MICRONUTRIENTS AGAINST COVID19

Scientifically documented natural health program in effective control of COVID-19 infection

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CURRENT ISSUES OF PUBLIC HEALTH AND ENVIRONMENTAL SAFETY OF UKRAINE

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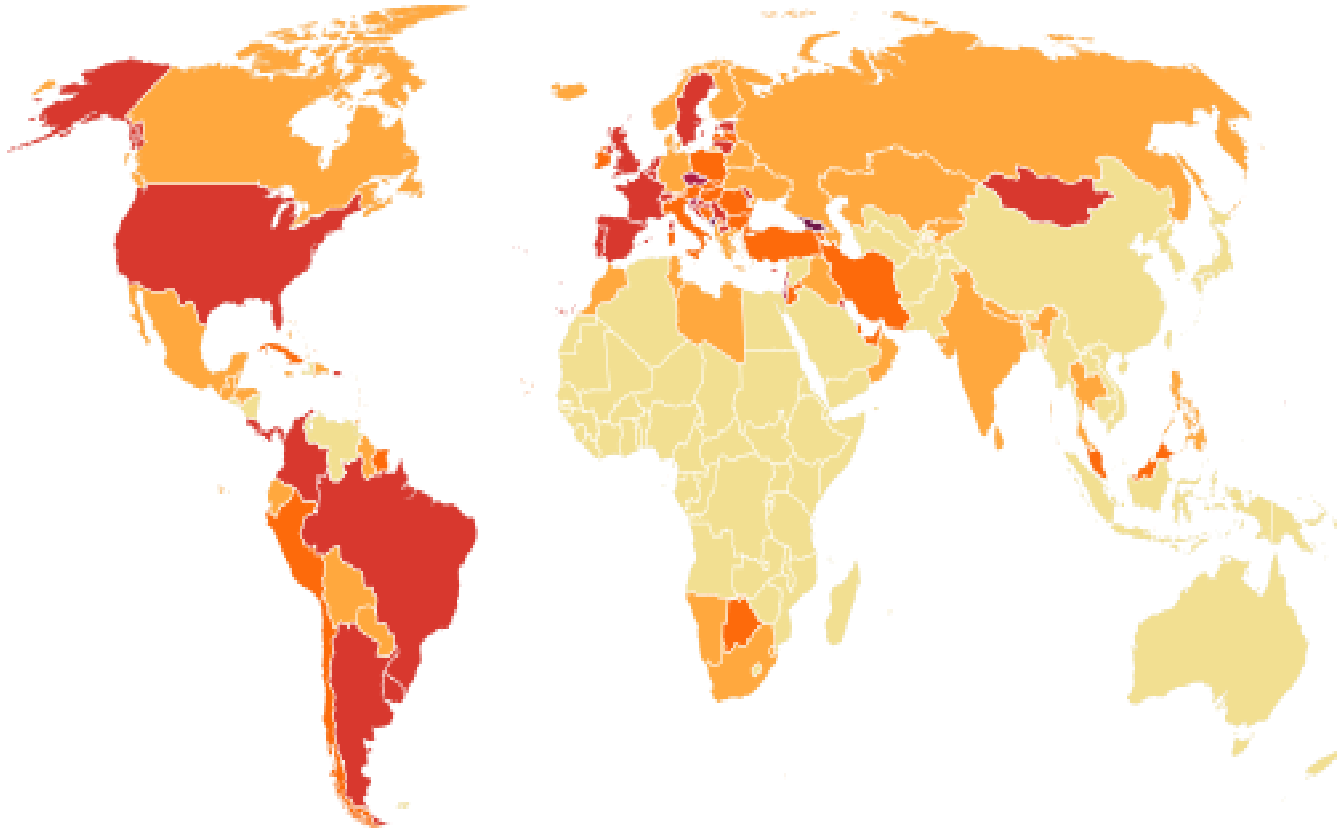
COVID19 PANDEMIC – HUDGE HUMAN AND ECONOMIC TOLL

- WHO reports over 230 million confirmed COVID19 cases with over 4.8 million deaths worldwide.
- This pandemic has triggered the deepest economic recession in nearly a century, threatening health and well-being, disrupting economic activity and jobs.
- We still do not understand the details of SARS-CoV-2 infection.



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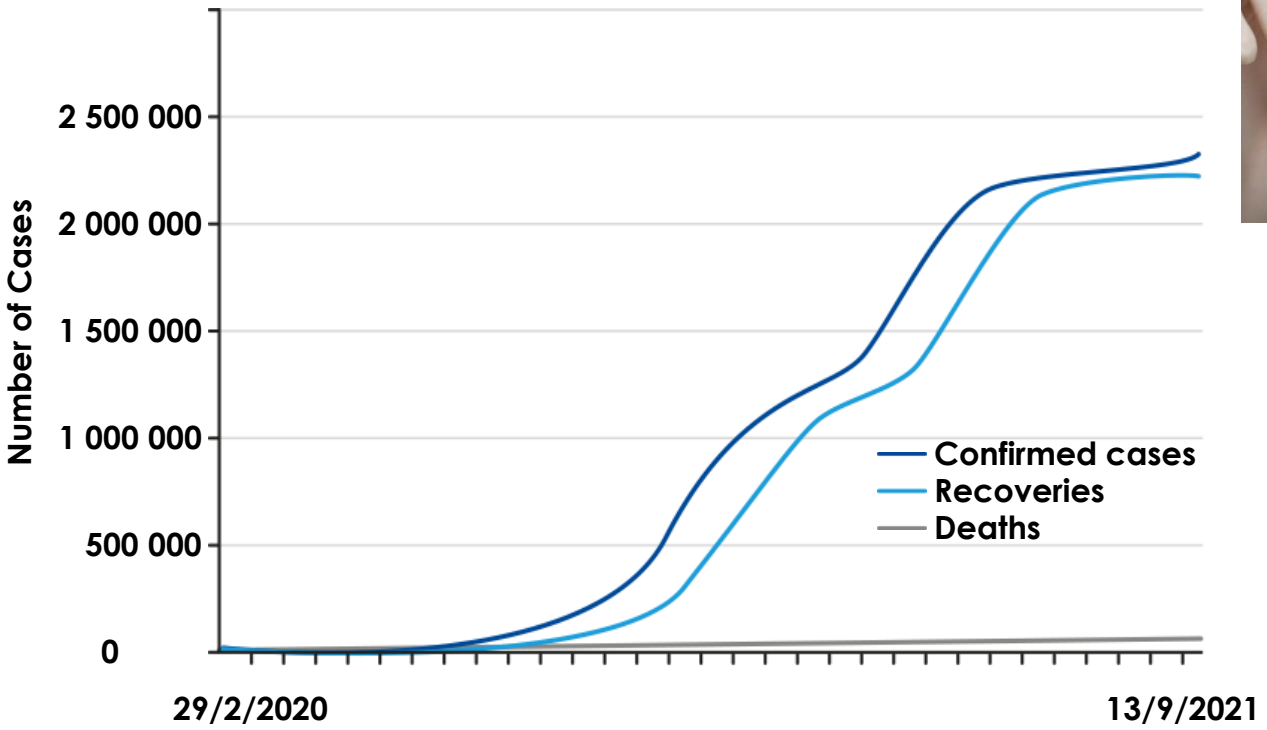
IS THAT ALL WE CAN DO TO SOLVE COVID19 PROBLEM?

Cumulative corona virus (COVID-19) confirmed cases, recoveries, and deaths in Ukraine from February 29, 2020 to September 13, 2021, by date of report



https://www.statista.com/statistics/1104595/coronavirus-situation-ukraine-by-date/

Prevention:

- Vaccines

Therapies:

- Monoclonal antibodies
- Antiviral drugs
- Steroids
- Anti-inflammatory

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DR. RATH RESEARCH:
NUTRIENT COMPLEXES AGAINST THREATS OF INFECTIONS

Over the years our research developed and promoted a multi-target metabolic approach towards effective control of many chronic diseases – as well as infections, including:

- Borrelia
- SARS
- Influenza/Bird flu
- HIV/AIDS
- **Now SARS-CoV-2**

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THE BASIS OF SUCCESSFUL ANTI-COVID APPROACH

- Target multiple aspects of viral life cycle
- Simultaneously inhibit viral attachment and its cellular replication
- Support immune system in eliminating a pathogen

Currently, no drug or a vaccine meets all these criteria.

