Production of Superantigens in *Staphylococcus aureus* from healthy individuals

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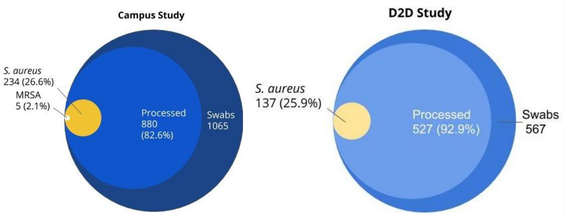
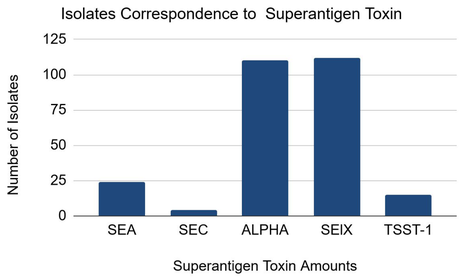
Background:

- The study has collected nasal swabs from healthy individuals on Concordia St. Paul Campus (CSP) and at the Minnesota State fair (D2D)
- *Staphylococcus aureus* is a commensal and opportunistic bacteria
- Those swabs are tested to determine if they are *S. aureus*



- Positive isolates are then tested for 5 toxins (SEA, SEC4, TSST-1, Alpha and SEI-X



- Total of 139 isolates tested since Fall 2019

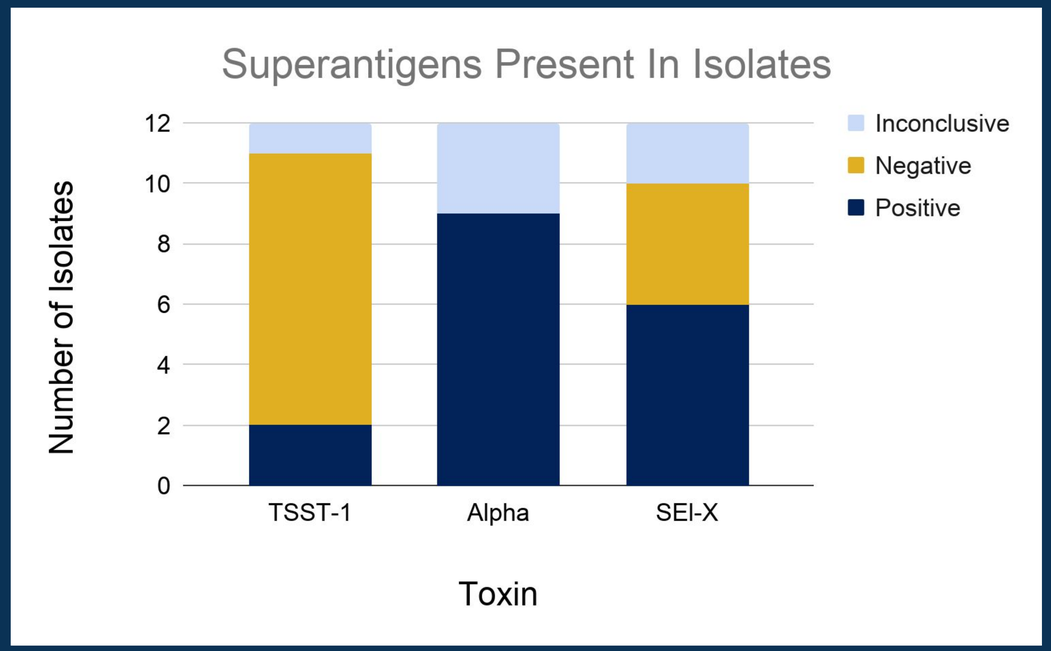
Methods:

- Colony PCR is used to amplify the DNA sequence for each toxin
  - Positive controls are clinical isolates that are known for having desired toxin or toxins
  - Negative controls contain no bacteria
- DNA gel electrophoresis is used to visualize the amplified DNA sequence
- Isolates were run through colony PCR and DNA gel electrophoresis twice to confirm results

Discussion:

- Out of the 12 isolates tested:
  - TSST-1: 2 positive, 9 negative and 1 inconclusive
  - Alpha: 9 positive, 0 negative and 3 inconclusive
  - SEI-X: 6 positive, 4 negative and 2 inconclusive
  - Inconclusive = isolate results of both runs didn't match, needs to be run again

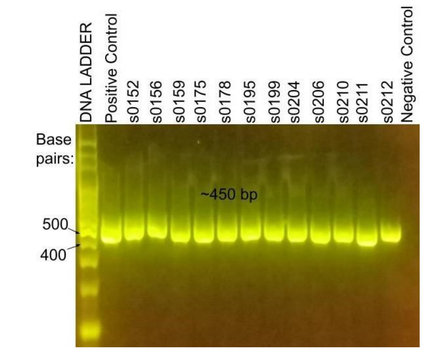
Staphylococcus aureus isolated from anterior nares of healthy individuals typically don't have the TSST-1 toxin but have alpha and SEI-X toxins.



Superantigen and Toxin Information

- Staphylococcal Enterotoxins (SEs)
  - Category B select agents
  - Resistant to heat and acid
  - Express emetic activity
    - Throwing up
- Staphylococcal Enterotoxin A (SEA)
  - Most common in staph related food poisoning
- Staphylococcal Enterotoxin C 4 (SEC4)
  - Seen in non-menstrual Toxic Shock Syndrome (TSS)
  - Produced mainly by pathogenic or MRSA strains
- Toxic Shock Syndrome Toxin-1 (TSST-1)
  - Cause of menstrual TSS and half of non-menstrual TSS
  - Has the ability to cross mucosal barriers
- Alpha
  - Pore-forming toxin (only one that isn't a superantigen on our list)
    - Causes cell lysis, specifically hemolysis
  - Associated with pulmonary edema (excess of fluid in lungs)
- Staphylococcal Enterotoxin-like X (SEI-X)
  - Only SE to attack the innate (neutrophils) and adaptive (T-cells) immune system
  - Associated with toxic shock syndrome and necrotizing pneumonia

Alpha toxin run 1 gel image:



- s0### = isolate labeling
- Bands at the same base pair as the positive control is a positive result
- No bands or bands at different base pairs as the positive control is a negative result

Acknowledgements:
Special thanks to Dr. Patrick Schlievert (University of Iowa) for helpful conversations. This research was partially funded by eight CSP Faculty Development Grants. This work has IRB approval from CSP (studies 2016_42 & 2018_37).

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