

A microscopic image of cells, likely fibroblasts, showing red and blue fluorescence. The red fluorescence highlights the nuclei, while the blue fluorescence highlights the cytoplasm and cell membranes. The cells are arranged in a cluster, with some showing a more elongated, spindle-like shape and others being more rounded.

# Commercialisation pathways for plasma-activated coatings and plasma immersion ion implantation

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**Biomedical scientists worldwide  
have a huge problem.**

**Biomolecules often hate polystyrene  
and really hate glass.**

Biomolecules=protein, DNA, RNA, sugars, vitamins, fats.

Binding is often poor or impossible.

Unfolding and denaturation.

# So what?

We need biomolecules to attach to the surface of plastic multiwell dishes to:

## **1. Growing therapeutically important cell types in the dish**

- drug screening
- immunotherapies
- personalised medicine
- cellular agriculture

## **2. Manufacture new diagnostic systems-ELISA**

All use polystyrene dishes and plates.

Both products market size= \$billions



# The solution is plasma

\*Most cell culture plates are already treated with oxygen plasma ("TC quality").

\*We use a combination of Nitrogen, Argon and Acetylene to generate nanometres-thin coatings on the well bottom.

\*Plasma-activated coating (PAC)

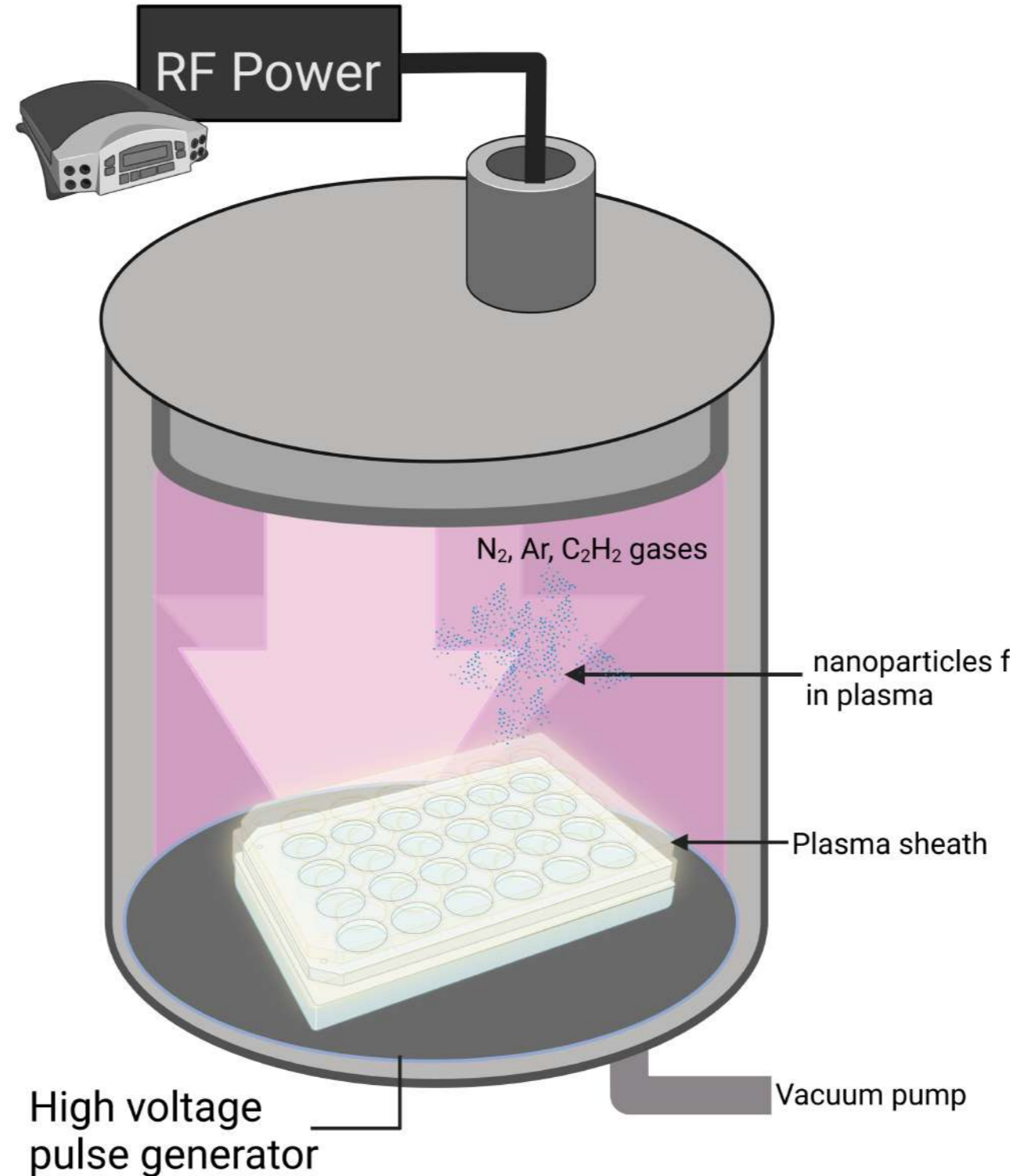


# Star plasma not blood plasma

- \*Radicals embed in surface
- \*Radicals rapidly **covalently** attach to functional biomolecules.
- \*No further chemistry required
- \*Normally need complex, linker chemistry



