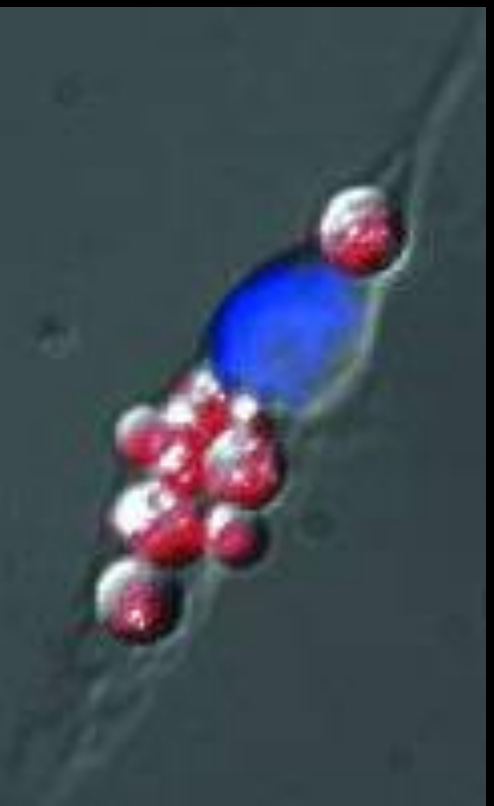
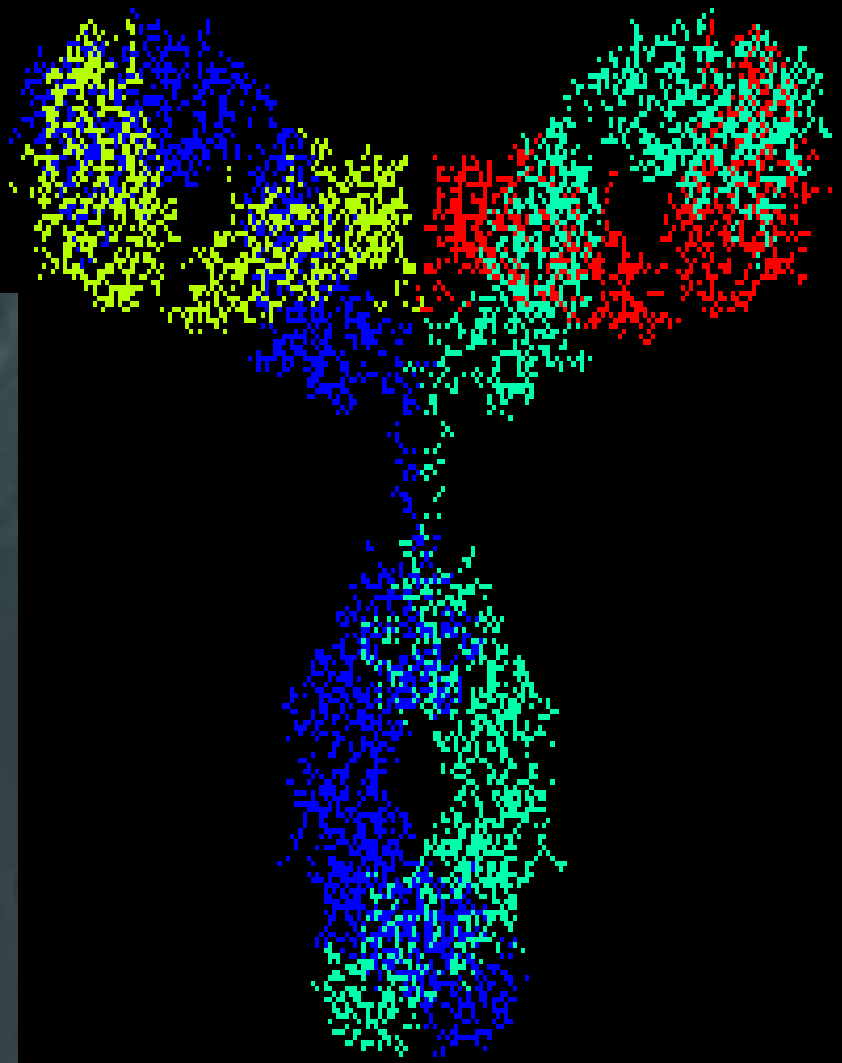
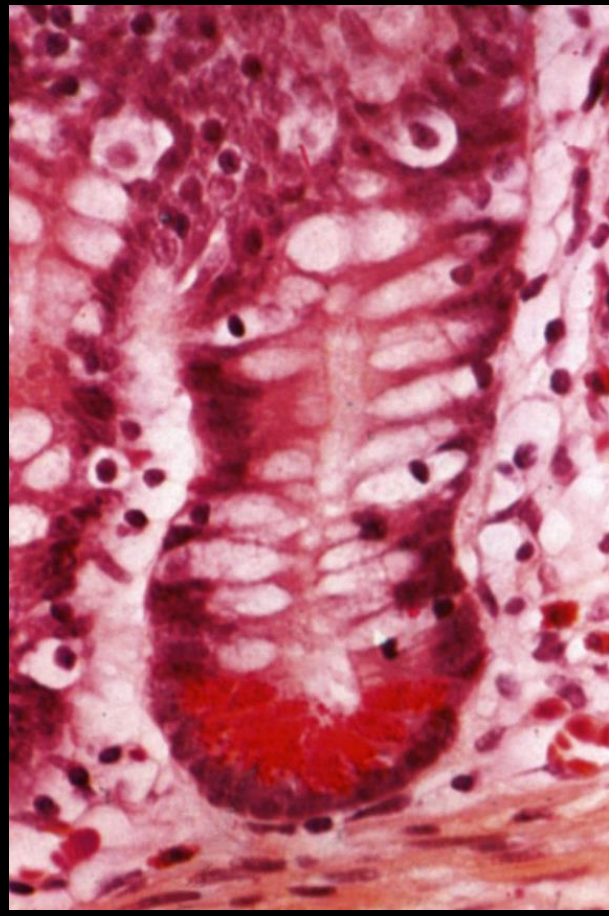
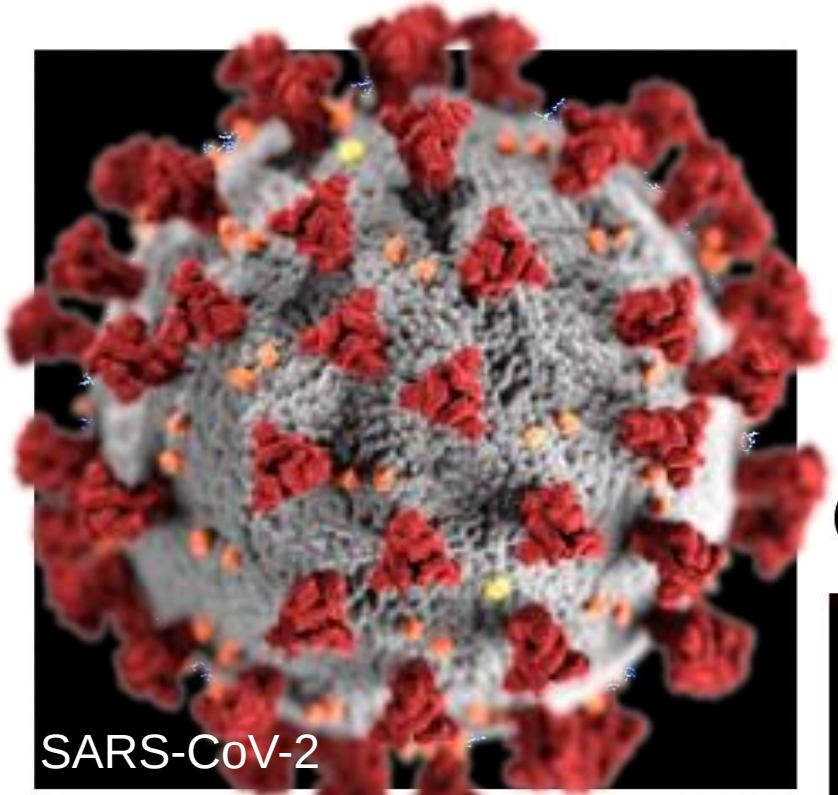
Biología celular de la inmunidad - I





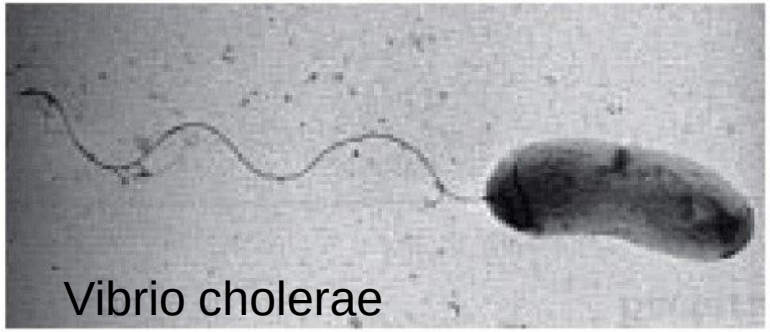


Flavio Zolessi



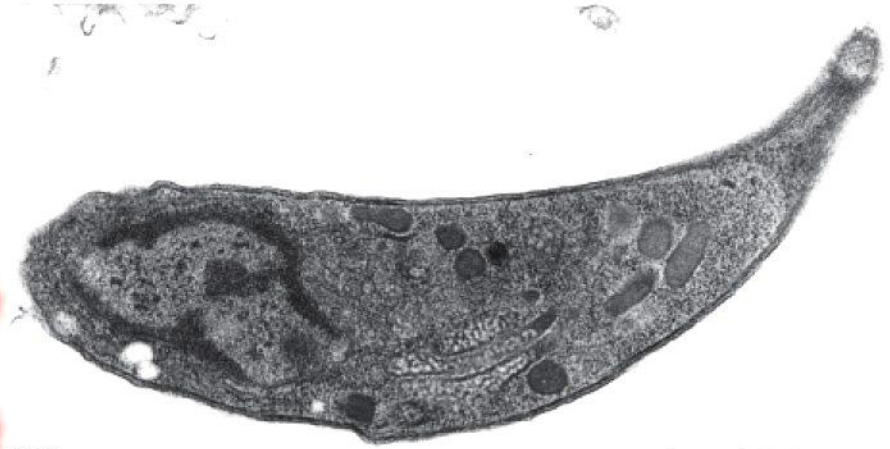
(A)

10 nm



(B)

1 μm



(C) Toxoplasma gondii

1 μm

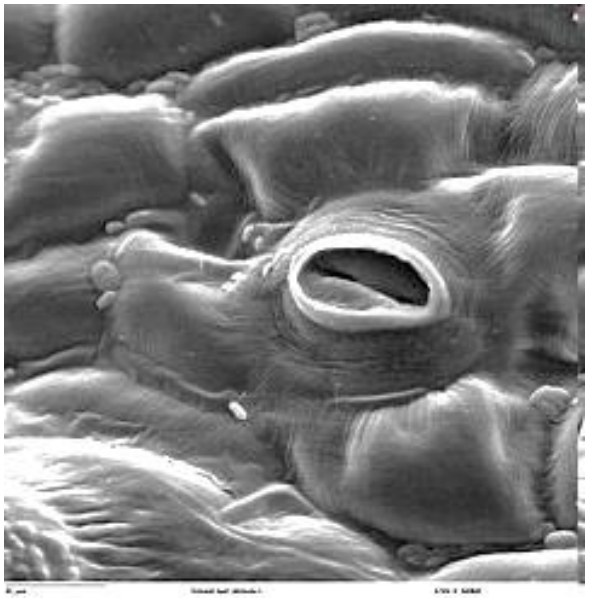
(D)

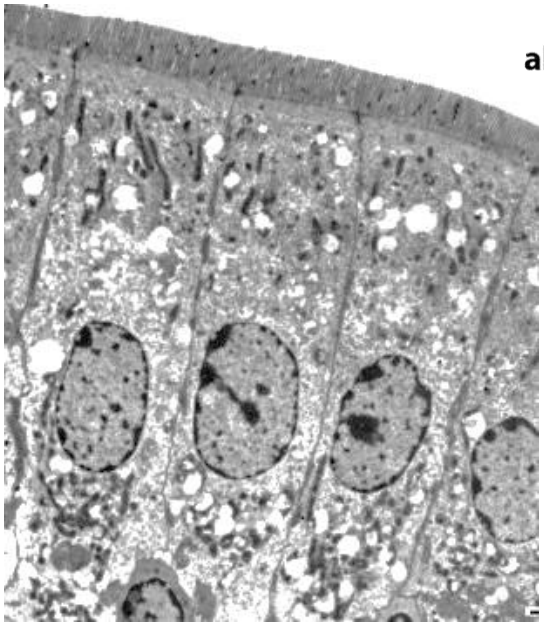
Mecanismos de defensa en organismos multicelulares

