



Completely replacing all invasive elements in polyclonal antibody production – possibilities and challenges using chickens

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What we will be covering during the next 15 minutes

1. Polyclonal antibodies – the whats, whys and hows
2. Applying the 3Rs – where do chickens enter the picture?
3. Moving forward – what are the challenges we need to meet?



1. Polyclonal antibodies

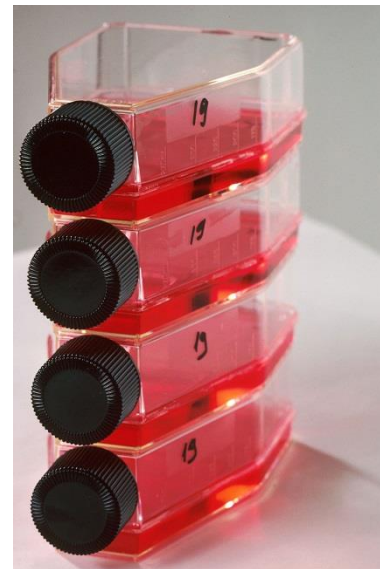
The whats, whys and hows...

What are polyclonal antibodies?

- Polyclonal antibodies are simply regular antibodies (mostly IgGs)
- They differ from **monoclonal** antibodies in that they are a mix of slightly different antibodies
- Polyclonals come directly from an animal, whereas monoclonals are grown in a lab...
- ...but we cannot make monoclonals without first producing a polyclonal starting material



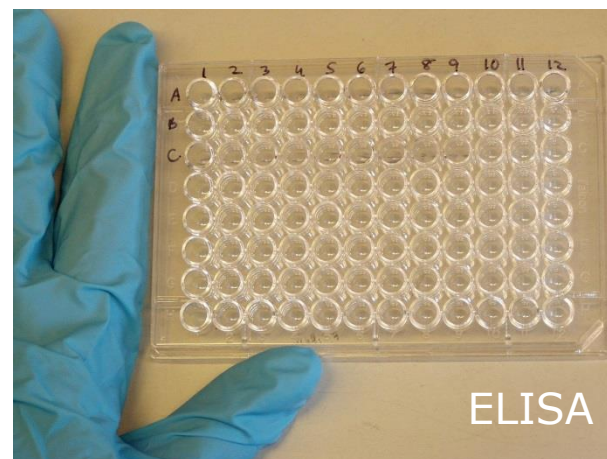
<http://hippityhoprabbity.weebly.com/new-zealand-whites.html>



Picture retrieved from Wikipedia

What do we use them for?

- For analyses in research labs all over the world
- To diagnose disease
- To fight disease (as pharmaceuticals)



Pictures retrieved from Wikipedia



<http://www.newkidscenter.com/images/10401080/image001.jpg>



<http://www.truemedcost.com/humira-price/>



How do we obtain polyclonal antibodies?

1. Obtain pure immunogen
2. Mix with an adjuvant
3. Present to the host (boost as needed)
4. Draw blood
5. Purify antibodies from blood (level of purity decided by application)
6. Put antibodies to good use



<https://www.immusmol.com/custom-rabbit-polyclonal-antibodies-ab-against-small-molecules-antibody-development-services.html>

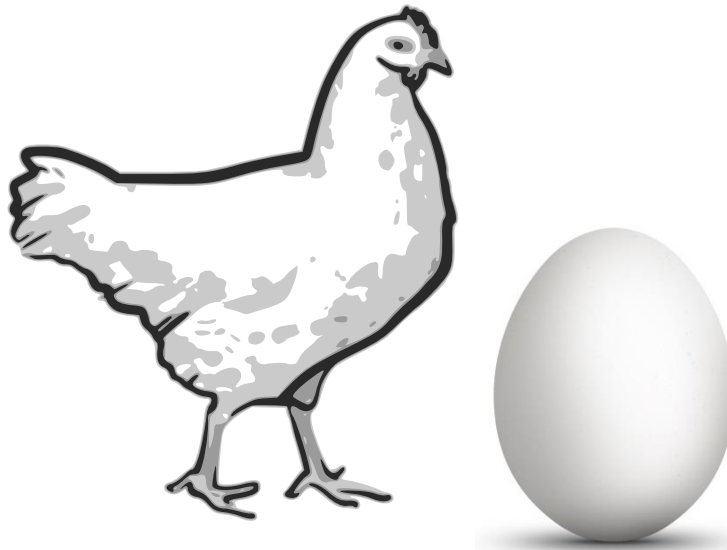


2. Applying the 3Rs

Where do chickens enter the picture?

