UNIVERSITY OF SASKATCHEWAN

SASKATCHEWAN SEROPREVALENCE STUDY

Hybrid Immunity to SARS-CoV-2

& Lessons Learned

MAUREEN ANDERSON, PHD

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DISCLAIMER

I have no COIs to declare related to this study.

PARTNER ORGANIZATIONS

Saskatchewan Health Authority

University of Saskatchewan College of Medicine

University of Manitoba

VIDO

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COVID-19 IMMUNITY TASK FORCE

GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

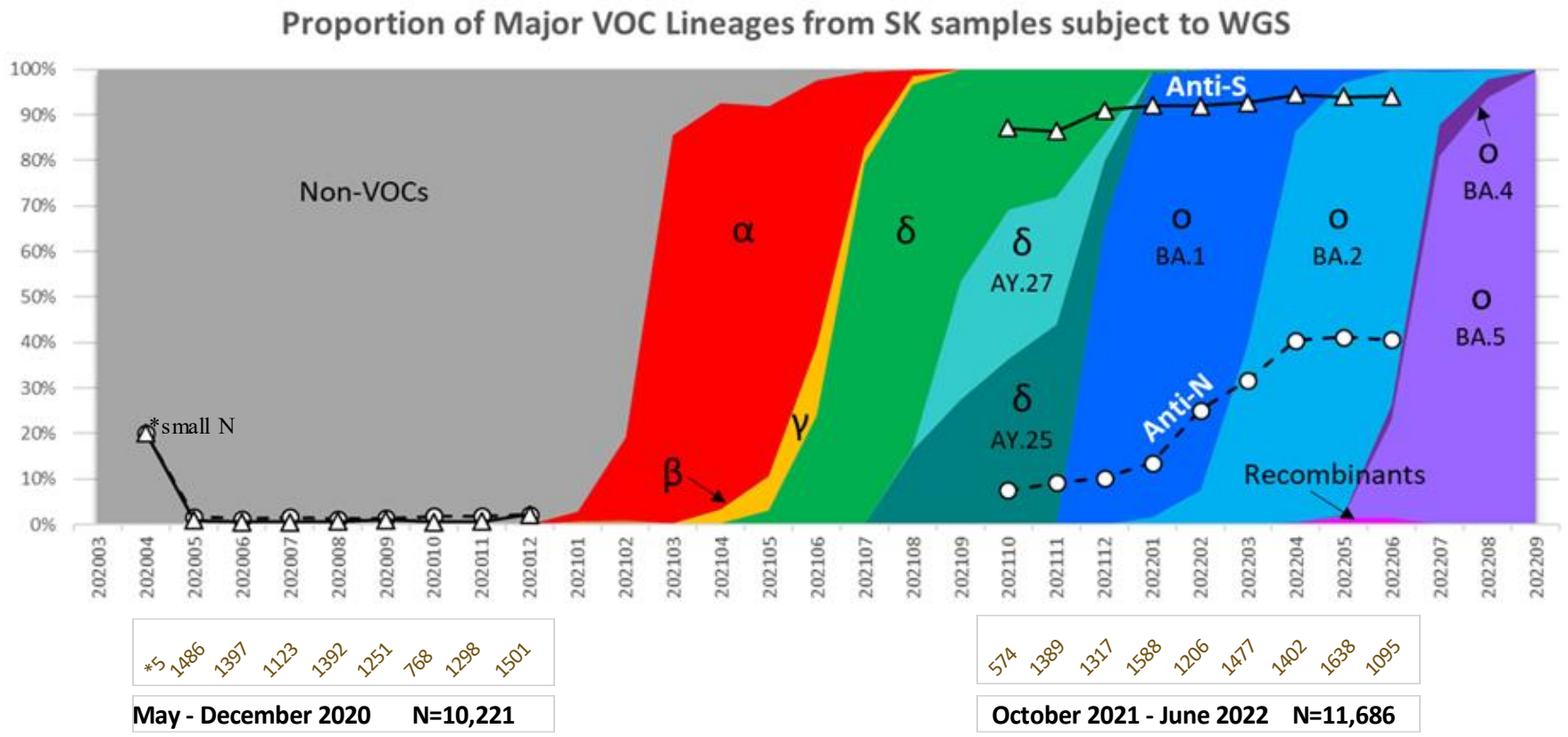
SARS-CoV-2 SASKATCHEWAN SEROPREVALENCE STUDY