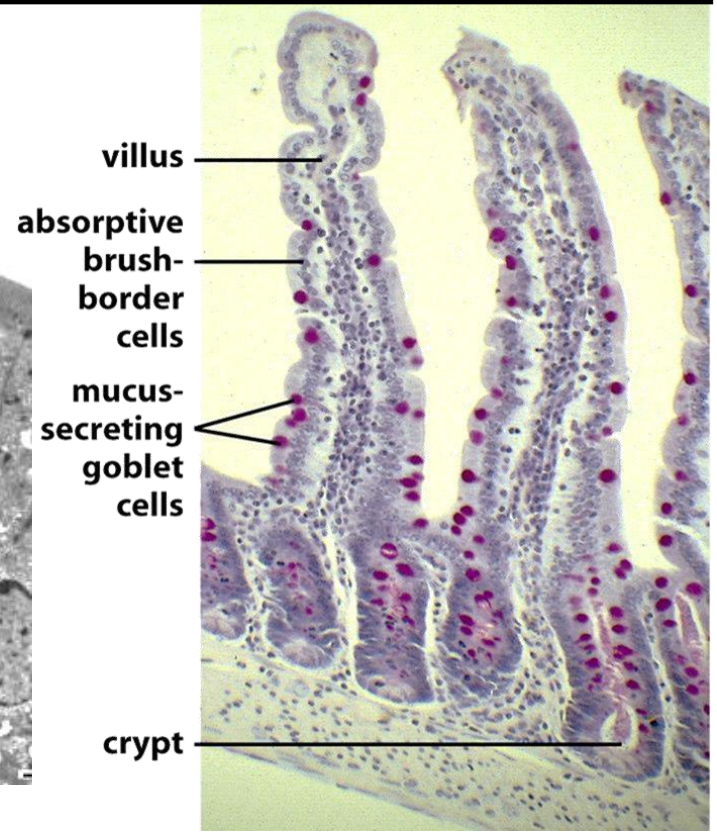
1- Barreras físicas: epitelios

2 - Inmunidad innata

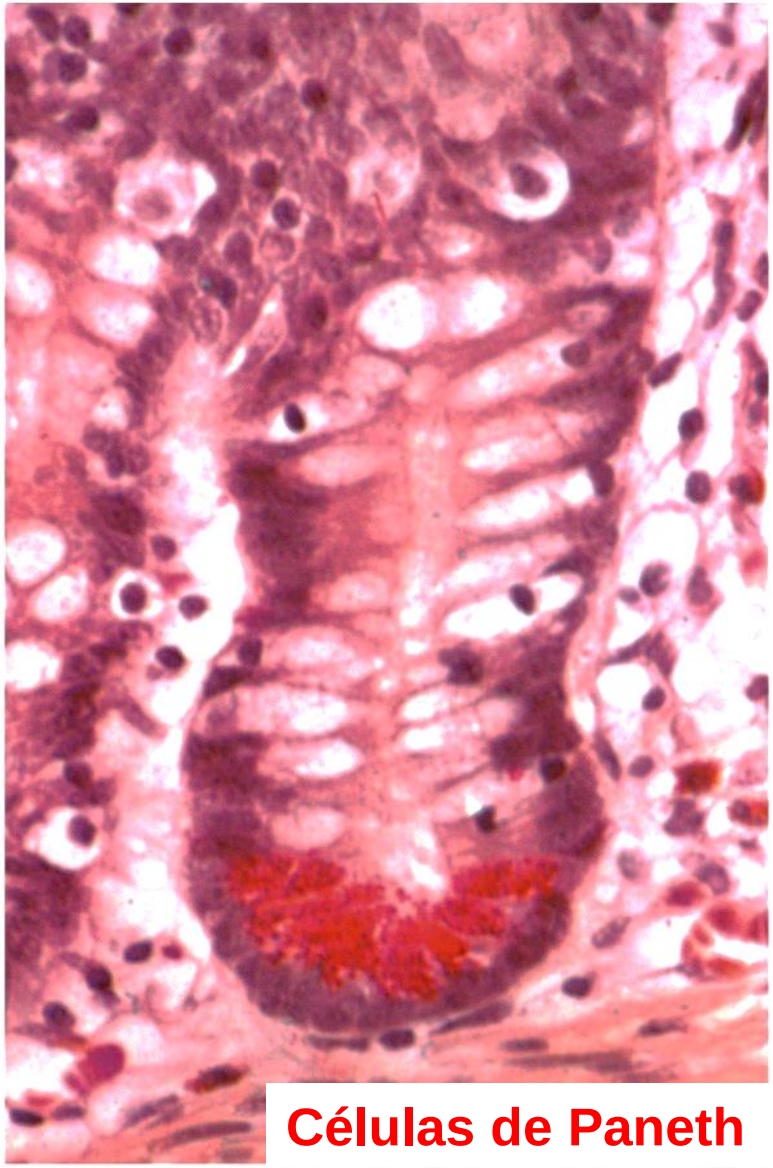
3 - Inmunidad adaptativa

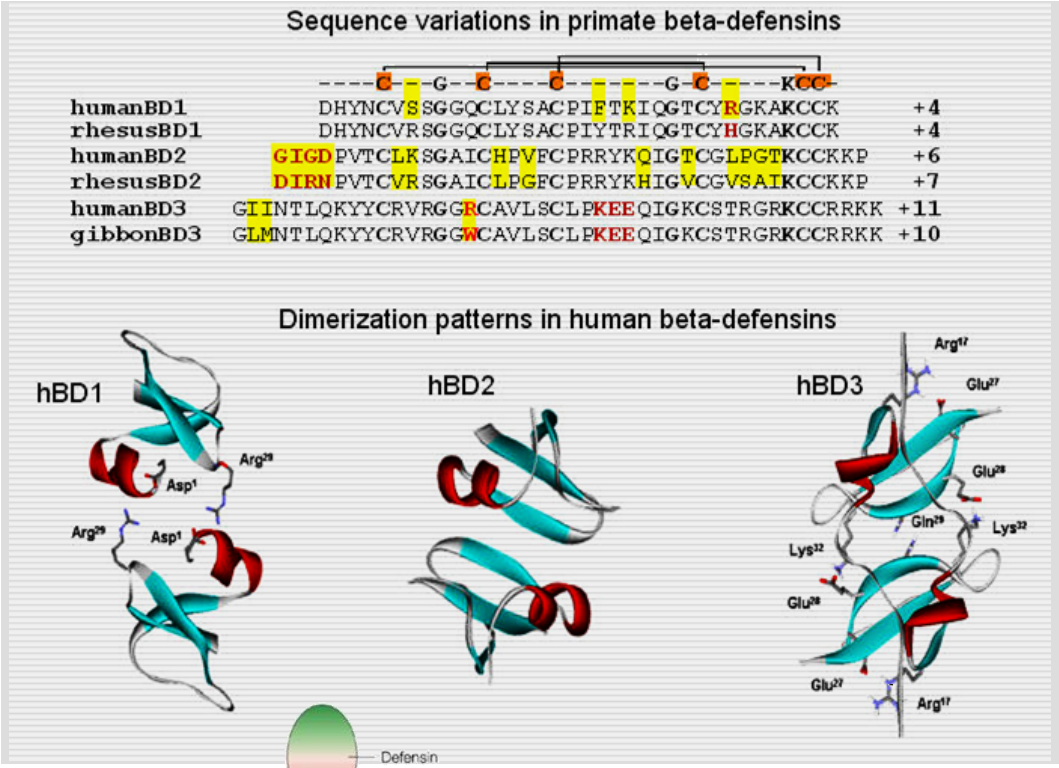


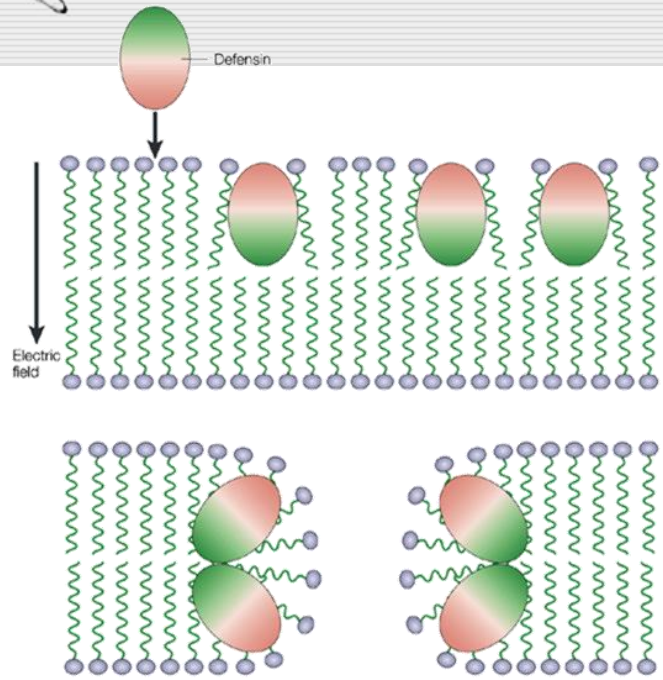




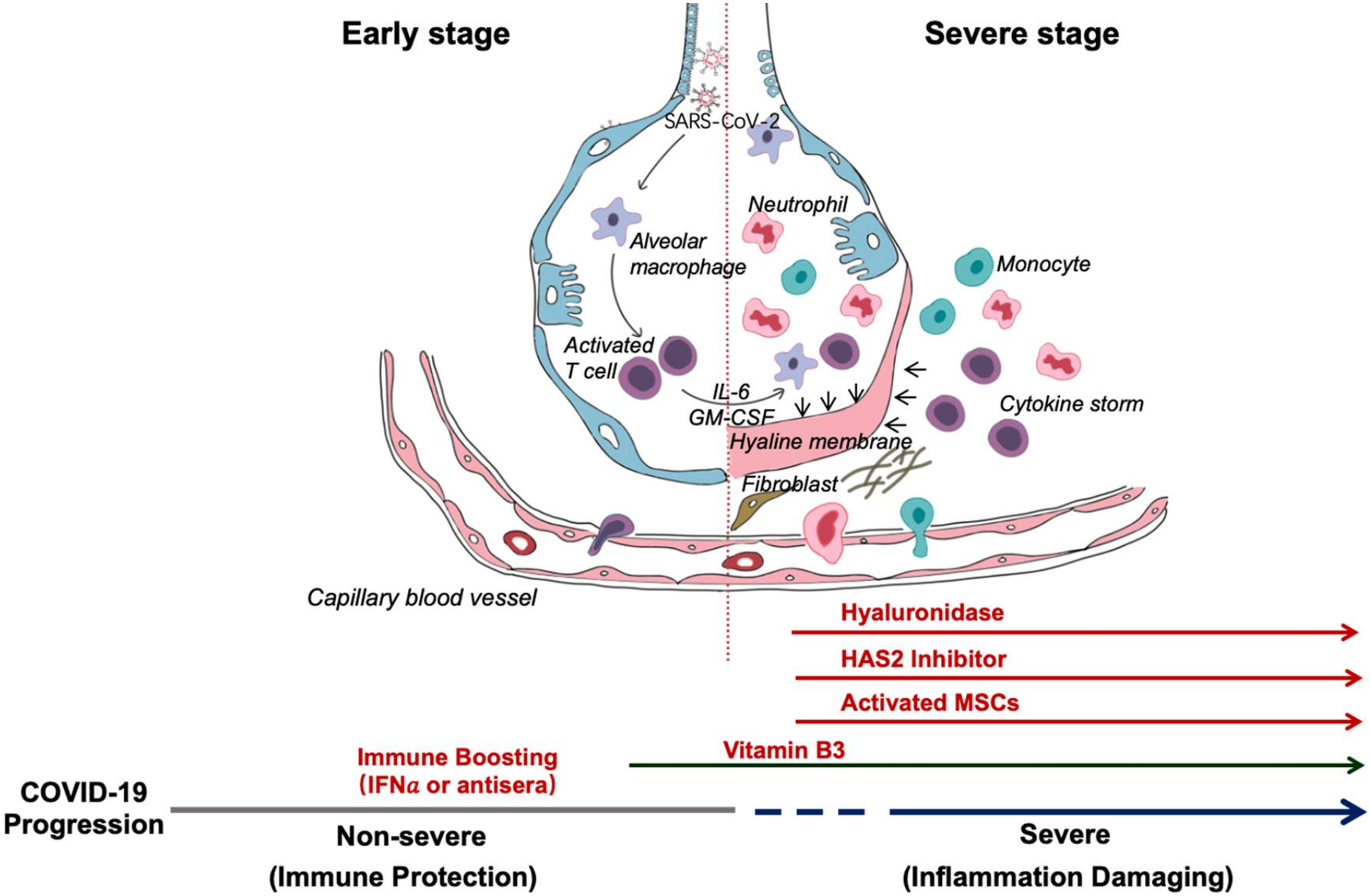
Inmunidad innata: defensinas







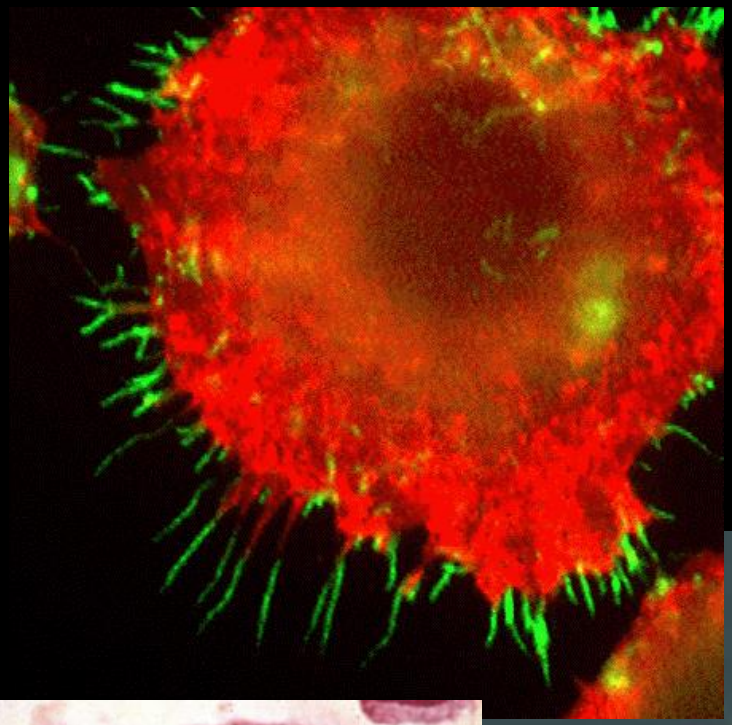
Infección por SARS-CoV-2 en el alveolo pulmonar



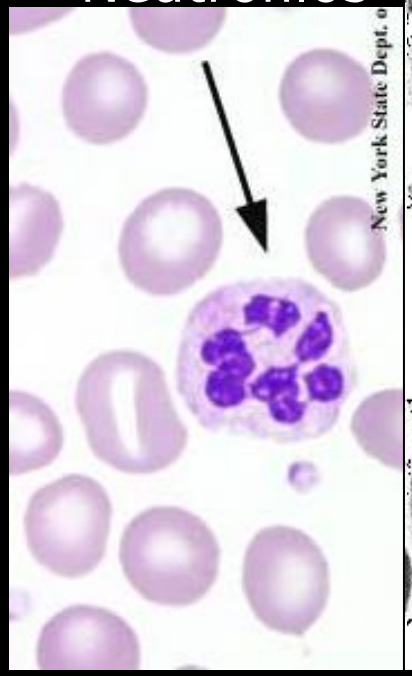
Shi et al., 2020

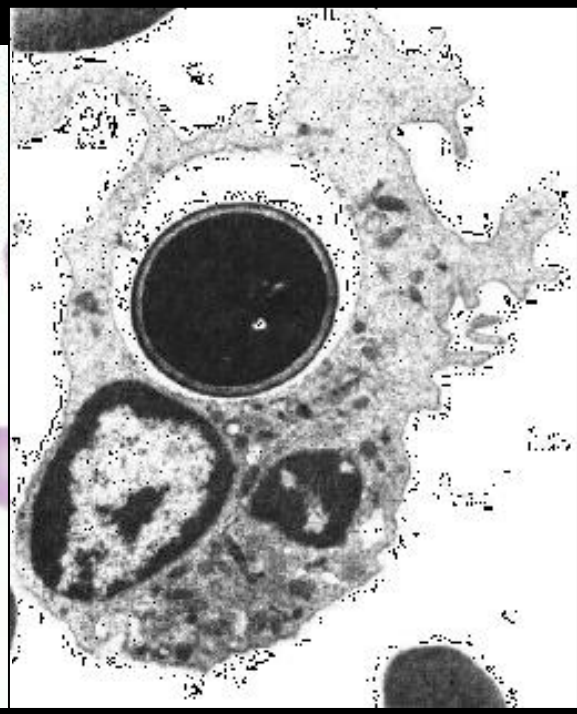
https://www.nature.com/articles/s41418-020-0530-3

