



VITAMIN D & IMMUNE HEALTH

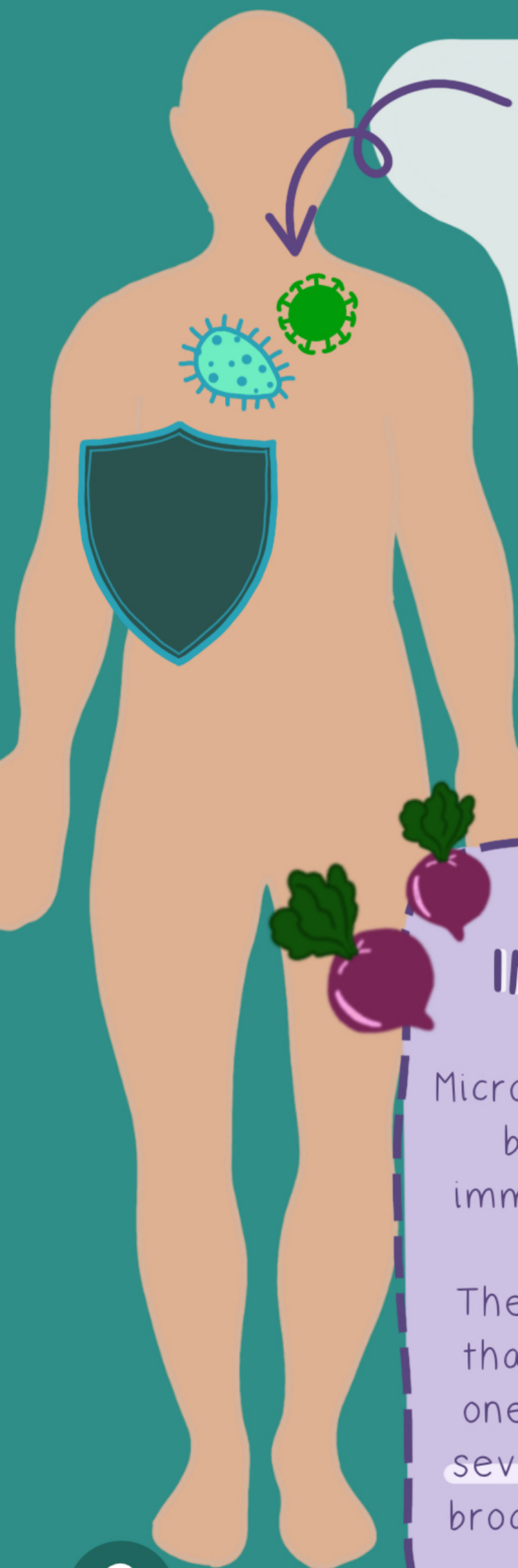
PROFESSOR MARTIN HEWISON

Webinar key messages
summarised for you.



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WHAT DO WE MEAN BY IMMUNE HEALTH?



There are a number of immune responses that the human body has in reaction to a challenge such as an infection.

Responses are either part of the innate or adaptive immune system.

INNATE IMMUNITY

Rapid, non-specific immune responses that stimulate anti-bacterial and anti-viral actions within some cells e.g. macrophages, neutrophils and dendritic cells.

ADAPTIVE IMMUNITY

More sustained and specific responses occurring in cells such as lymphocytes, T-cells and B-cells, which generate anti-bodies.

NUTRITION & IMMUNE HEALTH

Micronutrients can contribute to both innate and adaptive immunity in a variety of ways.

There is no one micronutrient that has a specific effect on one immune response, rather several micronutrients have a broader impact on the immune system as a whole.

THE 'SWISS CHEESE' MODEL

Each action we take to protect ourselves against infection offers some protection but also has some holes e.g. hand washing.