University of Saskatchewan

- Residual serum samples from participants (n = 21,907) tested for antibodies to SARS-CoV-2 during three time periods (May-Dec 2020; Oct-Dec 2021; Jan-Jun 2022)
- All samples tested for IgG antibodies to SARS-CoV-2 spike and nucleocapsid proteins
- Additional Microneutalization testing conducted on 580 samples against Ancestral SARS-CoV-2(all), Delta and Omicron (2021/22)
- *In progress:* surveillance project assessing COVID-19 immunizations, antibody levels, COVID-19 respiratory tests, and outcome (inpatient, ICU, death)

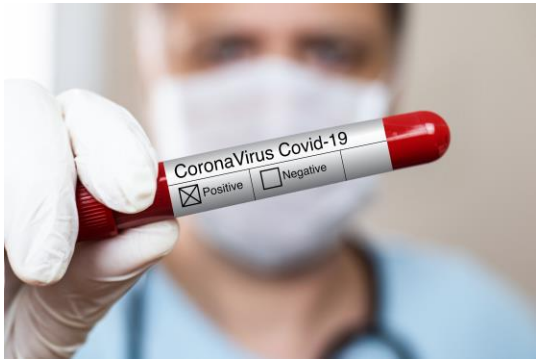
SK SEROPREVALENCE & VOC LINEAGES

May 2020 – September 2022



MAIN FINDING 1

Antibodies to Spike Protein & Nucleocapsid were Positively Correlated to Microneutralization Titres