# Nanometre-thin plasma activated coatings





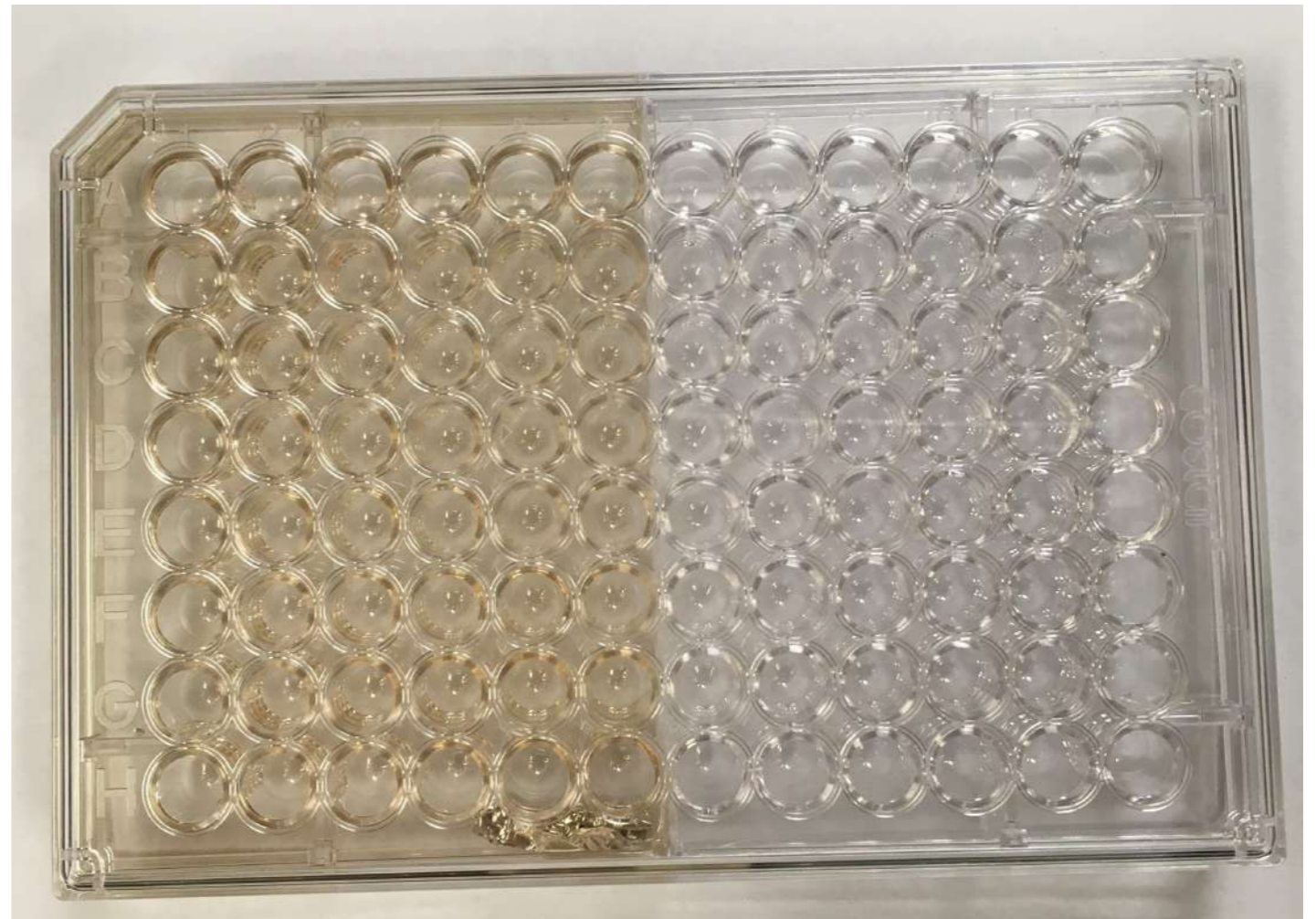
# Plasma-activated coatings (PAC)

Nanometres-thin coating with radicals.

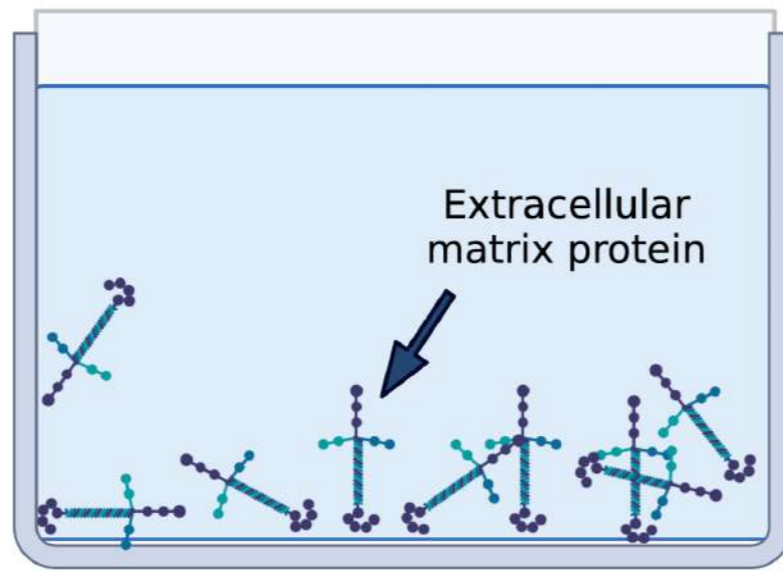
Radicals bind covalently instantly to biomolecules.