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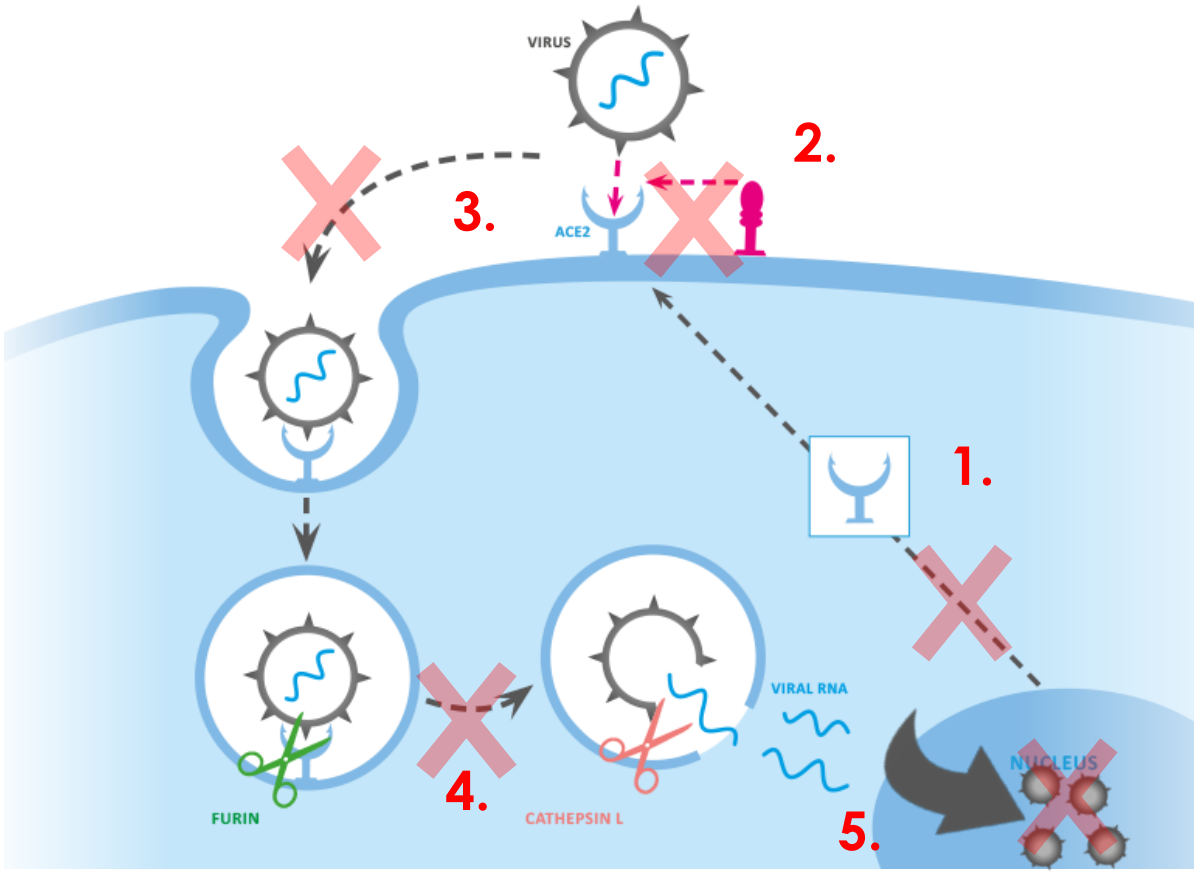
MICRONUTRIENTS CAN SIMULTANEOUSLY CONTROL SEVERAL MECHANISMS OF CORONAVIRUS INFECTION



1. Decrease ACE2 receptors on host cells (synthesis and expression)
2. Prevent virus from binding to ACE2 receptor
3. Inhibit virus internalization (TMPRSS2)
4. Inhibit viral processing in the cell (Furin and Cathepsin L)
5. Inhibit viral replication (RdRp activity)

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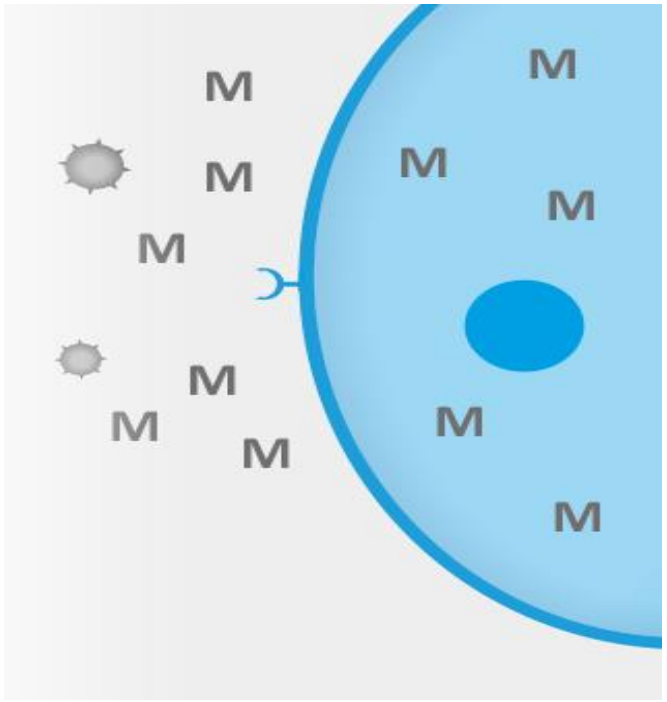
MICRONUTRIENTS DECREASE ACE2 RECEPTORS ON HOST CELLS



With micronutrient combination only few cell receptors (ACE2) are available for virus docking

- Availability of ACE2 receptors determines viral infectivity
- Vitamin C and a combination of curcumin, quercetin and other micronutrients reduce expression of ACE2 receptors on pulmonary epithelial and vascular endothelial cells

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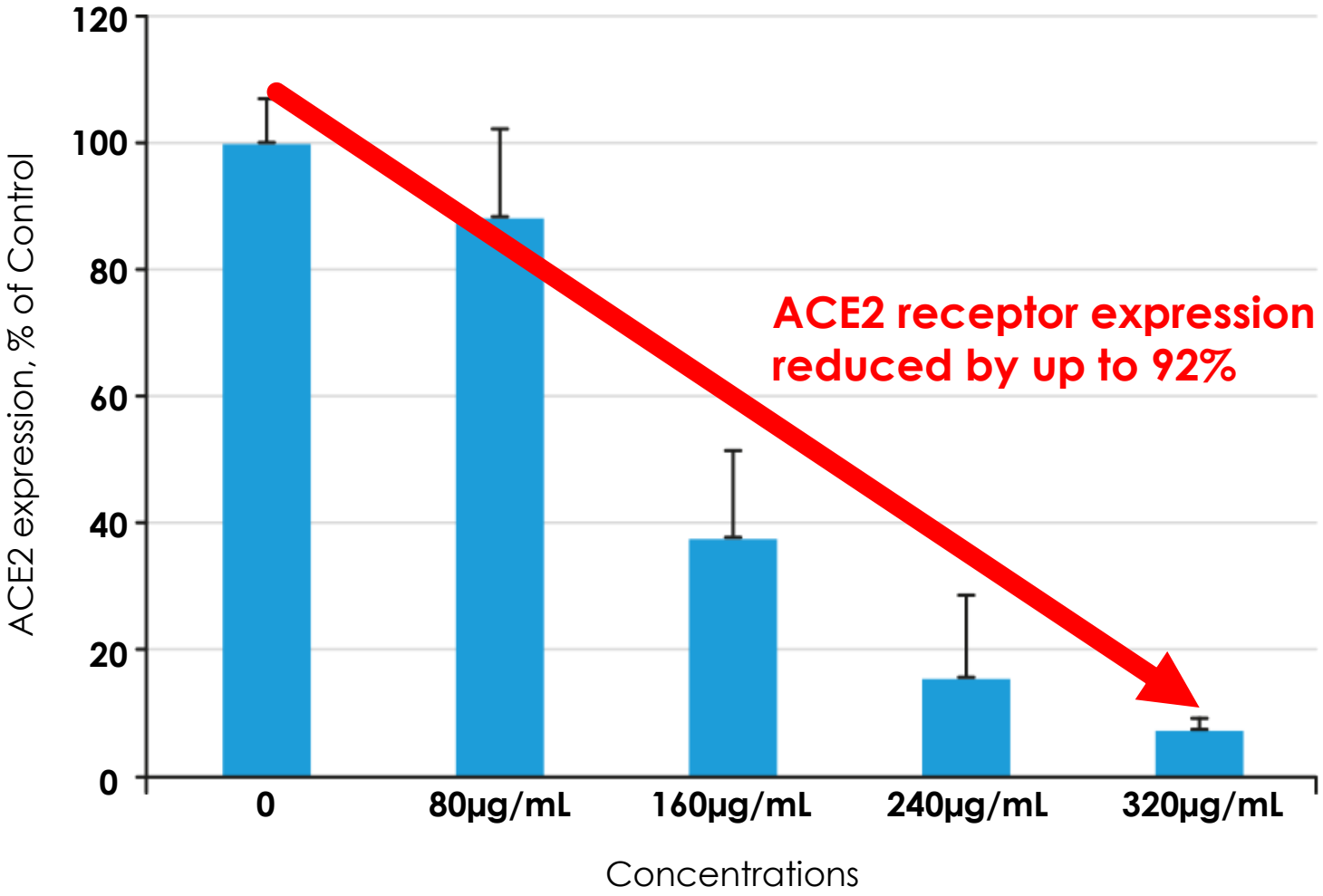
MICRONUTRIENT SYNERGY DECREASES ACE2 RECEPTORS ON HUMAN LUNG ALVEOLAR CELLS