Why chickens?

- Chicken eggs contain antibodies due to maternal transfer
- Layers in the poultry industry lay an egg every day
- Hens thus produce more polyclonal antibodies in a month than can be drawn from a rabbit in a year



Immunization vs. vaccination

- Immunizations and vaccinations are essentially the same procedure...
- They use the same techniques...
- ...and both strive to produce great numbers of antibodies to a specific target
- They only differ in that vaccinations benefit the host, whereas immunizations have a different motive

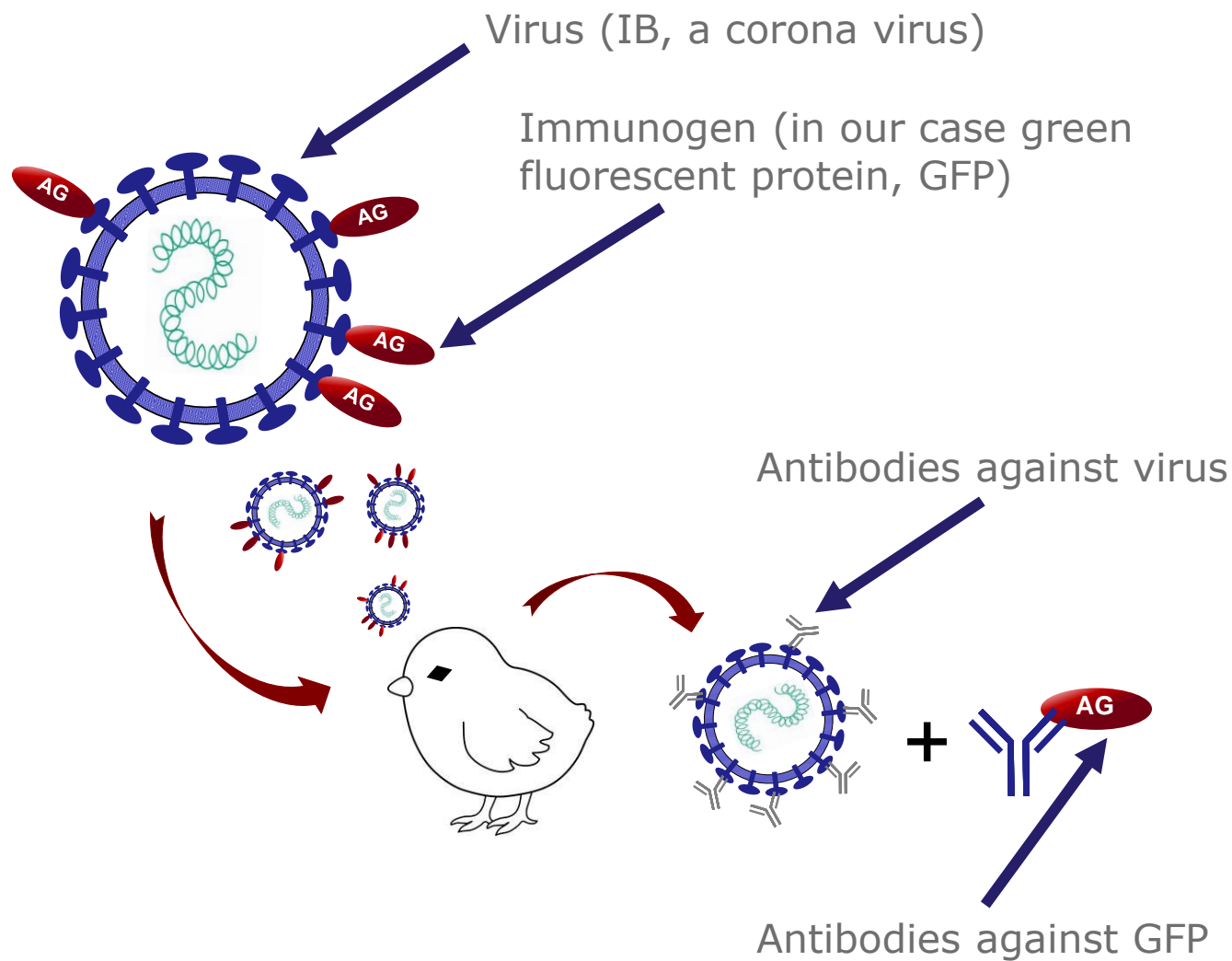


What we propose to do...

