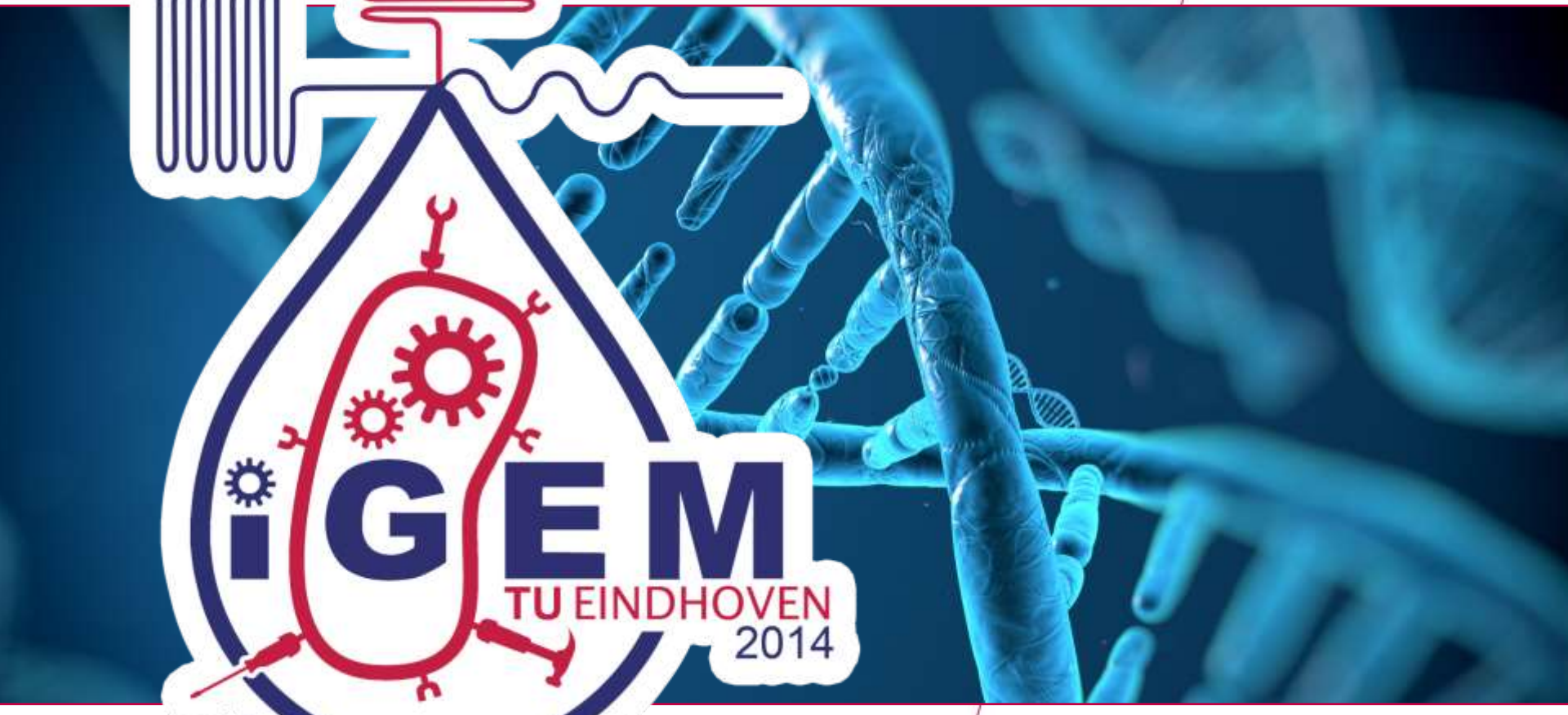

TU/e Technische Universiteit **Eindhoven** University of Technology

Where innovation starts

iGEM

- International Genetically Engineered Machine competition

- Competion for students in synthetic biology

- Aim: to build simple biological systems and operate them in living cells

iGEM
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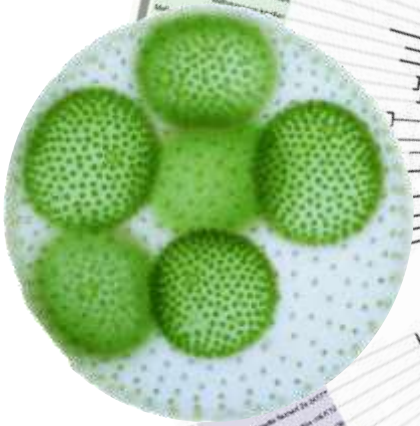
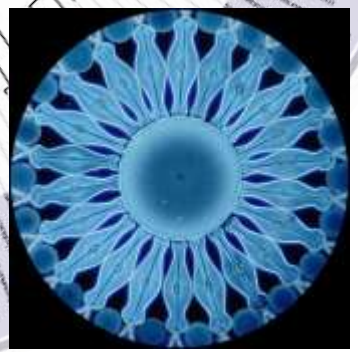
2014


Discman
SONY





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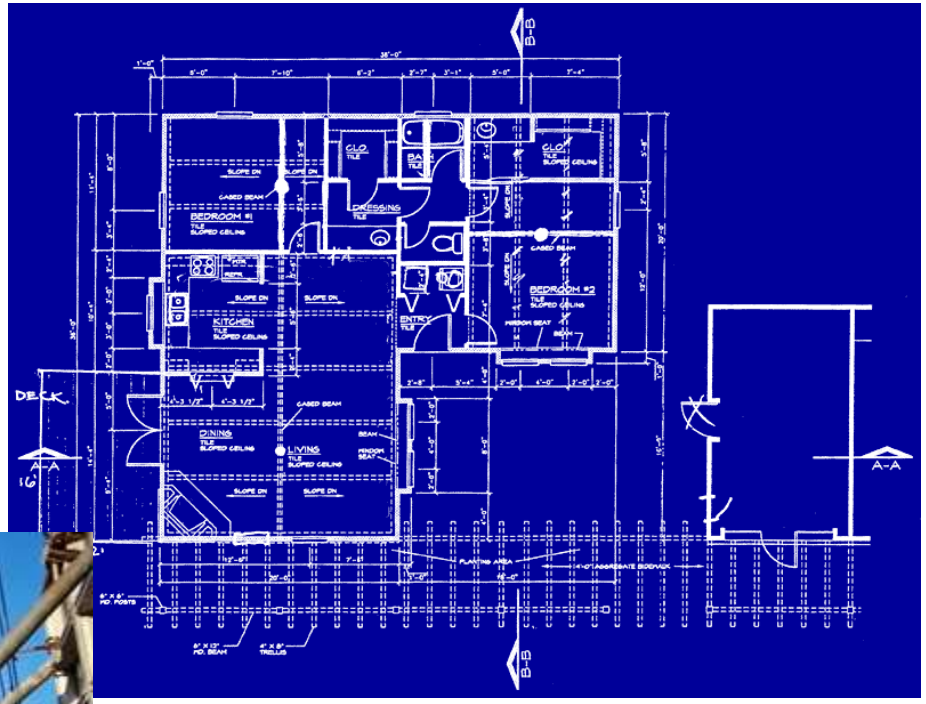
Synthetic Biology
What does it look like?


B-B
A-A
DECK
BEDROOM #1
BEDROOM #2
KITCHEN
DINING
LIVING
DRESSING
ENTRY
CASED BEAM
SLOPE DN
TILE
SLOPED CEILING
PLANTING AREA
B-B
A-A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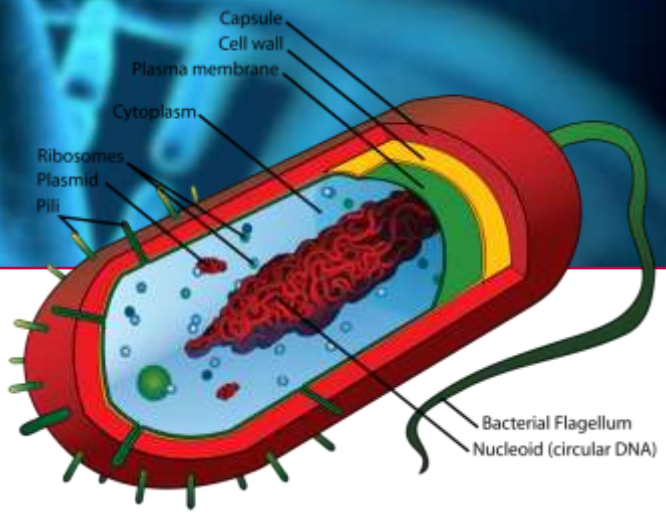
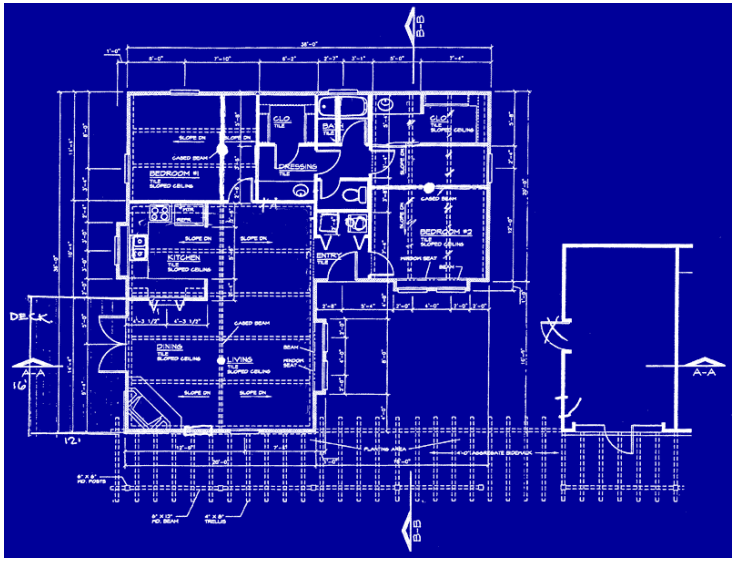
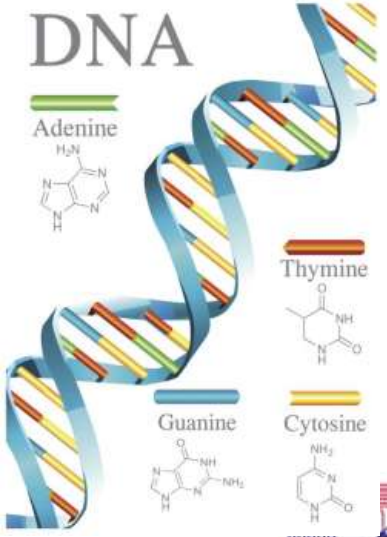
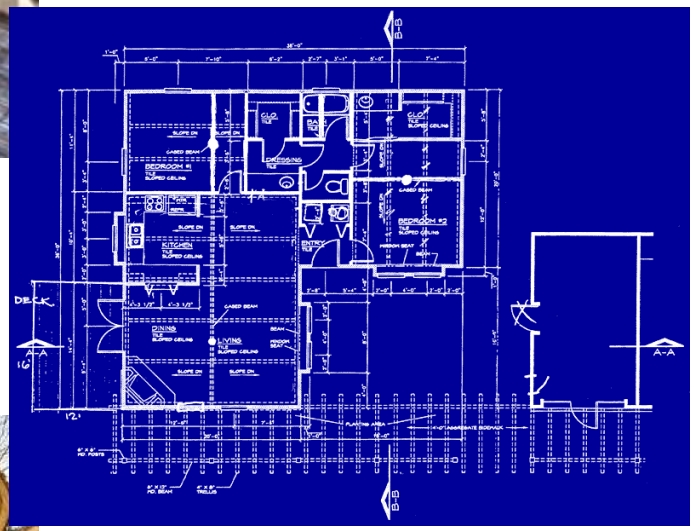

Capsule
Cell wall
Plasma membrane
Cytoplasm
Ribosomes
Plasmid
Pili
Bacterial Flagellum
Nucleoid (circular DNA)