Specific combination of bioactive plant components can reduce expression of ACE2 receptors in pulmonary epithelial cells by up to 92%.

Fewer receptors means that the possibility of the virus to enter cells is drastically reduced.

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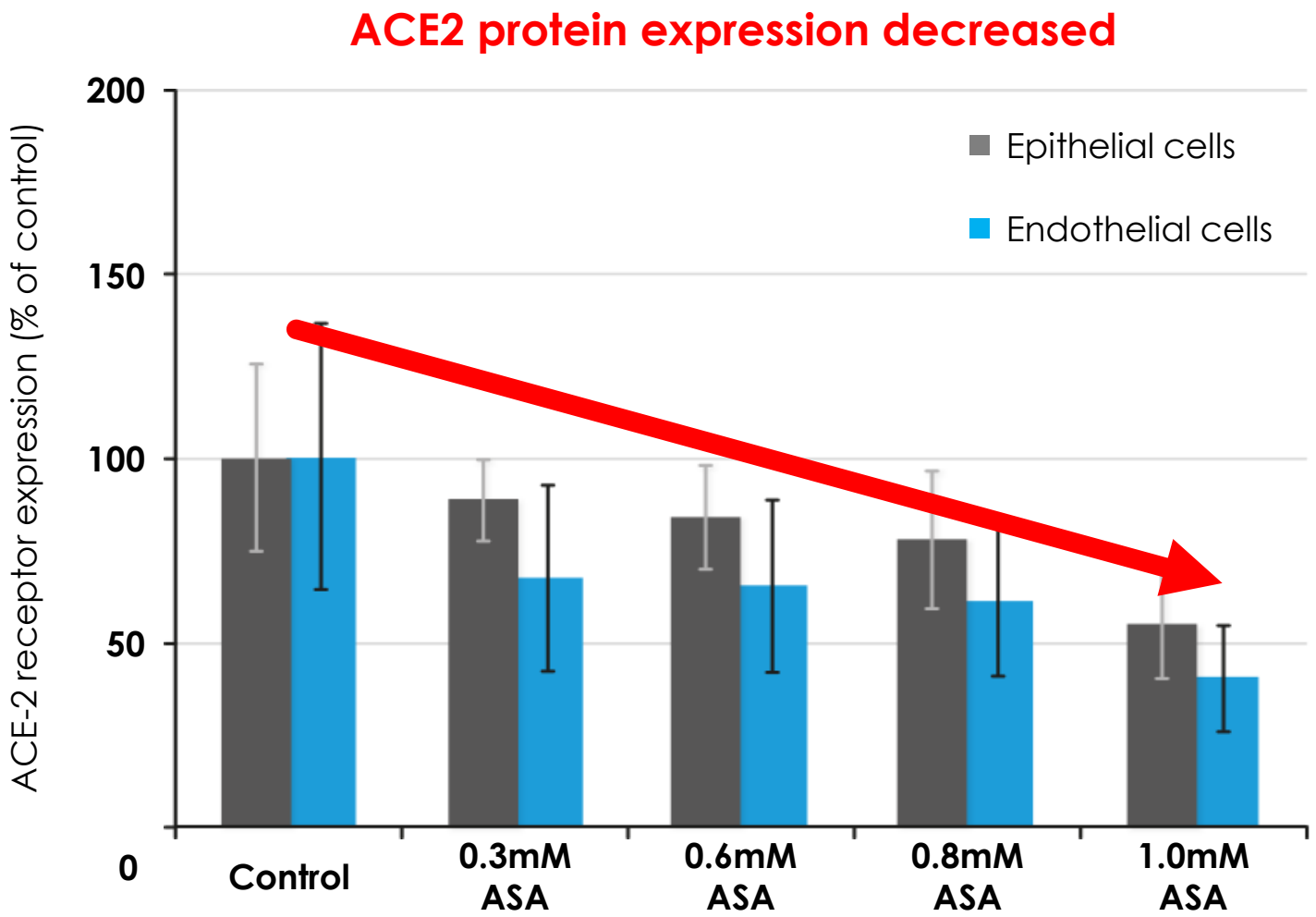
VITAMIN C ALONE CAN DECREASE ACE2 RECEPTORS IN HUMAN LUNG ALVEOLAR AND VASCULAR CELLS



Vitamin C alone inhibits expression of ACE2 protein on

- human vascular endothelial cells by up to 60%
- lung alveolar epithelial cells by up to 45%.

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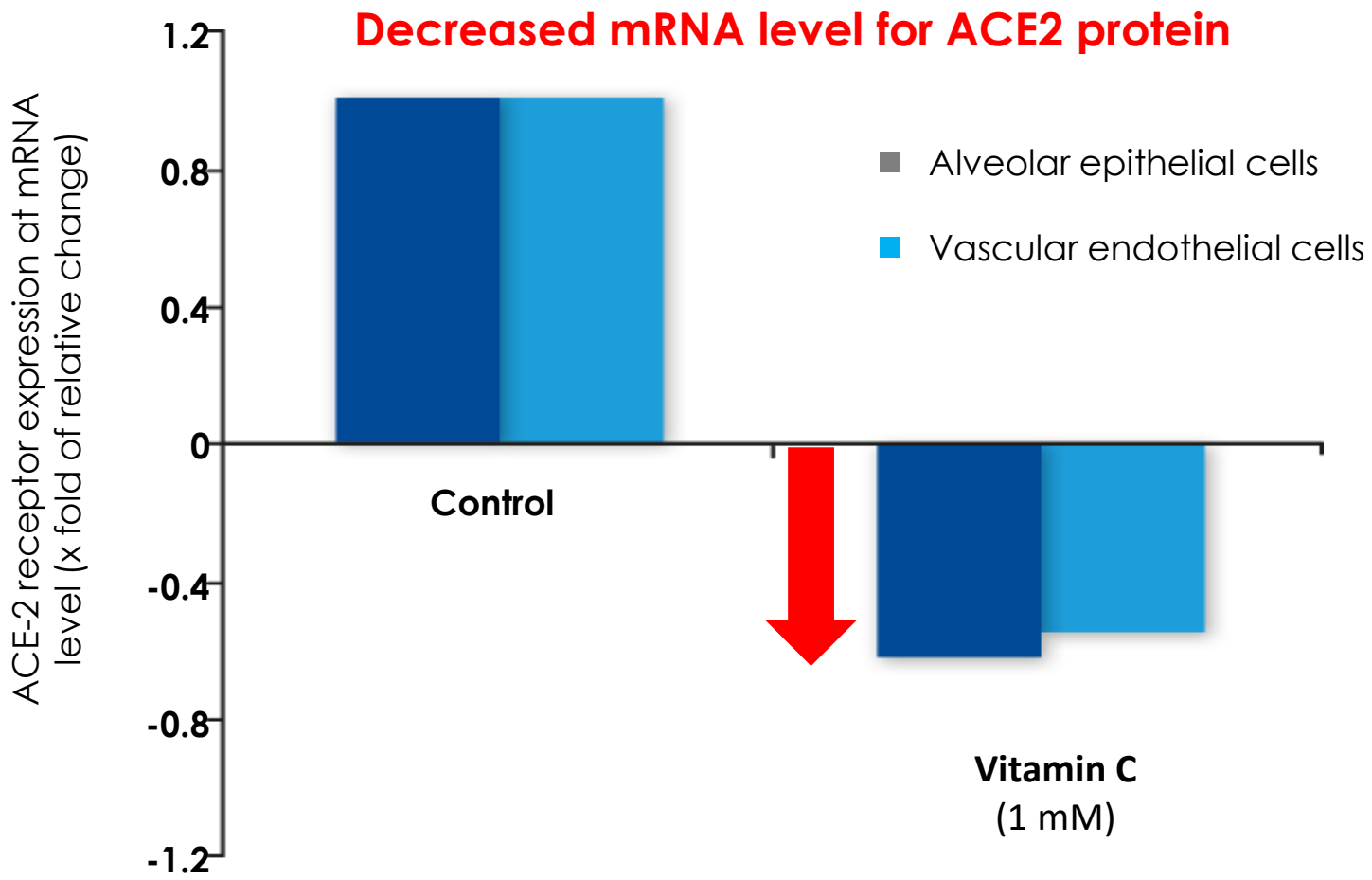
GENETIC DOWN REGULATION OF ACE2 RECEPTORS SYNTHESIS IN LUNG ALVEOLAR AND VASCULAR CELLS BY VITAMIN C