- Most Danish egg-layers are vaccinated every few weeks throughout their life
- Vaccines against respiratory viruses (such as infectious bronchitis virus; IB) are given in aerosol form
- If we can combine an immunogen with one of these vaccines...
- ...no injections are ever needed...
- ...and no blood has ever to be drawn...
- Fewer animals are needed (Reduction!) and no additional procedures or pain is applied (Refinement!)



How exactly..?



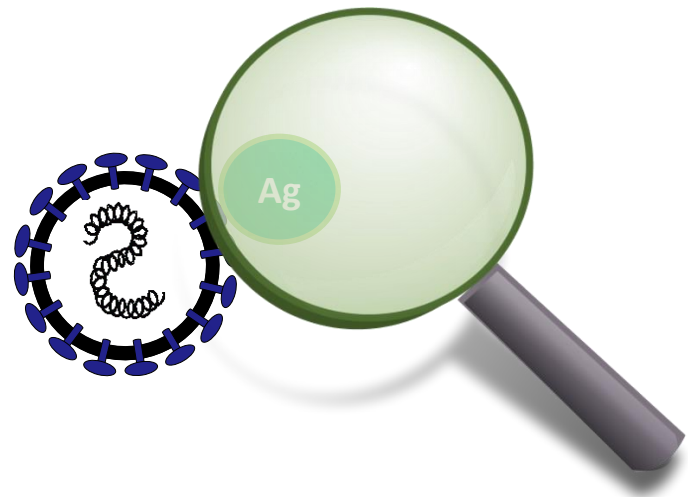


2. Moving forward

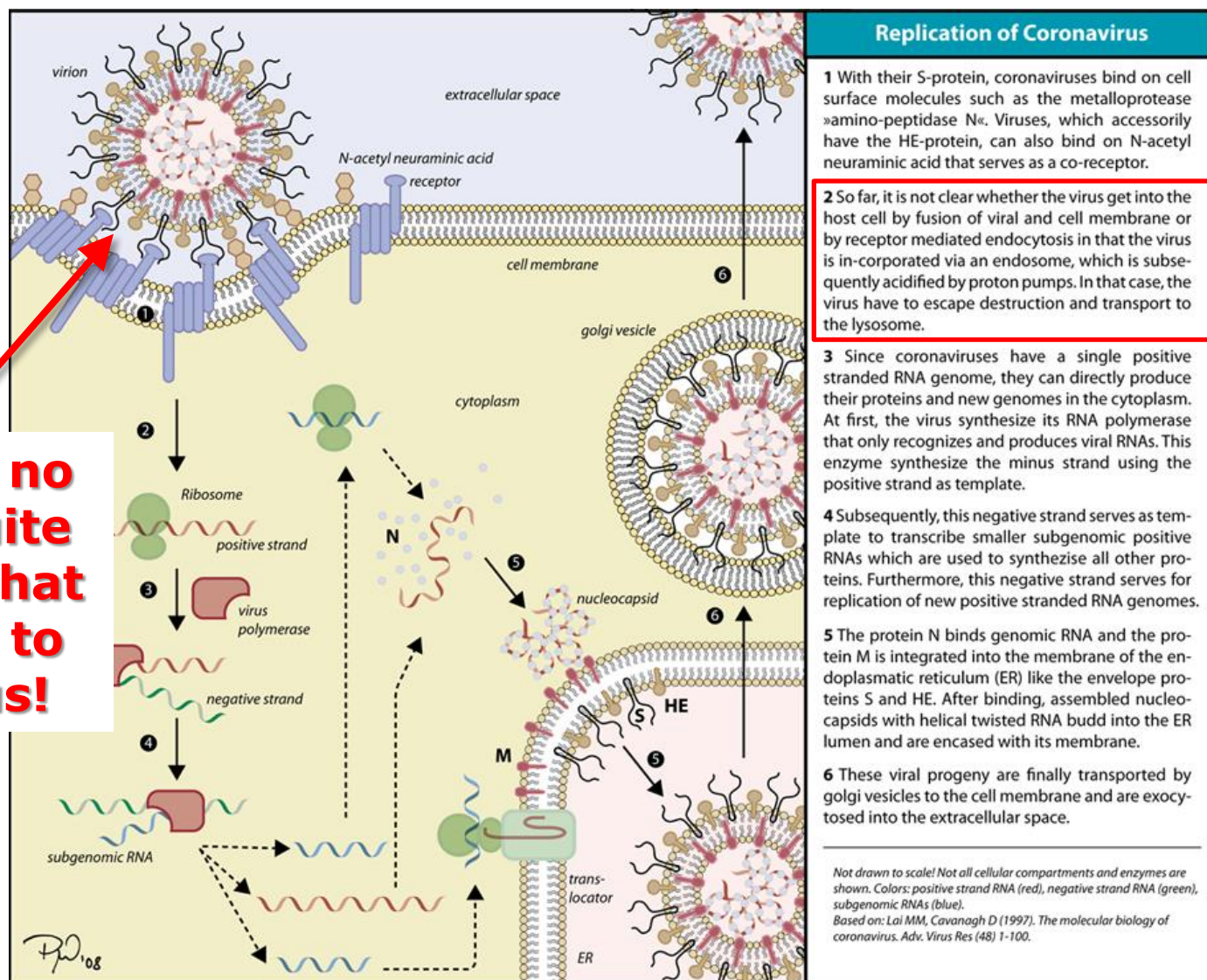
What are the challenges we need to meet?

