COVID-19
Re-infection after Recovery – Can it Happen?

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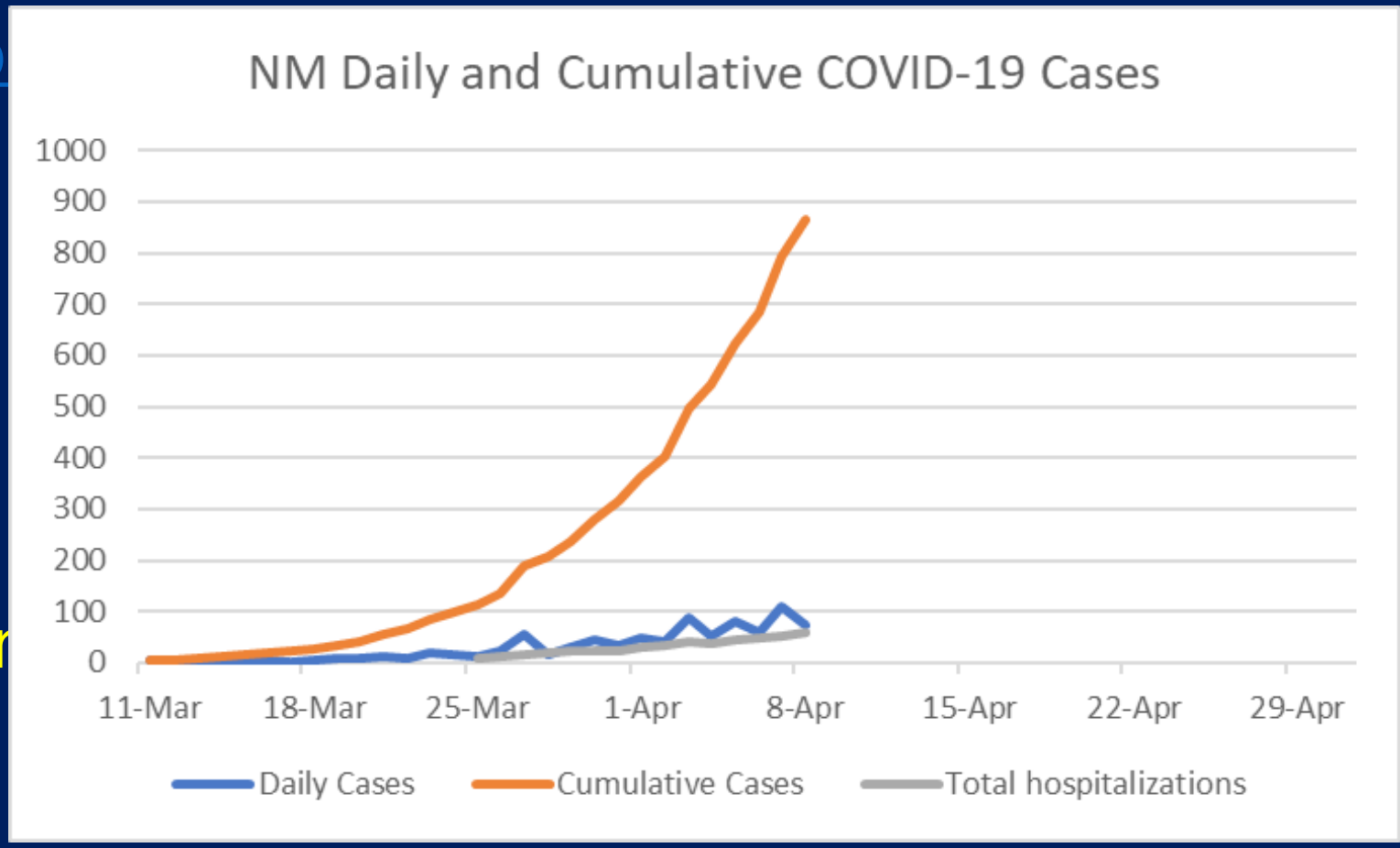
- Text in comic sans is pre-publication and has not been scientifically reviewed by experts in the field

Overview

- Situation update
- Antibodies 101
- Other Coronaviruses
- COVID-19 tests
- Reinfection reports