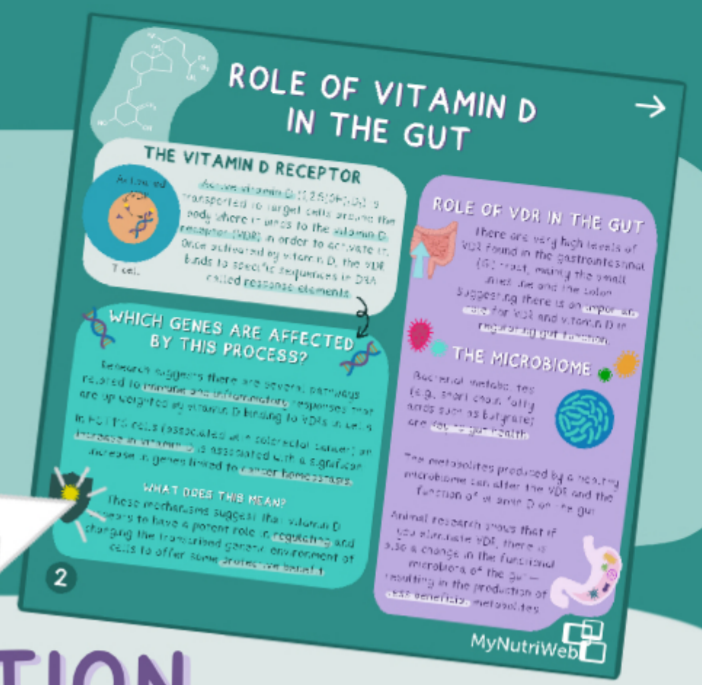
When we layer our actions, holes in each layer are more likely likely to be covered, therefore collectively offering a good barrier against infectious disease.

Looking after our immune health is one of the layers that can go some way to protecting us.

VITAMIN D & IMMUNE HEALTH →

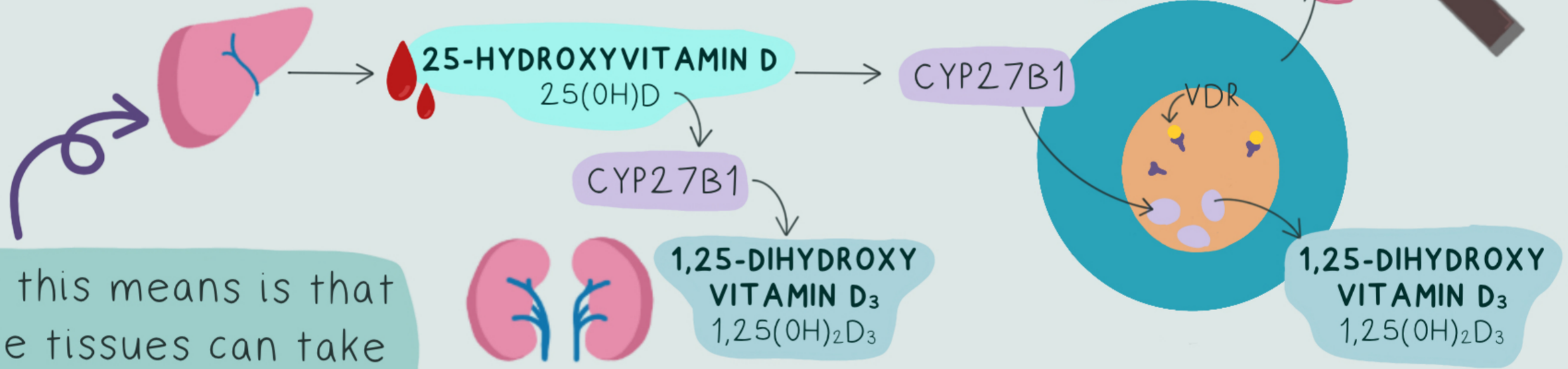


In session 2 of our #VitaminDScience webinar series, we learned about how vitamin D binds to the vitamin D receptor (VDR) in the gut, and the role it plays in gut health. However, there is also another mechanism taking place in other parts of the body which demonstrate how vitamin D impacts our immune health.



VITAMIN D & IMMUNE FUNCTION

Similar to the gut, immune response tissues found in the lungs and spleen have a high expression of VDR. They also express the vitamin D activating enzyme CYP27B1, found in the kidneys.



What this means is that these tissues can take the circulating form of vitamin D and convert it locally into the active hormone $1,25(OH)_2D_3$.

This local conversion is known as an intracrine response, rather than an endocrine response, and appears to be more closely linked to the antimicrobial, anti-inflammatory and anti-cancer effects of vitamin D.

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This system appears to be more sensitive to changes in vitamin D levels, so may be more influenced by deficiency or conversely supplementation.