DNA
Adenine
Thymine
Guanine
Cytosine



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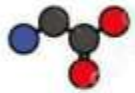
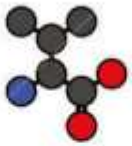
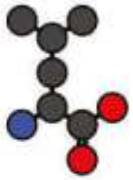


glycine (Gly, G)

L-alanine (Ala, A)



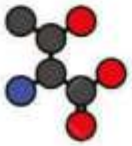
L-valine (Val, V)



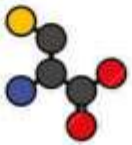
L-leucine (Leu, L)

L-isoleucine (Ile, I)

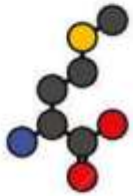
L-serine (Ser, S)



L-threonine (Thr, T)

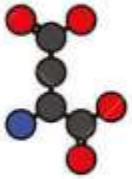


L-cysteine (Cys, C)

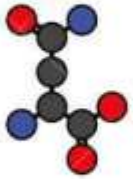


L-methionine (Met, M)

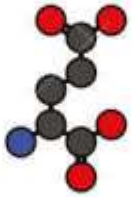
L-proline (Pro, P)



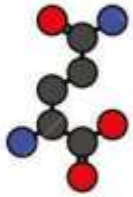
L-aspartic acid (Asp, D)



L-asparagine (Asn, N)



L-glutamic acid (Glu, E)



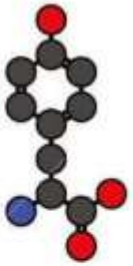
L-glutamine (Gln, Q)

L-lysine (Lys, K)

L-arginine (Arg, R)

L-histidine (His, H)

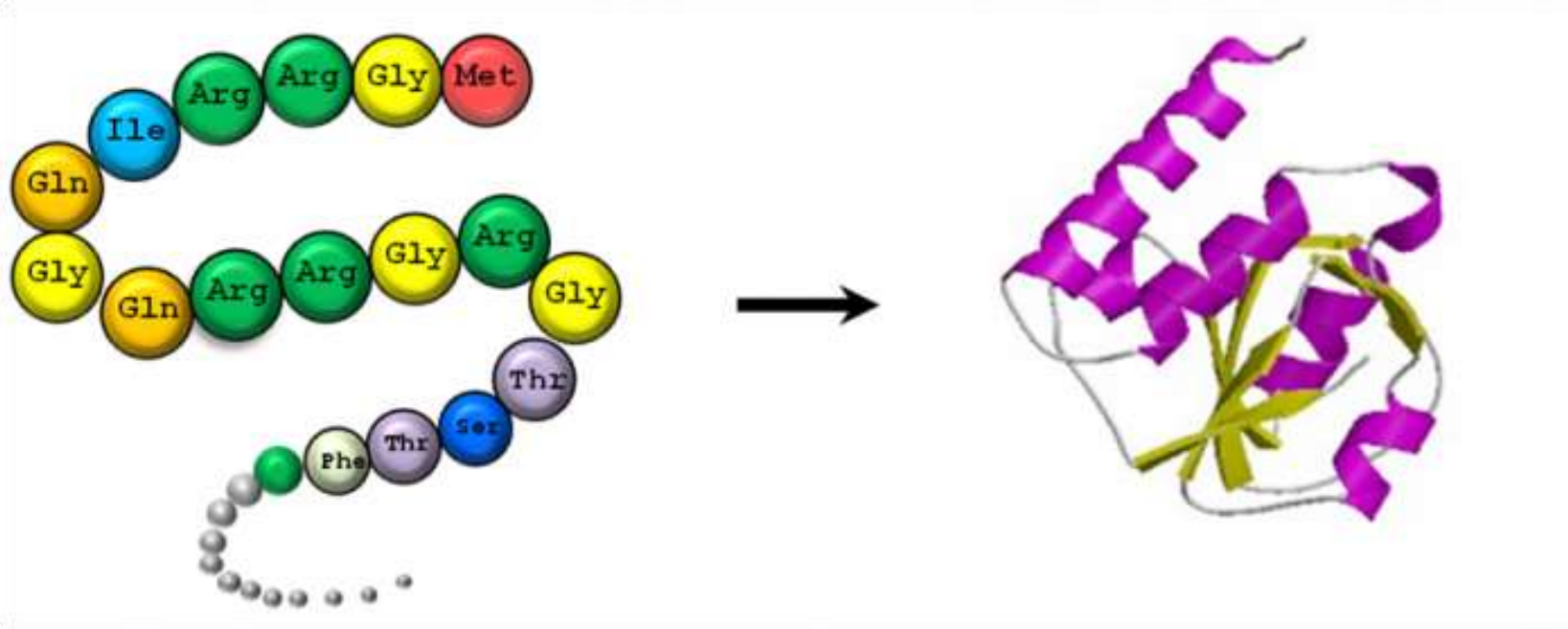
L-phenylalanine (Phe, F)



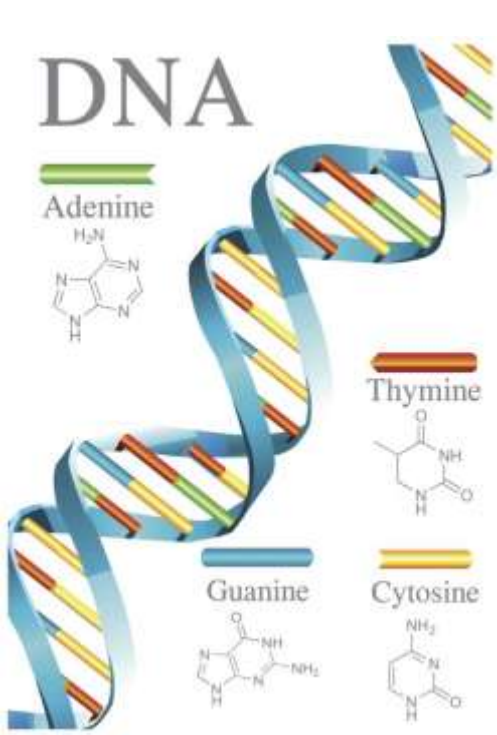
L-tyrosine (Tyr, Y)

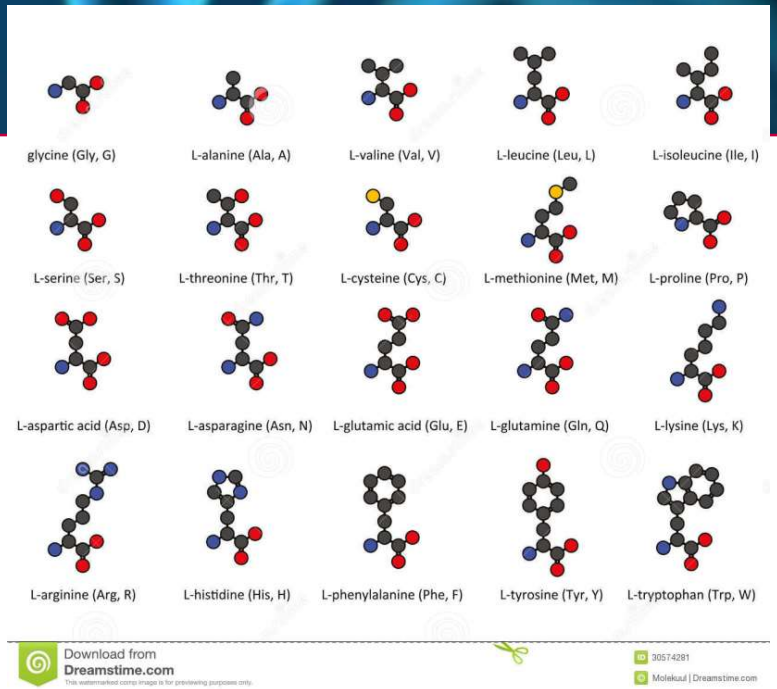
L-tryptophan (Trp, W)

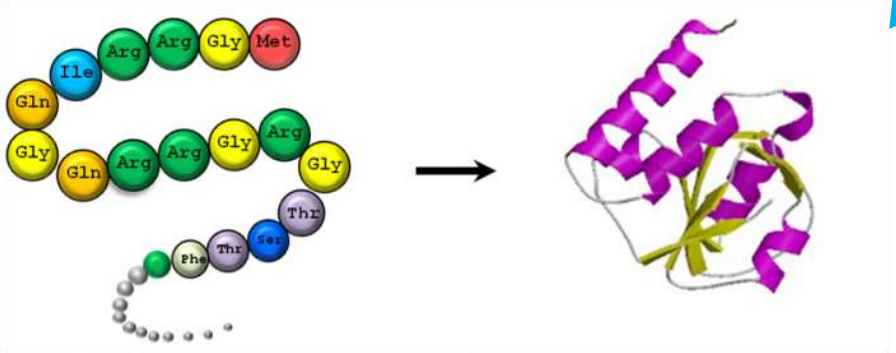
Proteins


Met
Gly
Arg
Arg
Ile
Gln
Gly
Arg
Gly
Arg
Arg
Gln
Gly
Thr
Ser
Thr
Phe

In short


DNA
Adenine
Thymine
Guanine
Cytosine


glycine (Gly, G)
L-alanine (Ala, A)
L-valine (Val, V)
L-leucine (Leu, L)
L-isoleucine (Ile, I)
L-serine (Ser, S)
L-threonine (Thr, T)
L-cysteine (Cys, C)
L-methionine (Met, M)
L-proline (Pro, P)
L-aspartic acid (Asp, D)
L-asparagine (Asn, N)
L-glutamic acid (Glu, E)
L-glutamine (Gln, Q)
L-lysine (Lys, K)
L-arginine (Arg, R)
L-histidine (His, H)
L-phenylalanine (Phe, F)
L-tyrosine (Tyr, Y)
L-tryptophan (Trp, W)
Download from
Dreamstime.com


Met
Arg
Arg
Gly
Ile
Gln
Gly
Gln
Arg
Arg
Gly
Arg
Gly
Thr
Ser
Thr
Phe

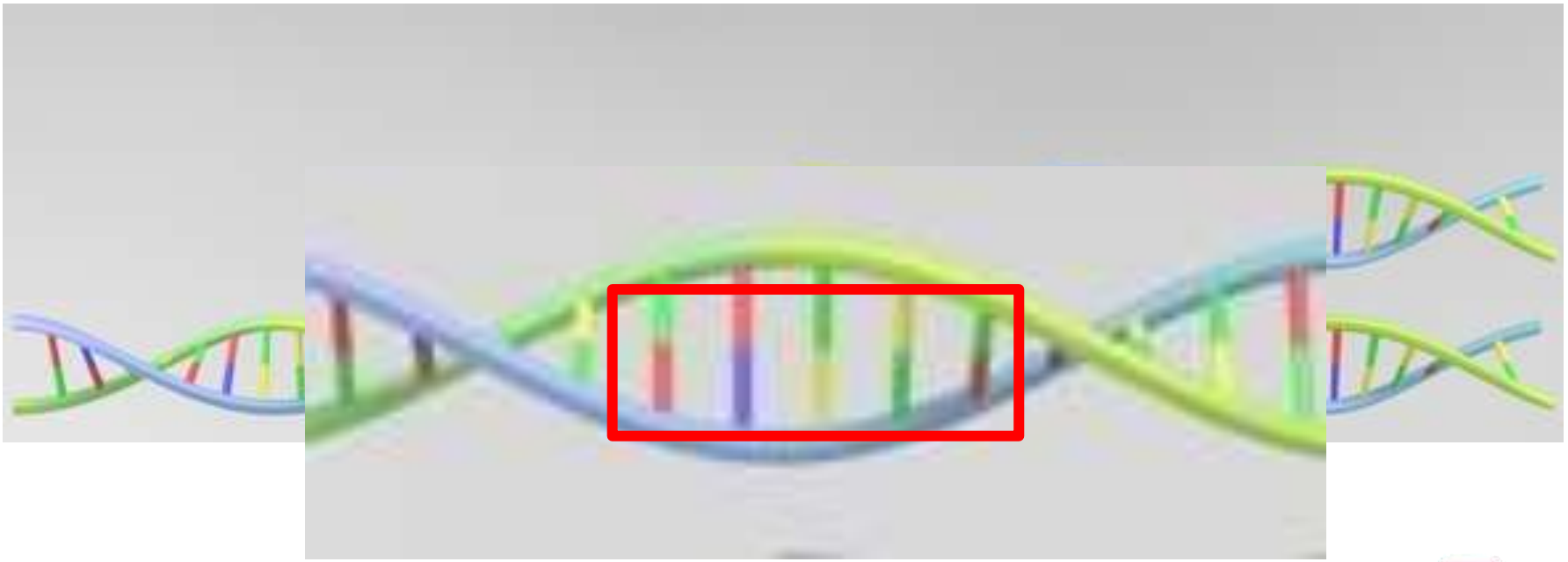
And now, what can we do with this knowledge?