- \*Proteins, peptides
- \*Lipids
- \*Carbohydrates
- \*DNA & RNA
- \*Drugs, small molecules
- \*Mixture of biomolecules

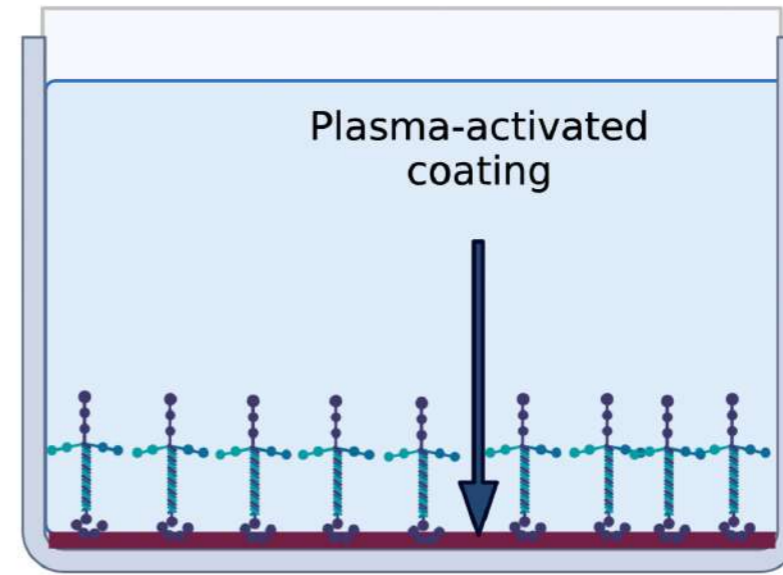
Function is maintained  
Proteins can be oriented  
Agnostic to molecule



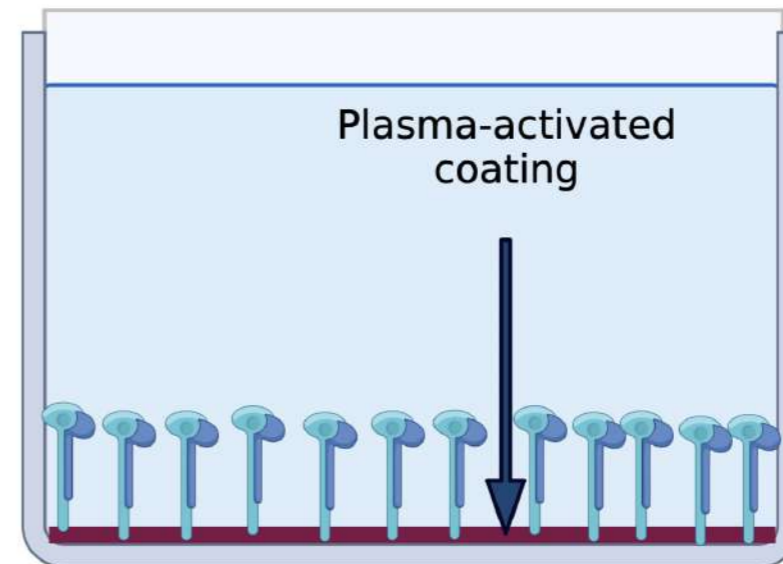
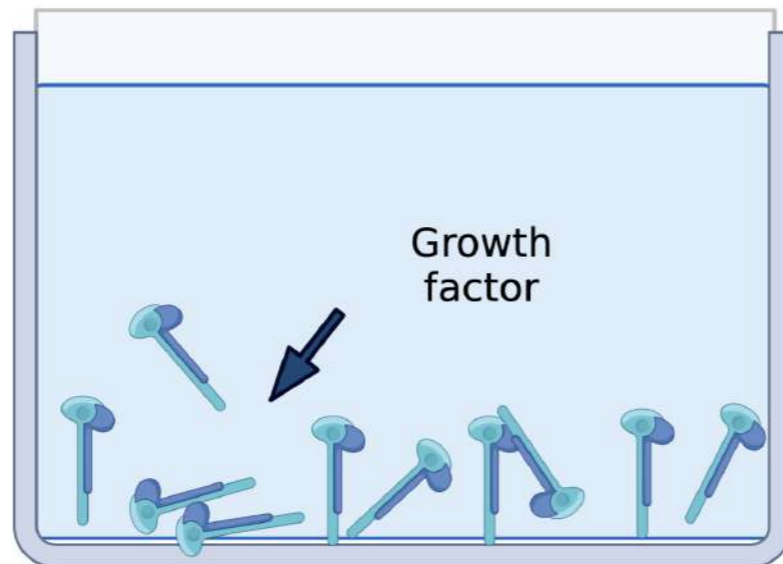
# Revolutionising cell culture with plasma-activated coatings