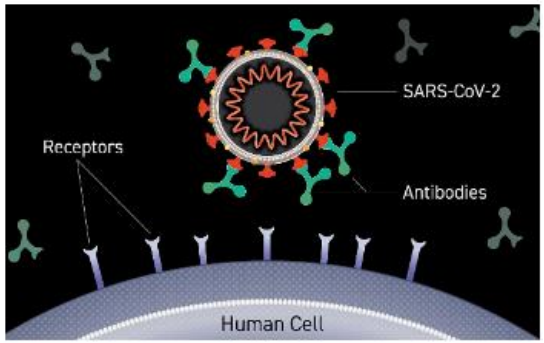
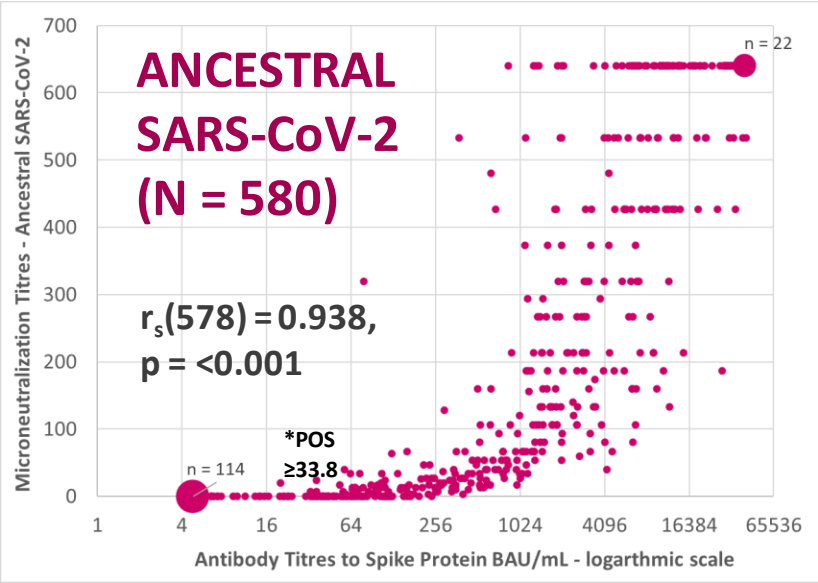
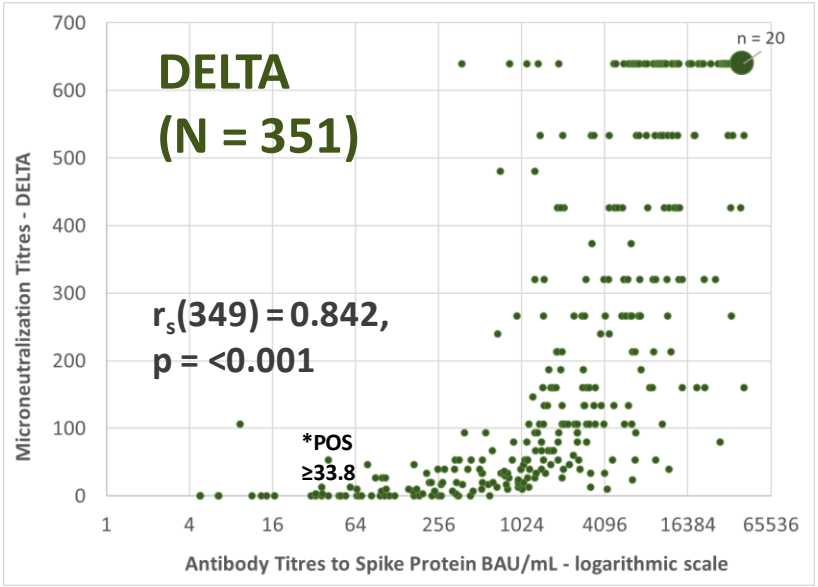
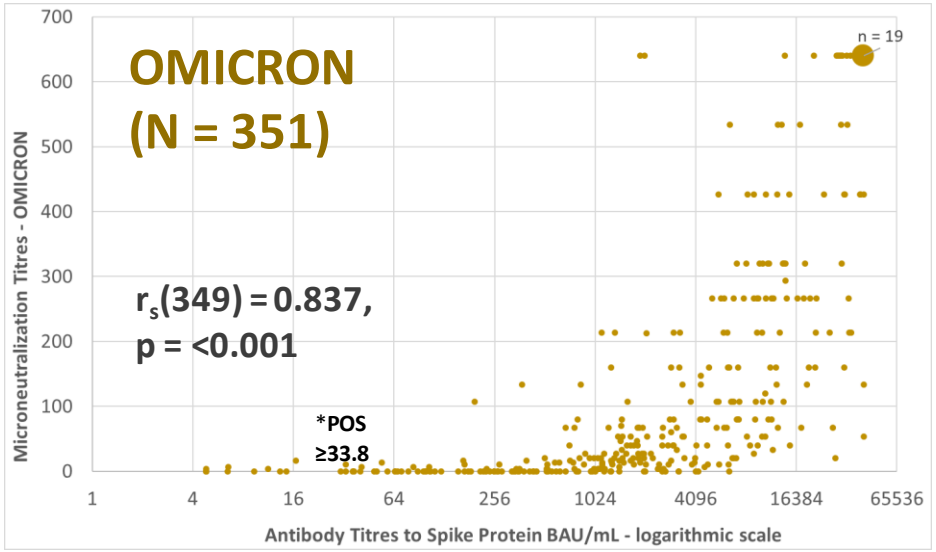


Figure 1. Image of antibody binding to the surface of a virus, blocking entry into a human cell. From "National Institutes of Health News Releases", by L Donohue, 2020 Retrieved February 23, 2023, from https://www.nih.gov/news-events/news-releases/clinical-trials-monoclonal-antibodies-prevent-covid-19-now-enrolling.

