



## Correspondence



# Reply: Vitamin C as a Possible Therapy for COVID-19

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► See the letter “Vitamin C as a Possible Therapy for COVID-19” in volume 52 on page 222.

Received: May 22, 2020

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### Conflict of Interest

No conflicts of interest.

### Author Contributions

Conceptualization: SBK, JSY. Data curation:

SBK, JSY. Formal analysis: SBK, JSY.

Investigation: SBK. Methodology: SBK. Project

administration: JSY. Resources: SBK. Software:

SBK. Supervision: JSY. Validation: JSY.

Visualization: SBK. Writing - original draft: SBK.

Writing - review & editing: JSY.

Dear Editor:

We appreciate the comment from Hemilä et al [1]. Previous studies based on *in-vitro* experiments have identified that high dosage intravenous Vit-C with copper and/or iron is virucidal [2]. However, despite these studies, the *in-vivo* virucidal activity of Vit-C has not been confirmed in detail. Previously, your meta-analyses of clinical trial data showed that regular Vit-C intake shortened the duration of the common cold by 8% [3]. However, coronavirus disease 2019 (COVID-19) is caused by a novel coronavirus (severe acute respiratory syndrome coronavirus 2) whose genome sequence differs from other human coronaviruses causing the common cold [4]. Moreover, two recent clinical trials have demonstrated no significant difference in the development of sepsis, or severe acute respiratory failure, between Vit-C and non-Vit-C groups. In the CITRIS-ALI trial, no significant difference was found between the Vit-C (50 mg/kg every 6 hours for 96 hours) and placebo groups in the primary outcomes measured. These included modified Sequential Organ Failure Assessment score, C-reactive protein levels, and thrombomodulin levels at 168 hours. However, secondary outcome measures did differ between the groups with 28-day all-cause mortality significantly lower and intensive care unit-free days significantly shorter in the placebo groups than in the Vit-C groups [5]. The Vitamin C, hydrocortisone and thiamine in patients with septic shock (VITAMINS) trial also reported that among patients with septic shock, a combination of intravenous Vit-C, hydrocortisone, and thiamine did not significantly improve the primary outcome measure (duration of time alive and free of vasopressor administration over 7 days) compared with that after the intravenous hydrocortisone treatment alone [6].

Although Vit-C generally exhibits low toxicity, taking >2 g of Vit-C per day may cause adverse gastrointestinal events including abdominal pain, diarrhea, and/or nausea. Although Vit-C is a water-soluble vitamin, with excess excreted in the urine, it can contribute to the formation of renal stones [7]. Additionally, glucose-6-phosphate dehydrogenase (G6PD) deficiency, a genetic condition that results in inadequate G6PD levels, can cause hemolytic anemia following intravenous Vit-C treatment [8].

Currently, multiple clinical trials investigating the effect of Vit-C on severe COVID-19 are on going [9]. However, this therapy can only be considered, and therefore incorporated into treatment guidelines, based on sufficient confirmatory research results. For now, we will have to wait.

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