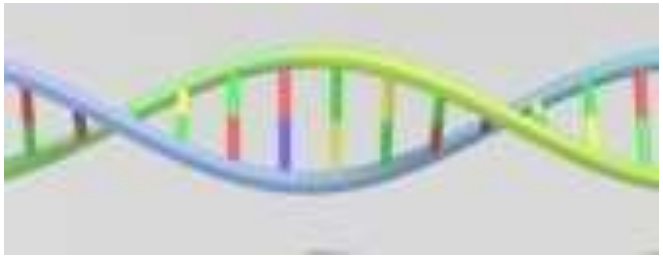
- **Protein A**

Protein B

- **Protein A**

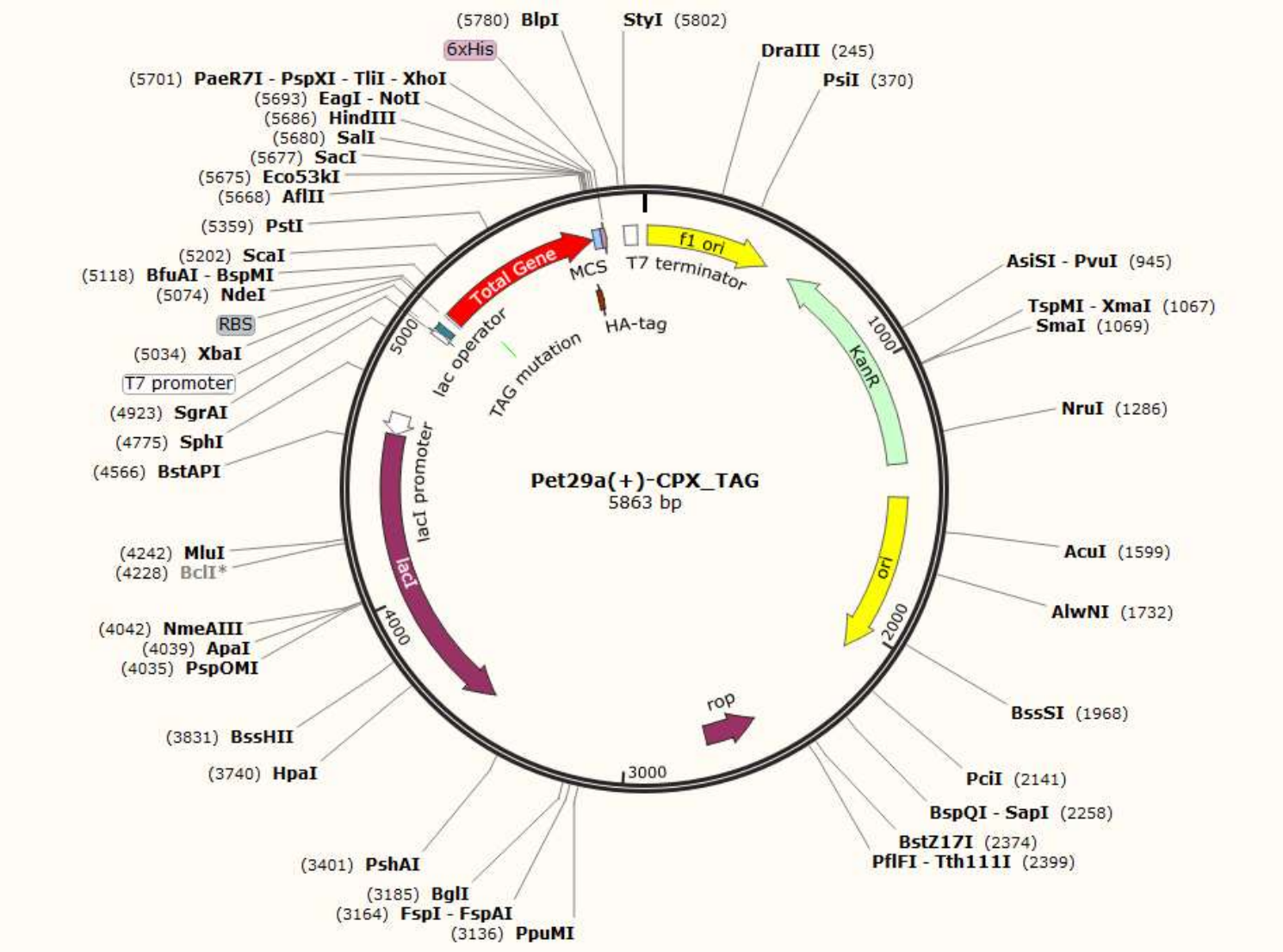
Protein B

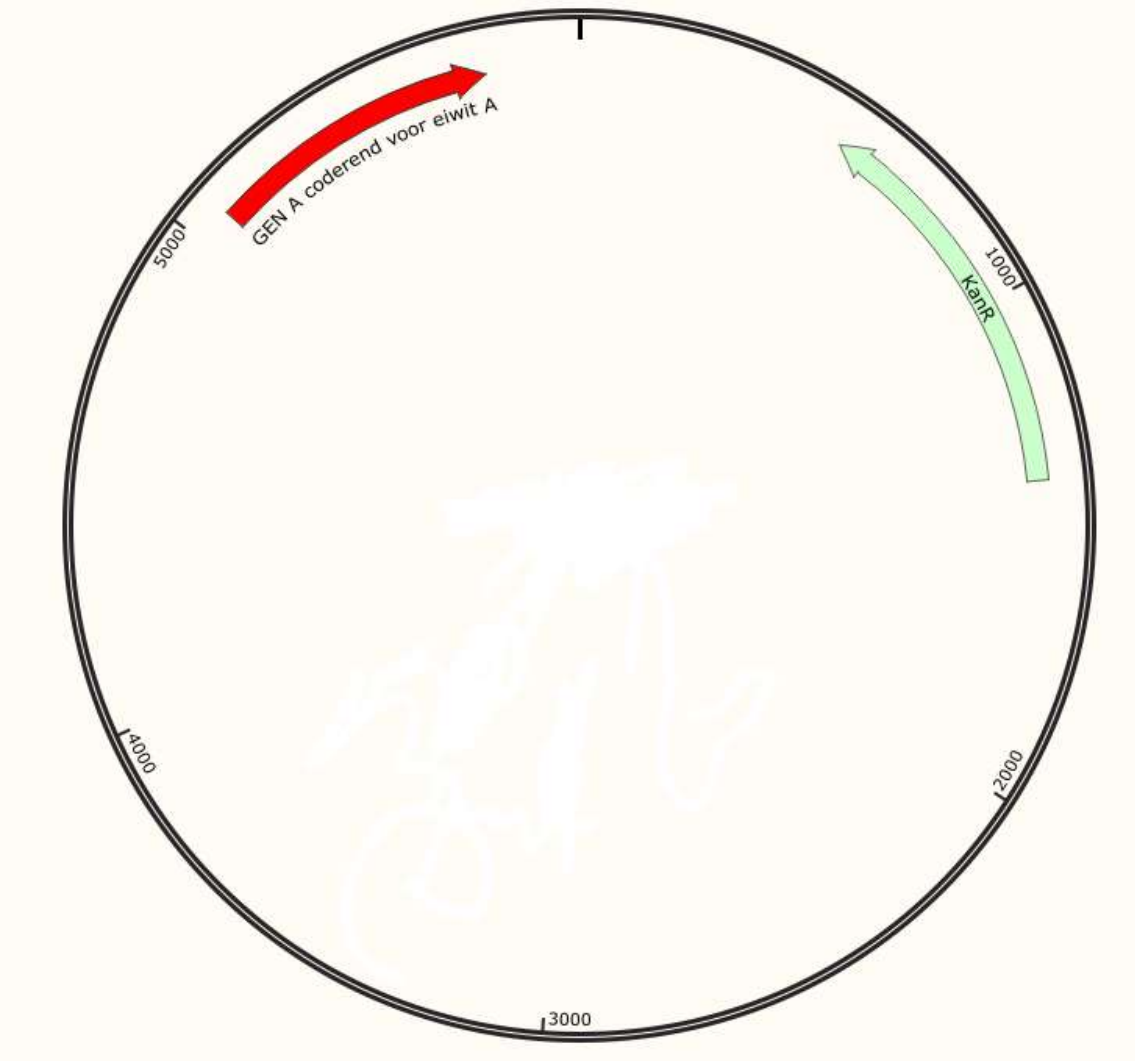




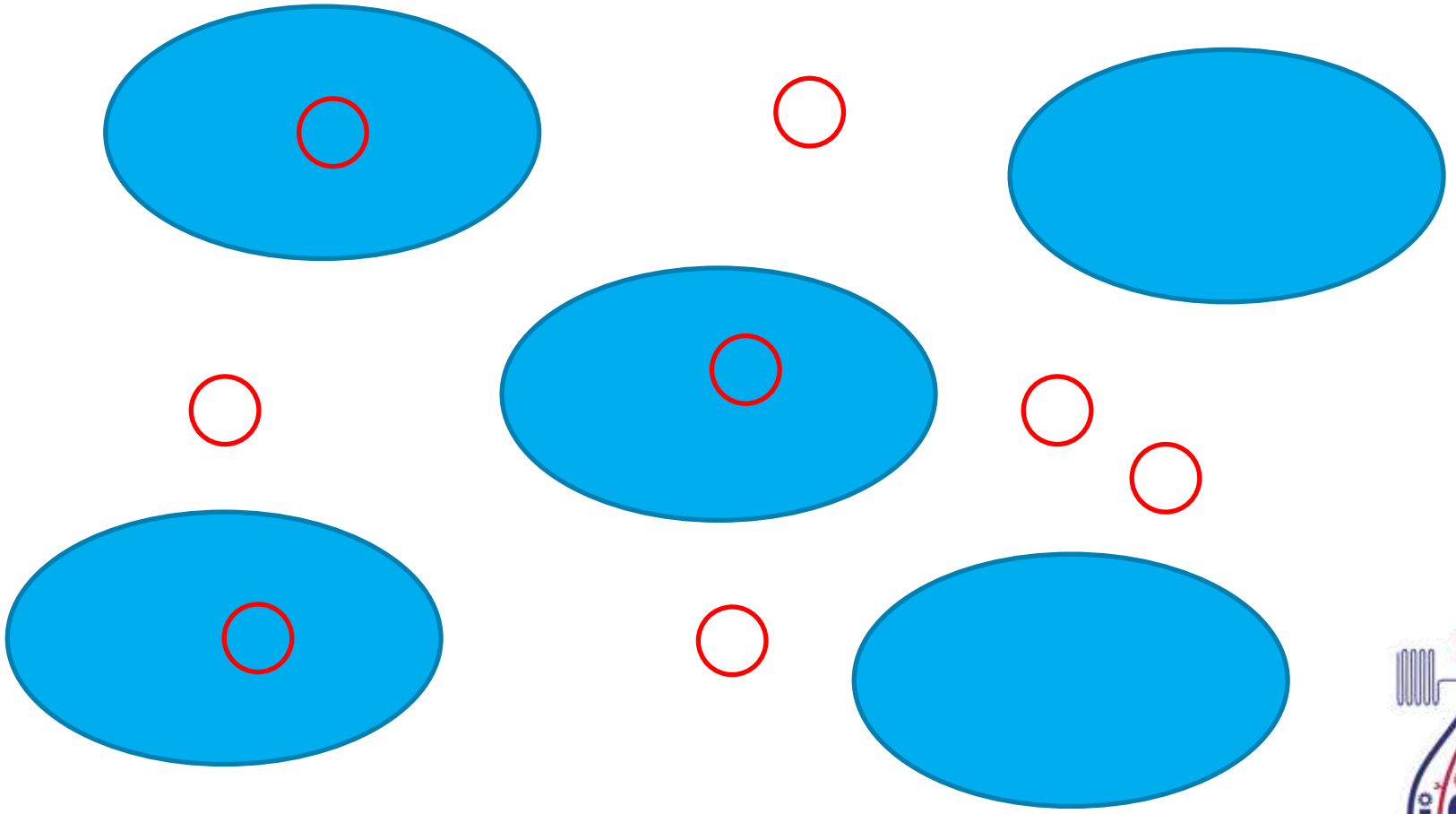
Gen A

?

