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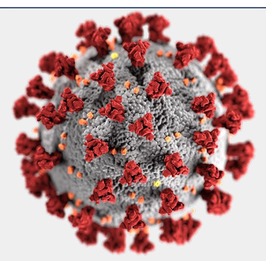
Activating the Innate Immune Response by Utilizing Macrophages as aÂ Defense for Immunosuppressed Individuals and COVID-19

Ashley Coddington

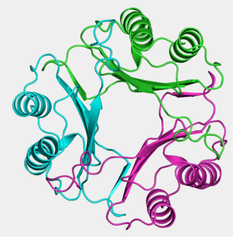
Christina Amoruso

Emma Rogers



Activating the Innate Immune Response by Utilizing Macrophages as a Defense for Immunosuppressed Individuals and COVID-19

Ashley Coddington, Christina Amoruso, and Emma Rogers
BIOL 488: Senior Capstone, Longwood University



Proposal

- We propose to the Virginia House of Delegates for their public support in spreading awareness for the need for an alternative treatment option against COVID-19 for immunosuppressed individuals.

Background

- COVID-19 is a virus that attacks the respiratory system and causes acute respiratory syndrome (SARS-CoV-2) (Kamenidou et al. 2020).
- SARS-CoV-2 contains spike proteins on the outer edges that are transmitted by respiratory droplets and enter healthy cells via binding to *angiotensin-converting enzyme 2* (ACE2) receptors (Huang, Y. et al. 2020).

All Health Districts Cases*		All Health Districts Hospitalizations**		All Health Districts Deaths	
631,083		**27,012**		**10,436**	
Confirmed†	Probable†	Confirmed†	Probable†	Confirmed†	Probable†
492,454	138,629	25,588	1,424	8,742	1,694

Figure 1. Total cases, hospitalizations, and death from COVID-19 in Virginia (CDC 2021).

- The current treatment research for COVID-19 has been focused on creating a long-term memory response, via targeting the body's adaptive immunity. (Fig. 2)
- Prevention of infection by using targeted proteins, receptors and enzymes that are a part of the T cell response in the adaptive immune system (Wondmkun & Ousman 2020).

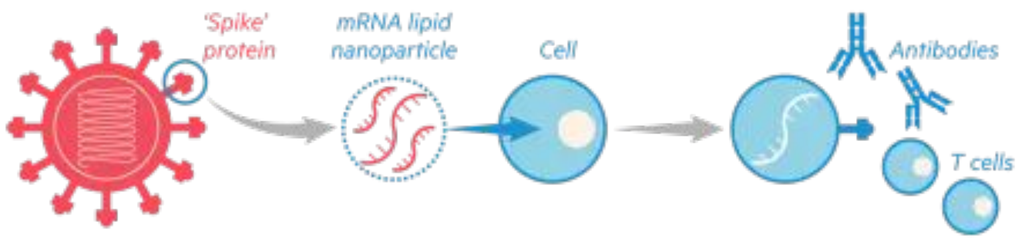


Figure 2. How the mRNA COVID-19 vaccine works (Miller 2020).

- The two types of immune responses that fight off a pathogen are the innate immune response and the adaptive immune response. (Fig. 3)

Innate Vs. Adaptive Immune System

	Innate	Adaptive
Receptors	Broad	Specific (T cells and B cells)
Activation Length	Fast Activation	Slow Activation
Amplification	No	Yes
Specificity	None	High
Duration	Short	Long (months to years
Memory	No	Yes

Table 1. Comparison of the innate versus adaptive immune system.

- The current vaccine research being done is focusing on targeting T cell responses to induce an adaptive immune response (Nelde et al. 2021).
- Immunosuppressed individuals are not responsive to the COVID-19 vaccine due to a T-cell deficiency, therefore, they need another treatment option (Boyarsky et al. 2021).

Objectives

- **Problem:** Immunosuppressed individual's adaptive immune response is not effectively activating to the COVID-19 vaccine.
- **Audience:** Virginia House of Delegates
- **Thesis:** The activation of the innate immune response by utilizing Interferon-Gamma to activate macrophages will provide for immunosuppressed individuals an additional treatment option for COVID-19.

Methods

- A few of the cells that are in the innate immune response are macrophages, mast cells, neutrophils, dendritic cells, natural killers and basophils. These cells are responsible for the immune response to a pathogen (Espíndola et al. 2016).
- We believe activating macrophages would be the most effective because it has shown to be more effective in resisting infections such as HIV-1 than CD4+ T-cells (Koppensteiner et al. 2012)
- Macrophages have the ability to kill invading and infectious cells.

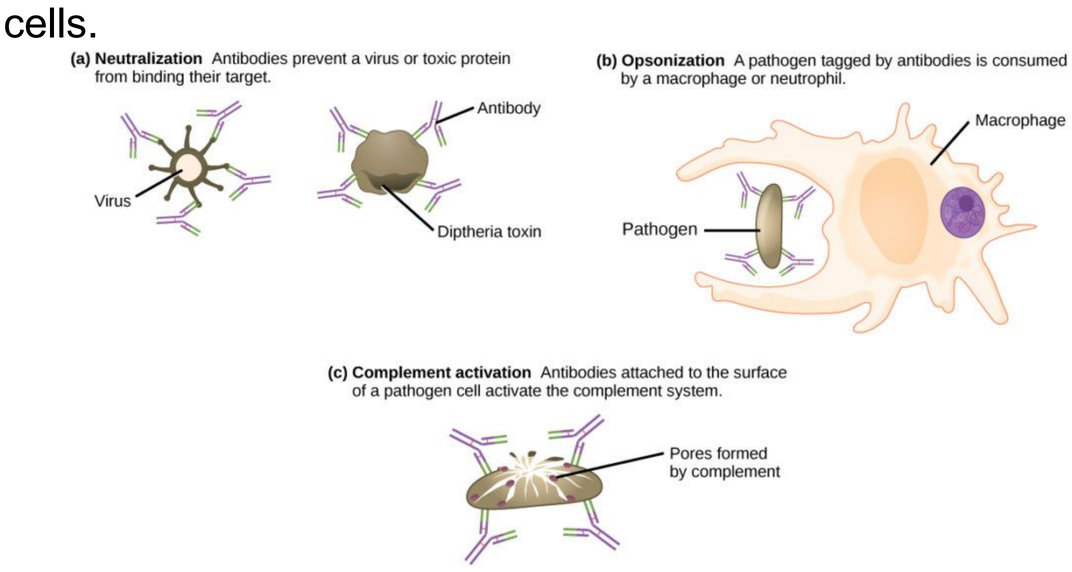


Figure 3. Macrophage function (Learning).

- Cytokines like interferon-gamma (IFN-y) can activate macrophages (Activated Macrophages).
- IFN-y should be injected into the bloodstream immunosuppressed individuals to activate macrophages.
  - it is not effective when ingested orally (Bennett et al. 2013).

Conclusion

- With funding for research we will be able to execute a clinical trial and research to determine if this is an alternative treatment for immunocompromised individuals.
- Expected results:
  - By activating macrophages with IFN-y, immunocompromised individuals should be more protected from transmitting COVID-19 or if they do have milder symptoms lessening their risk of death (Schijns & Lavelle 2020).
- Scan the QR code to the right for references.