Non-covalent biomolecules



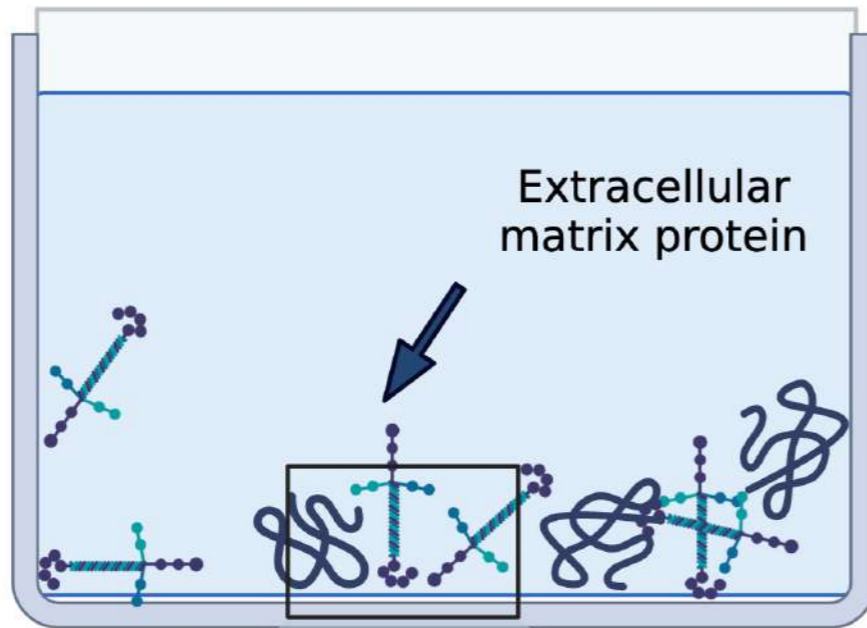
Covalently attached biomolecules



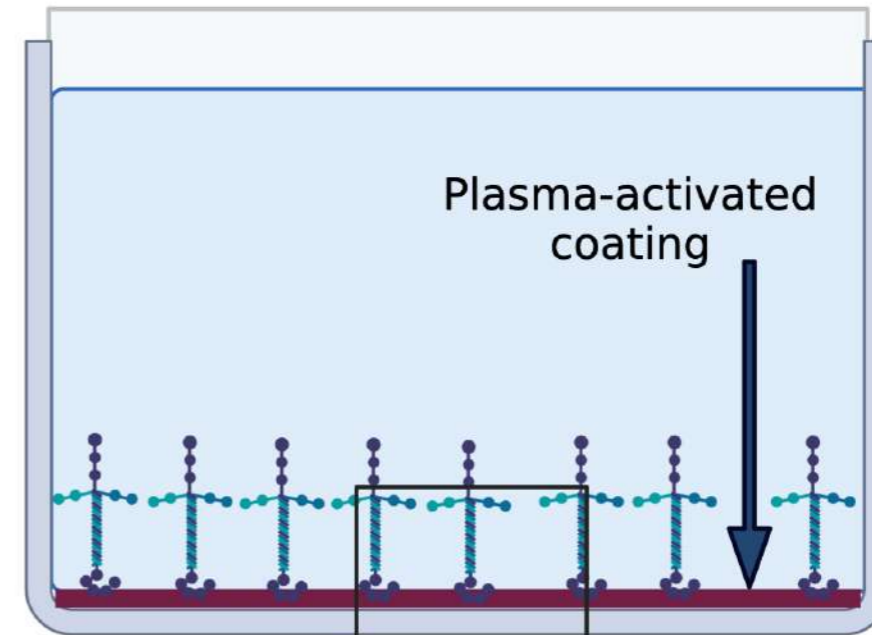
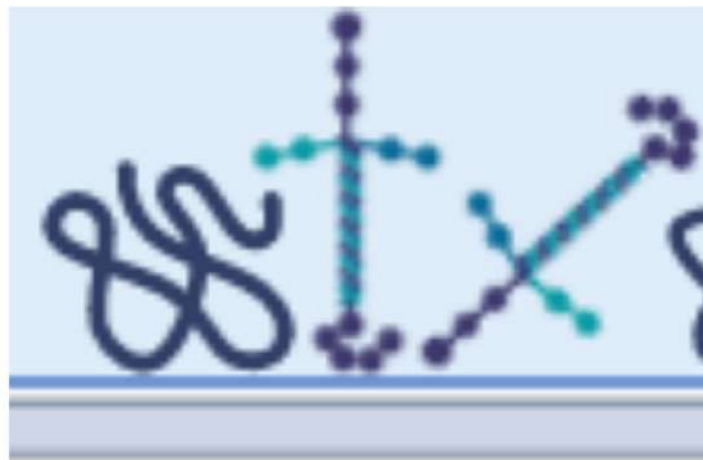
- rapid product manufacturing
- cheaper, faster, more stable and uniform, protein orientation



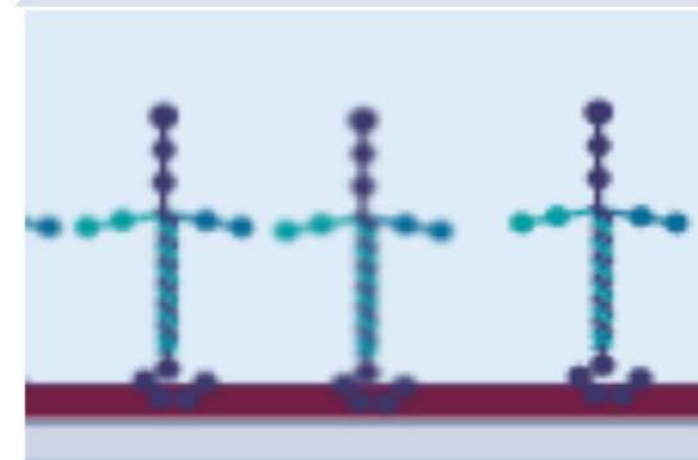
# Improving cell culture surfaces at the atomic level