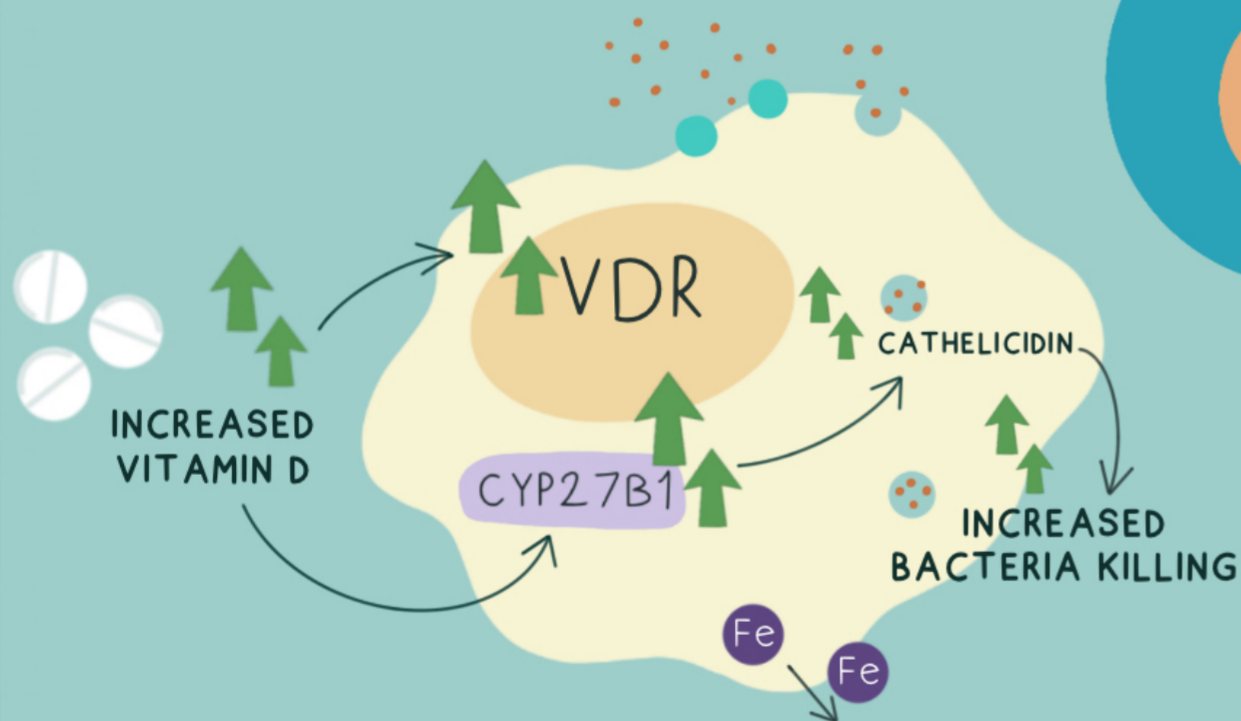
VITAMIN D & THE INNATE & ADAPTIVE IMMUNE SYSTEM



HOW DOES THIS WORK IN THE INNATE IMMUNE SYSTEM?

Macrophage and dendritic cells in the immune system have VDR and the vitamin D activating enzyme CYP27B1, so they can convert vitamin D locally to drive an immune response.

When a cell such as a macrophage encounters a pathogen, the expression of the VDR and CYP27B1 enzyme increase.



When we increase the circulating vitamin D, we see an increase in the production of anti-bacterial proteins such as cathelicidin, as well as the removal of iron from the cells which bacteria use as a food source.

...AND IN THE ADAPTIVE IMMUNE SYSTEM?

Innate immune responses in the macrophage and dendritic cells break down a pathogen and present it to T-cells, which triggers a reaction in the adaptive immune system.

Vitamin D has an anti-inflammatory effect on the body, suppressing inflammatory Th1 and Th7 cells, and increasing the number of regulatory T-cells, which help to moderate the immune response.

Vitamin D may help the innate immune cells to present the antigen to T-cells. It can also be released from the cells to bind to VDR in the activated T-cells.

TAKE HOME MESSAGE:

Vitamin D helps to protect against pathogens by promoting anti-viral and anti-bacterial responses but it also can help to limit damaging inflammatory responses that occur in auto-immune diseases.