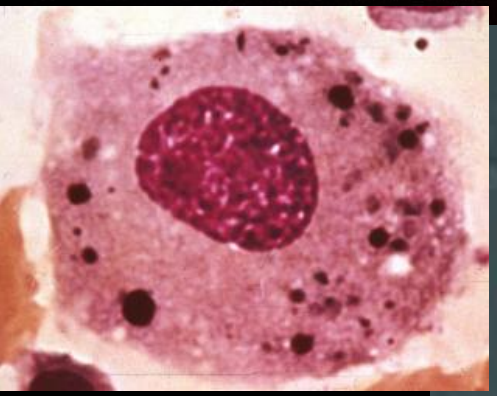
Fagocitos

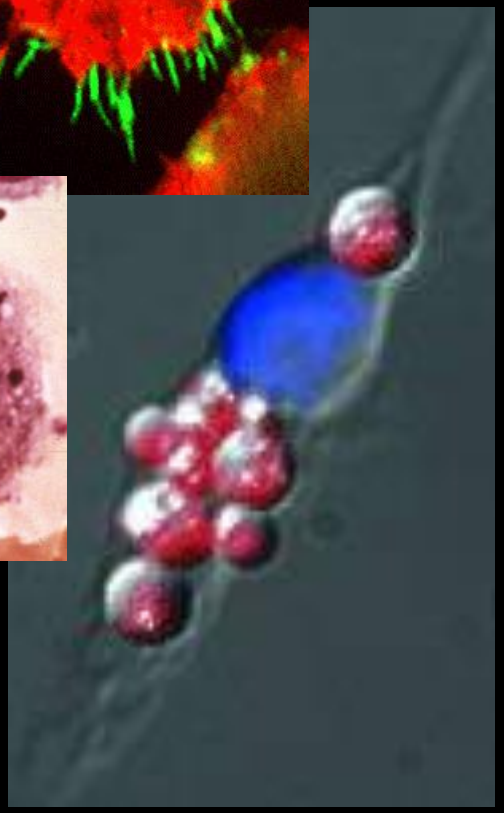


Neutrófilos





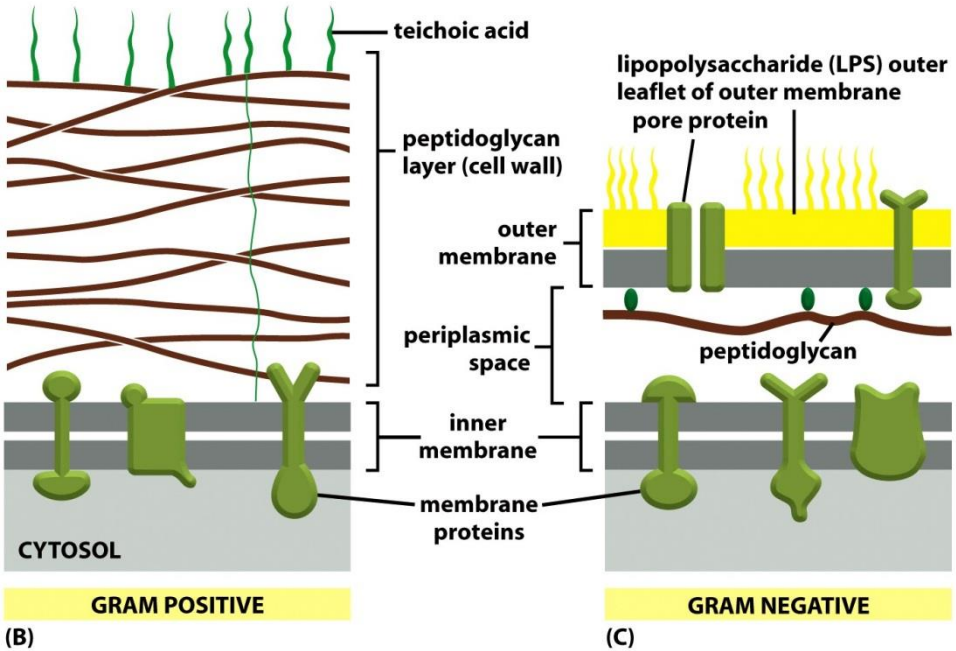


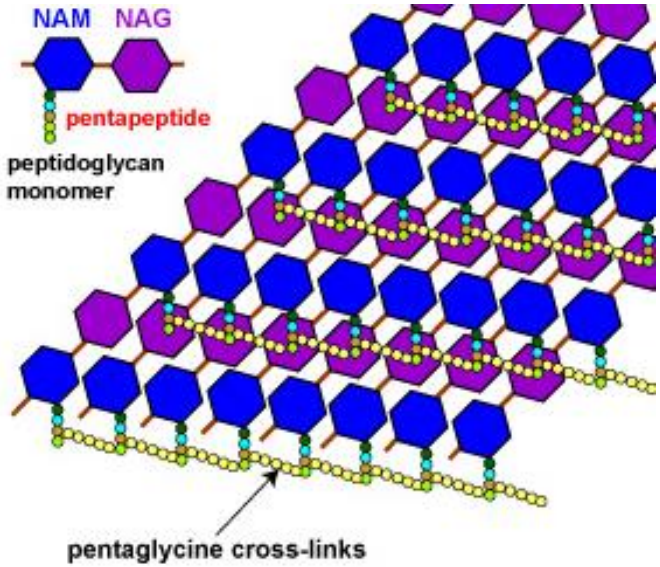


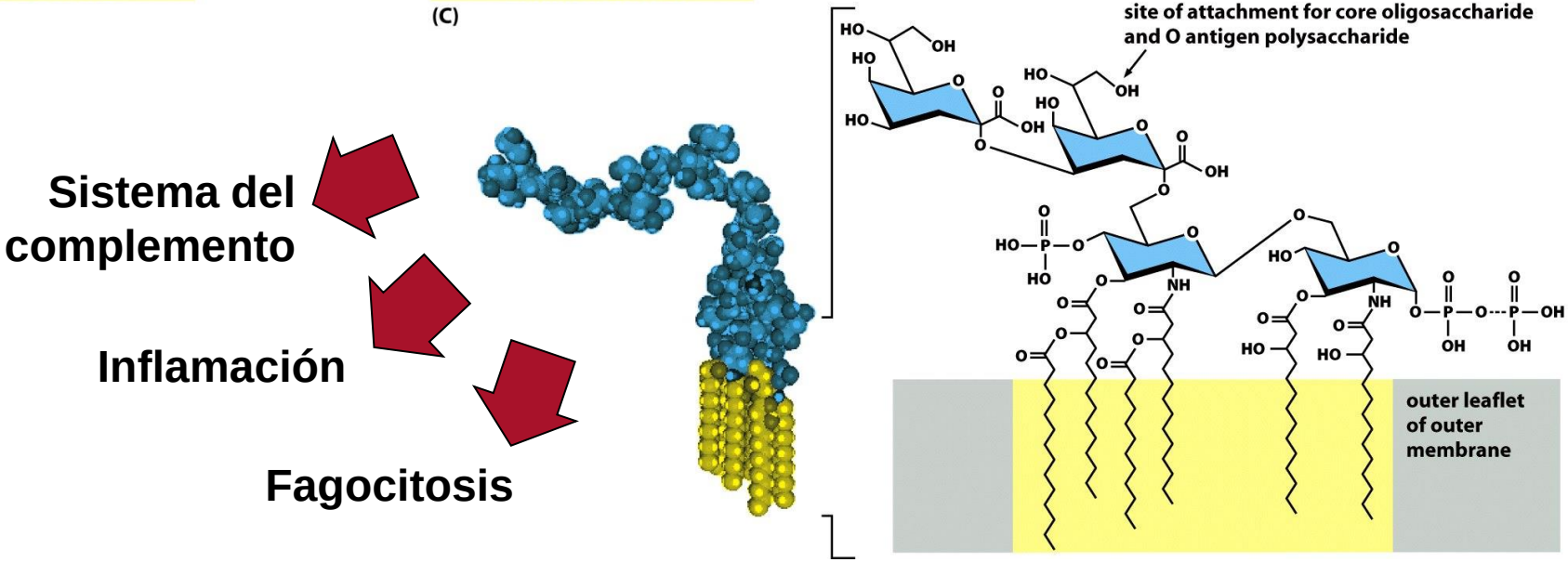
Macrófagos

Células dendríticas

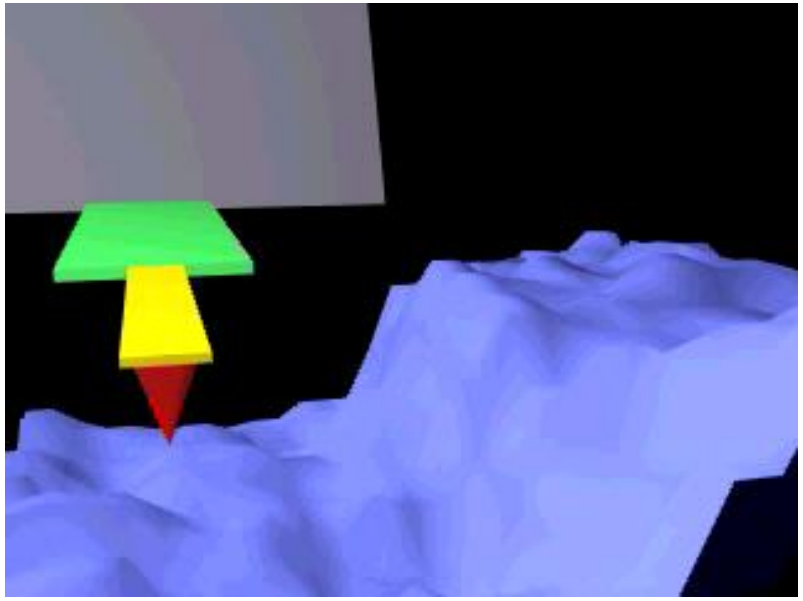
Detección de Arreglos Moleculares Asociados a Patógenos (PAMPs: Pathogen Associated Molecular Patterns)

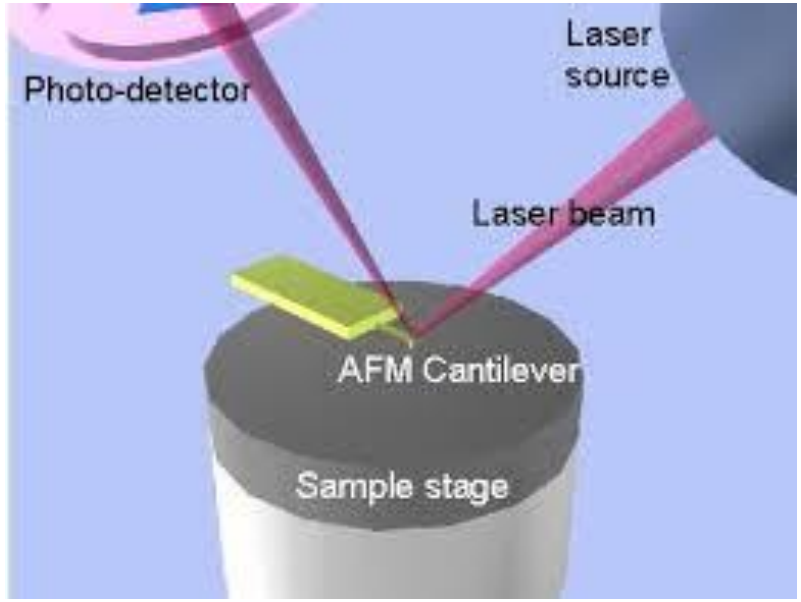


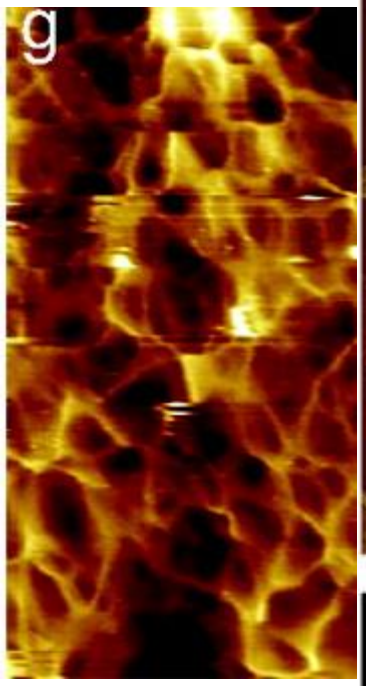


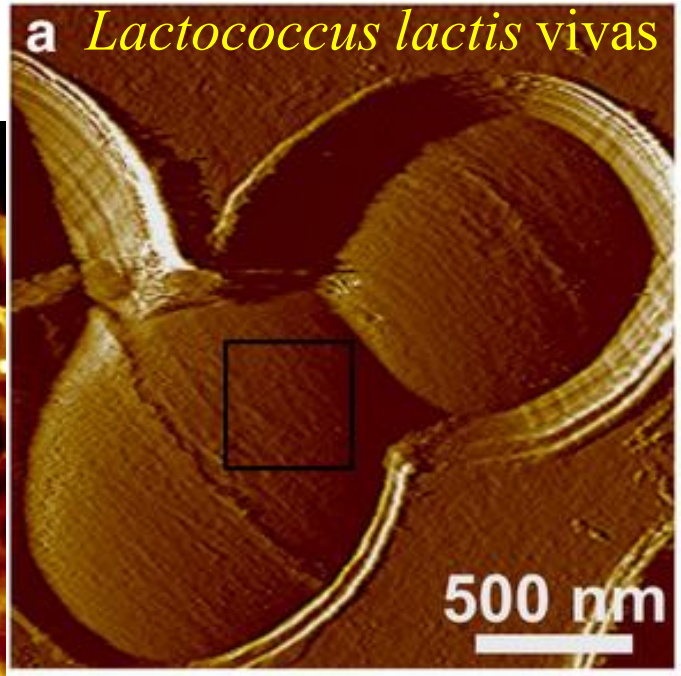


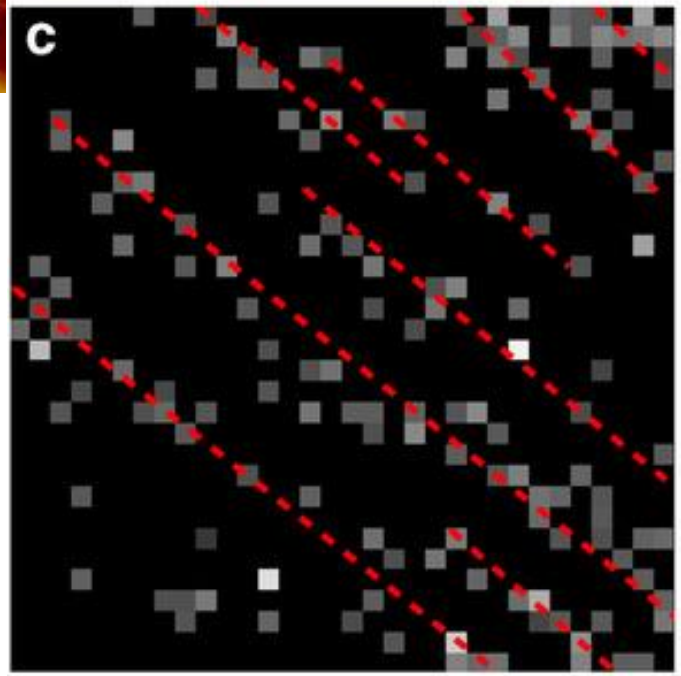
Estructura del peptidoglicano: microscopía de fuerza atómica







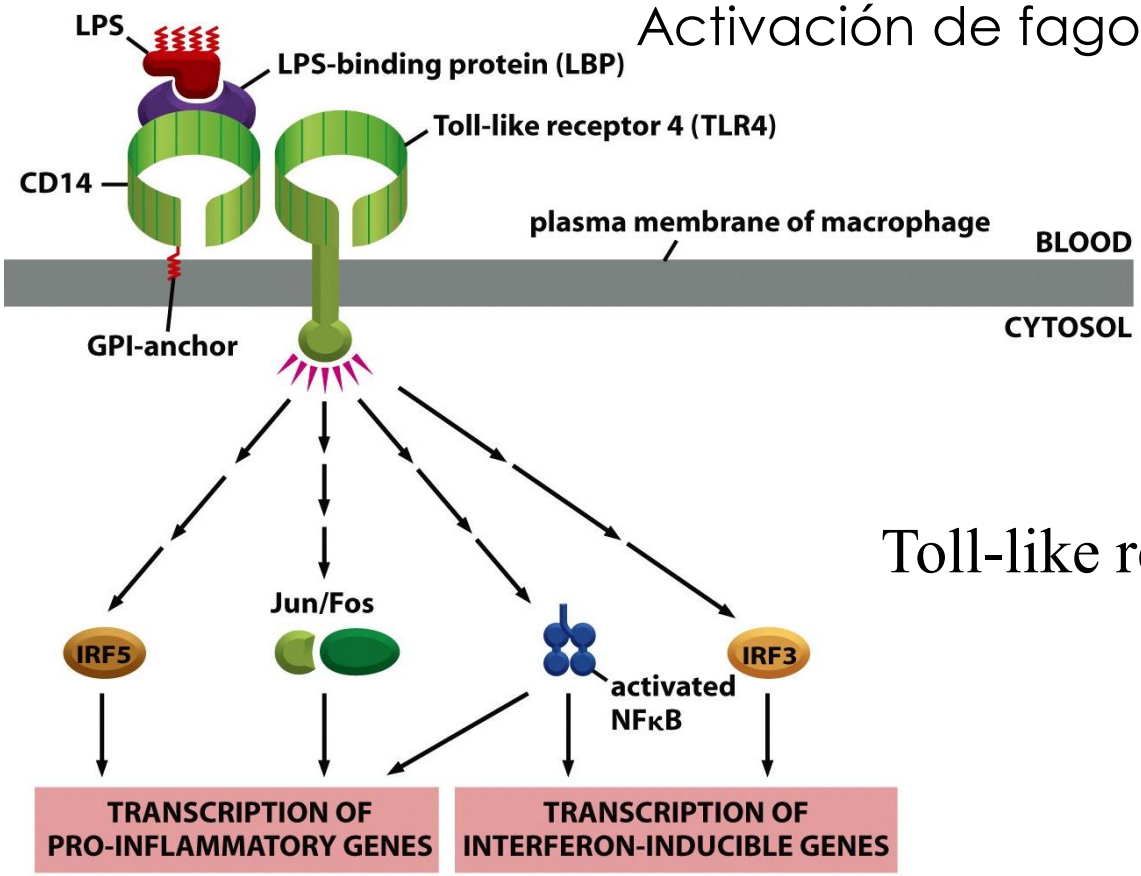


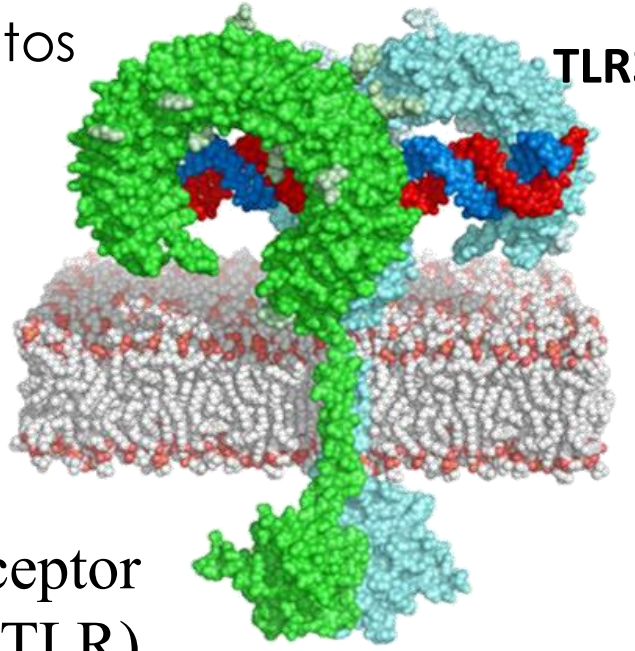


Mapa de fuerzas de adhesión
Punta con "Motivo Lisina" de la autolisina AcmA: Une peptidoglicano

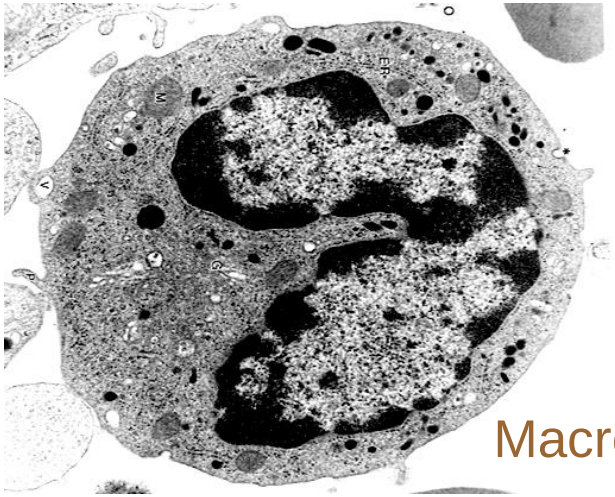
Andre et al., 2010
doi:10.1038/ncomms1027