Vitamin C regulates ACE2 expression at the genetic level by decreasing the synthesis of mRNA coding for this protein.

Vitamin C efficacy can be enhanced by its synergy with other nutrients

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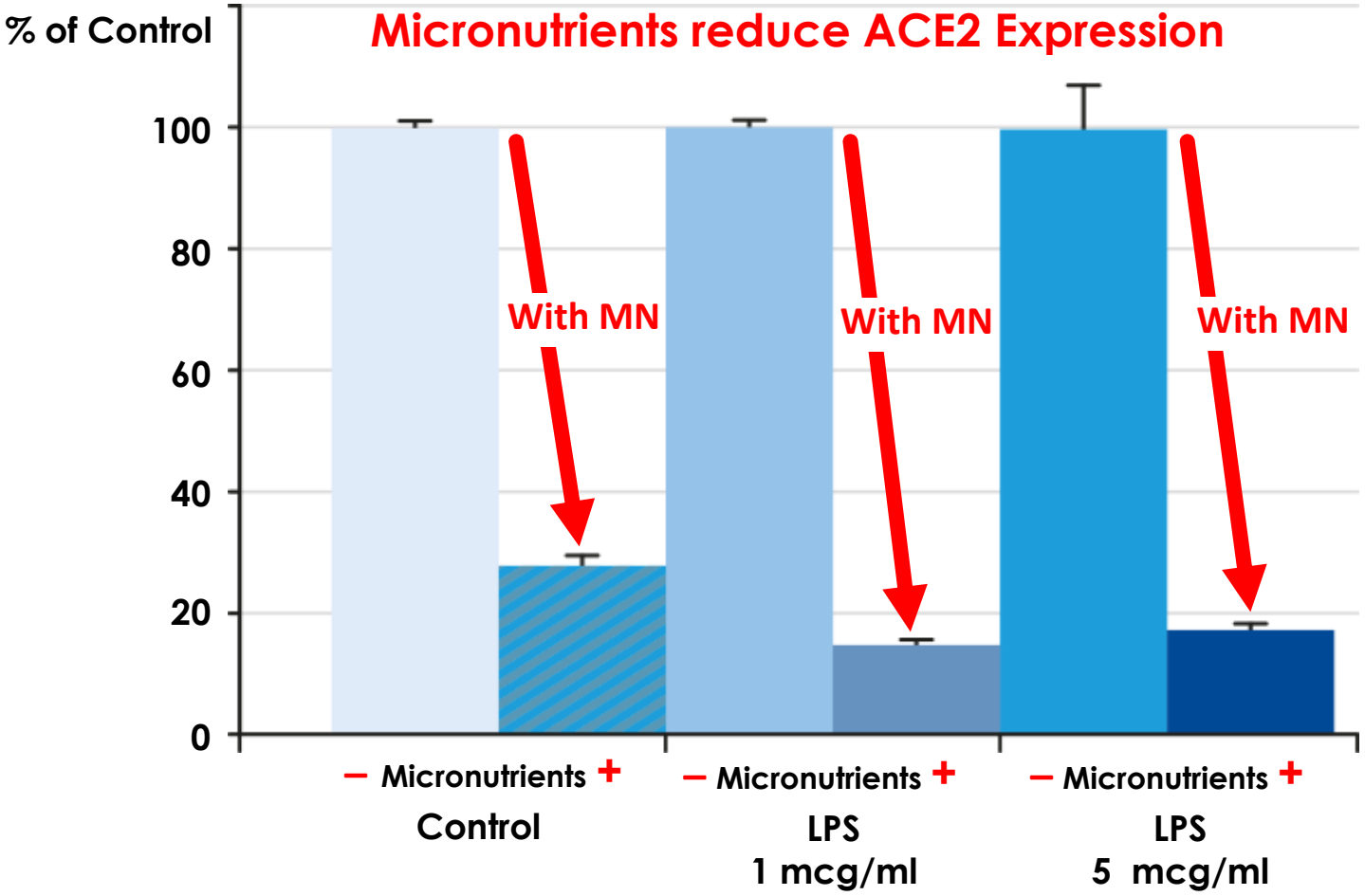
MICRONUTRIENTS INHIBIT ACE2 EXPRESSION UNDER NORMAL AND PRO-INFLAMMATORY CONDITIONS



Micronutrients reduced expression of ACE2 receptors in human small alveolar epithelial cells (SAEC) **by 73%.**

Under pro-inflammatory conditions (LPS) this inhibitory effect on ACE2 expression was enhanced, resulting in up to **86%** inhibition compared to controls.

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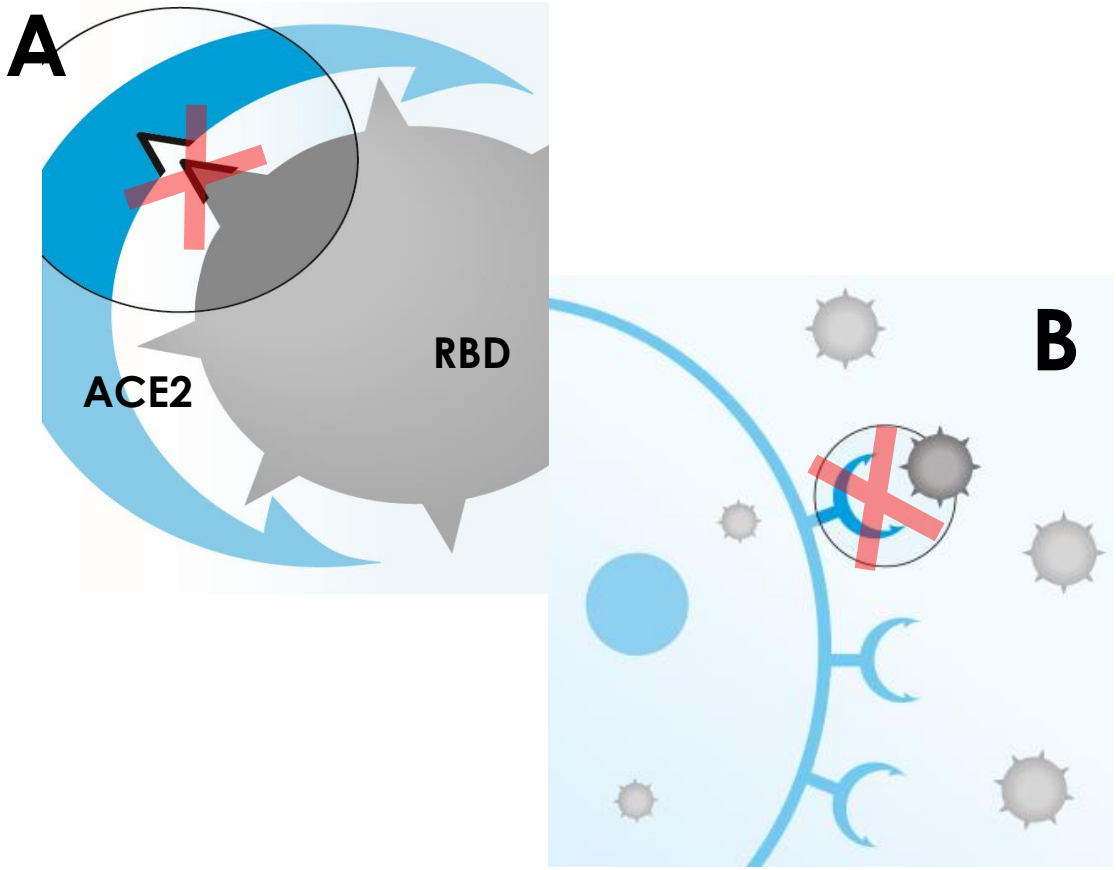
MICRONUTRIENTS INHIBIT VIRAL RBD BINDING TO ACE2 RECEPTORS



Micronutrient combinations reduce viral infectivity by directly inhibiting SARS-CoV-2 Spike (RBD) binding to ACE2 receptors.