Some challenges relate to size

- The virus (i.e. the vaccine) is big, our immunogen (GFP) is not
~1 GDa vs. 30 kDa
- Virus replicates itself (although poorly), GFP does not
- The virus consists of 88 different proteins, all in greater concentrations than GFP



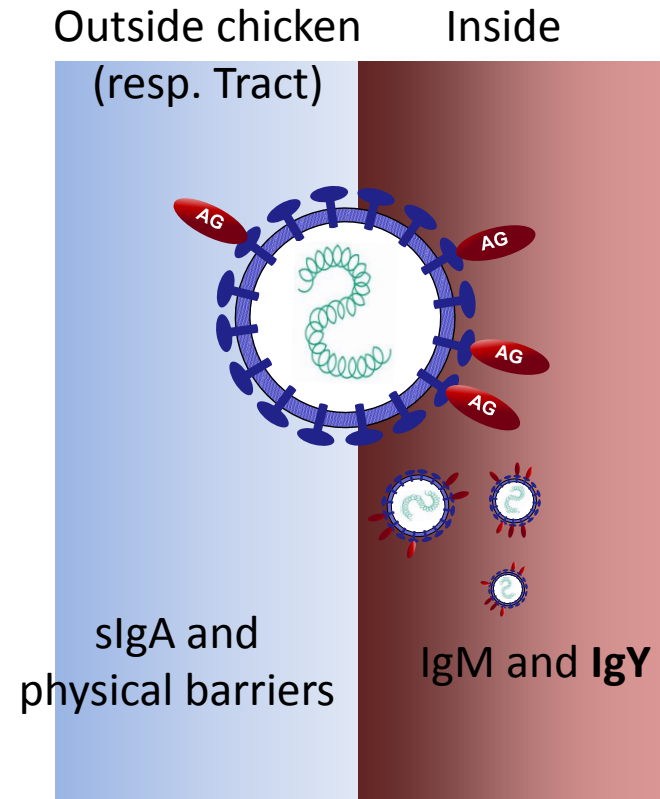
Some challenges relate to the unknown



It seems no one is quite certain what happens to this virus!

And the devil is in the details...

- If we immunize with insufficient amounts of GFP → nothing happens
- If we immunize with too much GFP → the immunogen prevents the vaccine from passing the endothelial barrier → nothing happens or IgA happens
- We want our GFP concentration to be just right





Recap

Why were we doing this again?

What do we ultimately hope to achieve?

- Present a simple way of producing antibodies in chickens
- A method that could be introduced at any farm where poultry is vaccinated (virtually all farms in Denmark)
- A method that highlights the 3Rs

Wish us luck!





Thank you for your attention

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