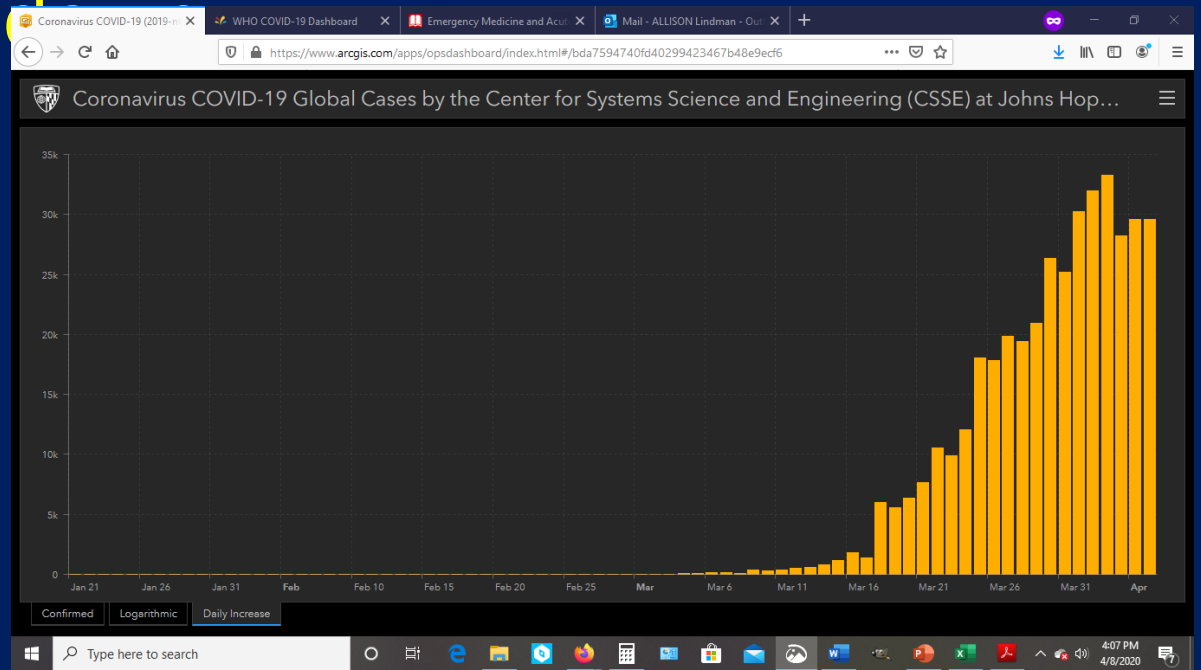
New Mexico 4/8/2020

- https://cv.nmhealth.o
- 865 cases
- 59 hospitalized
- 16 deaths (1.8%CFR)
- Outbreaks in San Feli
  Zia pueblos
- Extended suppressior
  measures until 4/30



Nationally

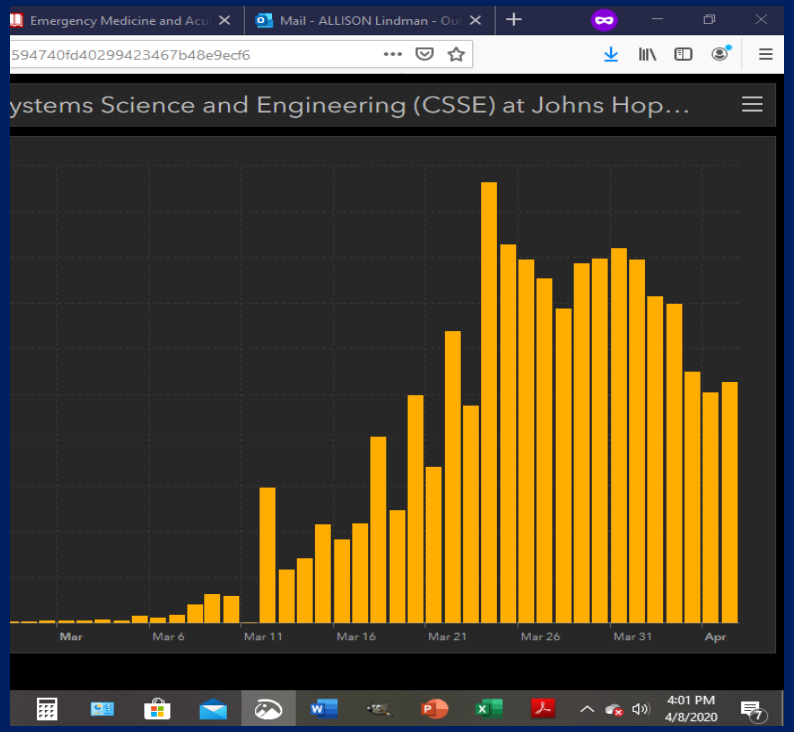
- https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
- 423,135 cases, 14,529 deaths (CFR 3.4%)
- NY – Daily rates of intubations and ICU admissions are going down