ANTIBODIES TO SARS-CoV-2 SPIKE PROTEIN BAU/mL (X-Axis) & MICRONEUTRALIZATION TITRES (Y-Axis), SK







*points marked 4.8 are below the cutoff titre that was performed during the assay

*points at 640 exceed the maximum titre that was performed during the assay

MAIN FINDING 2 – HYBRID IMMUNITY

Samples positive for antibodies to both spike protein and nucleocapsid had higher neutralization titres compared to samples positive to spike alone ($t = 6.8$; $p < 0.0001$)

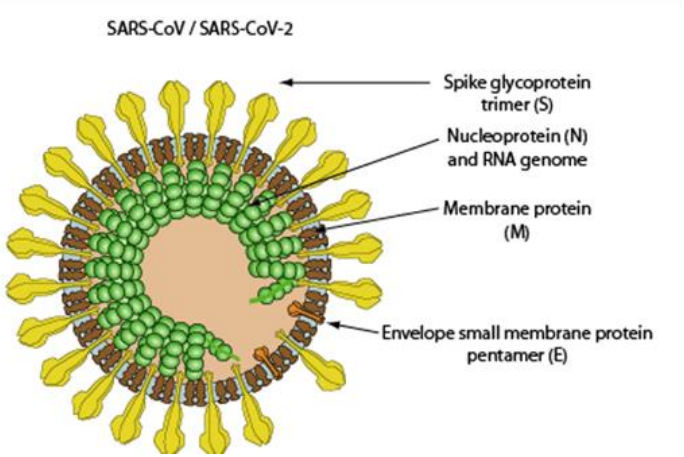


Figure 2. SARS-CoV/SARS-CoV-2. From "SARS-CoV-2, COVID-19 Coronavirus Resource," *Viral Zone.* Retrieved February 23, 2023, from https://viralzone.expasy.org/764. Copyright 2020 by ViralZone.

MAIN FINDING 3

Median microneutralization titres and median antibody titres to spike protein differ between the three time periods. Omicron Wave (2022) > Delta Wave (2021) > Ancestral SARS-CoV-2 Wave (2020)

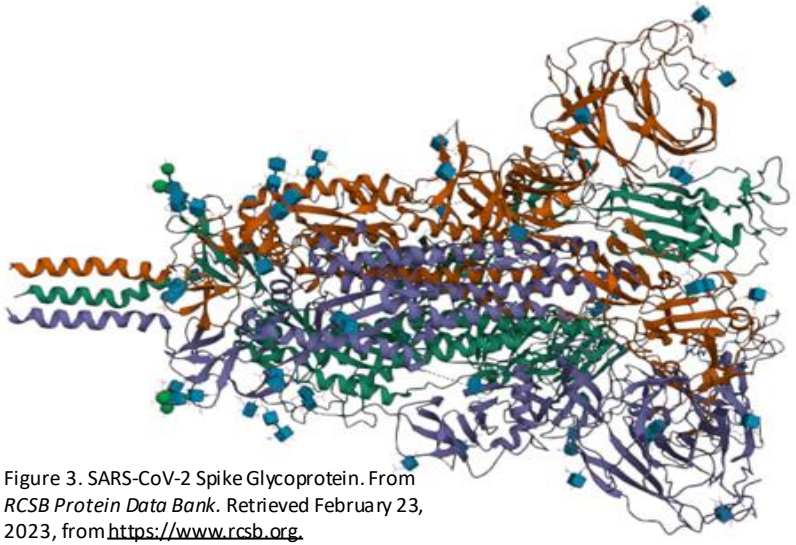


Figure 3. SARS-CoV-2 Spike Glycoprotein. From *RCSB Protein Data Bank*. Retrieved February 23, 2023, from https://www.rcsb.org.