Activación de fagocitos

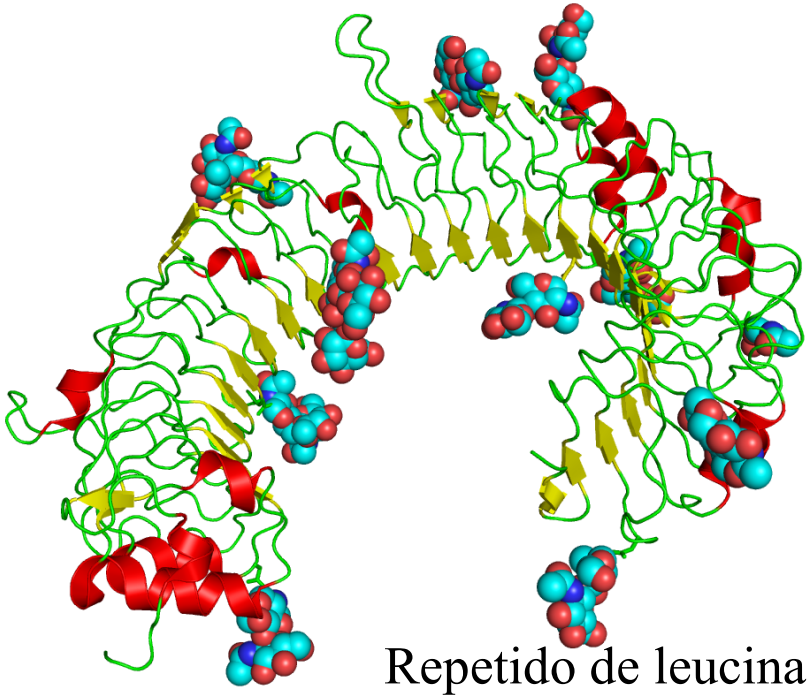




Toll-like receptor
(TLR)

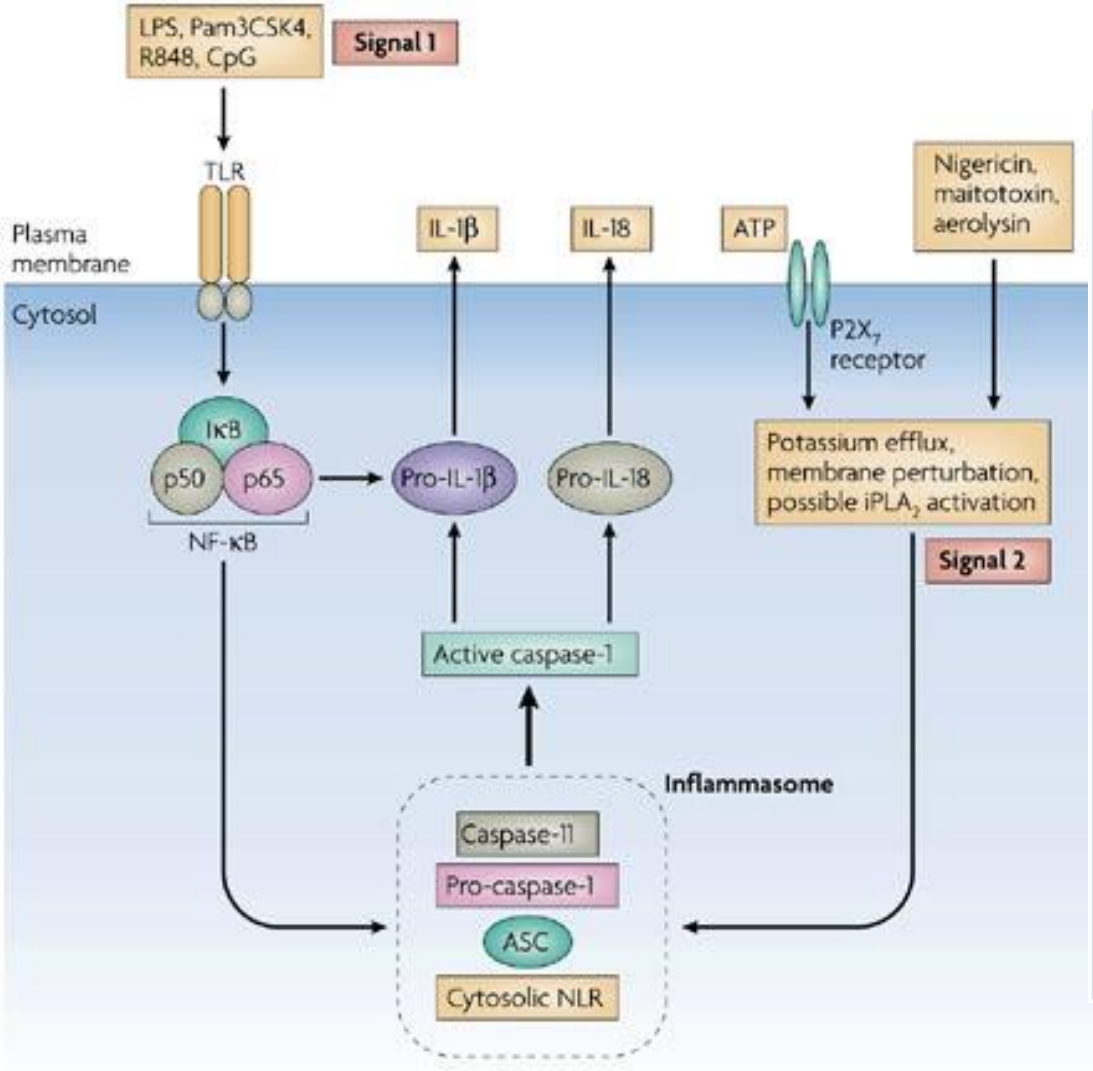


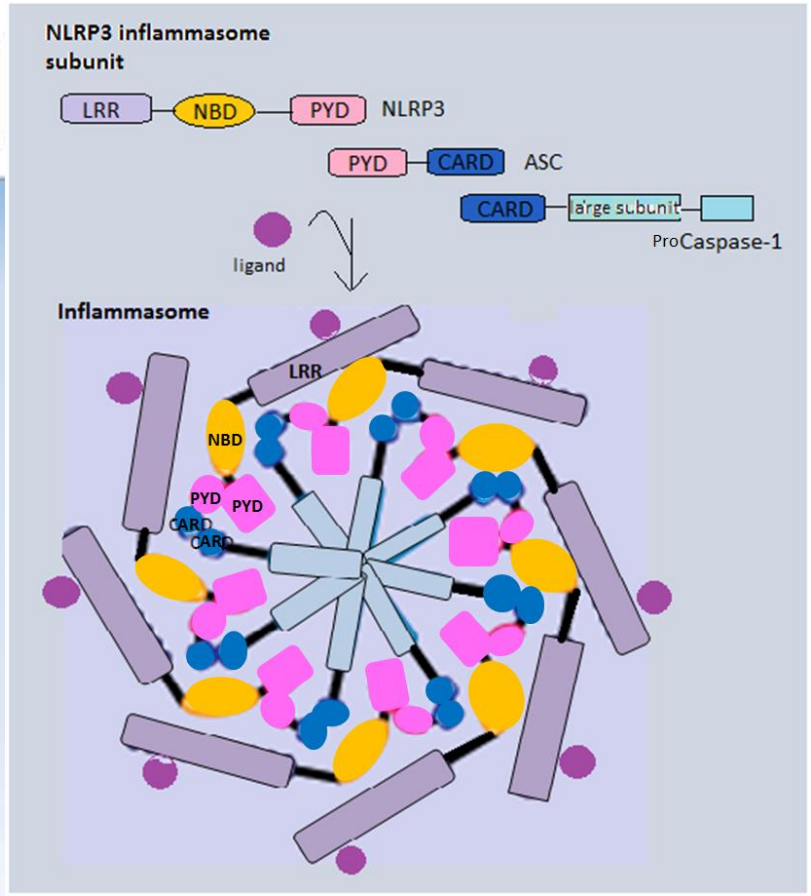
Macrófago



Repetido de leucina

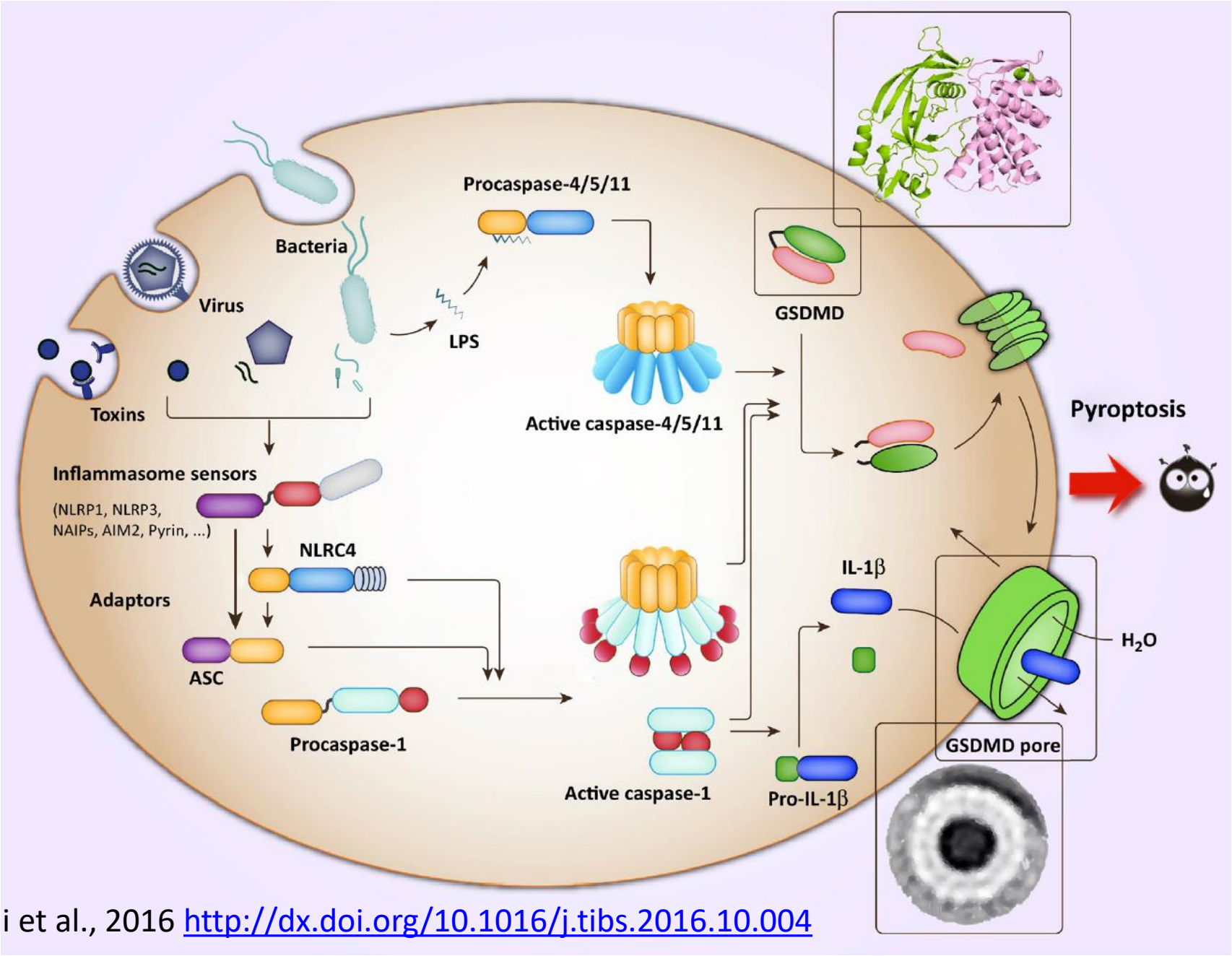
Detección de Arreglos Moleculares Asociados a Patógenos (PAMPs) e inflamasomas