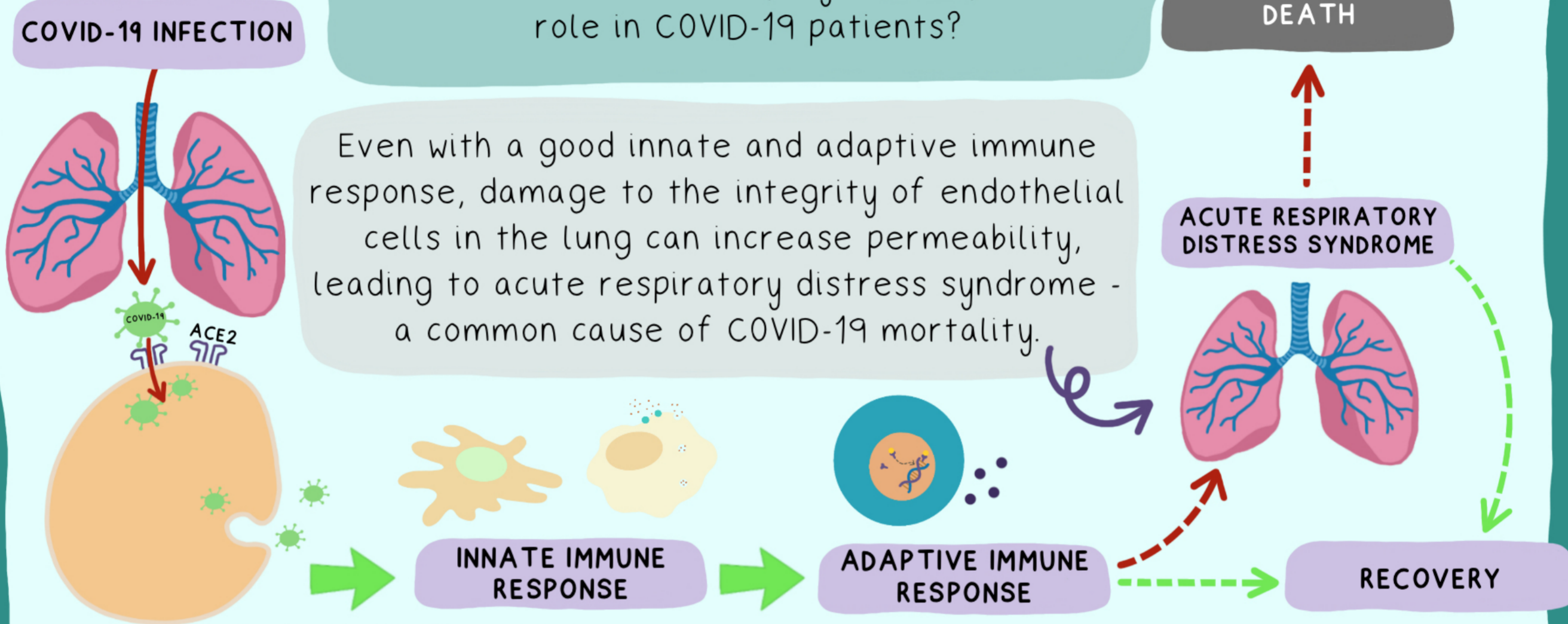
VITAMIN D & COVID-19

There have been several association studies linking vitamin D deficiency to human disease, including upper respiratory tract infections such as COVID-19.

But could vitamin D play a therapeutic role in COVID-19 patients?

Even with a good innate and adaptive immune response, damage to the integrity of endothelial cells in the lung can increase permeability, leading to acute respiratory distress syndrome - a common cause of COVID-19 mortality.

COVID-19 DISEASE PATHWAY



VITAMIN D IN THE COVID-19 DISEASE PATHWAY

- ✓ Activating macrophage anti-viral responses in the innate immune system
- ✓ Suppressing inflammation in the adaptive immune system
- ✓ Enhance integrity of cell walls in lung tissues - reducing permeability
- ✓ Regulator of ACE2 receptor

WHAT DOES THE RESEARCH SAY?

One approach proving to be effective in reducing COVID-19 mortality is through calcifediol supplementation.

Research has shown that supplementing with 20mcg calcifediol each day can raise circulating vitamin D levels far more quickly than a higher dose of vitamin D3 supplementation.

Calcifediol treatment is associated with a significant reduction in risk of needing ICU treatment with COVID-19.