We evaluated this effect in two ways:

A: Inhibition of a direct binding of **RBD sequence** to ACE2

B: Inhibition of **SARS-CoV-2 virions** binding to cells expressing ACE2

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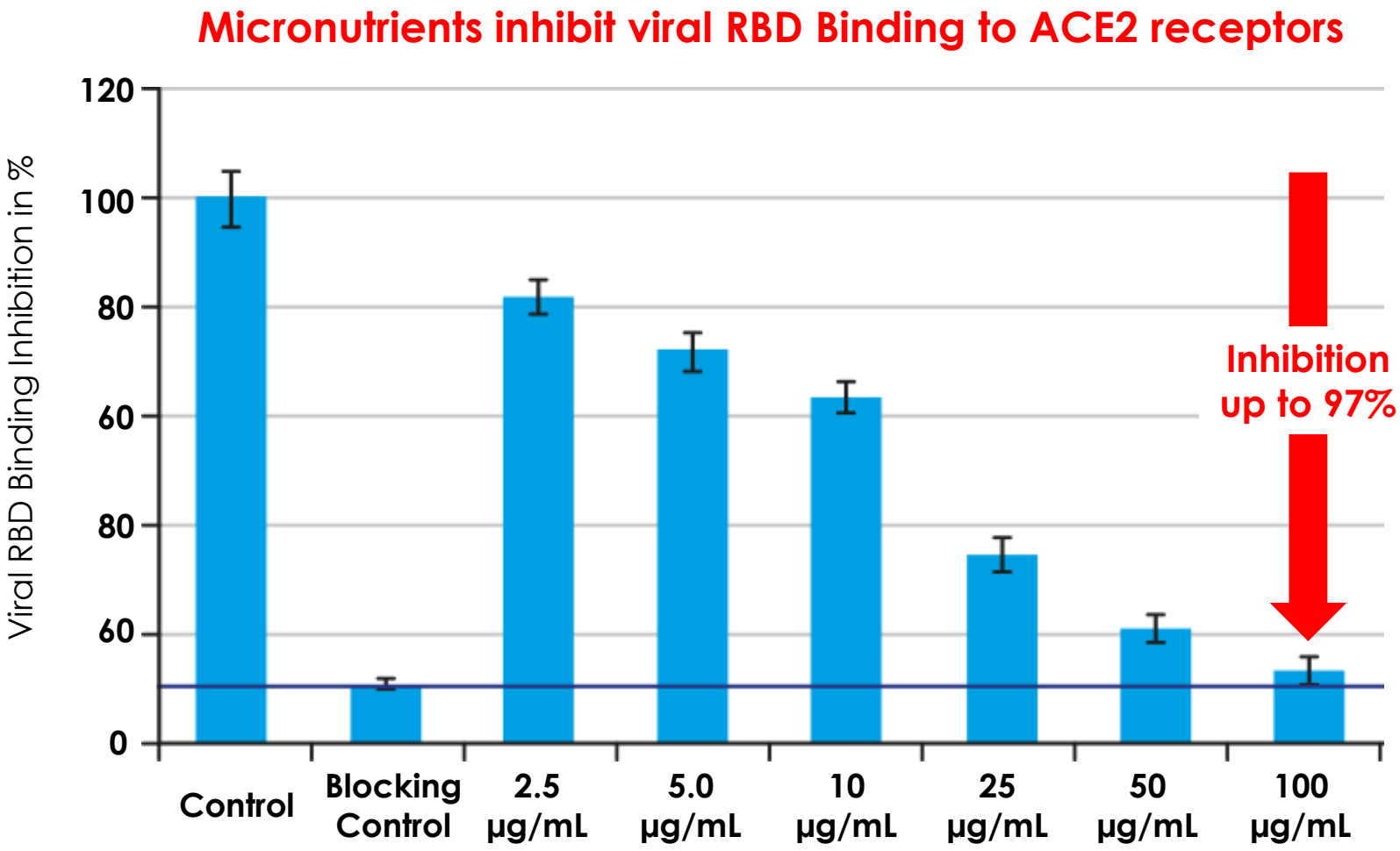
MICRONUTRIENTS INHIBIT VIRAL SPIKE RBD BINDING TO ACE2 RECEPTORS



The specific micronutrient combination can directly block binding of coronavirus Spike RBD sequence to cellular ACE2 receptors by up to **97%.**

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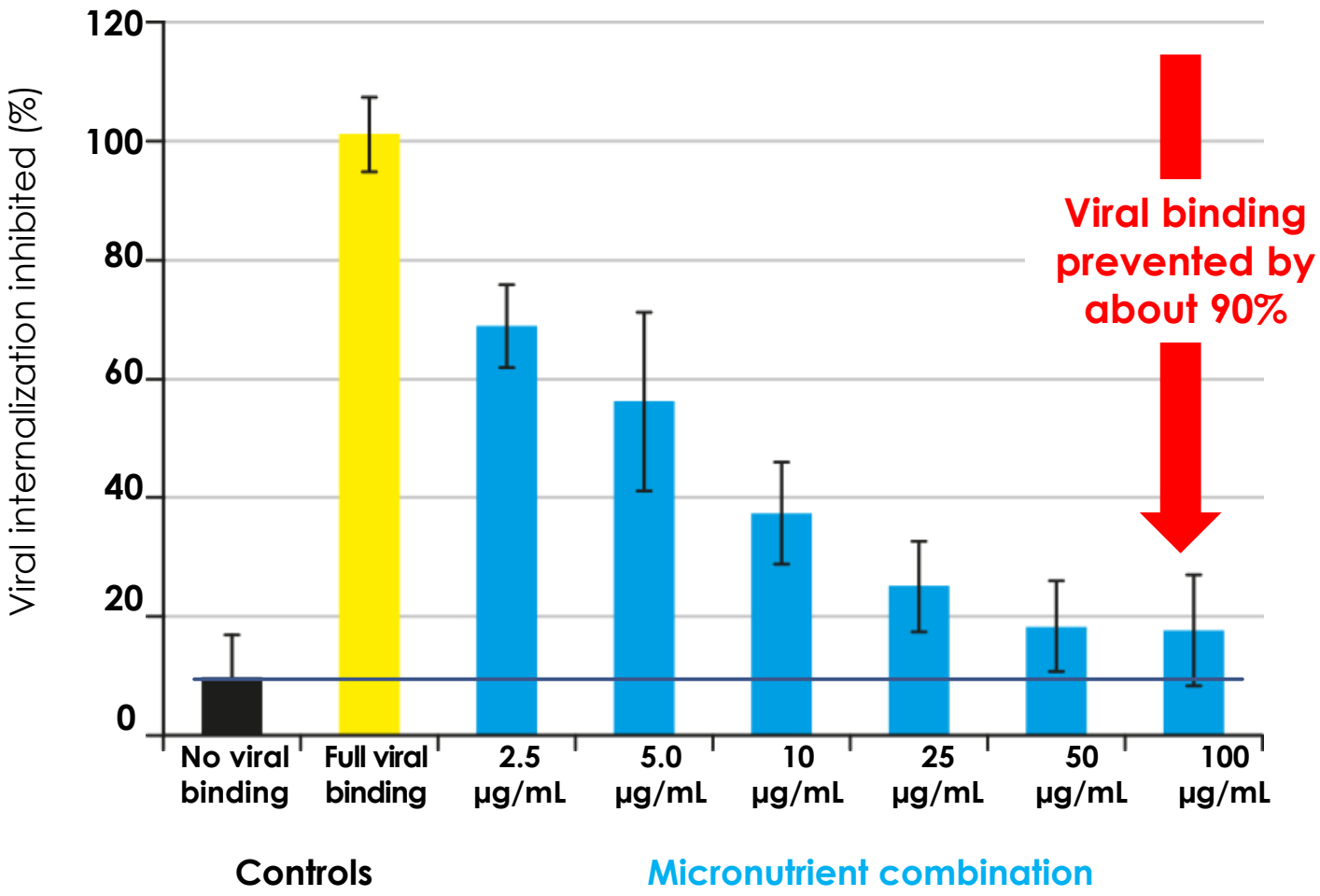
MICRONUTRIENTS INHIBIT ENTRY OF SARS-COV-2 VIRIONS IN HUMAN LUNG CELLS EXPRESSING ACE2 RECEPTORS



Micronutrient combination inhibits binding and internalization of SARS-CoV-2 virions in alveolar epithelial cells expressing ACE2 receptor by **90%**.