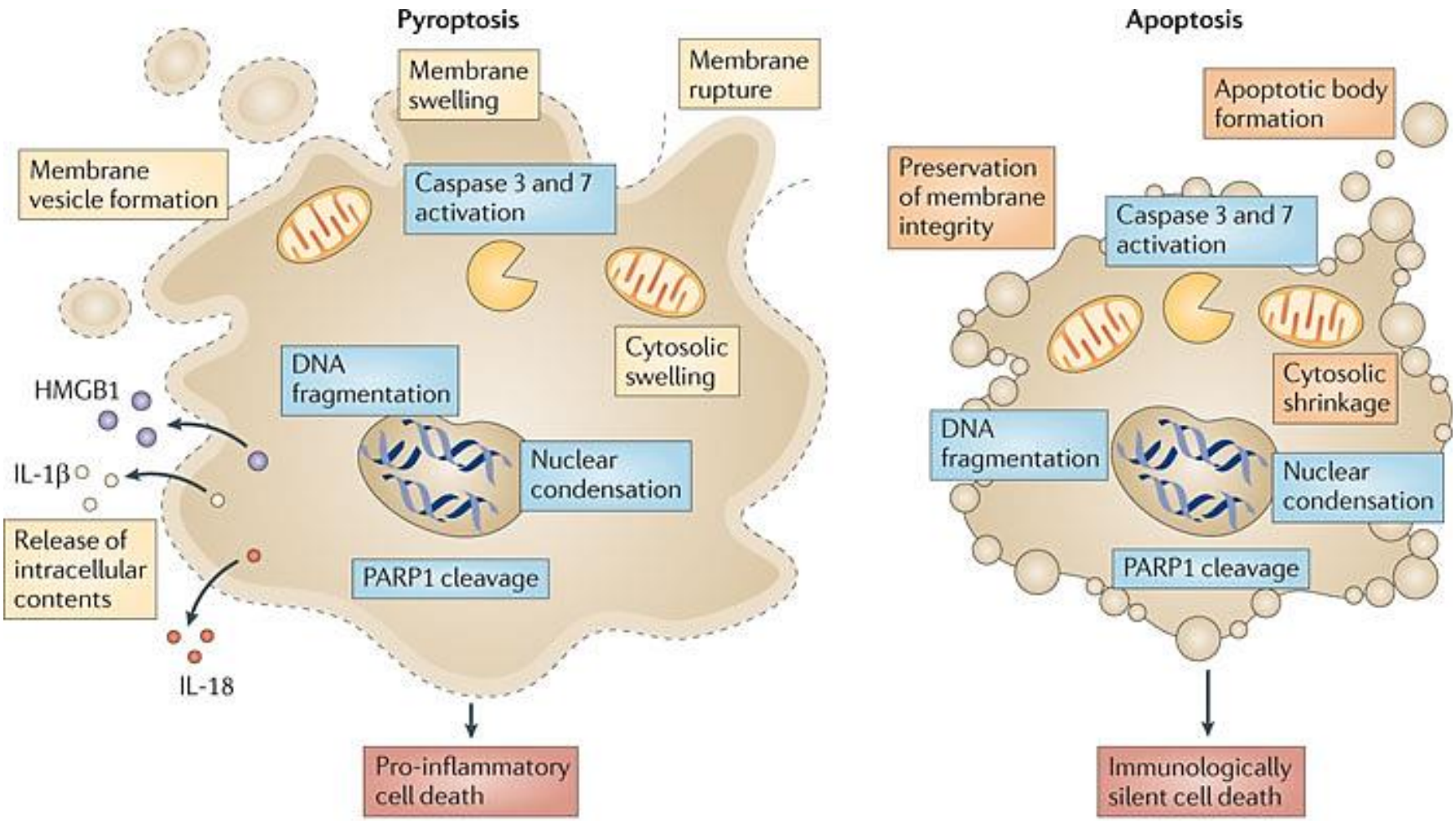
NLR = NOD-Like Receptor

Inflamasoma y piroptosis

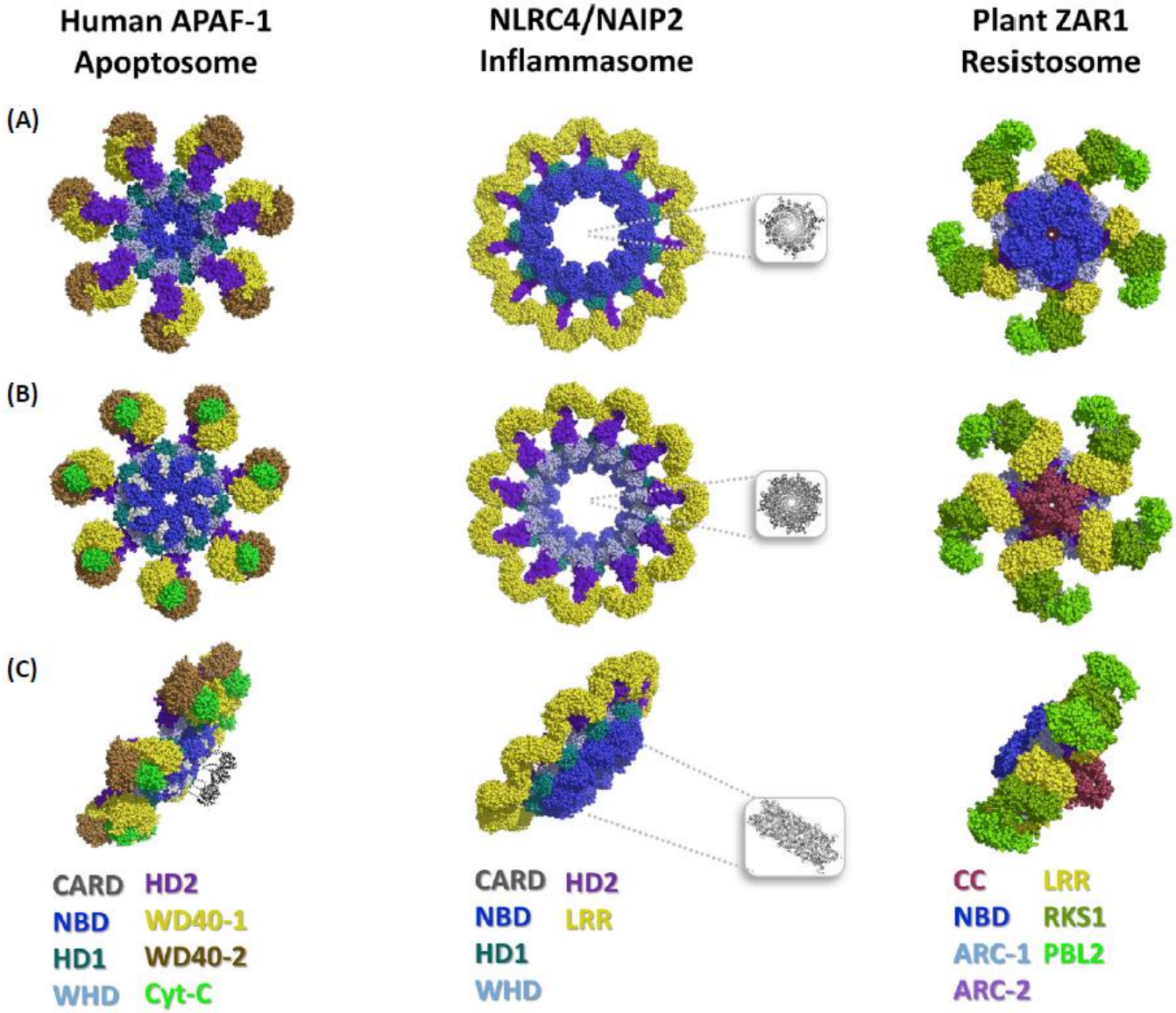


Shi et al., 2016 http://dx.doi.org/10.1016/j.tibs.2016.10.004

Muerte celular pro-inflamatoria: piroptosis

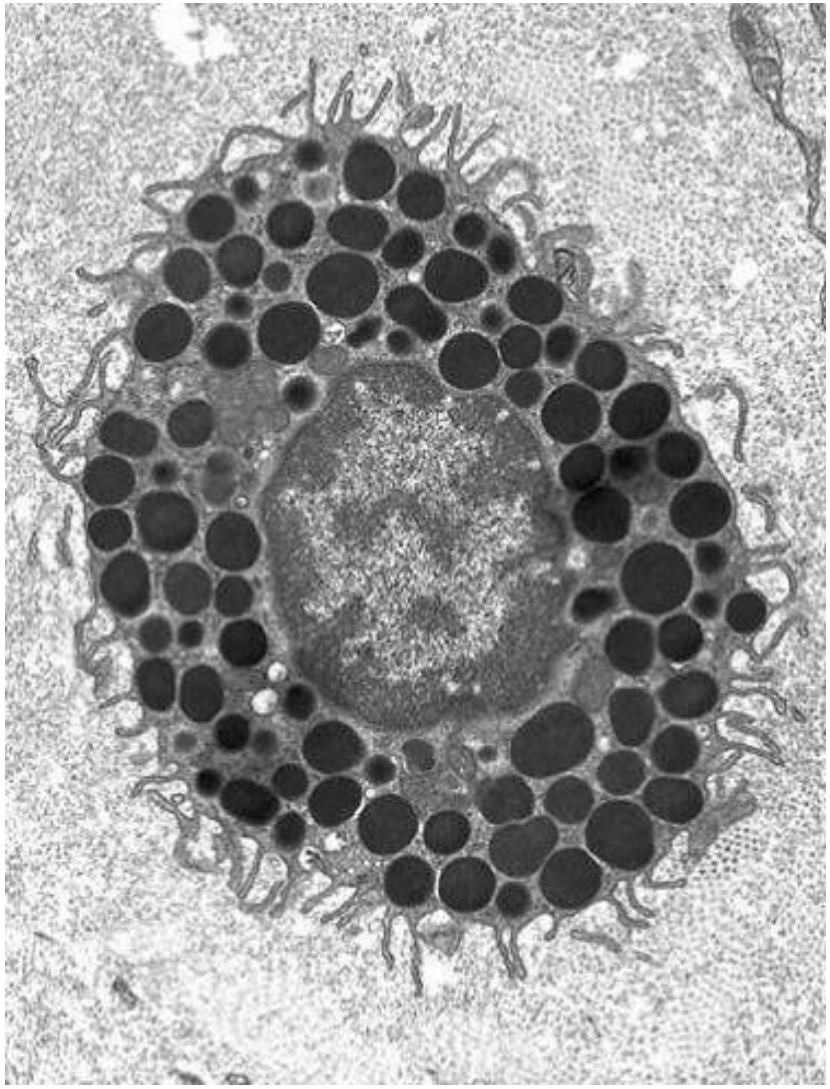


Apoptosomas, inflamasomas y resistosomas: complejos proteicos similares, en distintos reinos

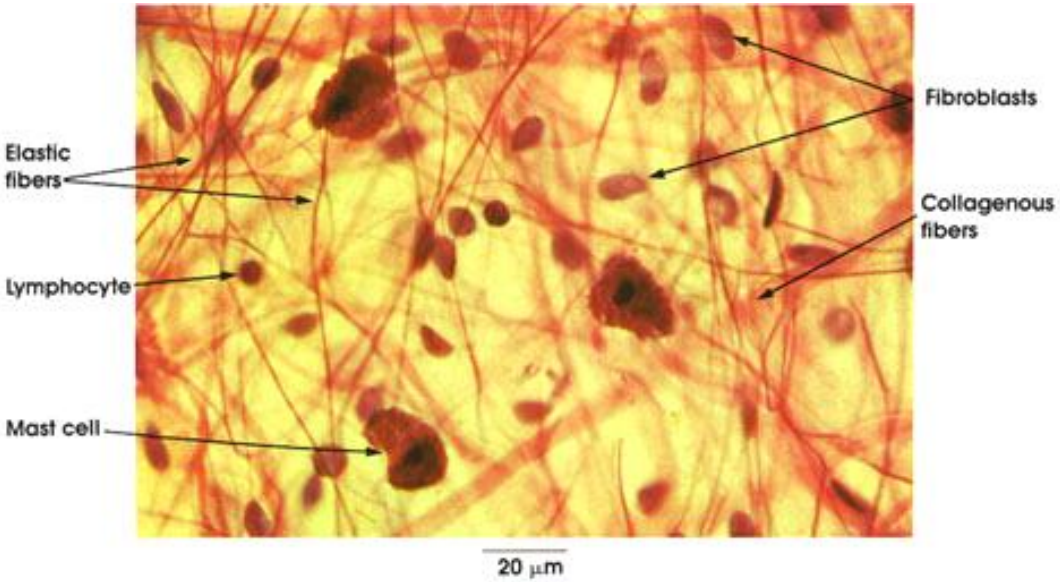


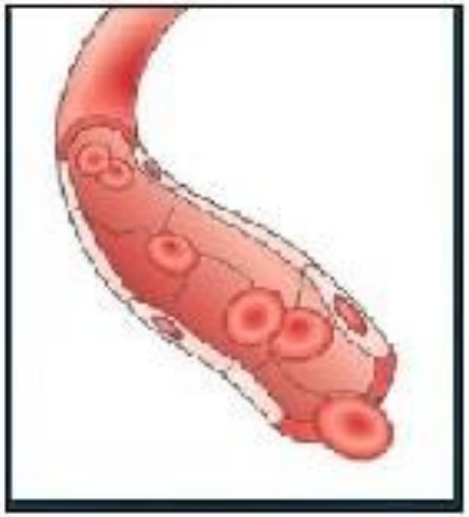
Mermigka et al., Plant and Animal Innate Immunity Complexes: Fighting Different Enemies with SimilarWeapons
Trends in Plant Science (2019) https://doi.org/10.1016/j.tplants.2019.09.008

Inflamación

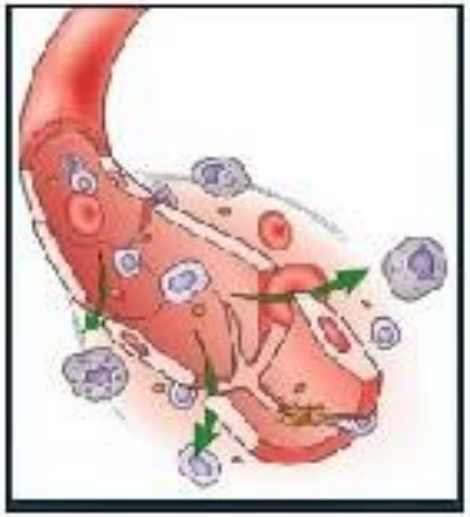


Mastocito



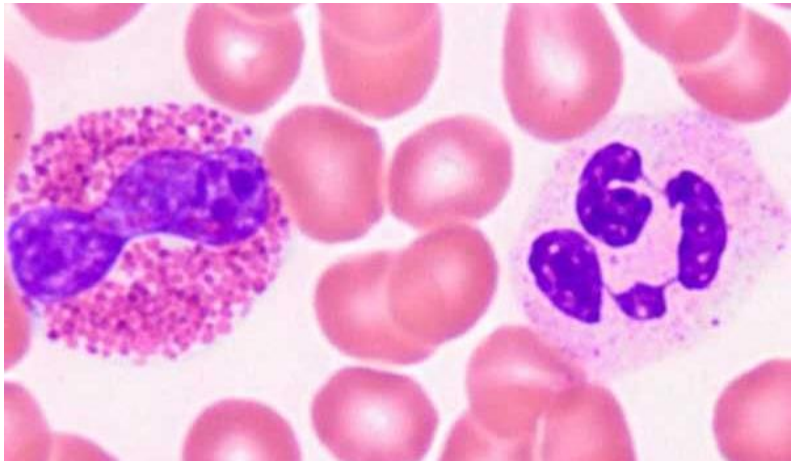


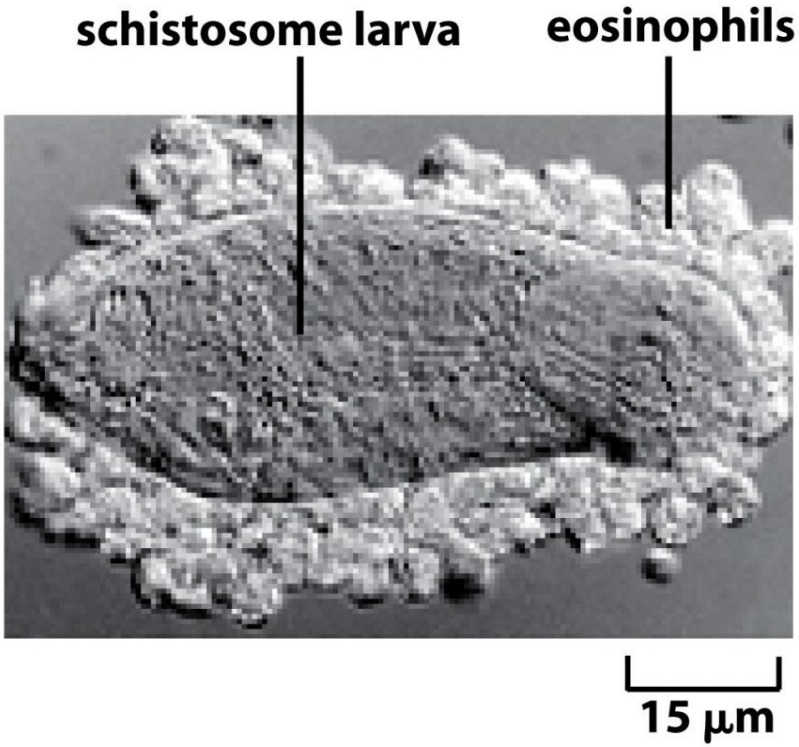
Normal Blood Vessel



Tissue Inflammation

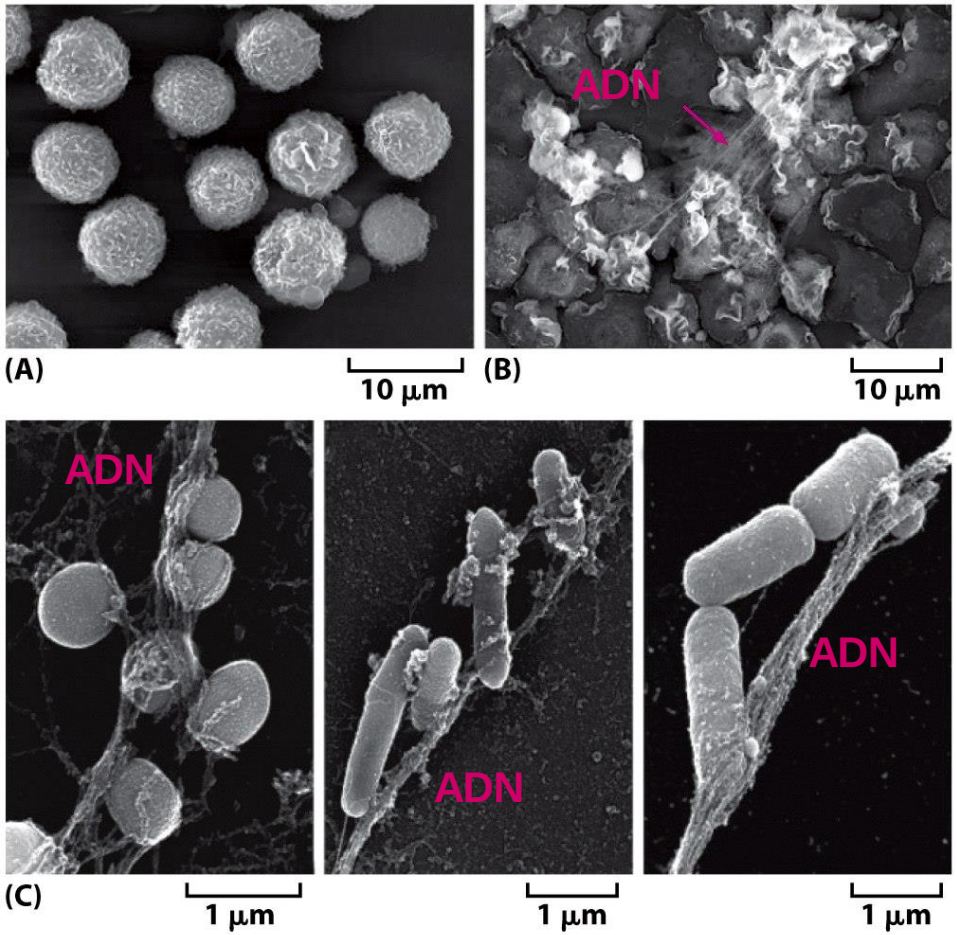
Otros métodos para la eliminación de patógenos