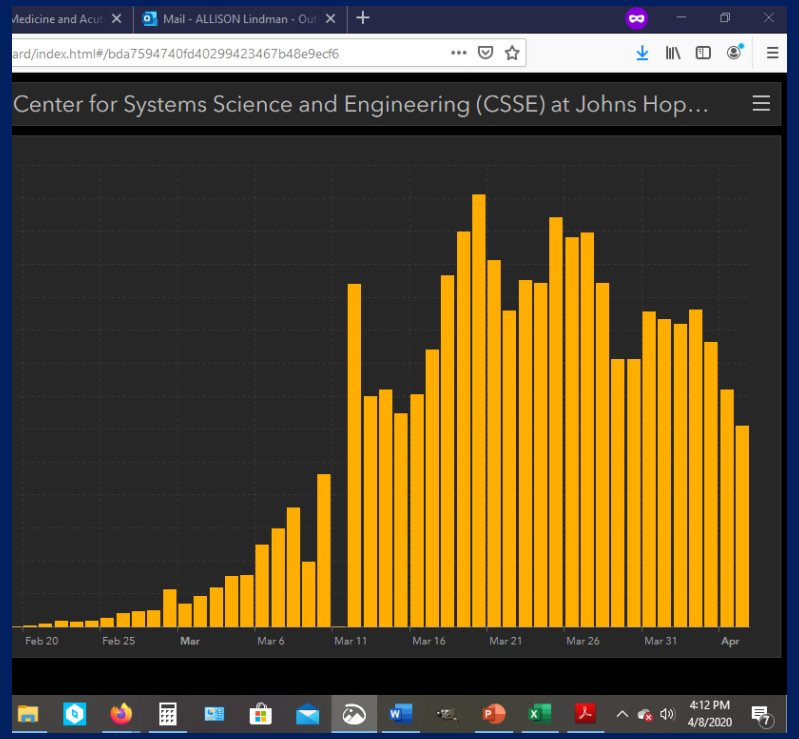
Globally

- https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6
- 1,500,830 cases, 87984 deaths (CFR 5.9%)
- Wuhan lockdown lifted