Inhibition of SARS-CoV-2 cellular entry was also present when micronutrients were applied 3 hrs after the cells were exposed to the virus.

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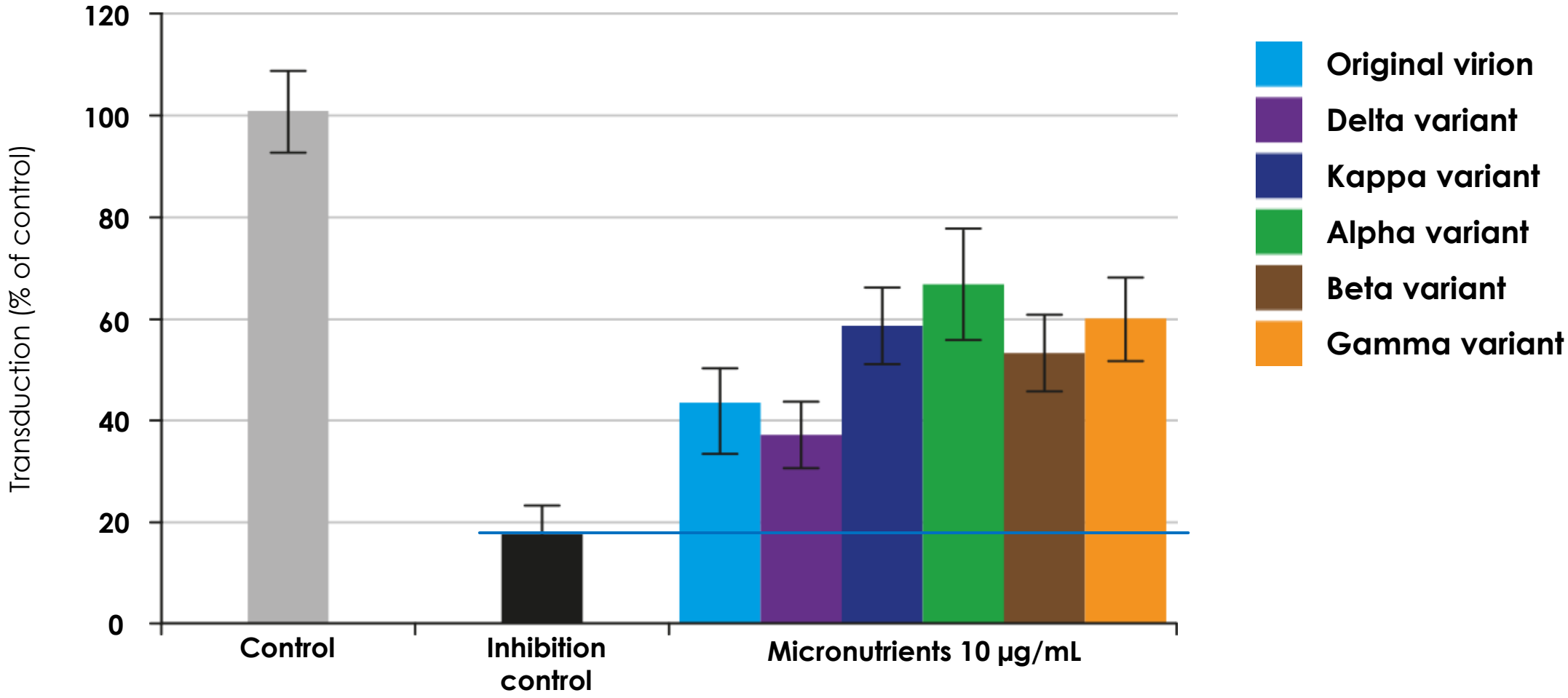
MICRONUTRIENTS INHIBIT ENTRY OF SARS-COV-2 AND ITS MUTATED VARIANTS IN HUMAN LUNG CELLS EXPRESSING ACE2 RECEPTORS



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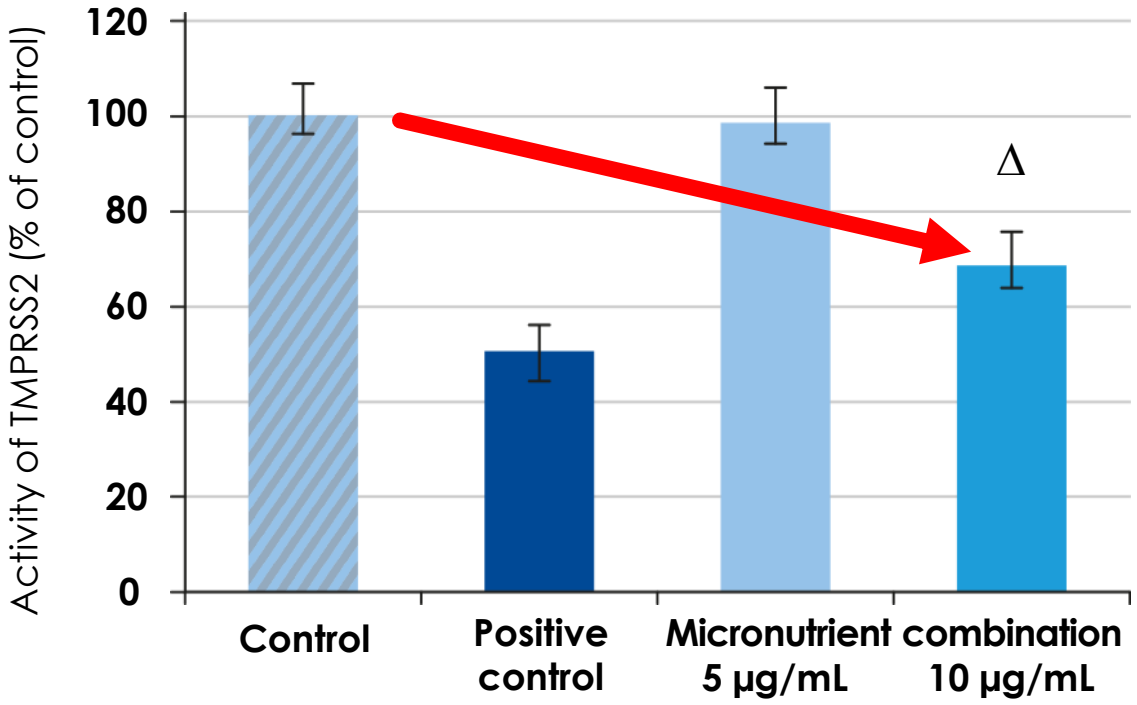
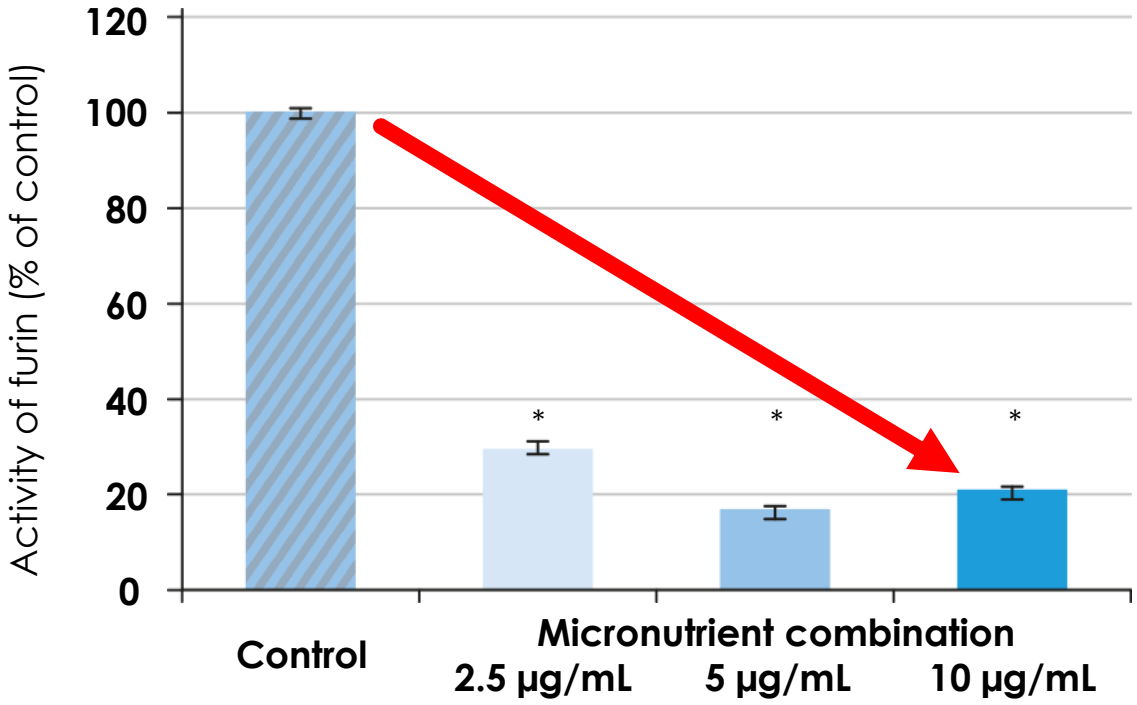
MICRONUTRIENTS INHIBIT ACTIVITY OF ENZYMES NEEDED FOR VIRAL INTERNALIZATION AND PROCESSING: TRMPSS2, FURIN