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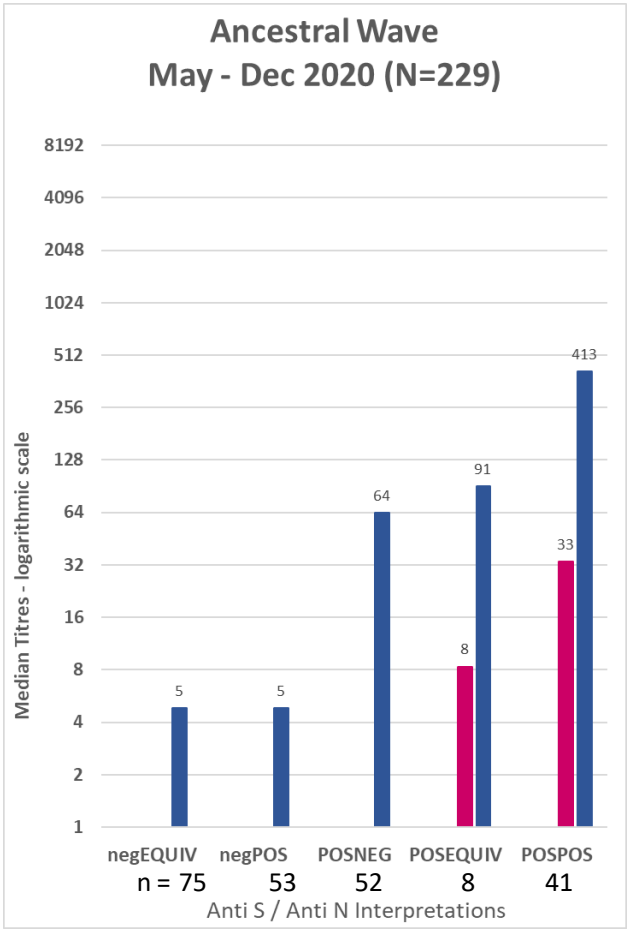
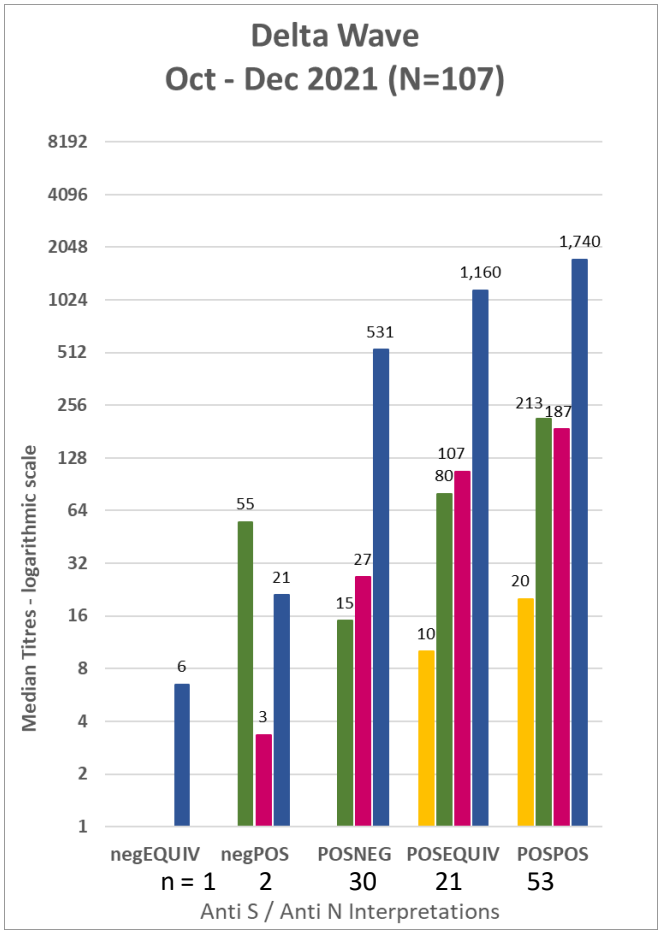
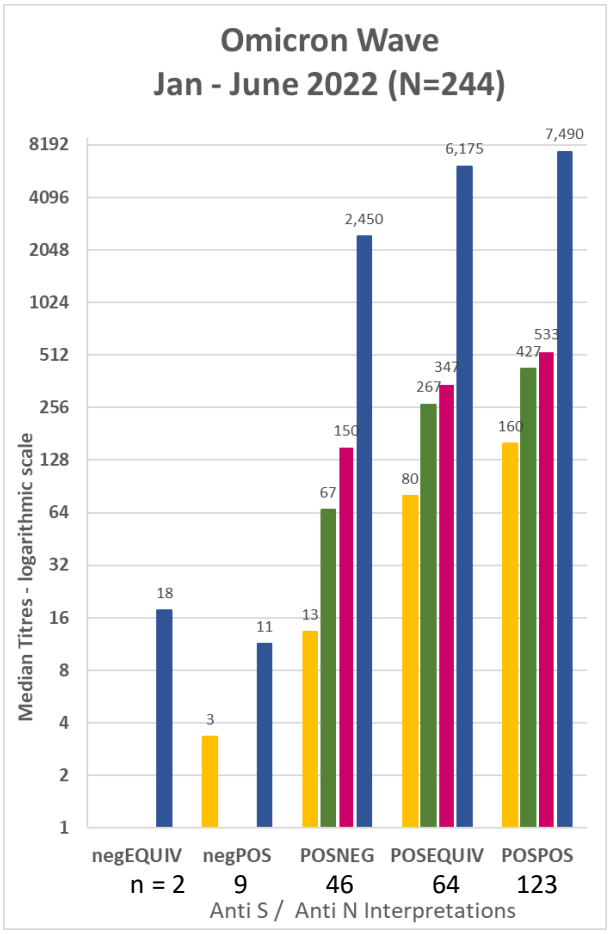
Median Microneutralization Titres against Ancestral SARS-CoV-2, Delta, and Omicron & Median Antibody Titres to SARS-CoV-2 Spike Protein by Anti S/Anti N Interpretations (n = 580)