Globally



Spain

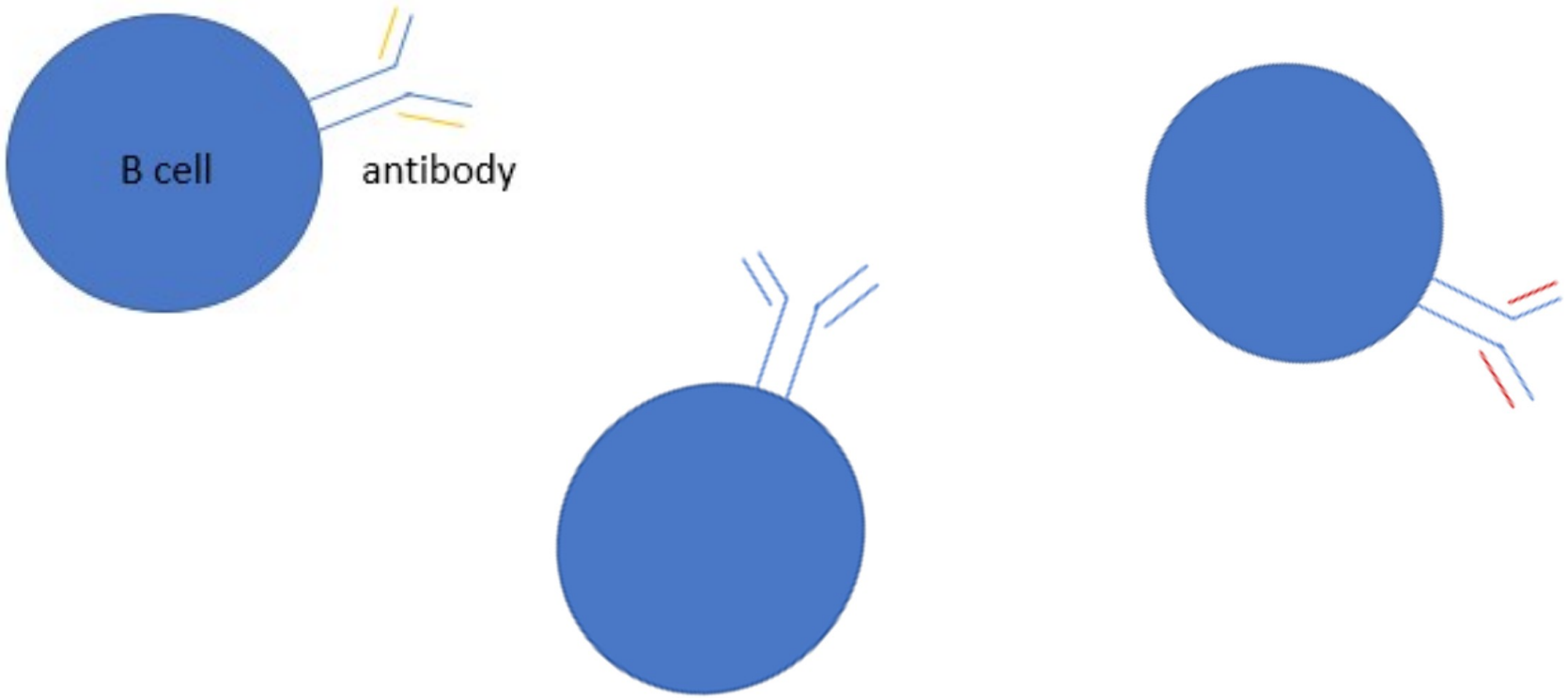


Italy

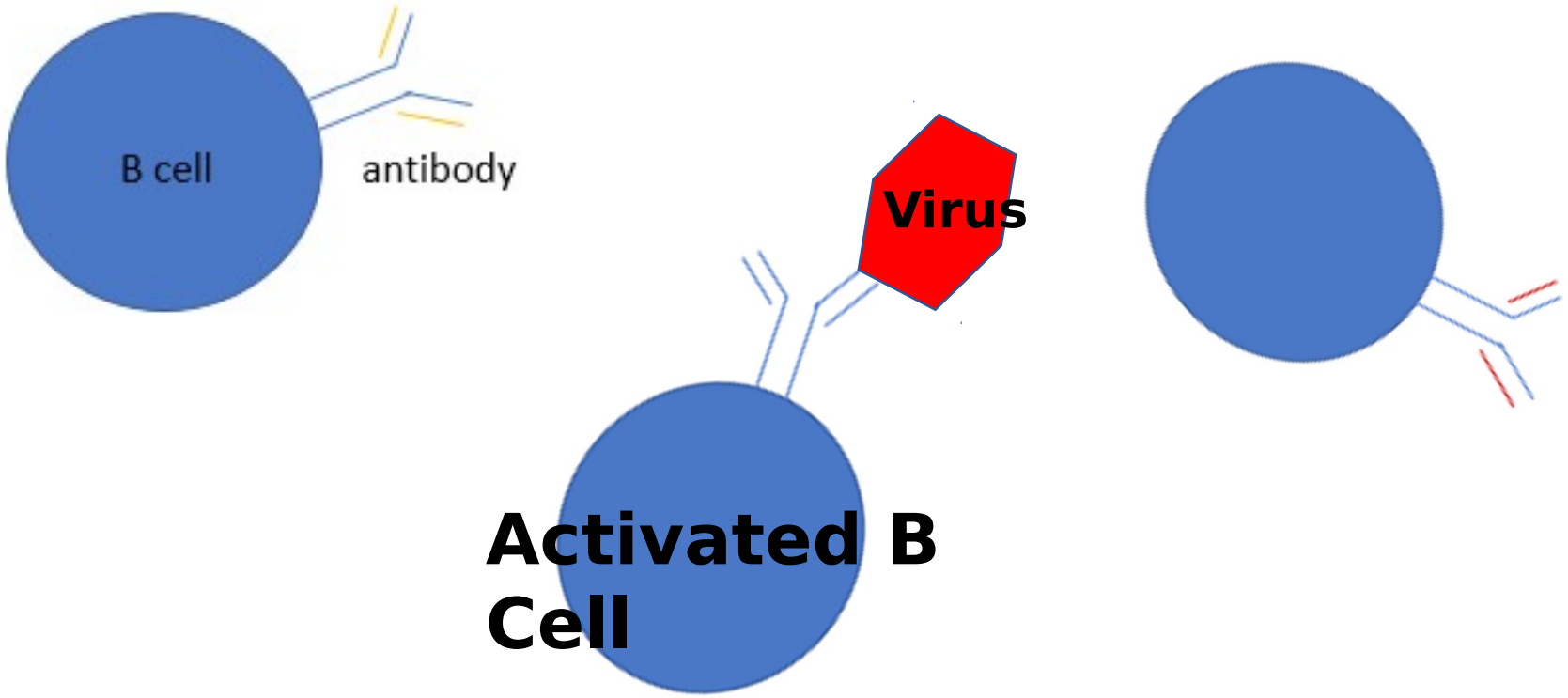
Immunology 101 - Antibody basics

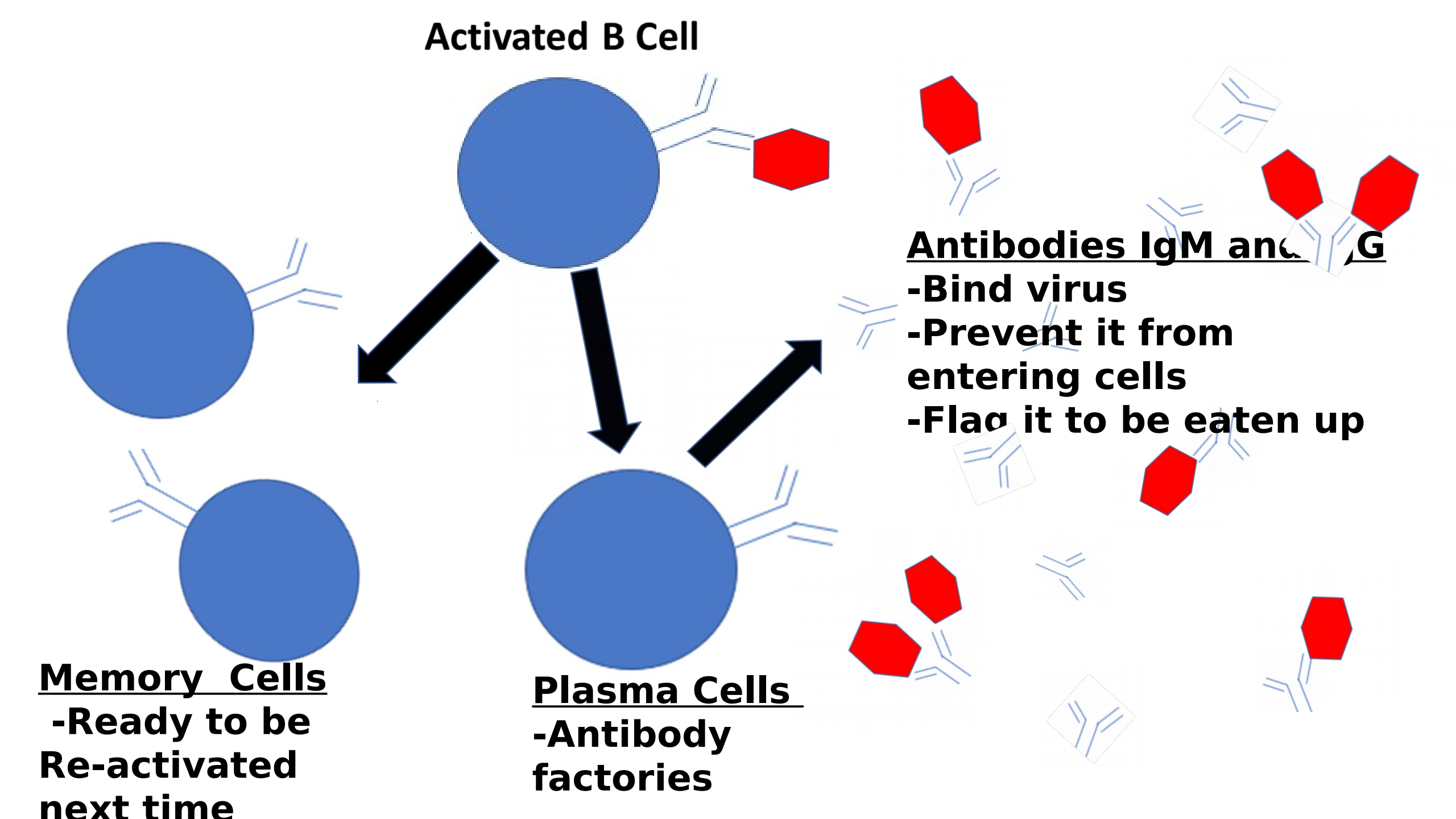
- Antibody – protein made by your immune system that attaches to foreign proteins to remove them
- Billions of different antibodies attached to “B Cell” immune cells
- B Cell encounters a shape that doesn’t belong in the body, attaches to it