Micronutrient combination inhibits **TRMPSS2** activity by up to 30% and by 80% when compared to inhibition control.



Micronutrient combination inhibits **Furin** activity by up to 80%

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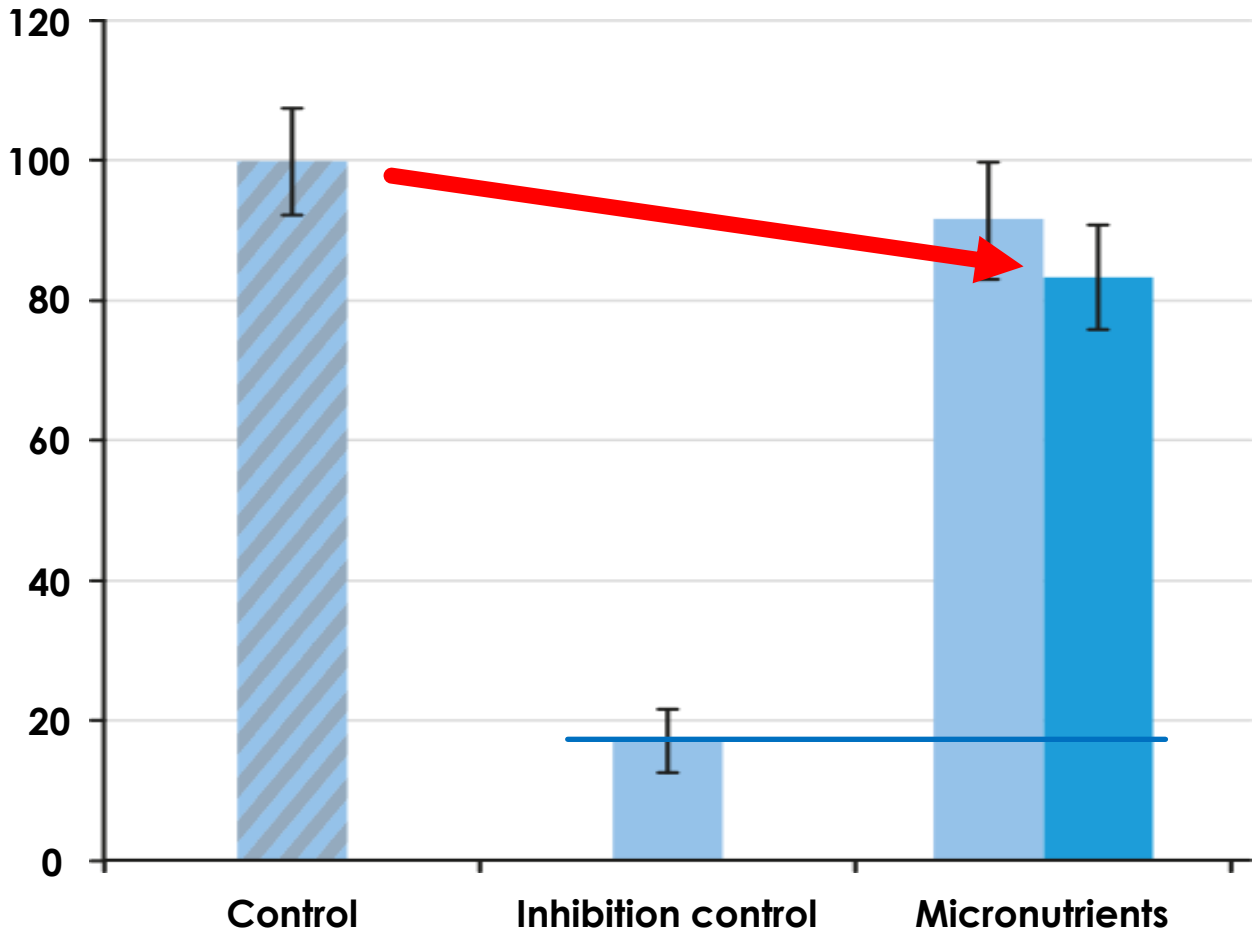
INHIBITING ACTIVITY OF ENZYMES NEEDED FOR VIRAL INTERNALIZATION AND PROCESSING: CATHEPSIN L



Specific micronutrient combination inhibits Cathepsin L activity by up to 20% compared to control.