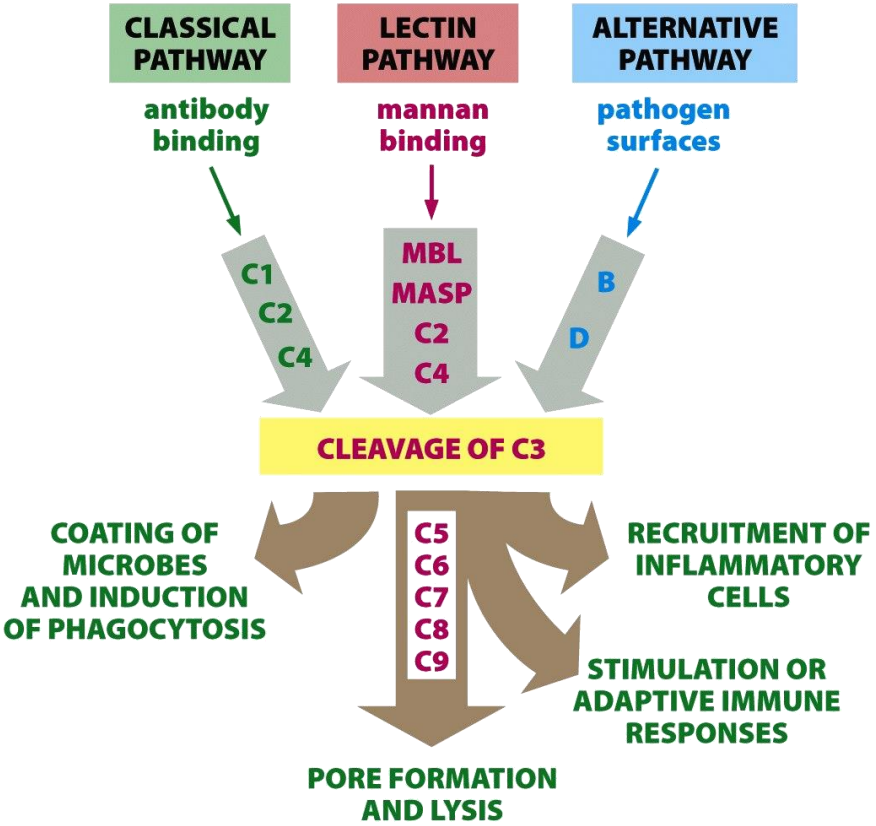


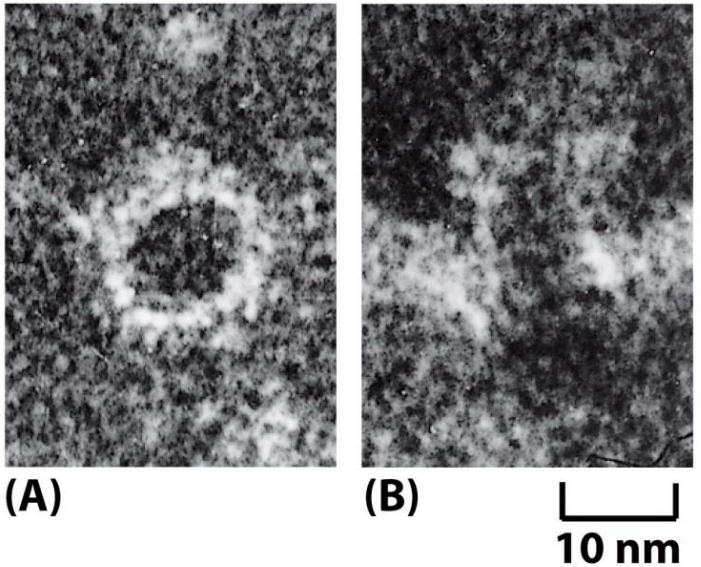
Neutrófilos en reposo

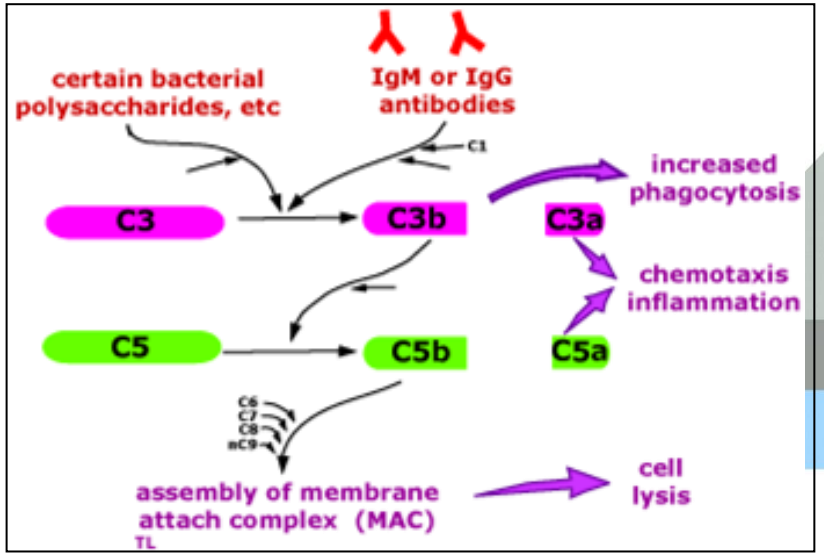
Neutrófilos activados

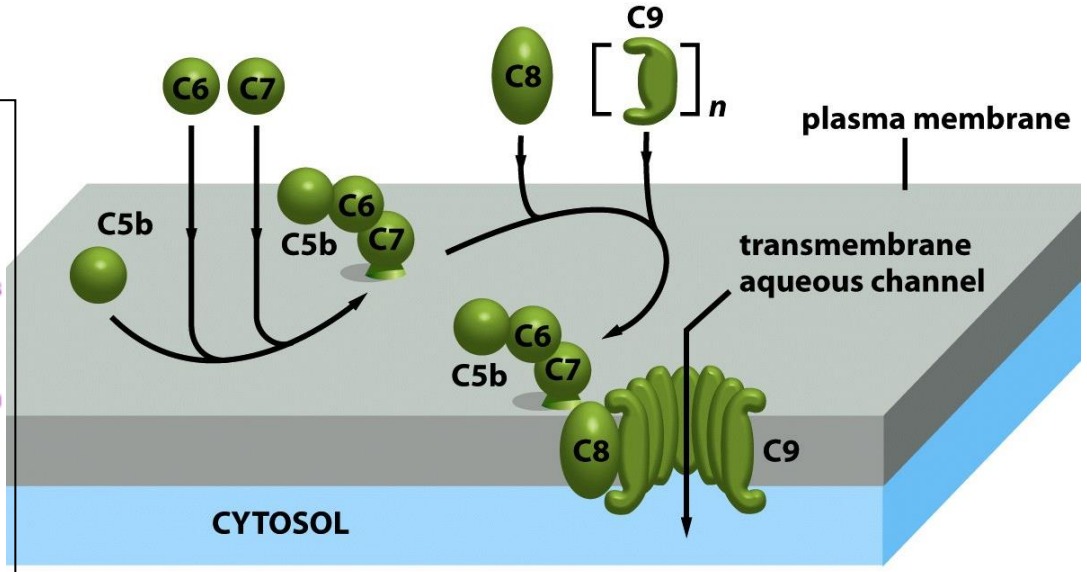


Sistema del complemento









Complement as a target in COVID-19?

NATURE REVIEWS | IMMUNOLOGY

VOLUME 20 | JUNE 2020 | 343

Antonio M. Risitano[1], Dimitrios C. Mastellos[2], Markus Huber-Lang[3], Despina Yancopoulou[4], Cecilia Garlanda[5,6], Fabio Ciceri[7] ✉ and John D. Lambris[8] ✉

There is an urgent need to develop effective therapies for COVID-19. Here, we urge immunologists and clinicians to consider the potential of targeting the complement system in these patients.

https://www.nature.com/articles/s41577-020-0320-7

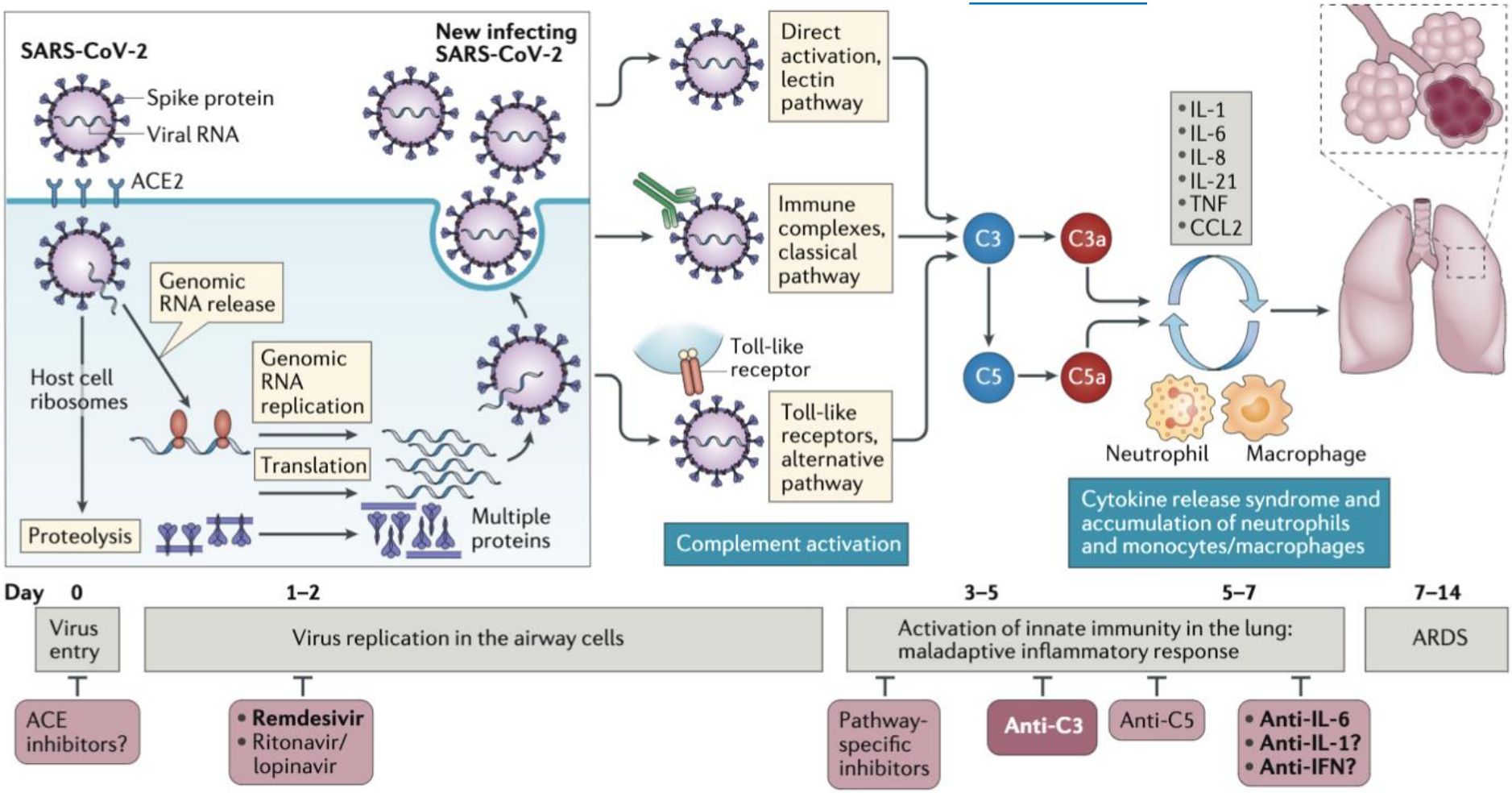
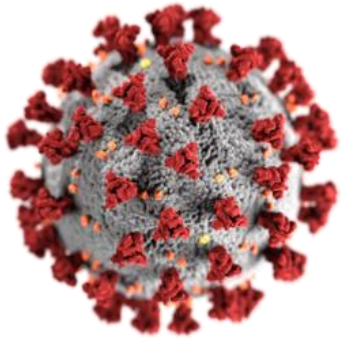
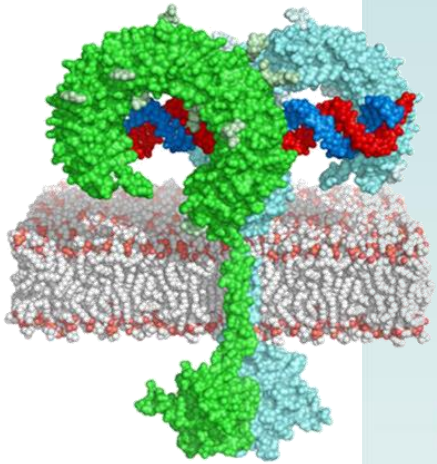


Fig. 1 | **Targeting complement in SARS-CoV-2-associated lung injury.** Complement activation may contribute to the maladaptive inflammatory response seen in some patients with severe COVID-19. Inhibition of C3 or C5 may have therapeutic potential. ARDS, acute respiratory distress syndrome.