Antibody basics



Antibody basics




Activated B Cell
Antibodies IgM and IgG
-Bind virus
-Prevent it from entering cells
-Flag it to be eaten up
Memory Cells
-Ready to be Re-activated next time
Plasma Cells
-Antibody factories

Q: Can people who recover from COVID-19 be re-infected with SARS-CoV-2?

A: The immune response, including duration of immunity, to SARS-CoV-2 infection is not yet understood. Patients with MERS-CoV are unlikely to be re-infected shortly after they recover, but it is not yet known whether similar immune protection will be observed for patients with COVID-19.

https://www.cdc.gov/coronavirus/2019-ncov/hcp/faq.html

MERS Survivors

- Closest relative to SARS-CoV-2
- No further outbreaks to determine if people become ill again
- Most patients had a high antibody levels by 3rd week, regardless of illness severity
- More severe illness correlated with antibodies lasting longer
  - ≥ 18 months vs ≤ 3 months for asymptomatic
- Widespread antibody testing found antibodies in 0.15% = mild or asymptomatic infections

SARS Survivors

- No further outbreaks to determine if people become ill again
- High antibody levels by 3rd week
- Antibodies levels were high for 18 months post recovery, then waned
  - Did not correlate with disease severity

COVID-19 tests - Antibodies

- Antibody tests are being developed and tested in US, Europe, and China
- Early results similar to MERS
- High antibody levels between 2nd and 3rd week
- More severely ill patients had higher antibody levels
- Antibodies were detected in asymptomatic contacts of COVID-19 patients.

COVID-19 tests – Swabs

- Does not detect live virus
- Detects RNA (genetic code) of the virus
- If the test is positive, you have the virus RNA in your nose
- If the test is negative, *probably* don't have the disease – but it's not 100%

Can the test be wrong?

Yes!

False positive test

- Don’t have the disease, but the test is positive
- Extremely rare
- Cross-contamination in the lab

False Negative test

- Have the disease, but the test is negative
- Early or late in the disease when there isn’t a lot of virus in your nose
- Inadequate collection
- “Amplification inhibitors” --- ?? Common cold medications??
- Problems with handling of the sample

False Negative test

- https://www.fda.gov/media/134922/download

- “Collection of multiple specimens (types and time points) from the same patient may be necessary to detect the virus.”