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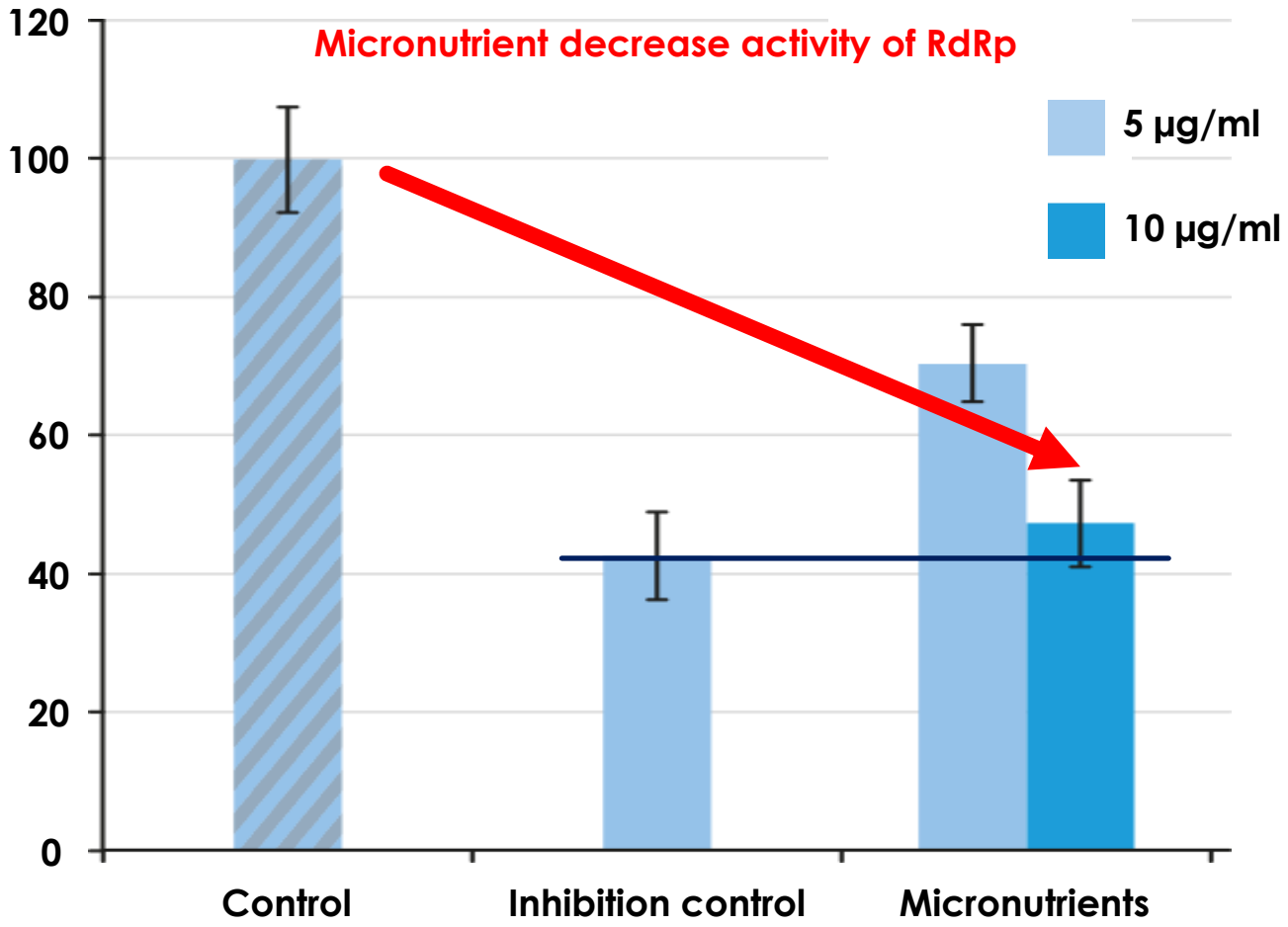
MICRONUTRIENTS INHIBIT ACTIVITY OF RdRp NEEDED FOR VIRAL REPLICATION



Specific micronutrient combination inhibits activity of RNA-dependent RNA-polymerase (RdRp) by:

- 30% at 5 mcg/ml
- 53% at 10 mcg/ml.

compared to control

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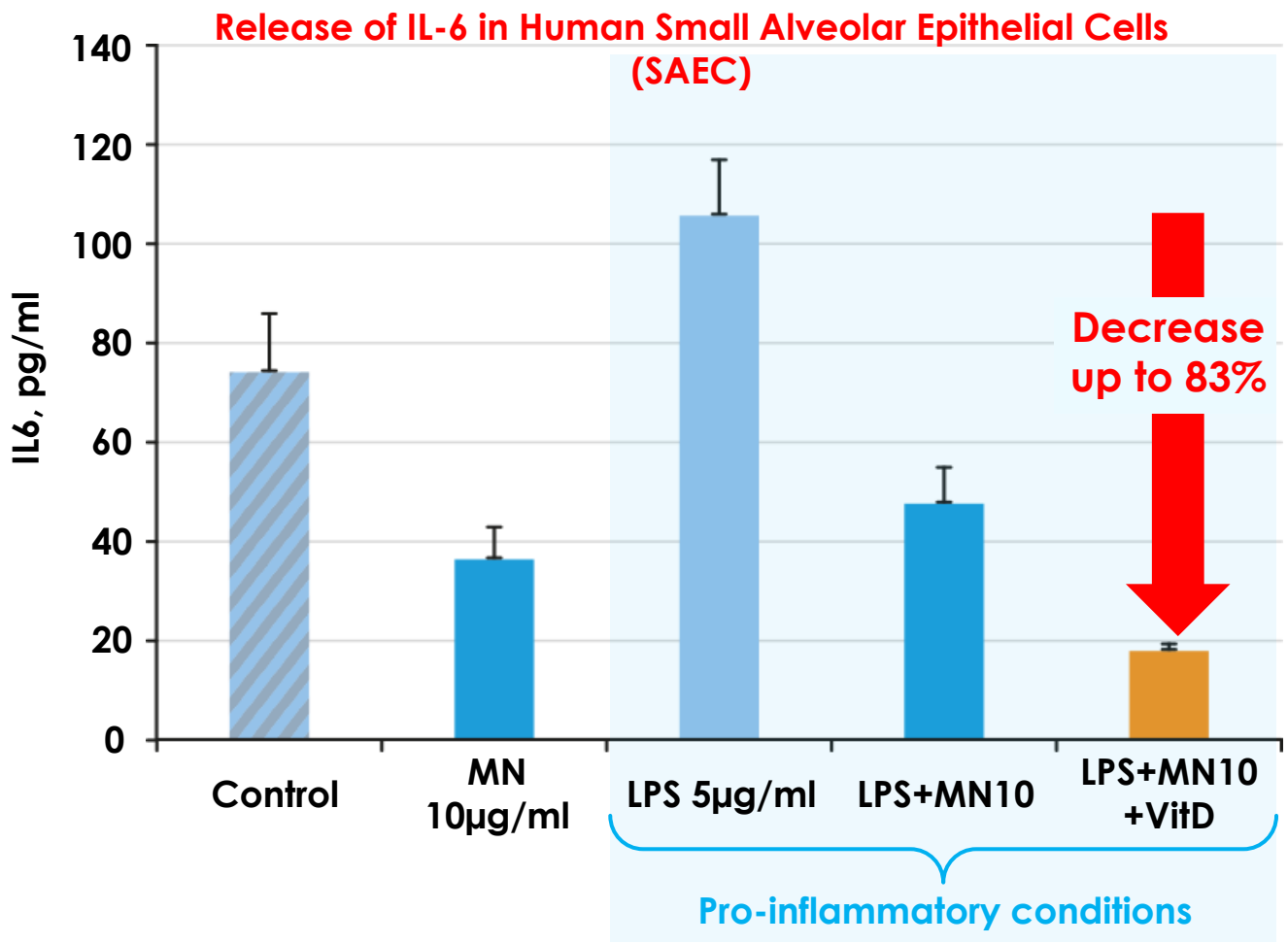
MICRONUTRIENTS INHIBIT IL6 SECRETION UNDER NORMAL AND PRO-INFLAMMATORY CONDITIONS



Micronutrient combination decreased IL-6 secretion in SAEC by 50%.

Under pro-inflammatory conditions (exposure to LPS)

- IL-6 secretion in SAEC increased by 43%.
- Micronutrient combination decreased the (elevated) IL-6 secretion by 55%
- Micronutrients plus vitamin D further decreased Il-6 by up to 83%.

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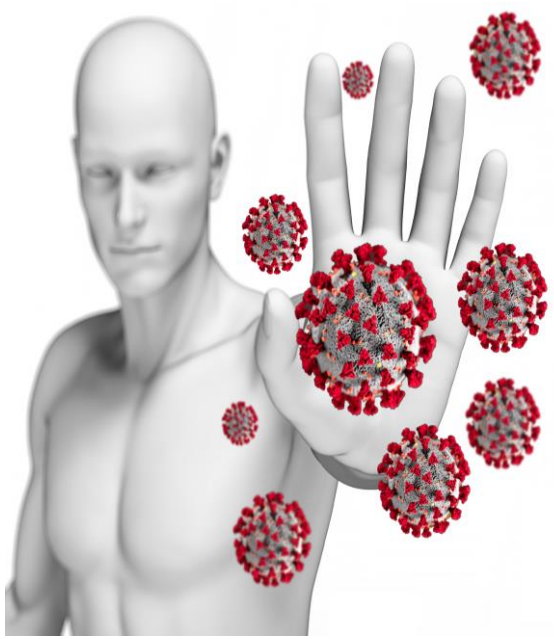
IMPLICATION OF THIS KNOWLEDGE



Synergistic combinations of natural compounds can simultaneously control key mechanisms involved in COVID19 by acting at various cellular levels.

Micronutrients and nutritional support should form the basis of

- **effective**
- **safe**
- **economic**

preventive measure against COVID 19 including their application as adjuncts to vaccines and other conventional approaches.

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URGENCY OF ACTION – IN FACE OF THE HUMAN AND ECONOMIC COSTS OF THE PANDEMIC

We are willing to share our scientific knowledge with governments and public institutions – free of charge – for the benefit of human health.

Contact us at: research@drrath.org

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