

Unravelling the Mystery of COVID-19 Pathogenesis: Spike Protein and Cu Can Synergize to Trigger ROS Production

Autorzy

Monika Katarzyna Lesiów

Maciej Witwicki

Nian Kee Tan

Marcus Edward Graziotto

Elizabeth Joy New

Rok wydania

2023

Czasopismo

Chemistry-A European
Journal

Numer woluminu

29

Strony

e202301530/1-
e202301530/11

DOI

10.1002/chem.202301530

Kolekcja

Naukowa

Język

Angielski

Typ publikacji

Artykuł

Streszczenie

The COVID-19 pandemic has had a devastating impact on global health, highlighting the need to understand how the SARS-CoV-2 virus damages the lungs in order to develop effective treatments. Recent research has shown that patients with COVID-19 experience severe oxidative damage to various biomolecules. We propose that the overproduction of reactive oxygen species (ROS) in SARS-CoV-2 infection involves an interaction between copper ions and the virus's spike protein. We tested two peptide fragments, Ac-ELDKYFKNH-NH₂ (L1) and Ac-WSHPQFEK-NH₂ (L2), derived from the spike protein of the Wuhan strain and the β variant, respectively, and found that they bind Cu(II) ions and form a three-nitrogen complexes at lung pH. Our research demonstrates that these complexes trigger the overproduction of ROS, which can break both DNA strands and transform DNA into its linear form. Using A549 cells, we demonstrated that ROS overproduction occurs in the mitochondria, not in the cytoplasm. Our findings highlight the importance of the interaction between copper ions and the virus's spike protein in the development of lung damage and may aid in the development of therapeutic procedures.

Słowa kluczowe

COVID-19, copper, DNA damage, ROS, SARS-CoV-2, spike protein

Adres publiczny

<http://dx.doi.org/10.1002/chem.202301530>

Strona internetowa wydawcy

onlinelibrary.wiley.com