse bakteriofaagide vastu



Enesetapp bakteriofaagi leviku vastu (töötab lähisuguluses bakterite puhul)



Miks me seda uurime?

Teaduslikult huvitav

Järgmine rakenduslik läbimurre (mida praegu ennustada ei oska)?

Tartu Ülikool

Toomas Mets

Tetiana Brodiazhenko

Minhal Abdullah

Niilo Kaldalu



Lundi Ülikool

Vasili Hauryliuk

Gemma Atkinson

Chayan Saha

Karin Ernits

Tatsuaki Kurata



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