Sensing of viral RNA and IFN induction

IFN signalling & expression of ISGs

Cell membrane

Cytoplasm

Type 1 IFNs

IFNAR

TYK2

JAK1

ssRNA

Short 5'(p)pp dsRNA

Long dsRNA

Long(branched) dsRNA

TLR7

TLR3

Endosome

MDA5

RIG-1

PKR

OAS

Myd88

TRIF

MAVS

TRAF3

TRAF6

TRAF3

TRAF2/3

TRAF5/6

IKKα

IKKα

IKKβ

TBK1

IKKε

IKKα

IKKβ

TBK1

IKKε

IRF7

NFκB

IRF3

NFκB

IRF3

STAT1

STAT2

IRF9

ISGF3

RIG-1

...and others

APOBEC

TRIMs

Mx

IFITs

ADAR

MDA5

IRF7

IRF7

Type 1 IFN

NFκB

NFκB

Proinflammatory cytokines

IRF3

IRF3

Type 1 IFN

STAT1

STAT2

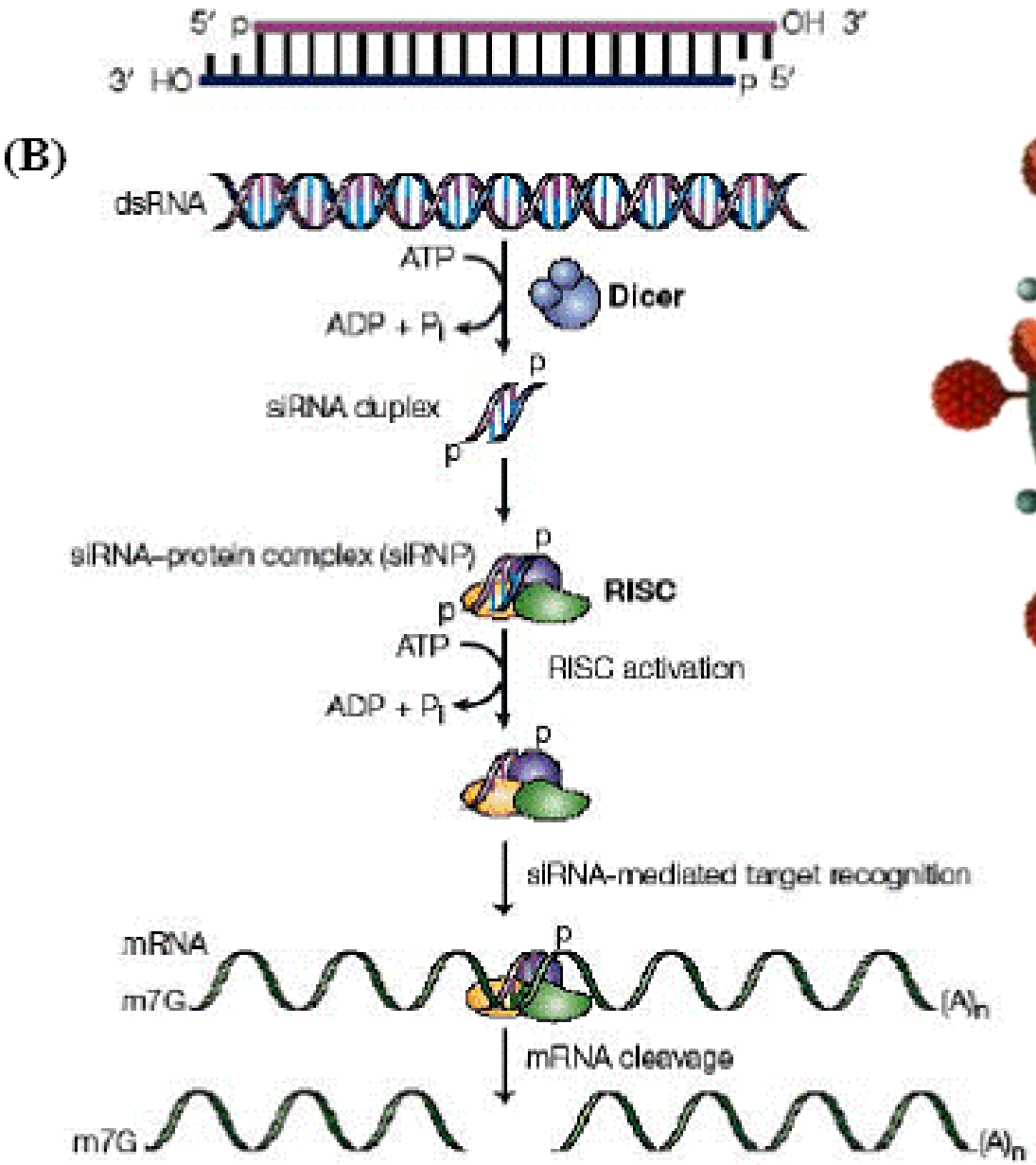
IRF9

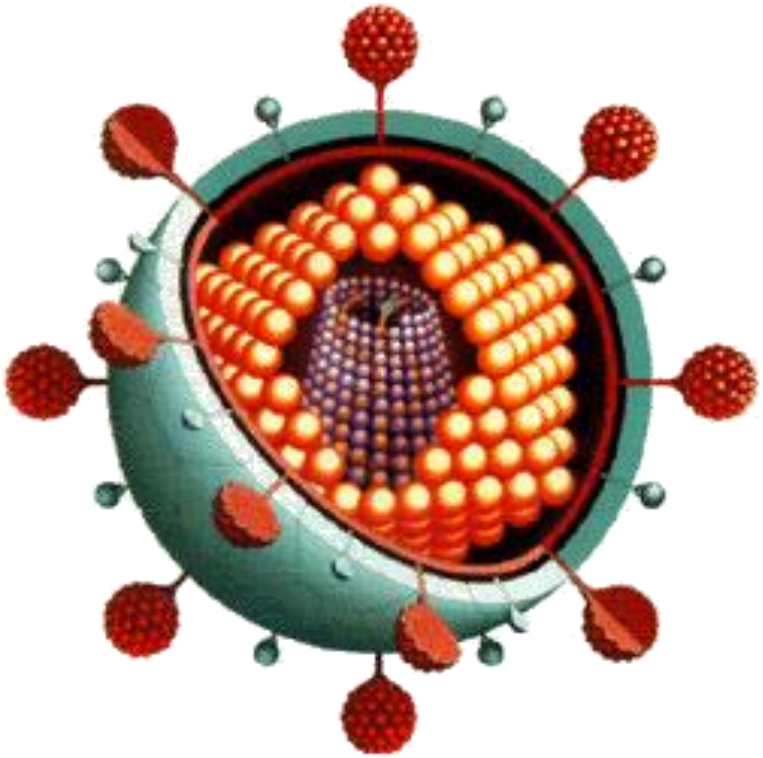
ISRE

ISG

Nucleus

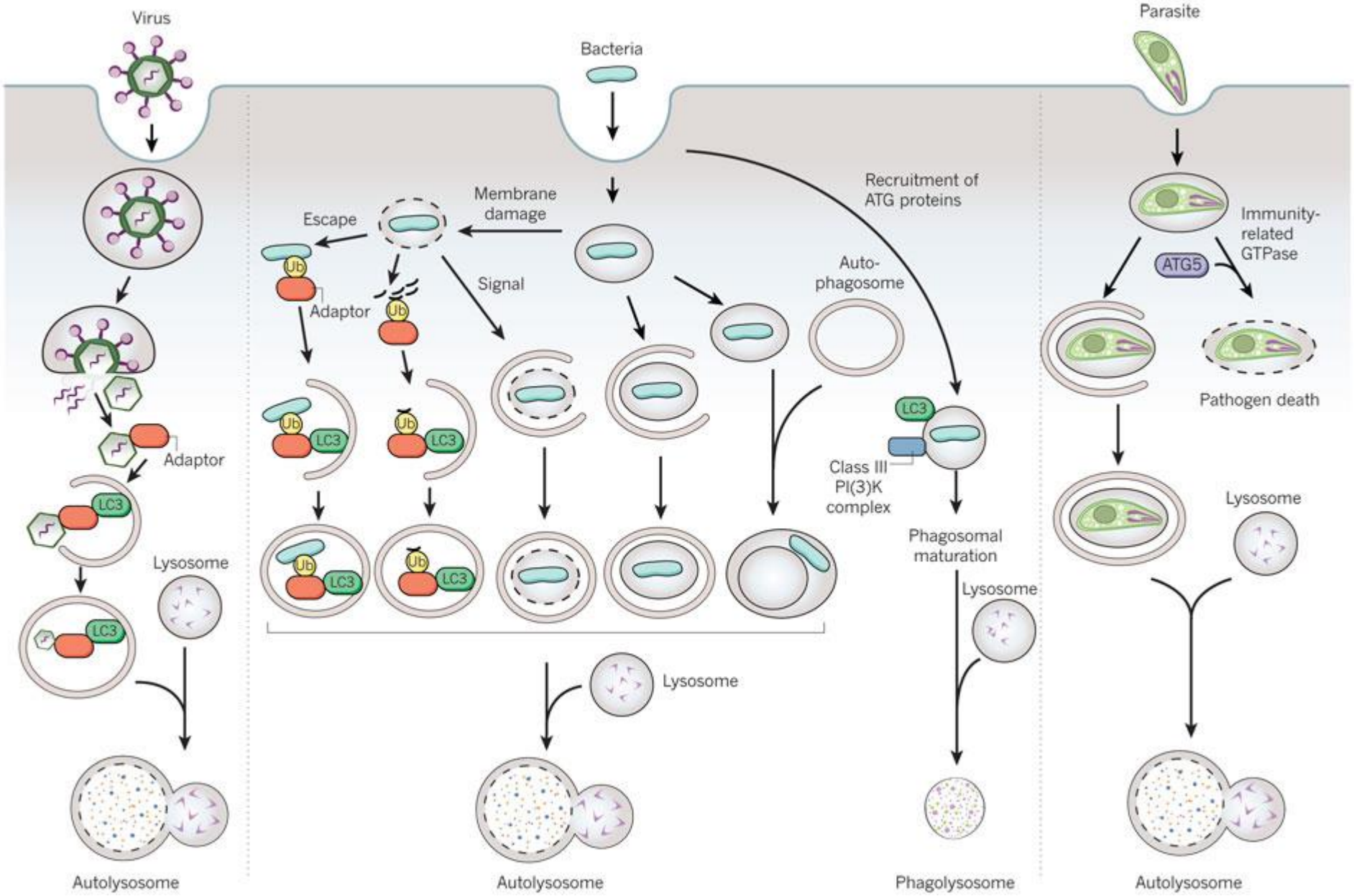
Eliminación de virus del interior celular



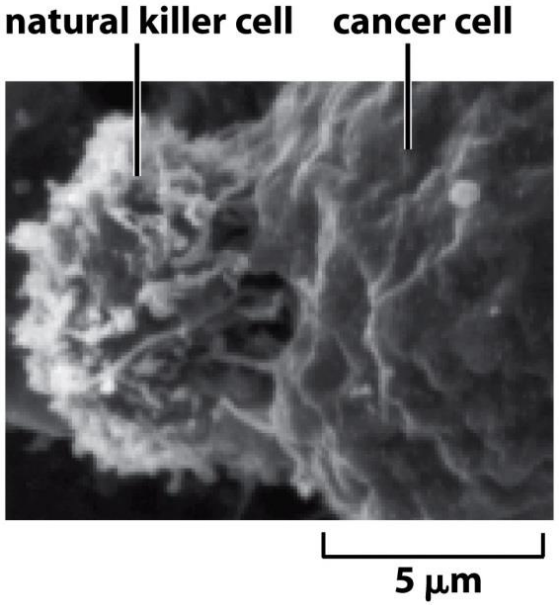


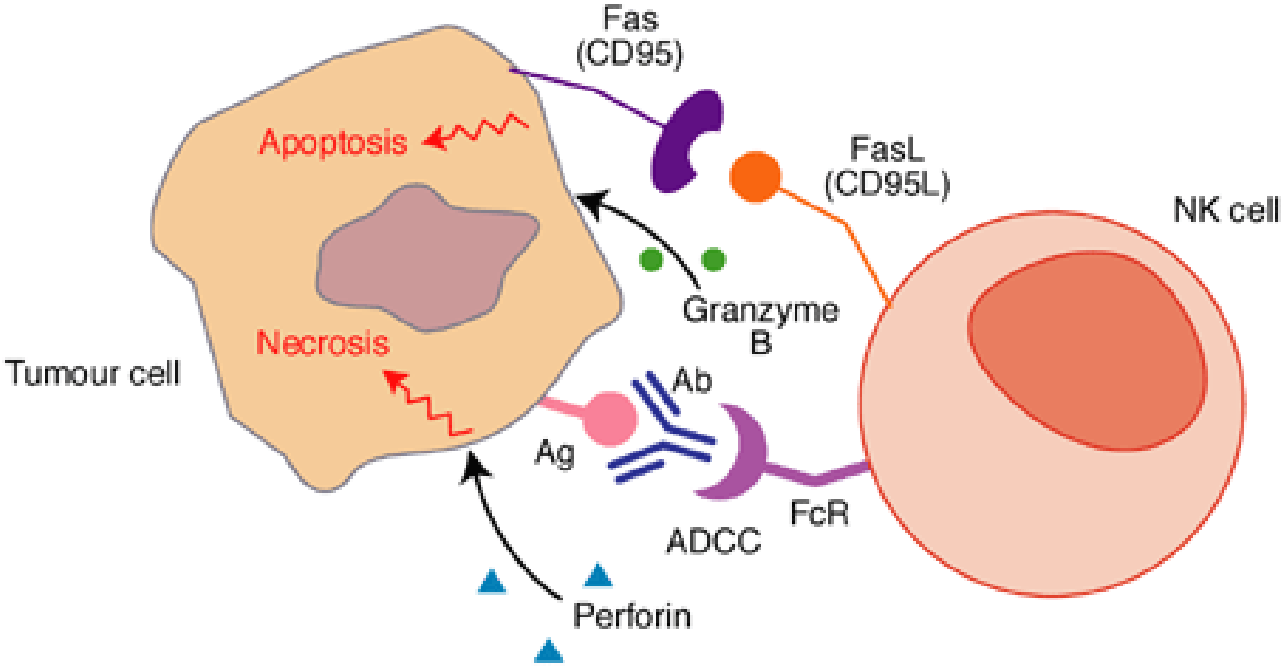
Ante dsRNA, la célula infectada secreta: interferón α; interferón β