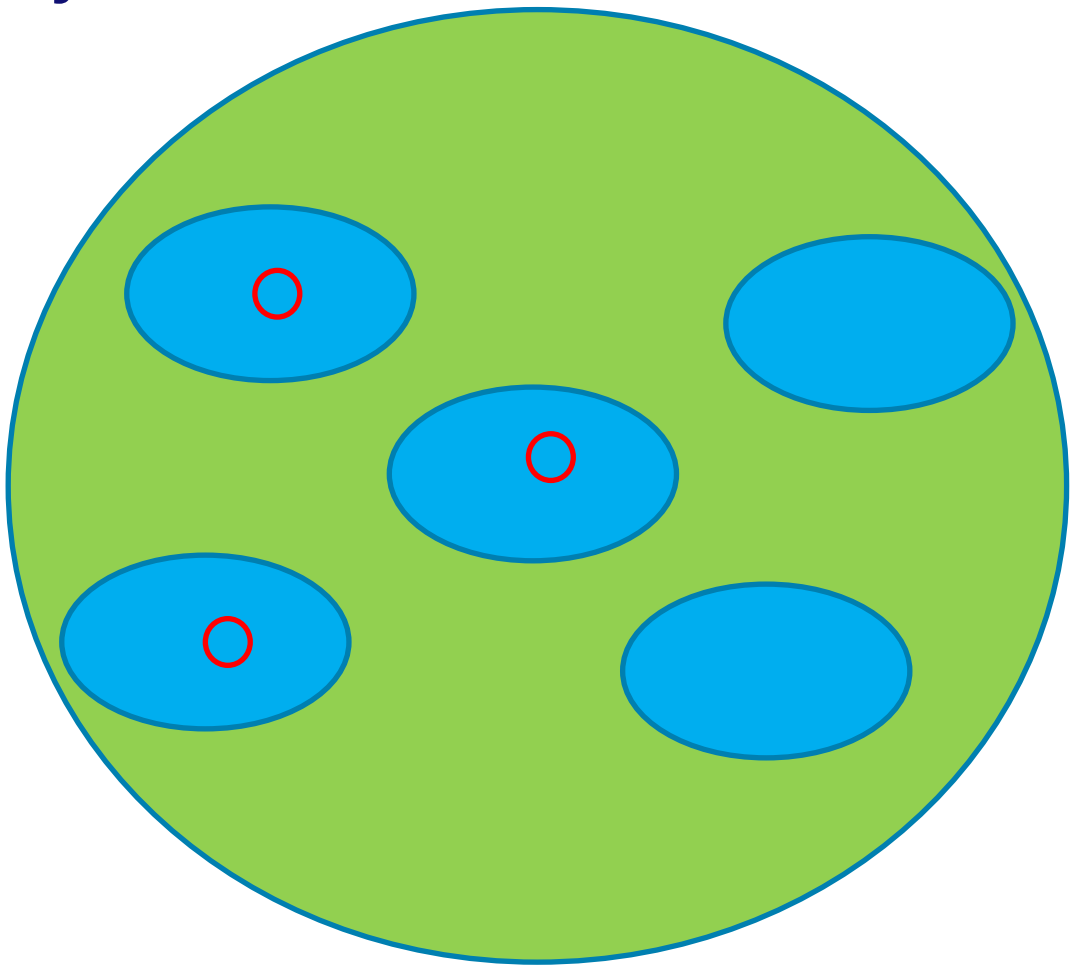

(5780) BlpI
StyI (5802)
6xHis
DraIII (245)
(5701) PaeR7I - PspXI - TliI - XhoI
PsiI (370)
(5693) EagI - NotI
(5686) HindIII
(5680) SalI
(5677) SacI
(5675) Eco53kI
(5668) AflII
(5359) PstI
(5202) ScaI
(5118) BfuAI - BspMI
(5074) NdeI
RBS
(5034) XbaI
T7 promoter
(4923) SgrAI
(4775) SphI
(4566) BstAPI
(4242) MluI
(4228) BclI*
(4042) NmeAIII
(4039) ApaI
(4035) PspOMI
(3831) BssHII
(3740) HpaI
(3401) PshAI
(3185) BglI
(3164) FspI - FspAI
(3136) PpuMI
Total Gene
MCS
T7 terminator
f1 ori
HA-tag
lac operator
TAG mutation
lacI promoter
lacI
rop
ori
KanR
5000
1000
2000
3000
4000
AsiSI - PvuI (945)
TspMI - XmaI (1067)
SmaI (1069)
NruI (1286)
AcuI (1599)
AlwNI (1732)
BssSI (1968)
PciI (2141)
BspQI - SapI (2258)
BstZ17I (2374)
PflFI - Tth111I (2399)
Pet29a(+)-CPX_TAG
5863 bp


GEN A coderend voor eiwit A
KanR
5000
1000
4000
2000
3000

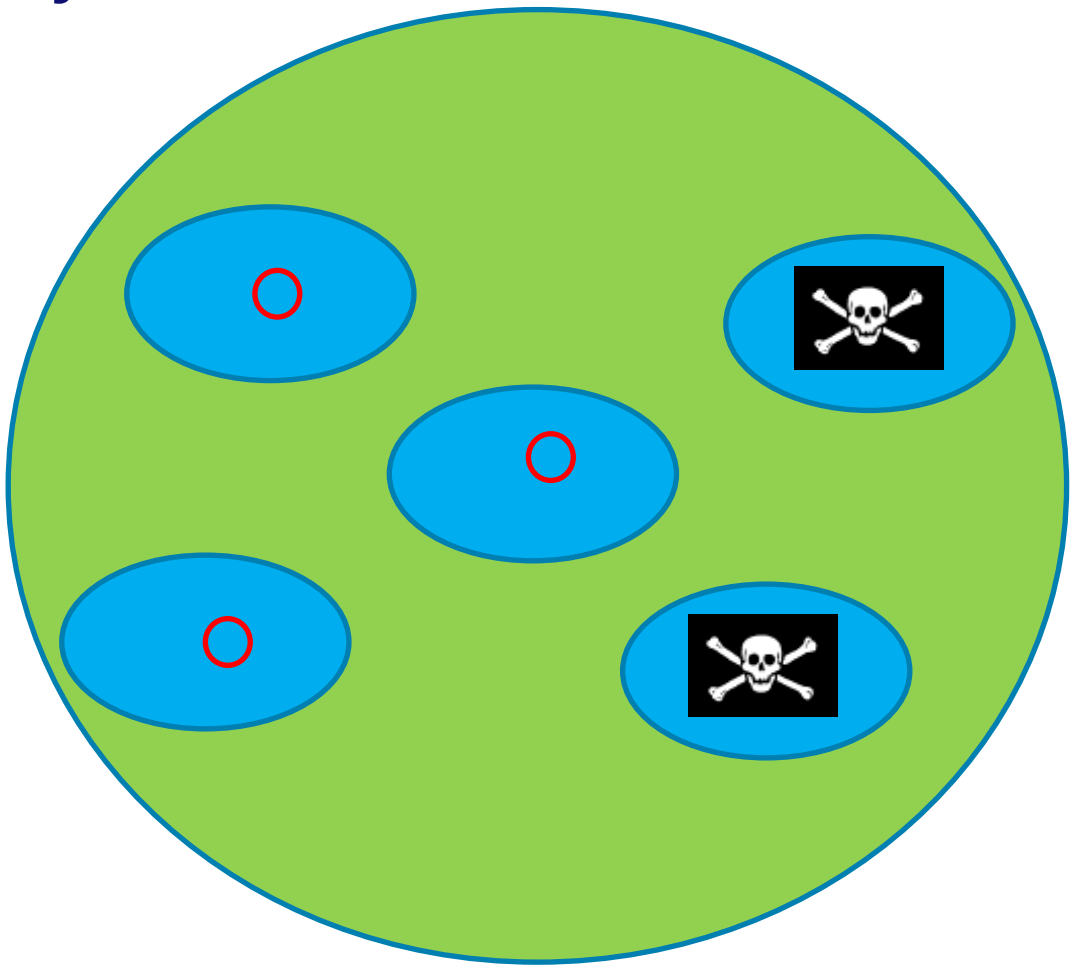
Selection mechanism?