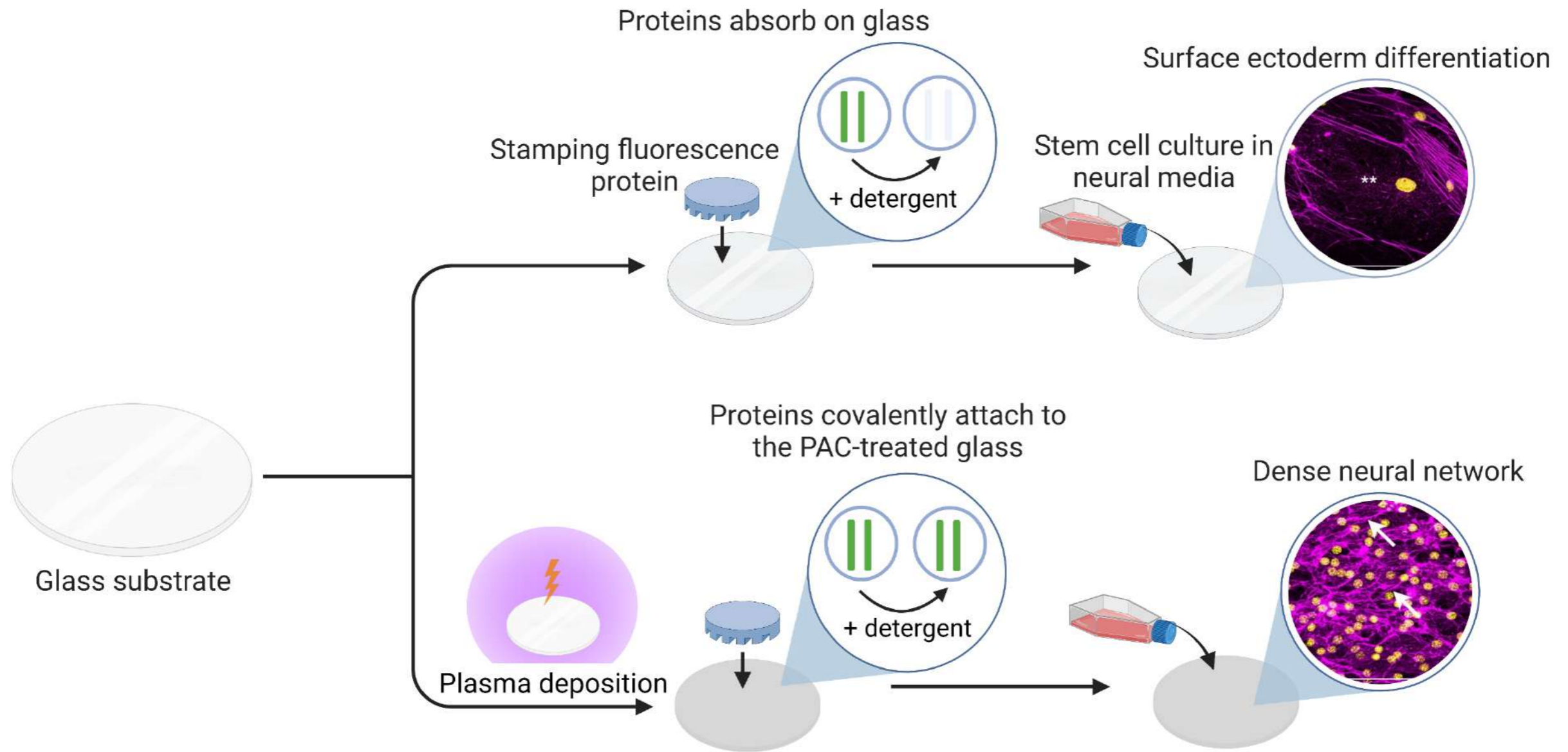
Physisorbed biomolecules



Covalently bound biomolecules



# PAC-on-glass solves a long-standing problem: How do we grow cells on glass for microscopy?

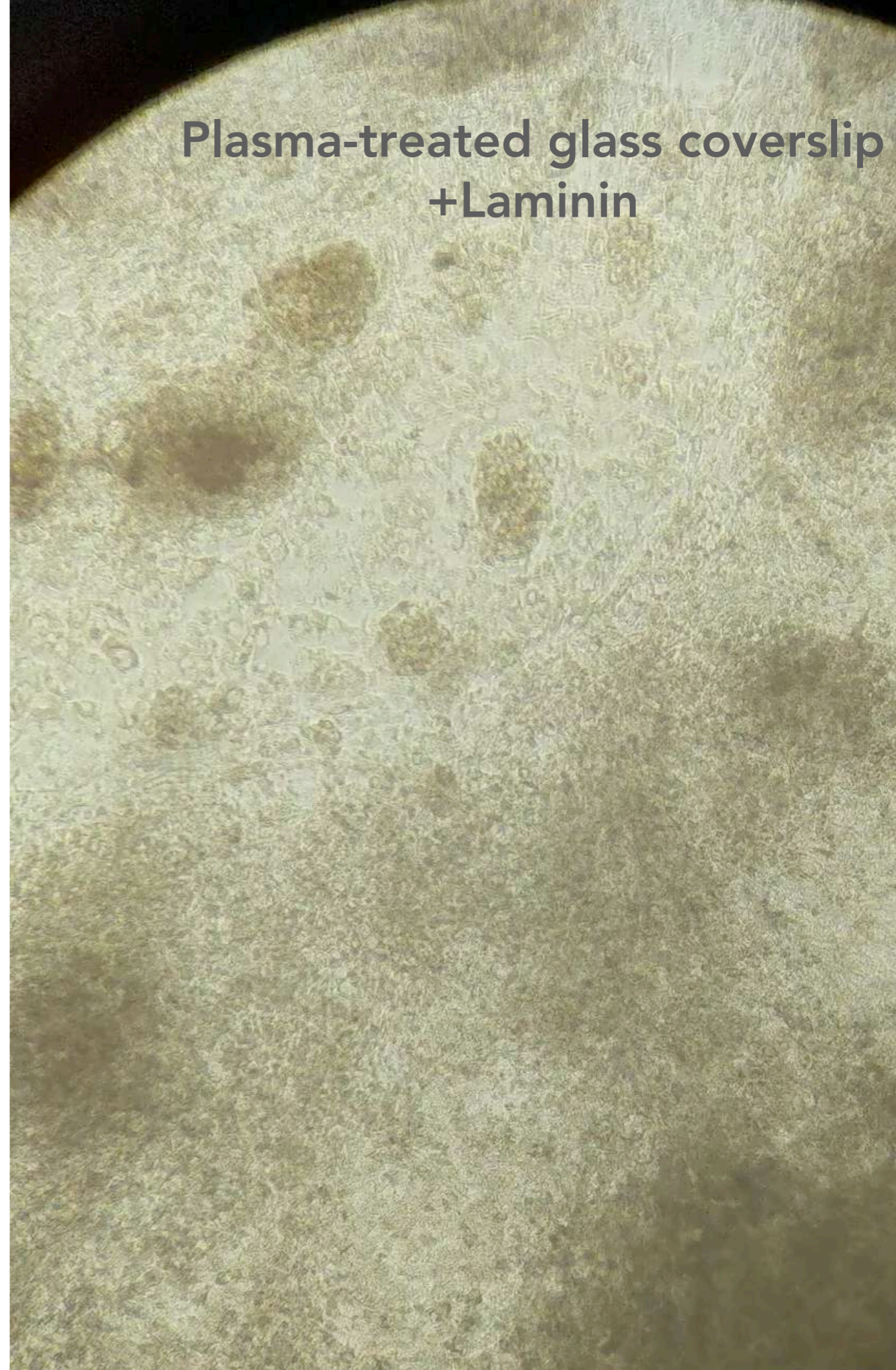




Untreated glass coverslip  
+Laminin



Plasma-treated glass coverslip  
+Laminin





# “Culturon<sup>•</sup>”

Cultura- : “to grow”

-on : suffix meaning particle

• : chemical notation for radicals

Colour reflects plasma glow

Culturon is now a registered trademark  
in Australia.