Autofagia como mecanismo de eliminación de patógenos

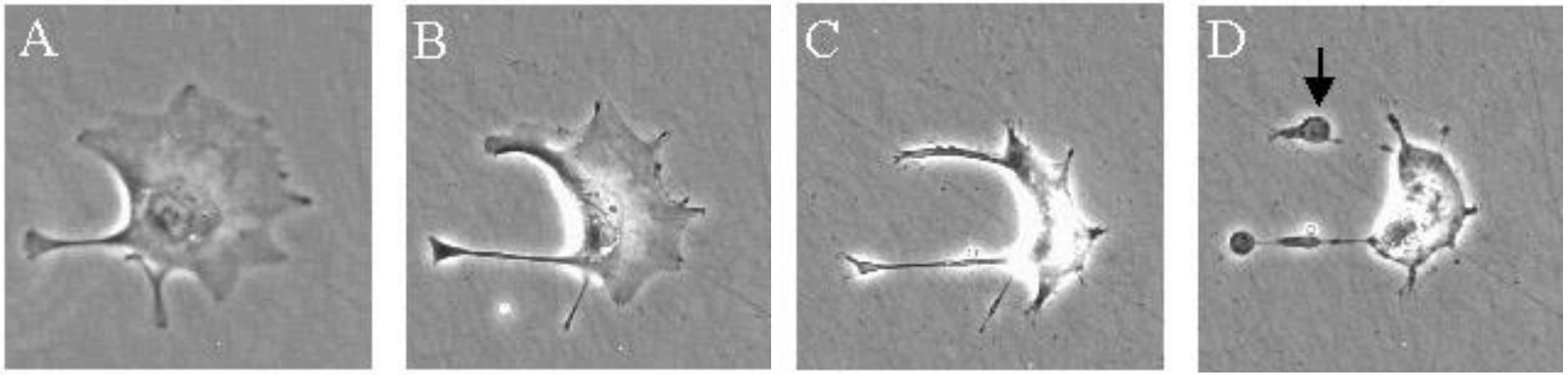


Eliminación de células infectadas por virus y tumorales

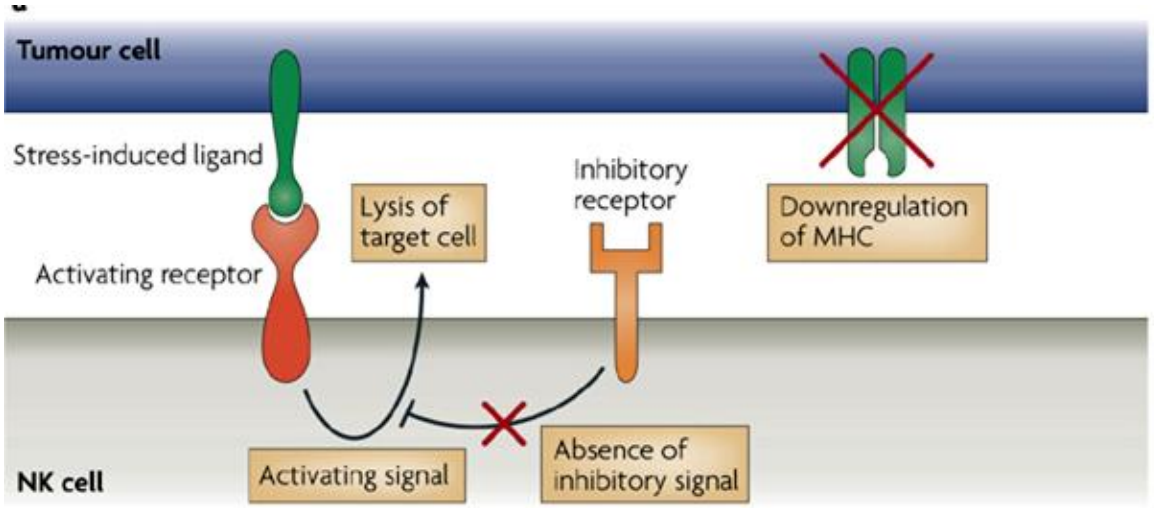


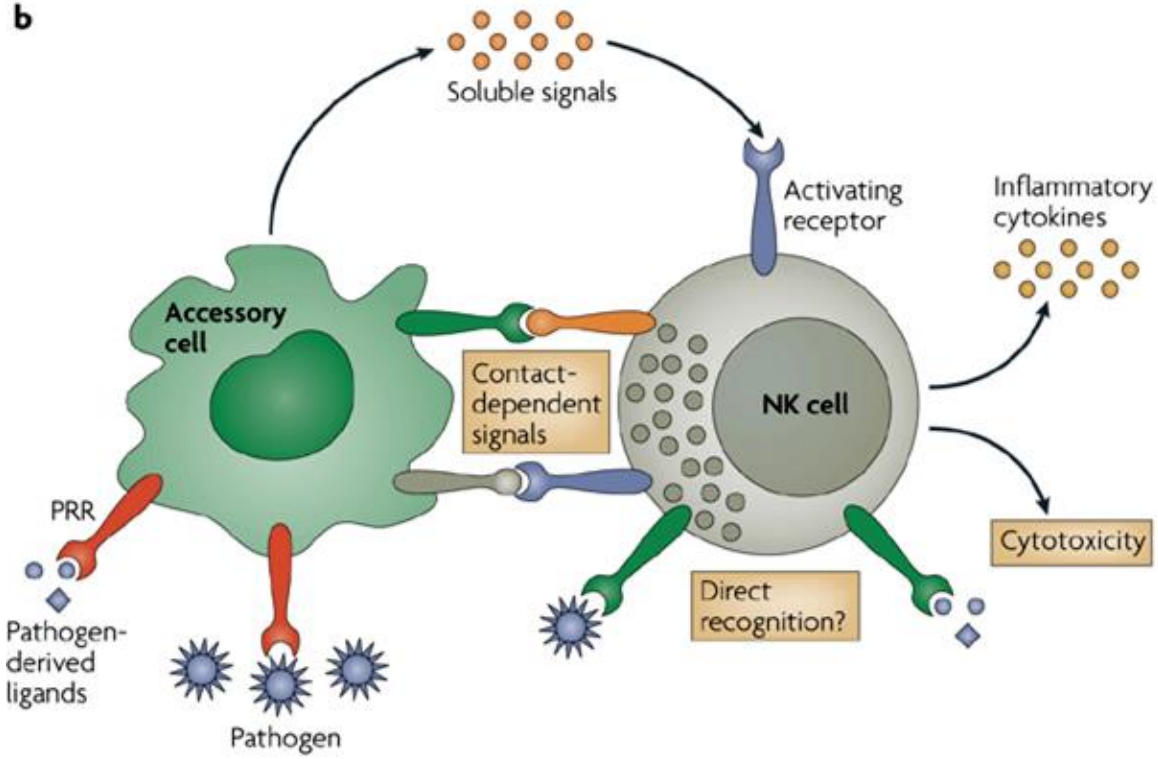


The natural killer (NK)-cell response to tumour cells



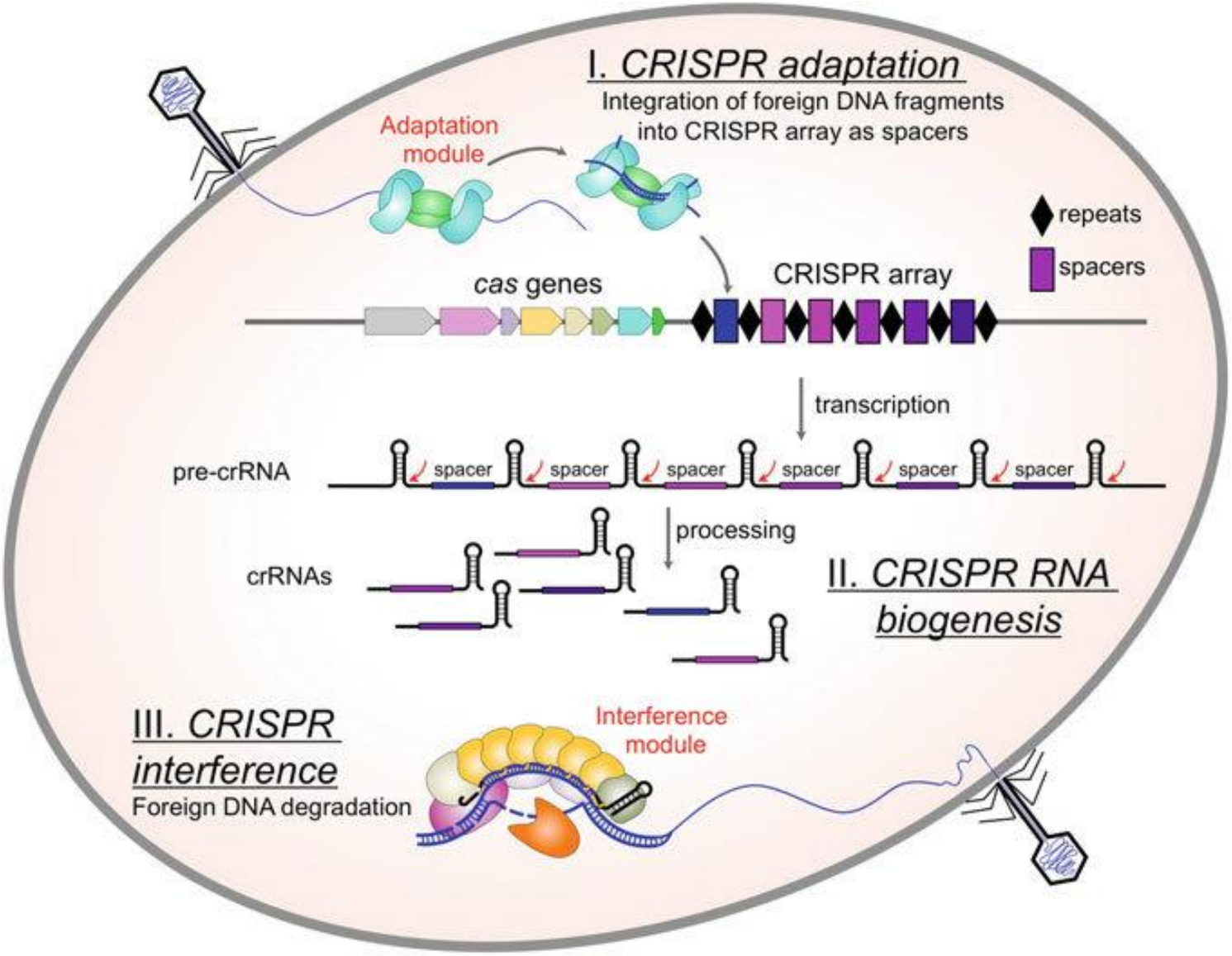
Eliminación de células infectadas por virus y tumorales



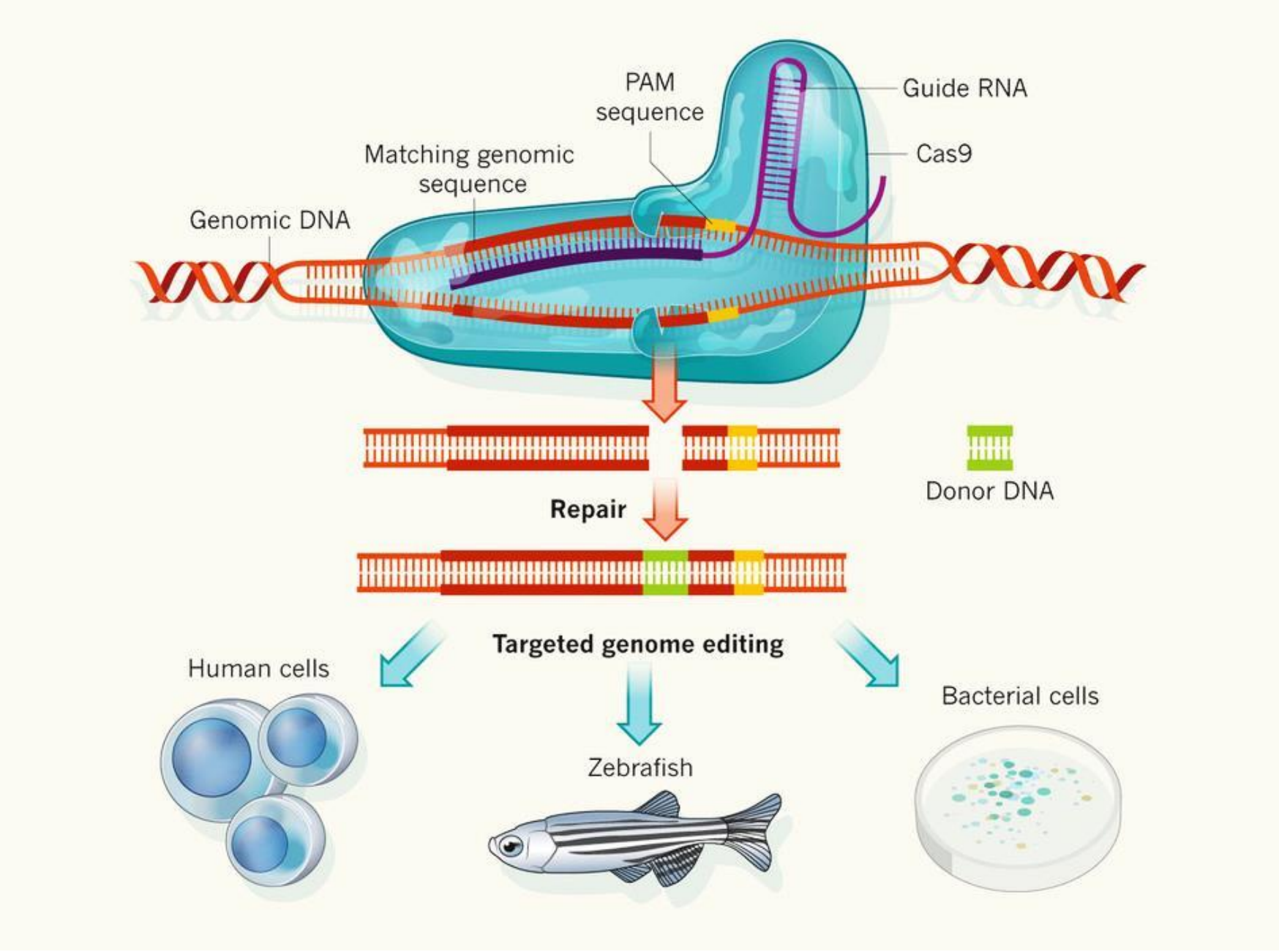


Inmunidad adaptativa

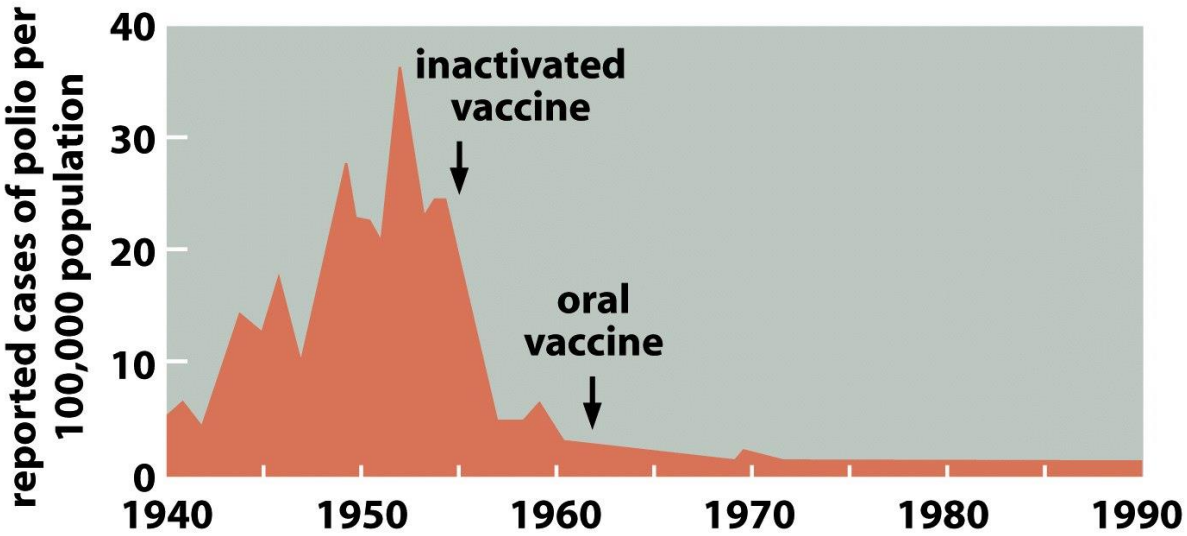
CRISPR
(Clustered Regularly Interspersed Short Palindromic Repeats)
¿Inmunidad adaptativa en bacterias?

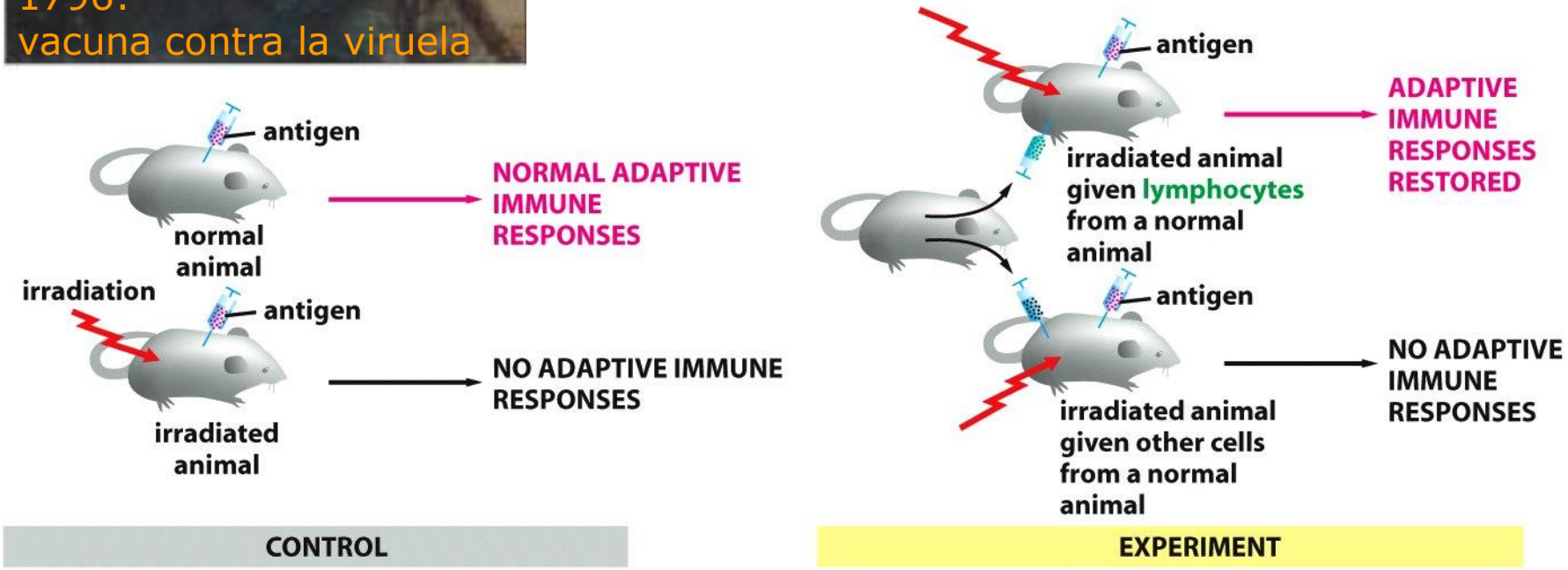


CRISPR-Cas9 como herramienta molecular

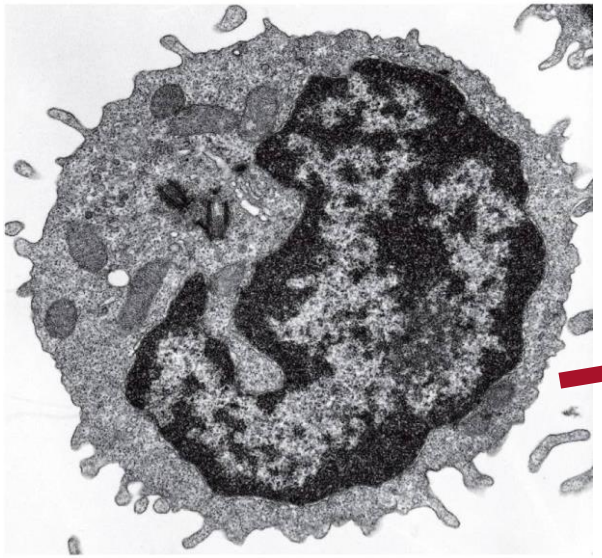


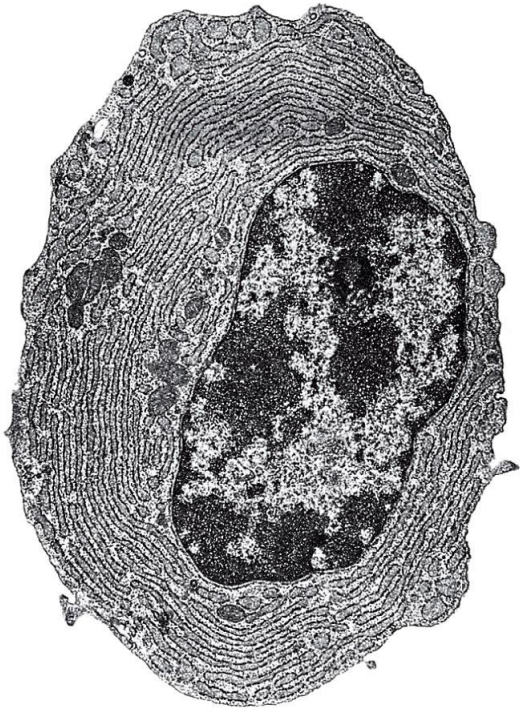
Inmunidad adaptativa en mamíferos





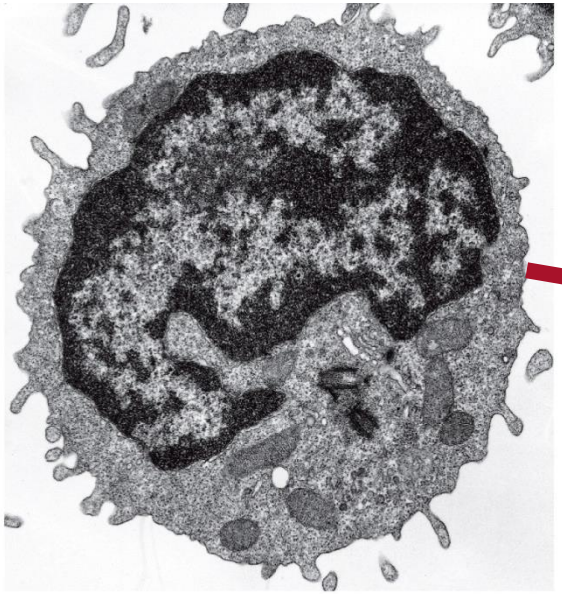
Inmunidad adaptativa: Linfocitos





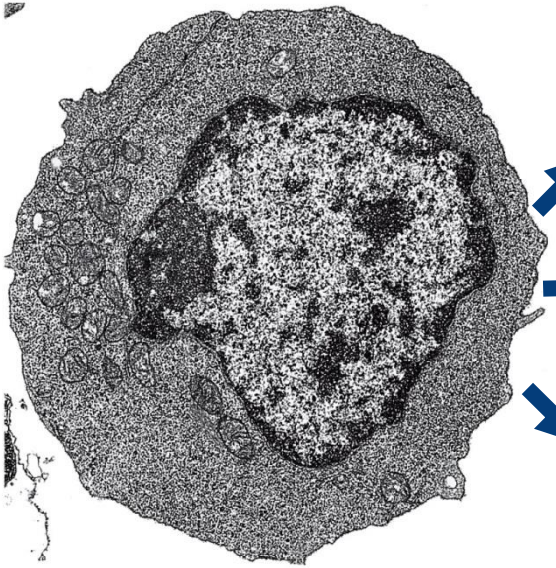
effector B cell (plasma cell)

1 µm



resting T or B cell

1 µm



effector T cell

1 µm

Citotóxicos

Colaboradores

Reguladores (supresores)