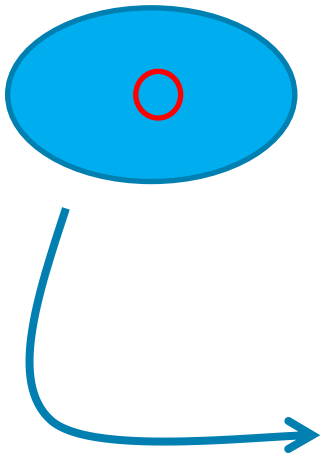


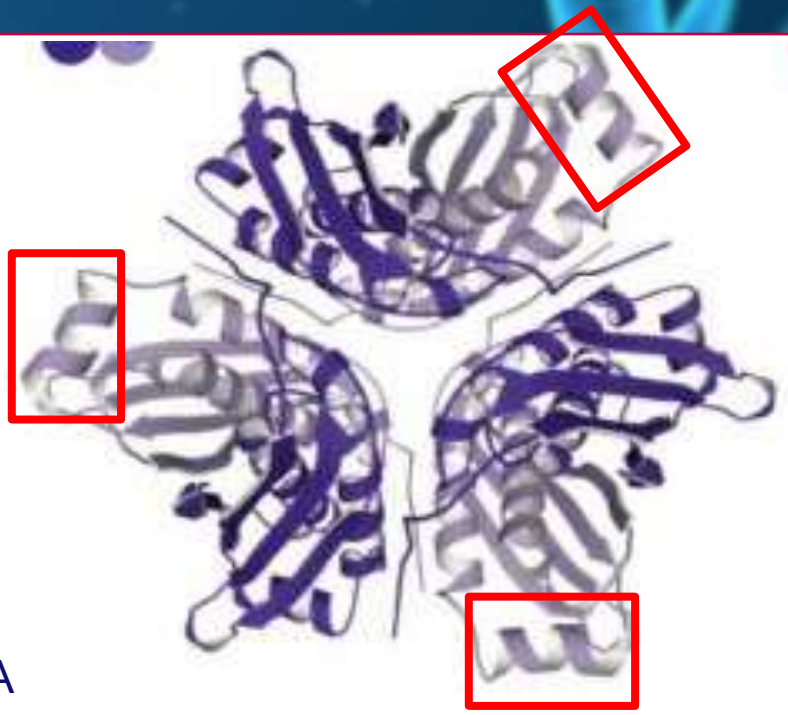
- **Kanamycin enriched Plate**



- **Kanamycin enriched Plate**

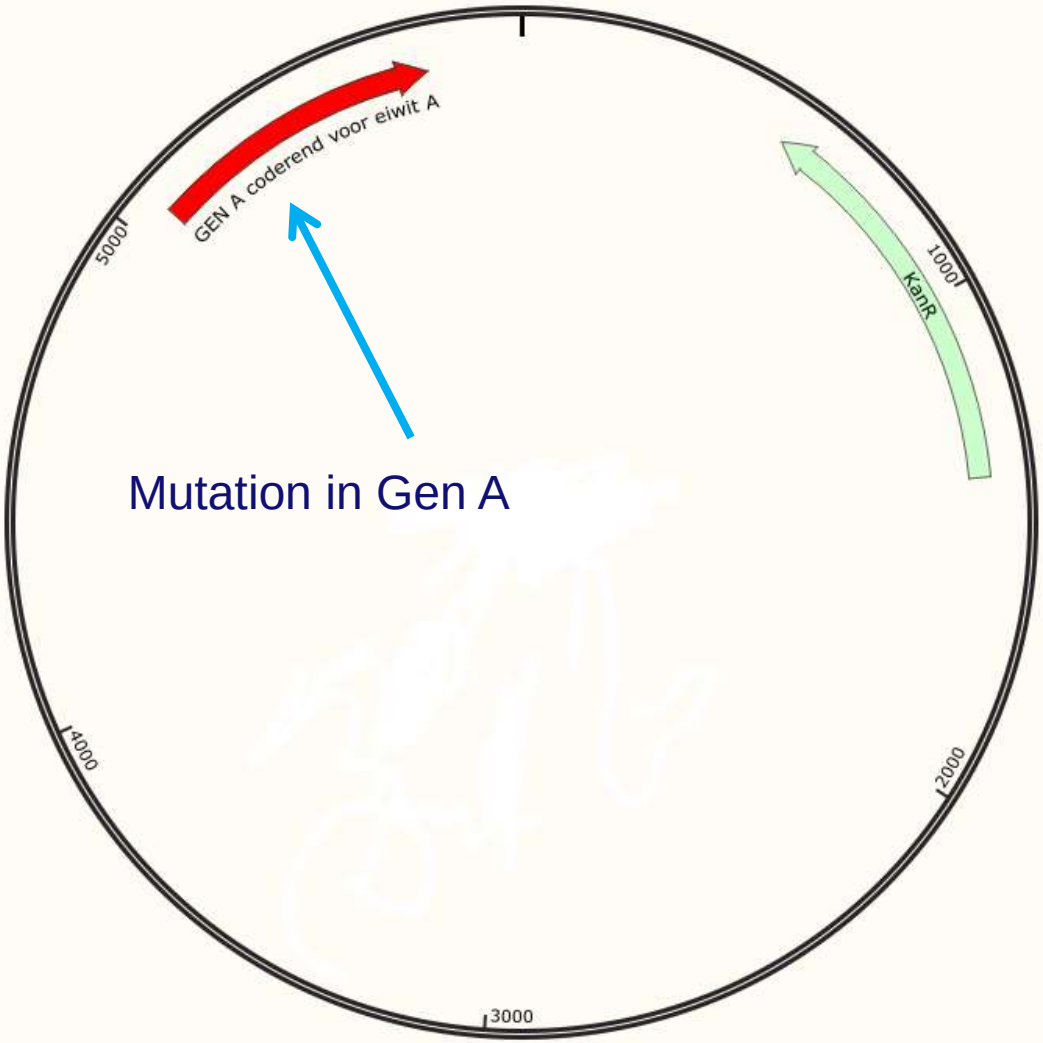






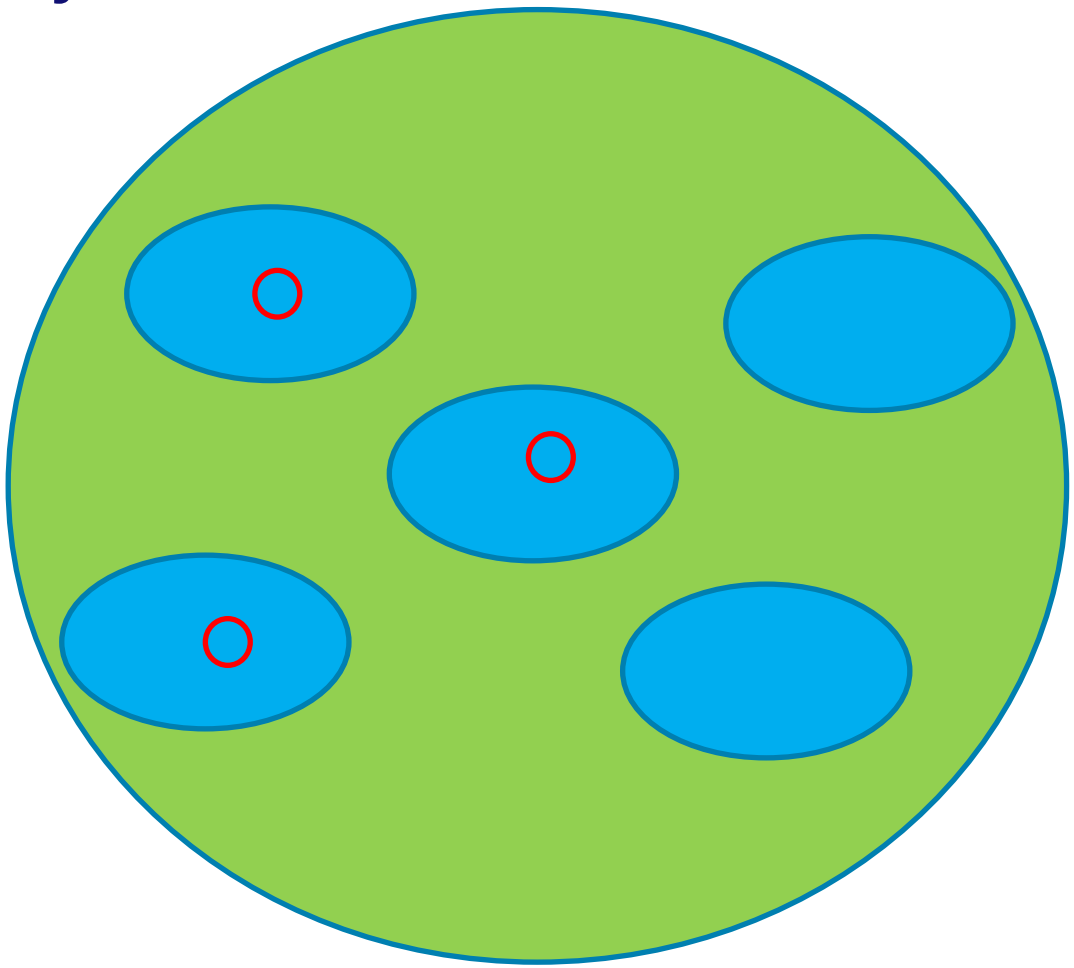
Gen A

Gen A+

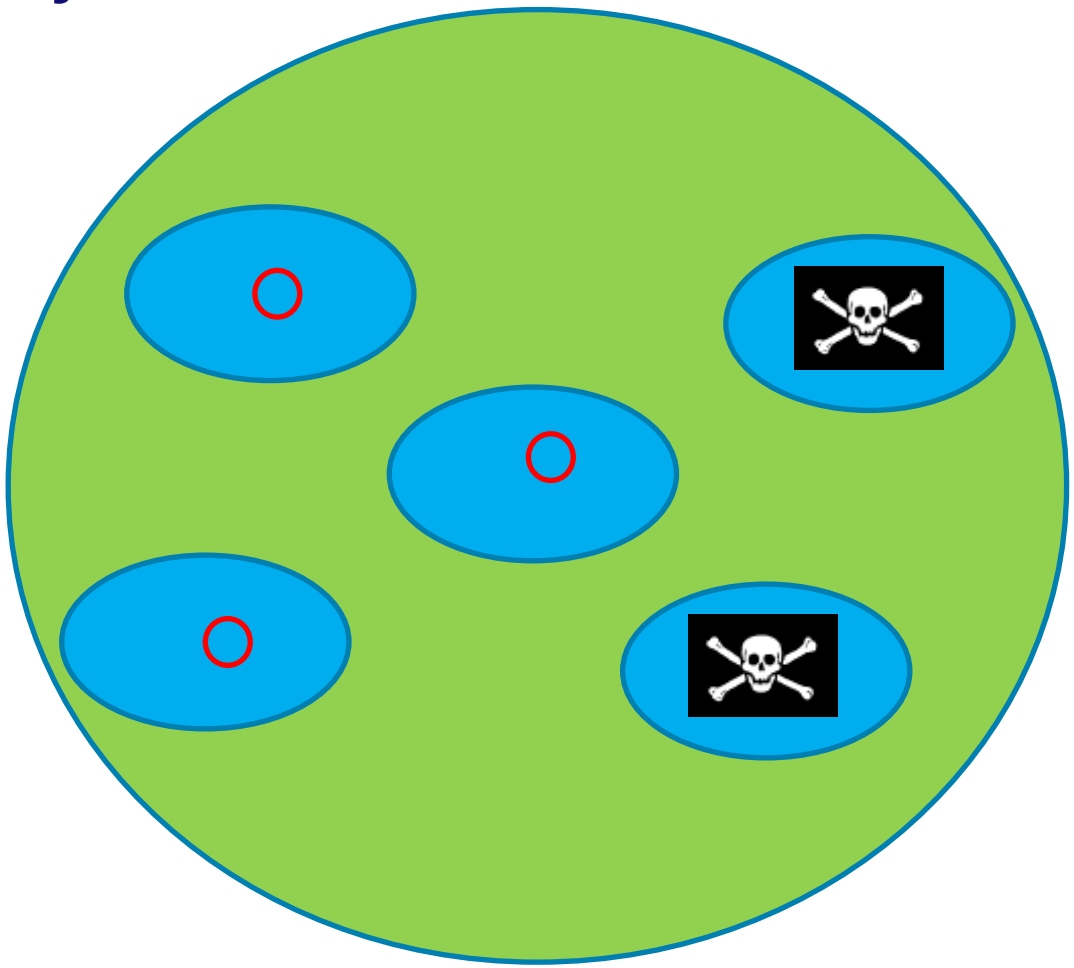


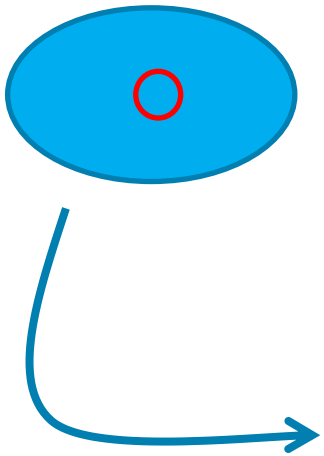
Mutation in Gen A

- **Kanamycin enriched Plate**

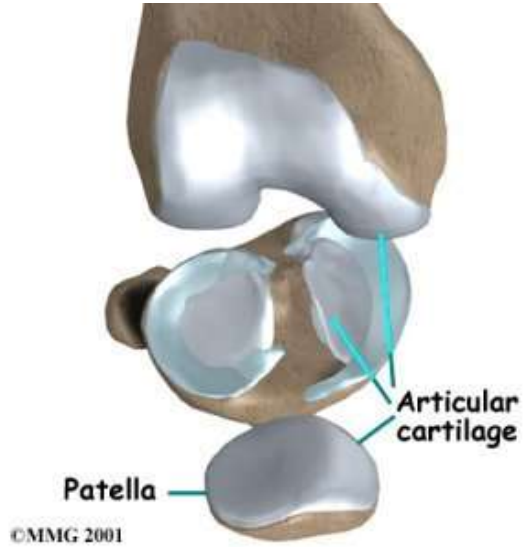


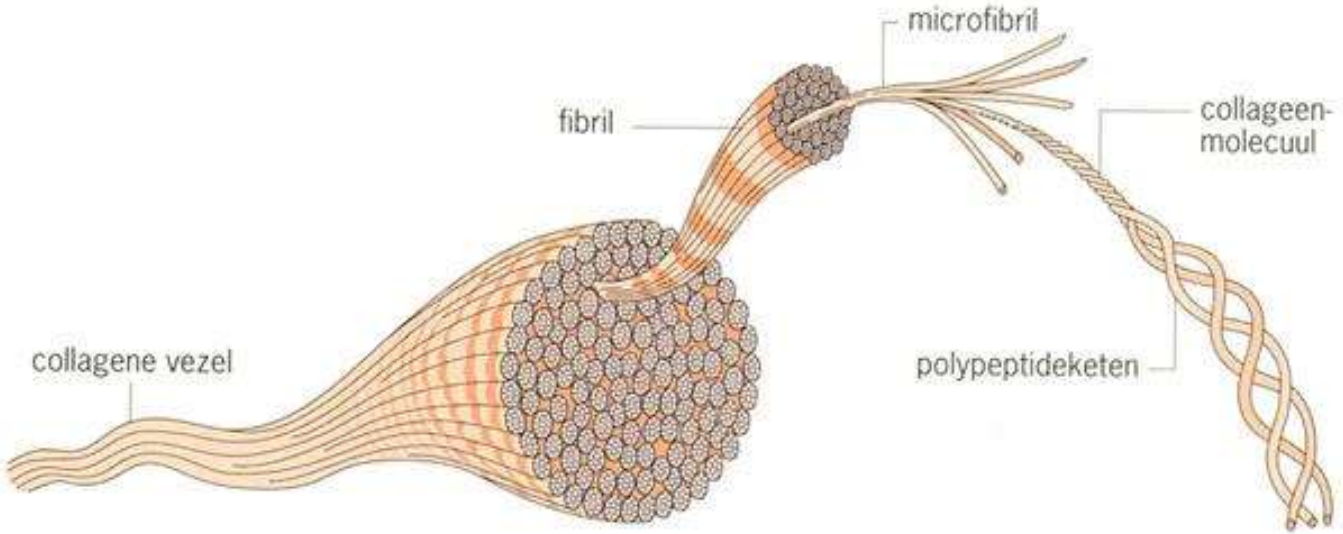