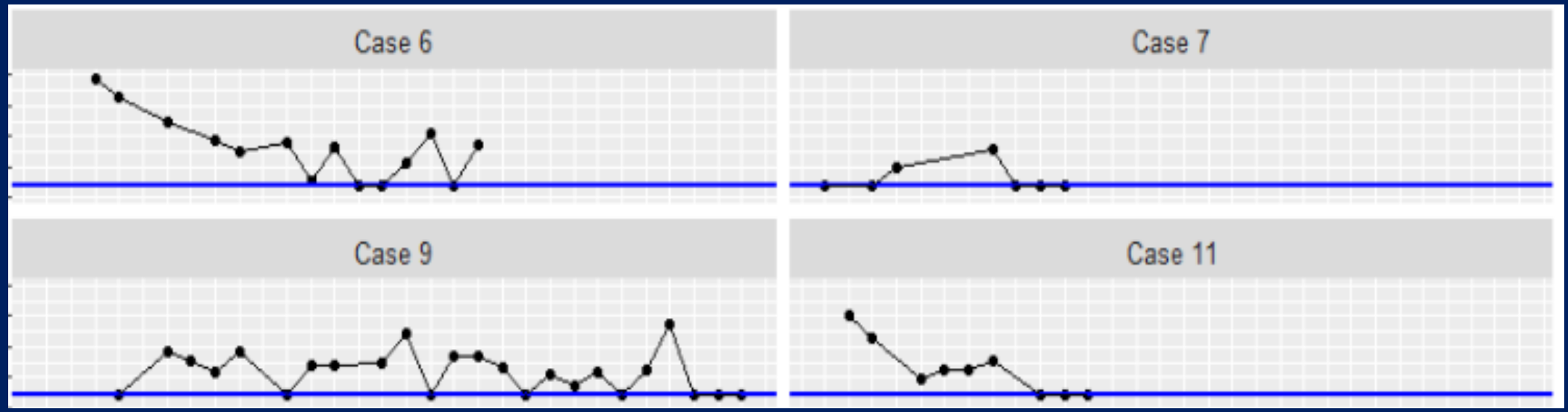
- “The performance of this test has not been established for monitoring treatment of 2019-nCoV infection”

COVID-19 Tests – Nasopharyngeal (NP) Swabs

- Studies show patients can have positive NP swabs in the days after having negative nasal swabs

COVID-19 Tests – NP Swabs

- Young, B et.al. *Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore* JAMA 2020 doi: 10.1001/jama.2020.3204



COVID-19 Tests – Nasal Swabs

Lan, L et.al. *Positive RT-PCR Test Results in Patients Recovered From COVID-19* JAMA 2020 doi:10.1001/jama.2020.2783

- 4 hospitalized healthcare providers with COVID-19
- All recovered – symptoms improved, CT scan normal, 2 negative swabs
- Discharged home

COVID-19 Tests – NP Swabs

Lan, L et.al. *Positive RT-PCR Test Results in Patients Recovered From COVID-19* JAMA 2020 doi:10.1001/jama.2020.2783

- 5 days later, all had positive swabs
- All had *2 more* positive swabs in the next 5 days
- None had symptoms
- No family members became ill

Possible Explanations

- Treatment in hospital suppressed virus, then increased again after discharge
- Amount of virus is at the threshold of *positive/negative*
- No live virus, but pieces of dead virus RNA in nose
- Asymptomatic carriers of live virus

Other studies

- Article in Chinese regarding patients who recovered, then developed fever and tested positive
- Abstract in English doesn’t report anything else regarding illness in these patients
- 1 small animal study in pre-publication shows Rhesus macaques do NOT become ill when reinfected after recovery

Conclusion

- Antibody response to SARS-CoV-2, MERS, and SARS suggests people should be immune starting 2-3 weeks into infection and lasting for 3 – 18 months after infection
- After 18 months immunity will probably wane
- Positive swabs after recovering from COVID-19 do not necessarily mean re-infection
- There are no case reports in English language medical journals of people becoming ill with COVID-19 again after recovering

Thank you!

- Amanda Lewis
- Janet Phillips
- Greg Shores
- Brittney VanDerWerff

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