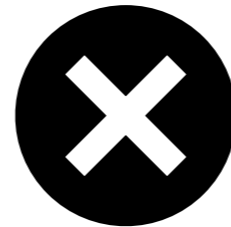
IP owned by Culturon parent company.

# Collagen Type 1 coated 6 well plates: In-house vs Commercial vs Culturon<sup>•</sup>

Covalent?



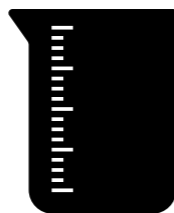
Multiple  
biomolecules  
conjugated



OHS



Infra-  
structure



Staff

Time

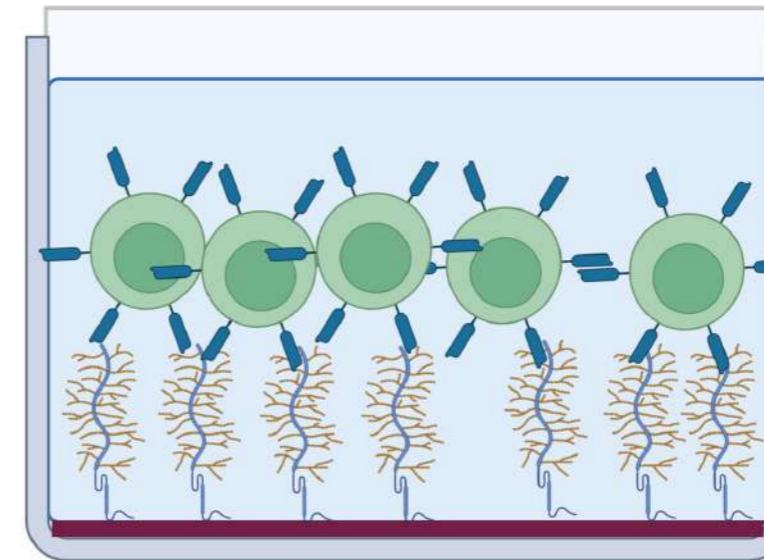
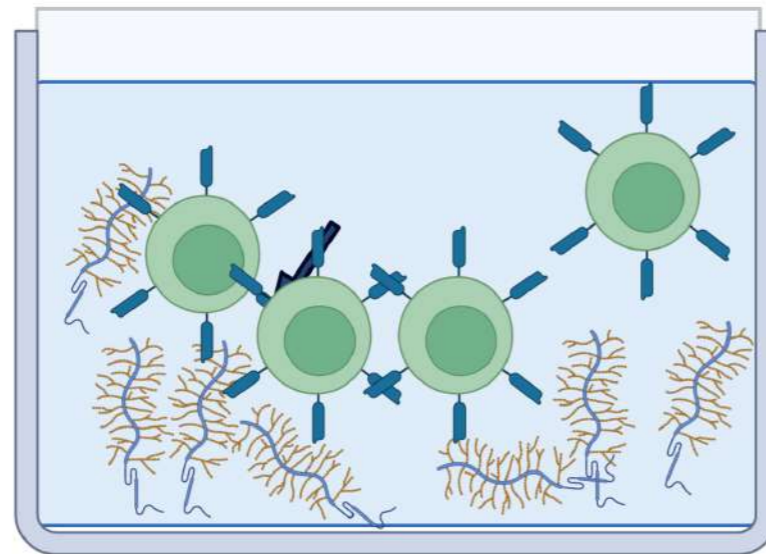
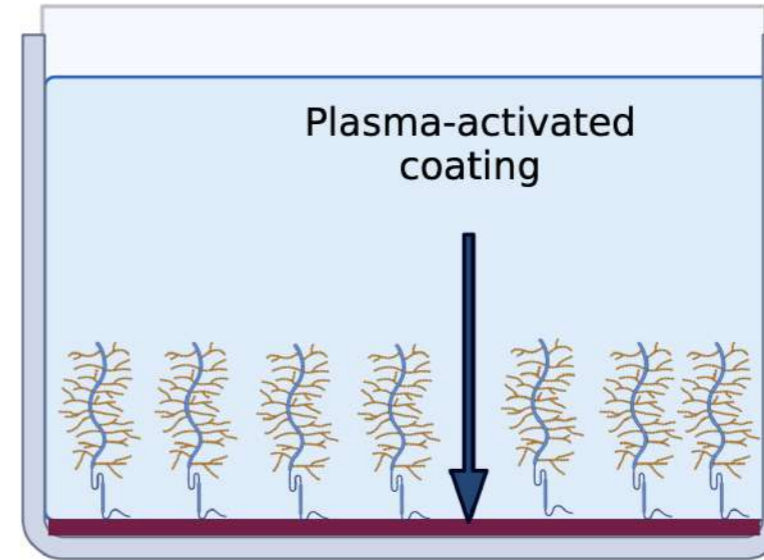
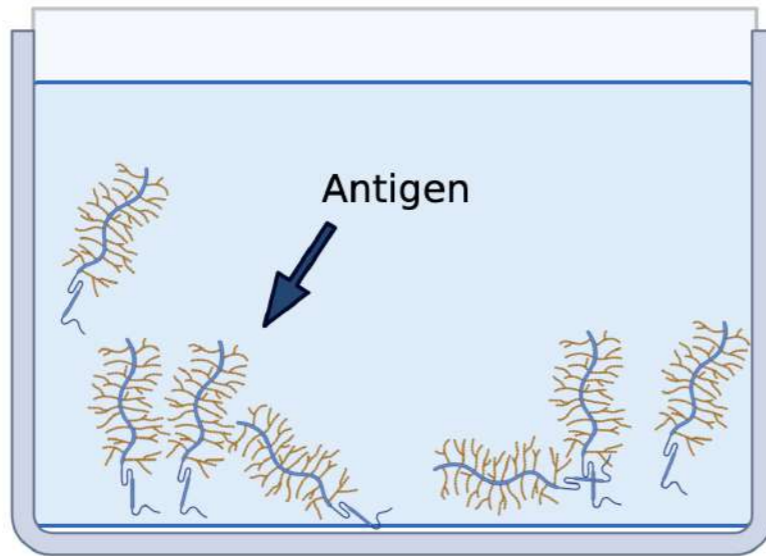
Resources