- **Kanamycin enriched Plate**

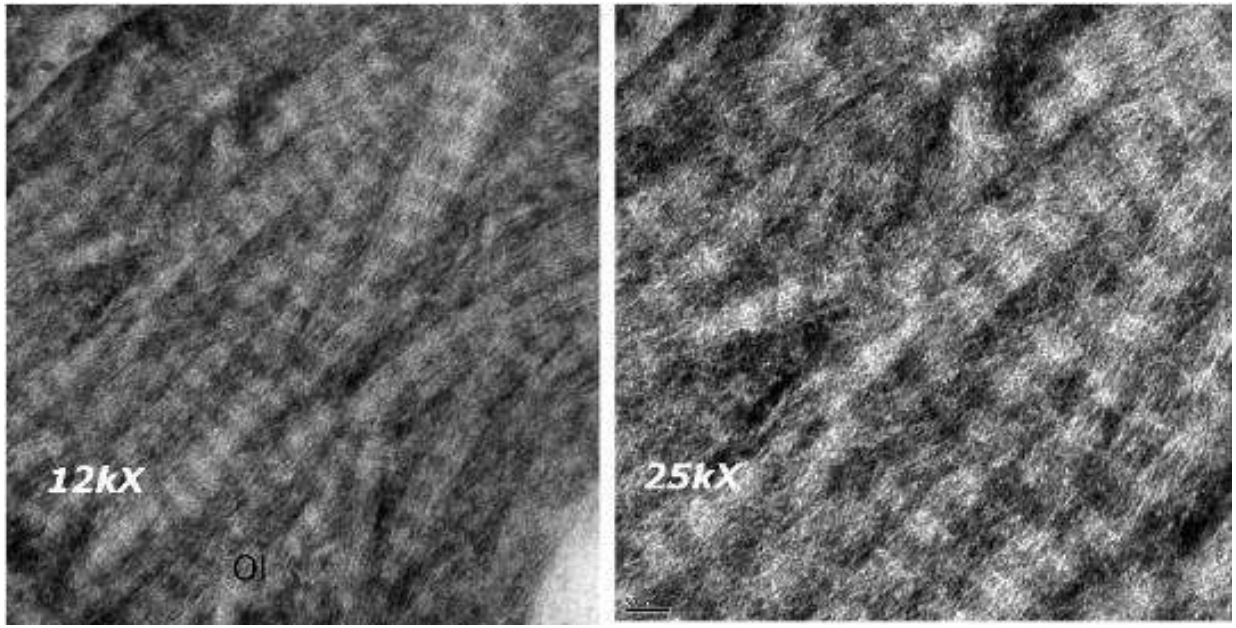




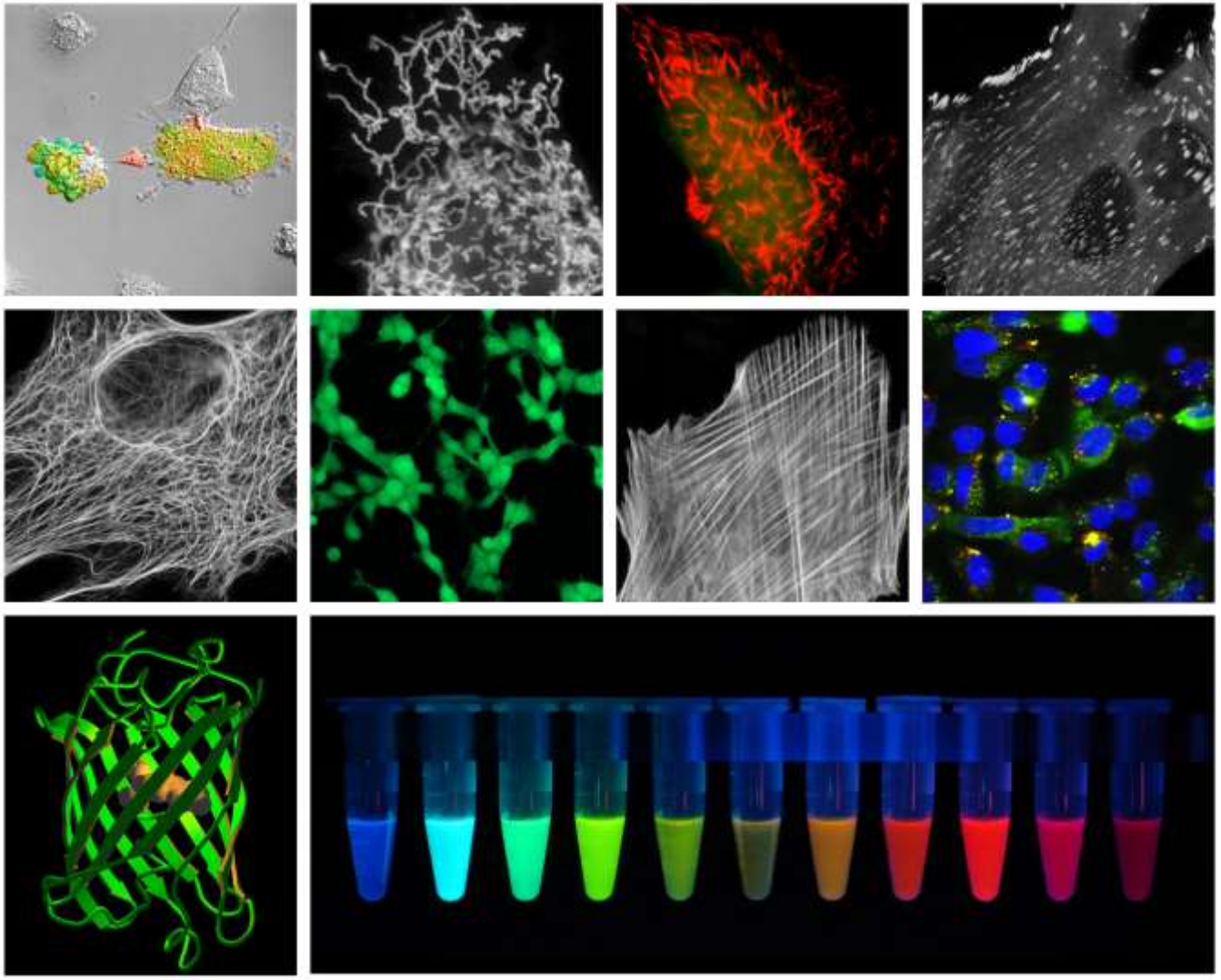
Tissue Engineering



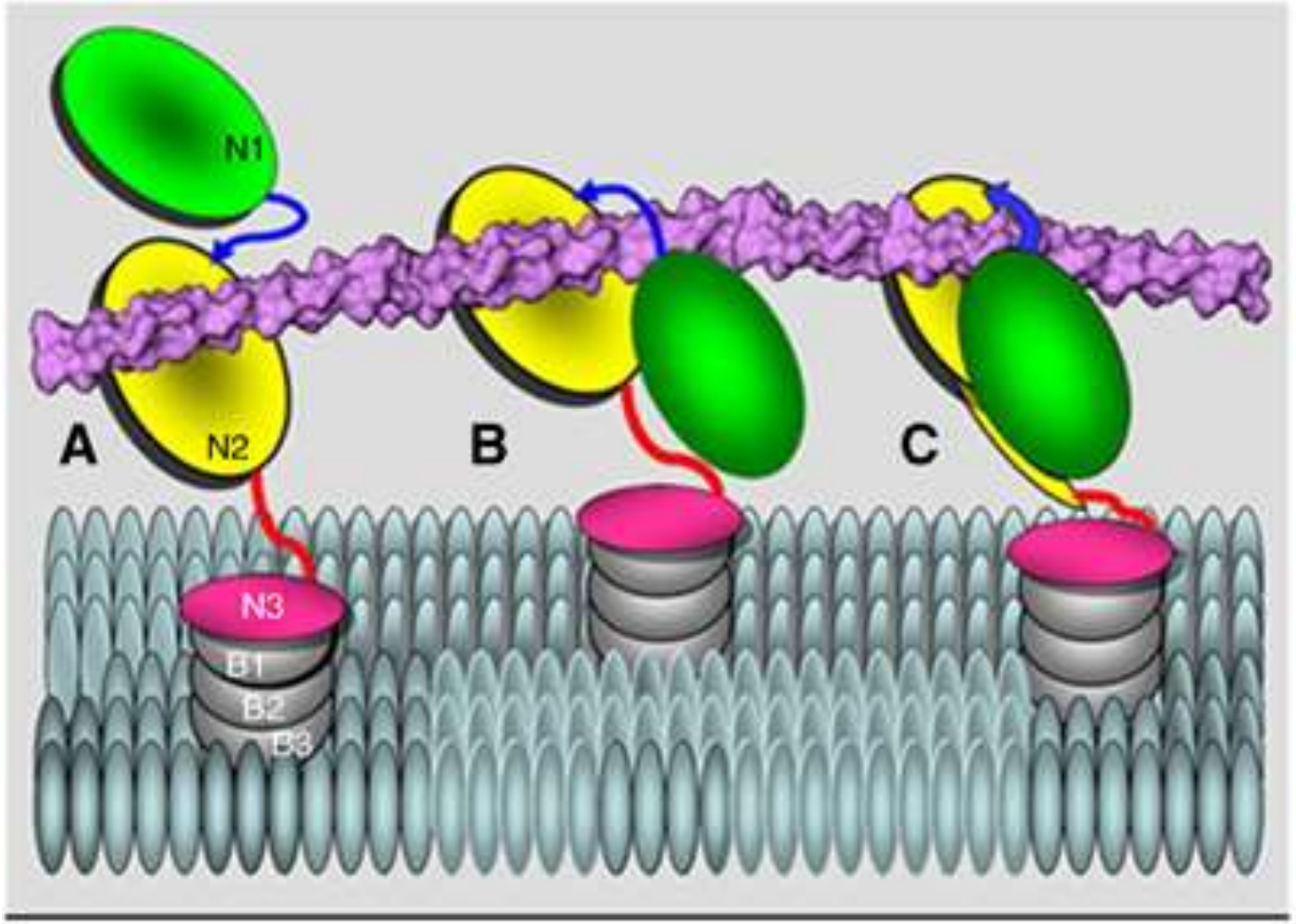


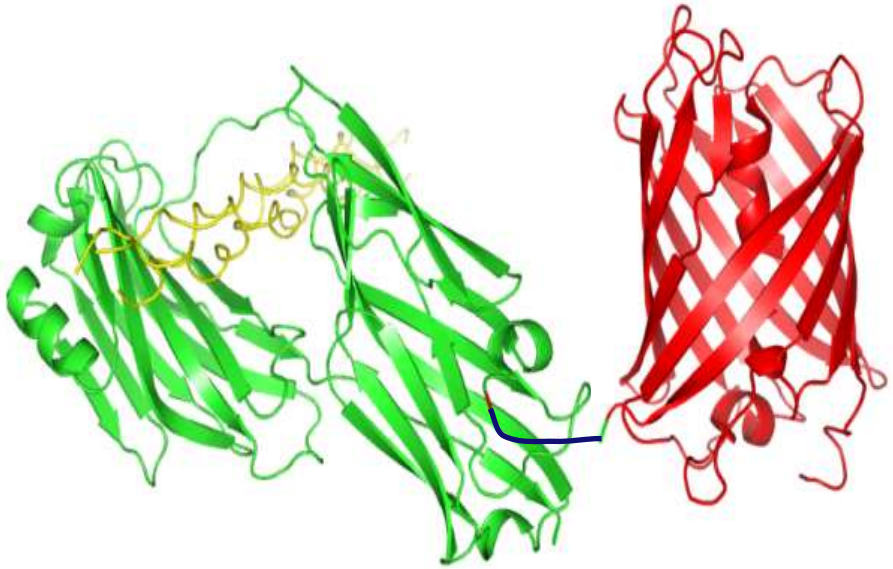

12kX
OI
25kX

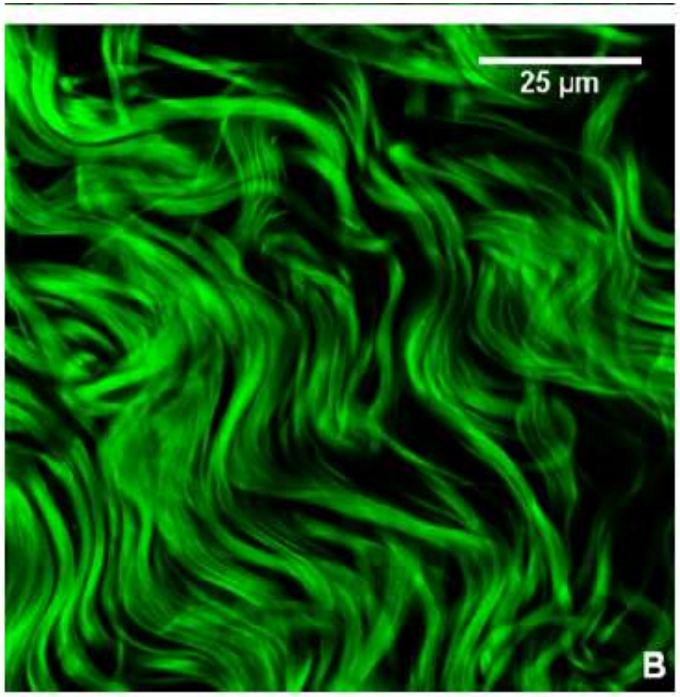
Fluorescent protein

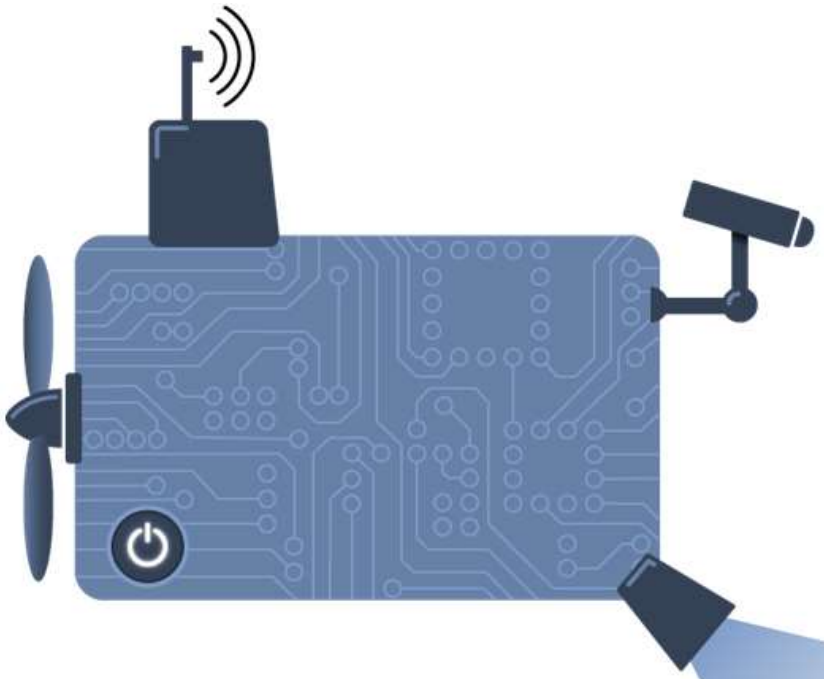


Collagen binding protein






25 µm
B

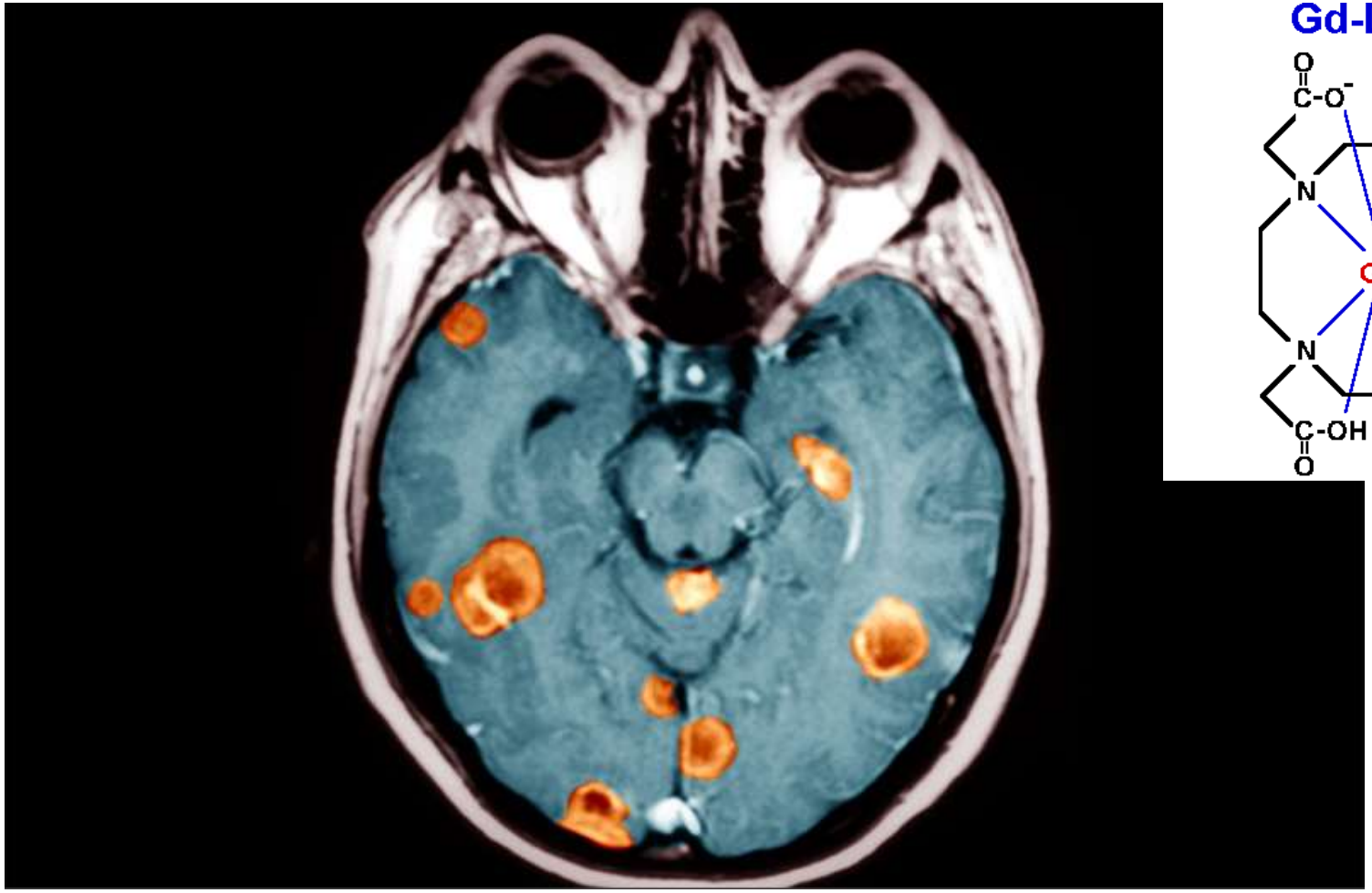


MRiGEM