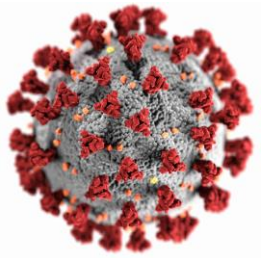
*Note Logarithmic scale







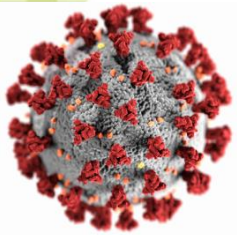
Median MN Titres – Omicron Median MN Titres – Delta Median MN Titres - Ancestral SARS-CoV-2 Median Titres to Spike Protein



CONCLUSION

- Findings support previous research [Andeweg et al., 2022; Altarawneh et al., 2022; Bobrowitz et al., 2023]
- Pre-vaccine era and post-vaccine era titre differences
- Difference in titres between the SARS-CoV-2 Waves
- Individuals with antibodies to spike protein from SARS-CoV-2 infection and/or vaccination, combined with antibodies to nucleocapsid from infection (**"hybrid" immunity**) have the strongest antibody immune response

Figure 4. TAXONOMÍA SARS-CoV-2, by Ludavir. *Openverse*. Retrieved February 21, 2023, from https://openverse.org/image/87cc845b-e8bc-4f1d-be04-363616e455e0?q=SARS-CoV-2. Copyright CC BY-SA 4.0.



LESSONS LEARNED

- In jurisdictions the size of Saskatchewan, **individuals with both public health content expertise and outbreak response experience are limited**
  - Large institutional public health research teams do not necessarily exist
  - Many experts juggled multiple roles, including both urgent pandemic response activities coupled with public health research

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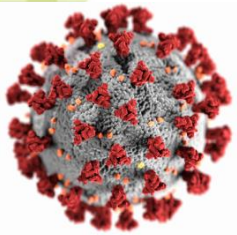

LESSONS LEARNED

Access to data for research

- NOT TIMELY
- Suggest: Process in peacetime that can be quickly stood up in a public health emergency

Data Processing & Analysis

- SPECIALIZED SKILL SET
- Suggest: National funding opportunities to include resourcing a centralized data support centre, as opposed to every jurisdiction recreating this on their own

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SARS-CoV-2 SASKATCHEWAN SEROPREVALENCE STUDY

STUDY TEAM

- Dr. Maureen Anderson, Principal Investigator
- Dr. Amanda Lang
- Lesley Behl
- Dr. Max Turgeon
- Dr. Darryl Falzarano
- Dr. Stephen Lee
- Dr. Jessica Minion
- Dr. Cory Neudorf

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