Expensive

Costs much lower

**Costs**

# Enhancing bioassay development with plasma-activated coatings



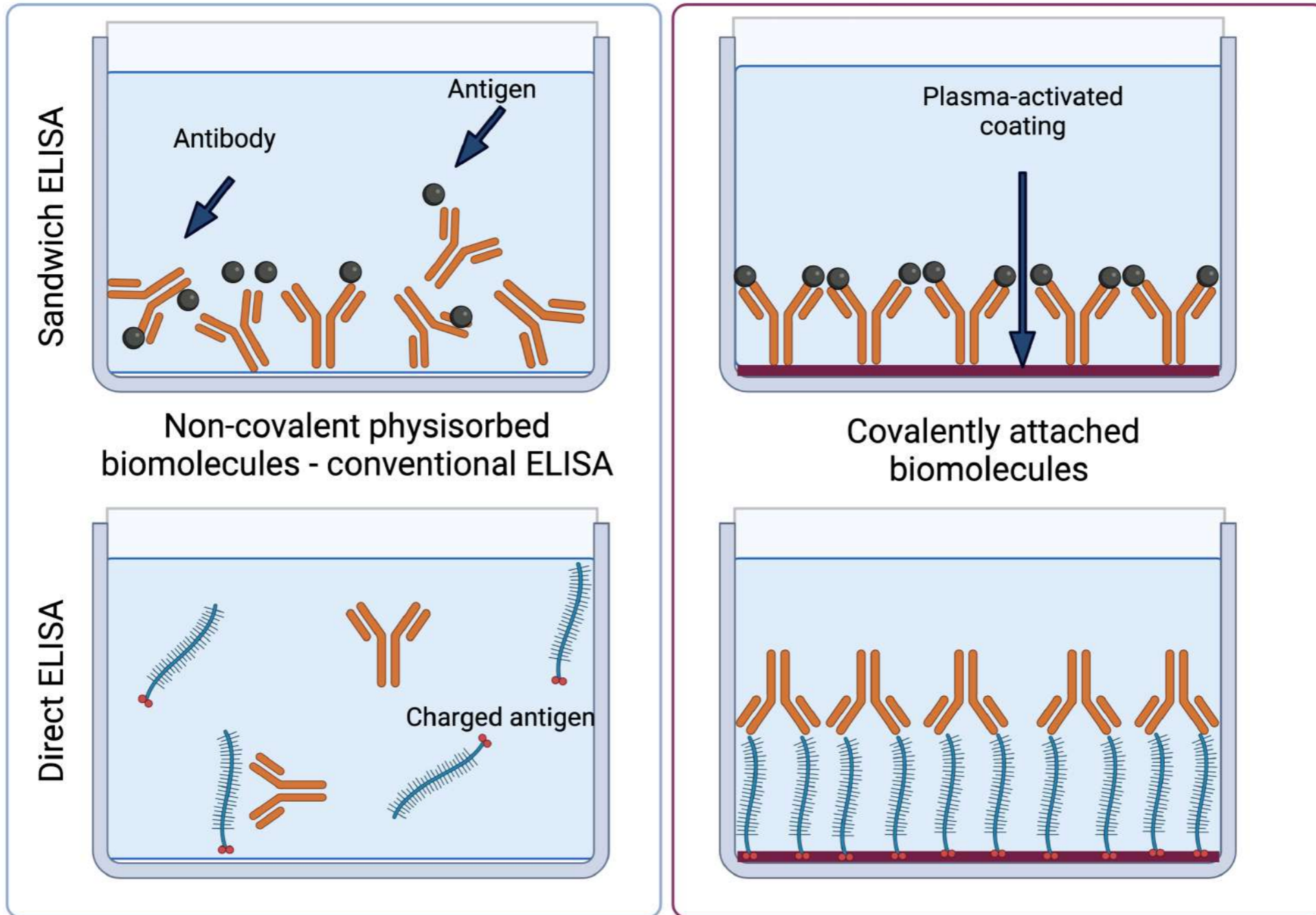
Non-covalently attached biomolecules

Covalently attached biomolecules

Cellular immunotherapy client



# Revolutionising diagnostics with plasma-activated coatings

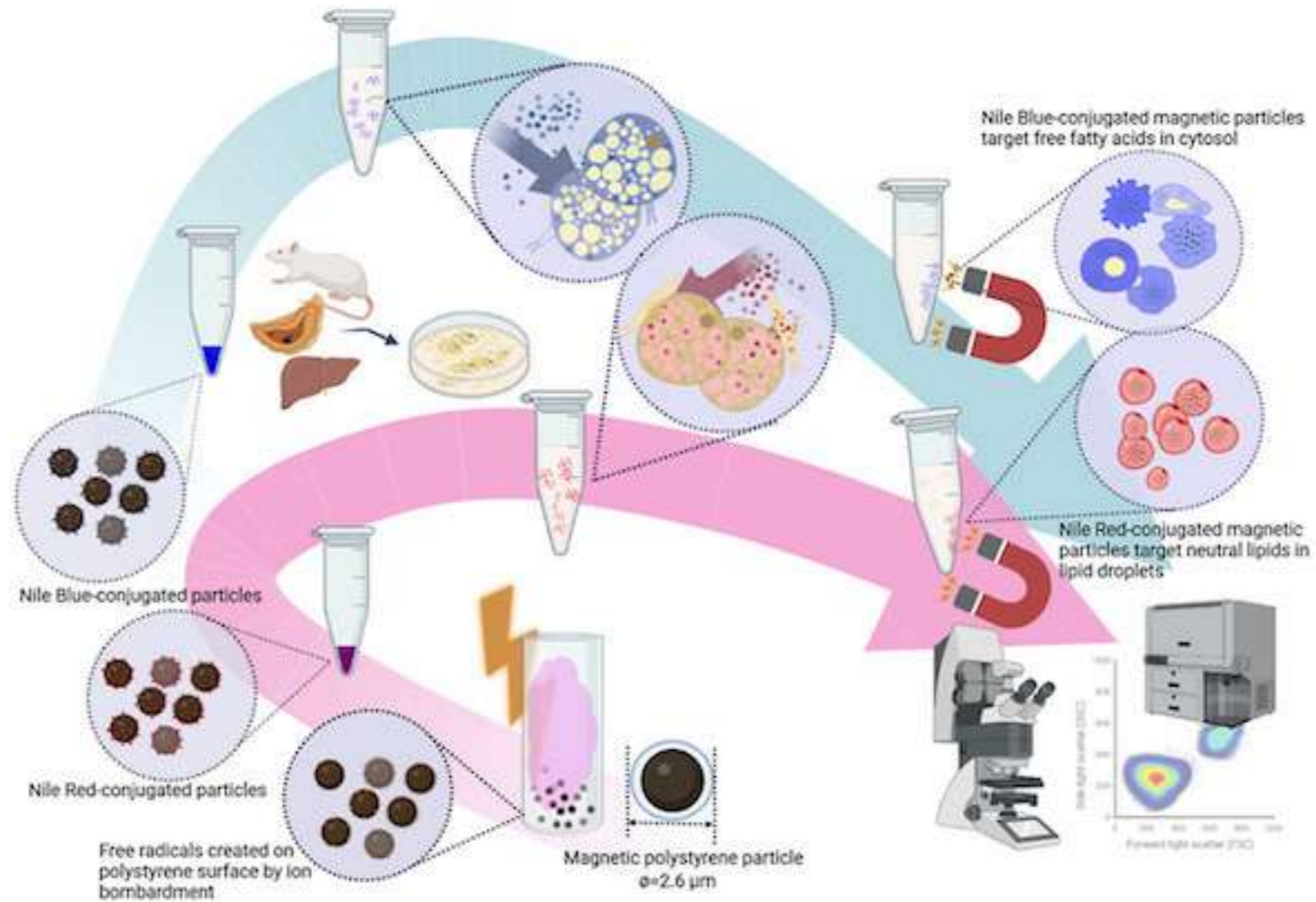


Animal health companies  
Government agencies

# The global Culturon<sup>•</sup> customer base

- \*Cellular therapies
- \*Pharmaceutical companies
  - \*Academic research