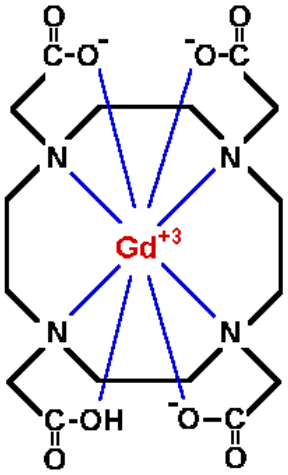
iGEM 2013 Eindhoven

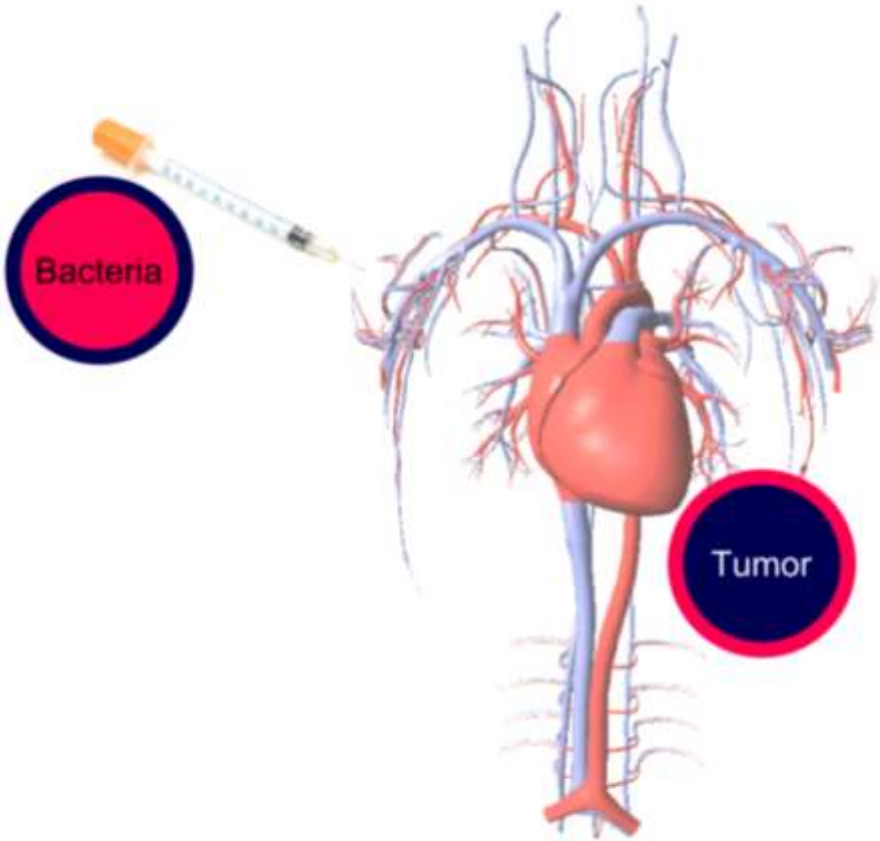
TEAM TU-EINDHOVEN

iGEM TU EINDHOVEN 2014

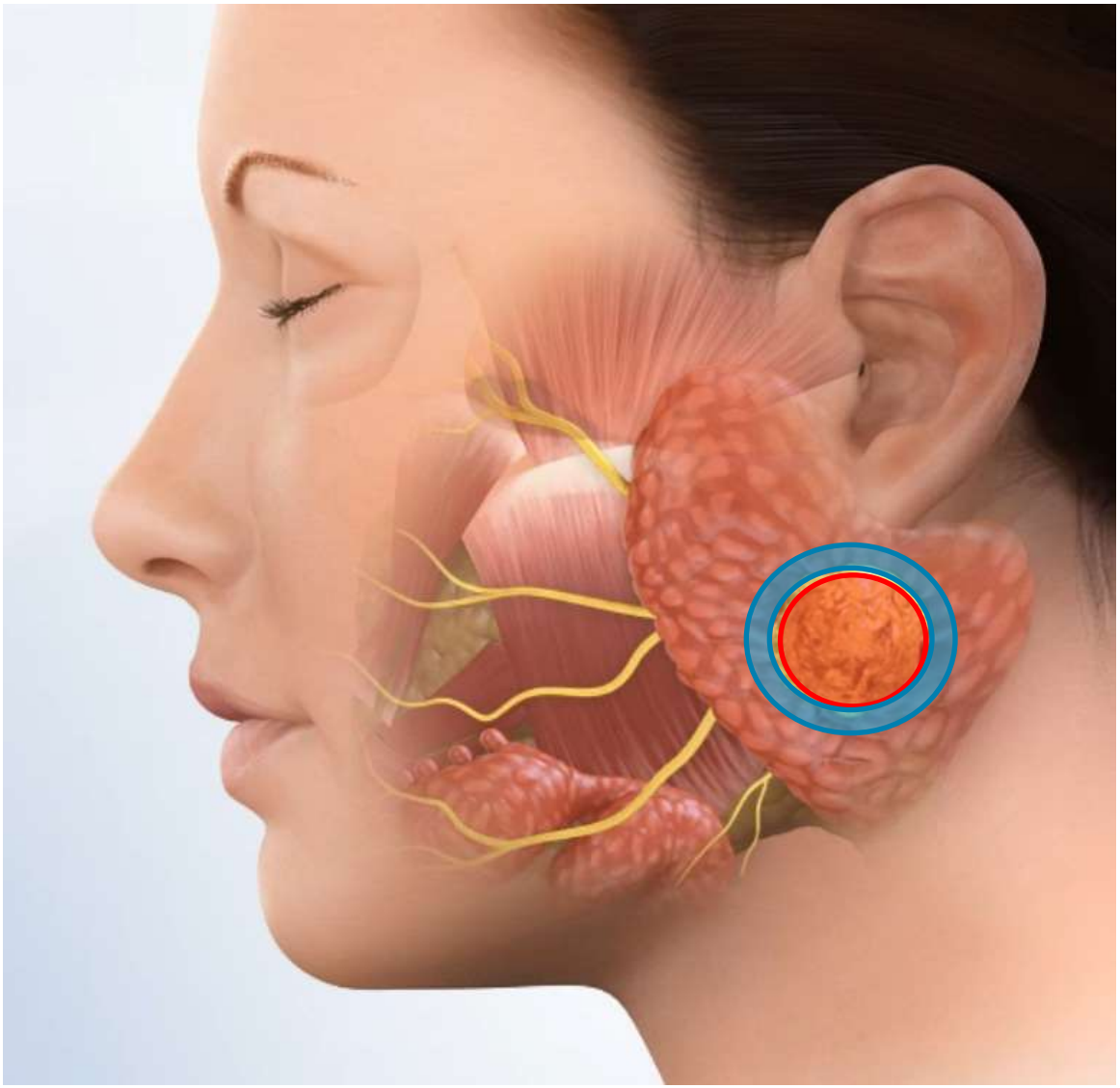


Gd-DOTA



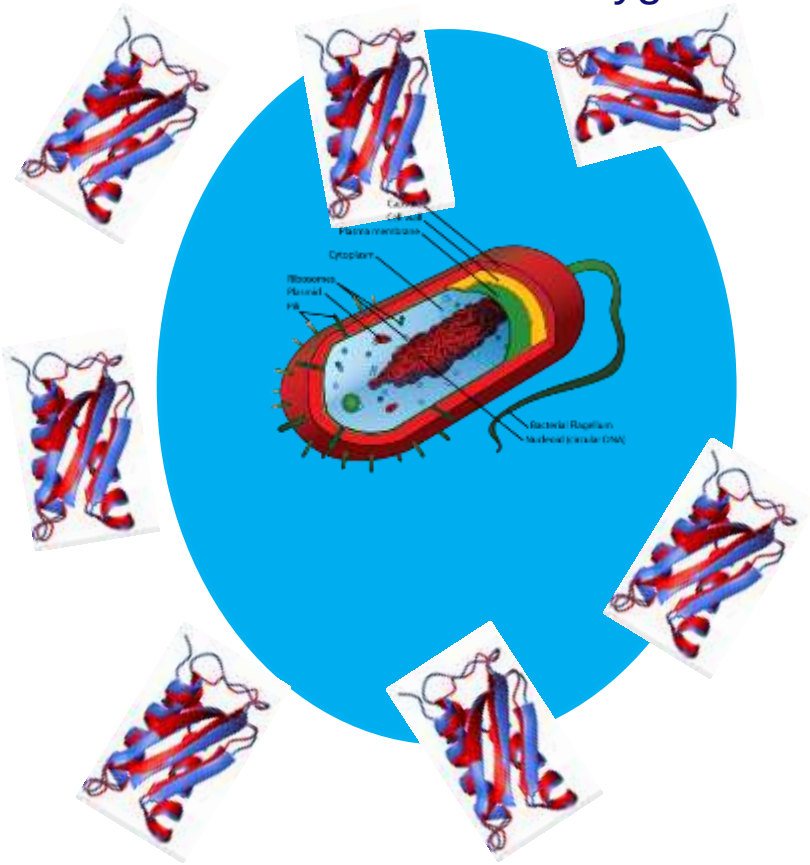

Bacteria
Tumor


MRI Image

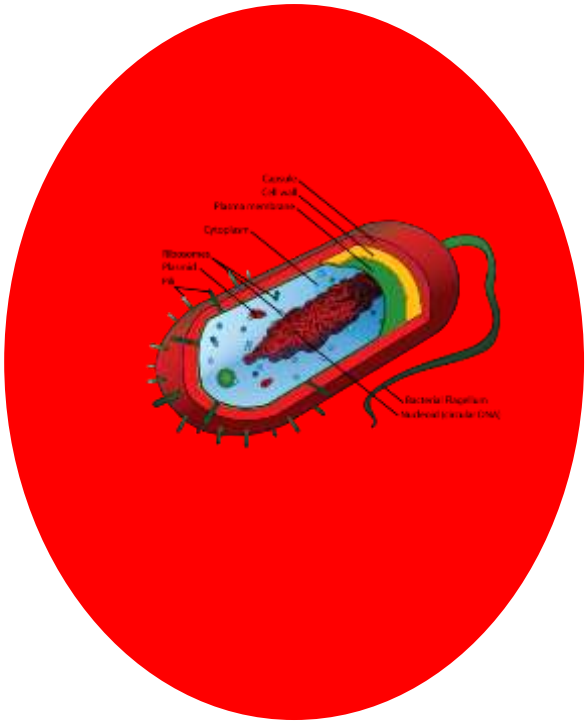


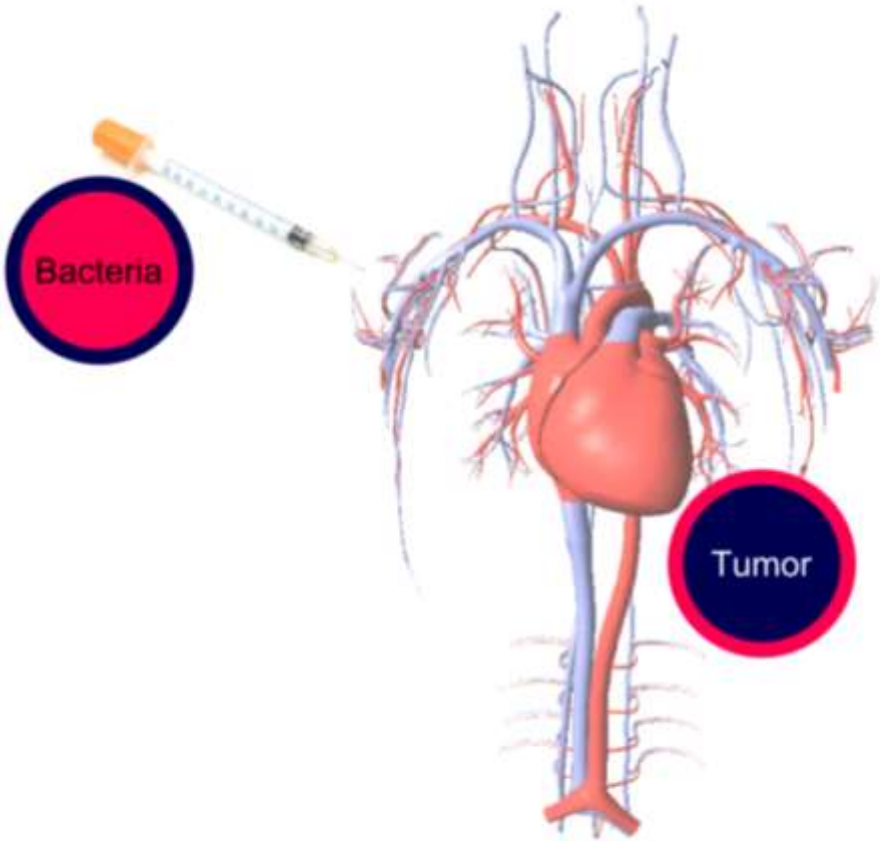
Mechanism

Low concentration of oxygen



High concentration of oxygen

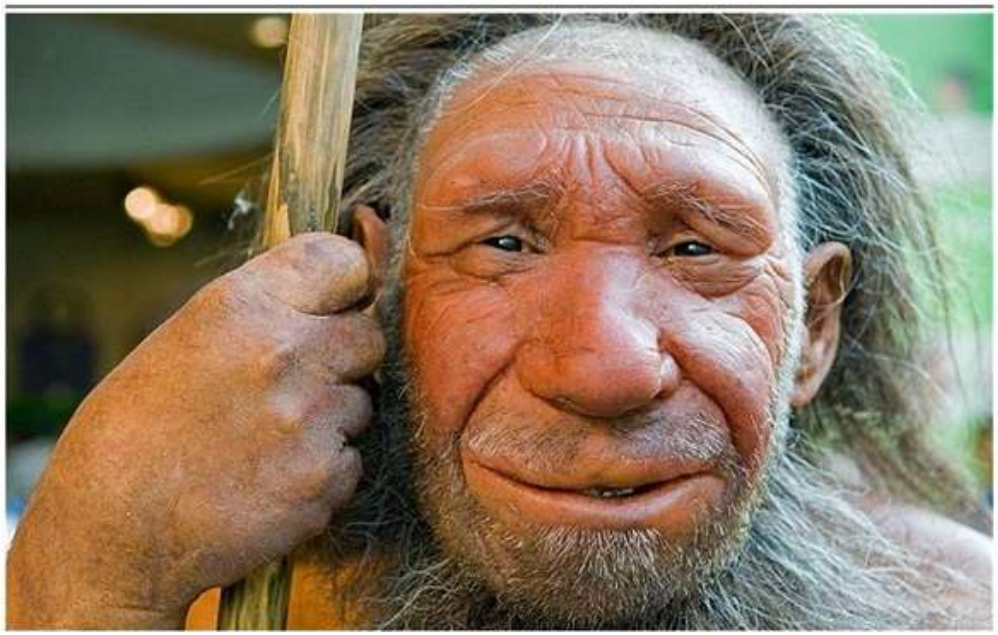



Bacteria
Tumor


MRI Image

'I can create Neanderthal baby, I just need willing woman'

A scientist has said it would be possible to clone a Neanderthal baby from ancient DNA if he could find a woman willing to act as a surrogate.



"You don't see anything sacrilegious about this?"

"I wouldn't say sacrilegious," Church responds. "Humans have been manipulating humans in many ways for many years."

George Church, 2010

Thank you for your attention!