  - \*Cellular agriculture
- \*Animal health companies

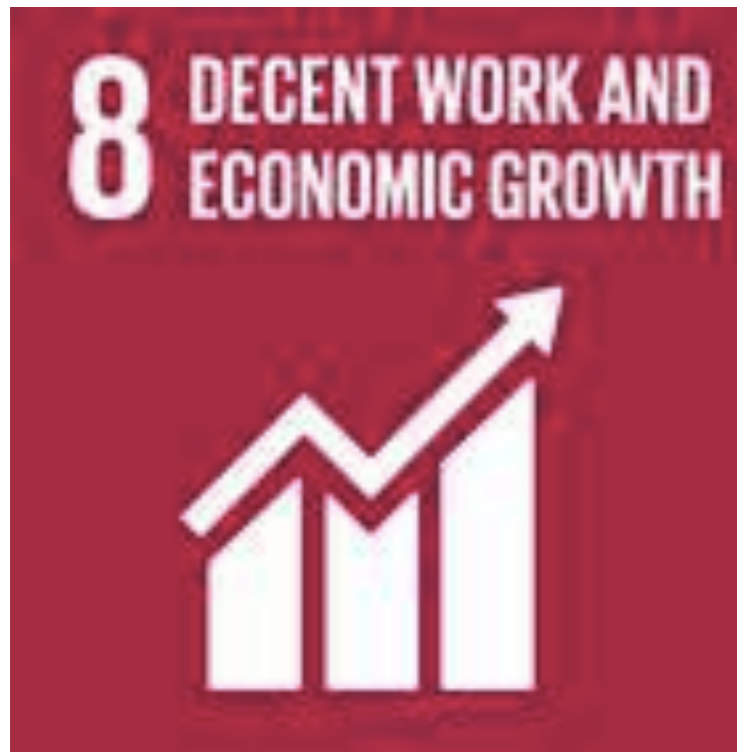
# Intracellular magnetic live cell sorting with PIII-treated magnetic particles



Magnetic clustering for drug delivery

Feng et al., 2022





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# Please reach out....

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I will get back to you as soon as physically possible.

Figures created on Blorender

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