

Uaktiveringskinetikk og mekanisme av et humant Norovirus-surrogat på overflater av rustfritt stål via klordioksidgass (ClO₂)



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ABSTRAKT

Akutt gastroenteritt forårsaket av humant norovirus er et betydelig folkehelseproblem. Ferske råvarer og sjømat er eksempler på mat med høy risiko assosiert med norovirusutbrudd. Overflatene med matkontakt kan også ha norovirus hvis de utsettes for fekal forurensning, aerosolisert oppkast eller infiserte matbehandlere. Foreløpig er det ingen effektive tiltak for å dekontaminere norovirus på matkontaktflater.

Klordioksid (ClO₂) gass er et sterkt oksidasjonsmiddel og brukes som et desinfiseringsmiddel i matprosesseringsanlegg. Målet med denne studien var å bestemme kinetikken og mekanismen for ClO₂ gassinaktivering av et norovirus surrogat, murint norovirus 1 (MNV-1), på flater av rustfritt stål (SS). MNV-1 ble inokulert på SS-flater i konsentrasjonen av 10 (7) PFU / flate. (En plakkdannende enhet (PFU) er et mål som brukes i virologi for å beskrive antall viruspartikler som er i stand til å danne plakk per volumenheter.)

Prøvene ble behandlet med ClO₂-gass ved 1, 1,5, 2, 2,5 og 4 mg/liter i opptil 5 minutter ved 25°C og en relativ fuktighet på 85%, og virusoverlevelse ble bestemt ved plakkanalyse. Behandling av SS-kupongene med ClO₂-gass ved 2 mg/liter i 5 minutter og 2,5 mg/liter i 2 minutter resulterte i minst en 3-log reduksjon i MNV-1, mens intet smittsomt virus ble utvunnet i en konsentrasjon på 4 mg/liter selv innen 1 minutt etter behandlingen.

Videre ble det funnet at mekanismen for ClO₂ gassinaktivering inkluderte nedbrytning av virusprotein, forstyrrelse av viral struktur og nedbrytning av viralt genomisk RNA.

Avslutningsvis kan behandling med ClO₂-gass tjene som en effektiv metode for å inaktivere et humant norovirus-surrogat på SS-kontaktflater.

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LOG REDUKSJON:

1-log = 90%
2-log = 99%
3-log = 99.9%
4-log = 99.99%
5-log = 99.999%
6-log = 99.9999%
(Nivåreduksjon ved sterilisering)

Teksten over er oversatt fra US National Library of Medicine, National Institutes of Health
Originaltekst og bilder finner du på <https://www.ncbi.nlm.nih.gov/pubmed/26475110>

PMC full text: [Appl Environ Microbiol. 2016 Jan 1; 82\(1\): 116–123.](#)

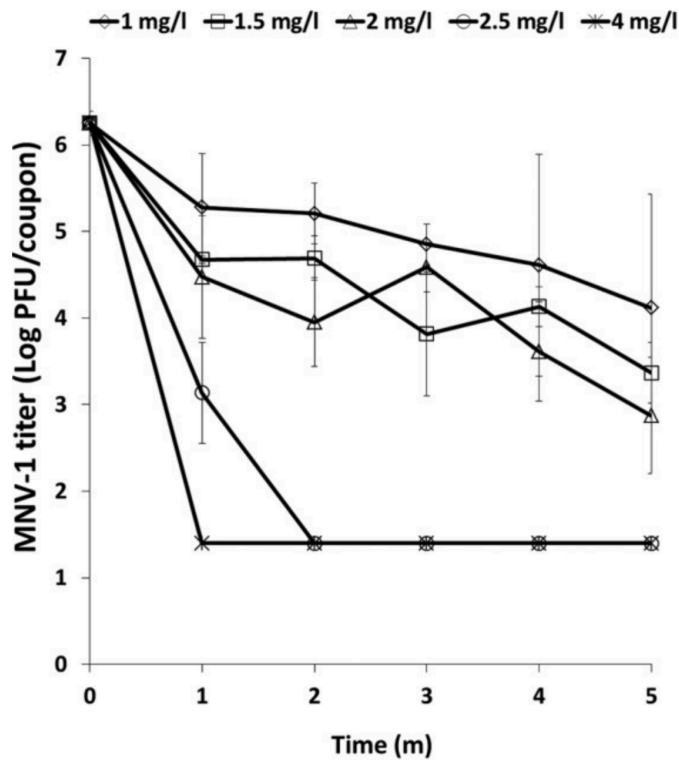
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FIG 1



Effect of ClO₂ gas concentrations on inactivation of MNV-1 on stainless steel coupons. Stainless steel coupons inoculated with 10⁷ PFU of MNV-1 were exposed to ClO₂ gas with concentrations ranging from 1 mg/liter to 4 mg/liter for 5 min at 25°C and a relative humidity of 85%. The survival of MNV-1 was determined by plaque assay. Data are the means of three replicates. Error bars represent the means ± standard deviations.

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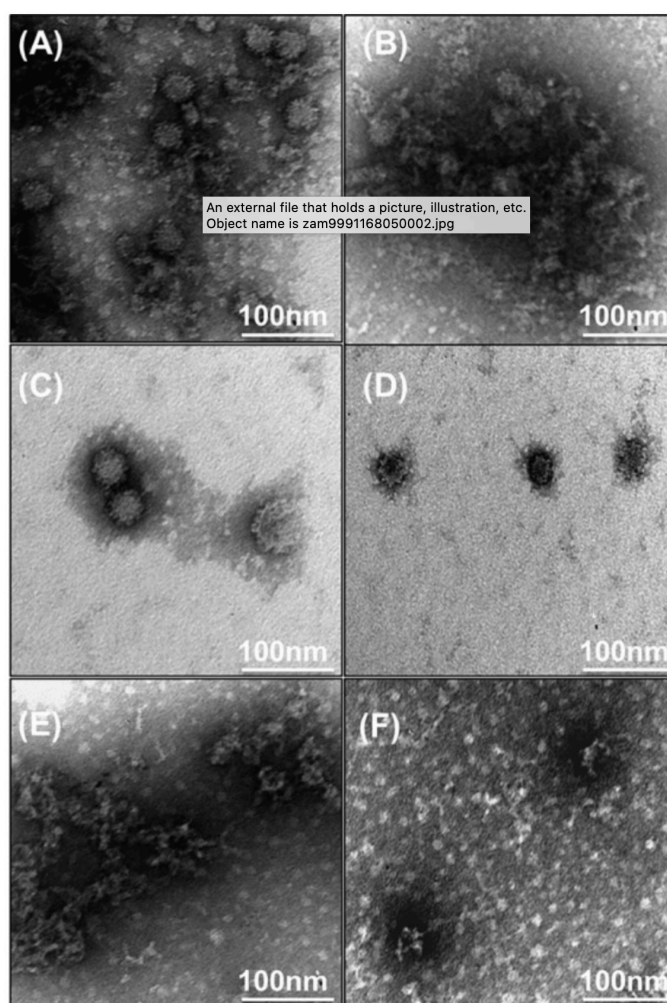
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FIG 2



The effect of ClO₂ gas on the structure of MNV-1 particles. Purified MNV-1 was treated with ClO₂ gas at 0.1 mg/liter for 30 s and at 2 mg/liter for 5 min, and samples were observed by TEM. (A, B) Untreated MNV-1 virion. (C, D) ClO₂ gas-treated MNV-1 at 0.1 mg/liter for 30 s. (E, F) ClO₂ gas-treated MNV-1 at 2 mg/liter for 5 min.

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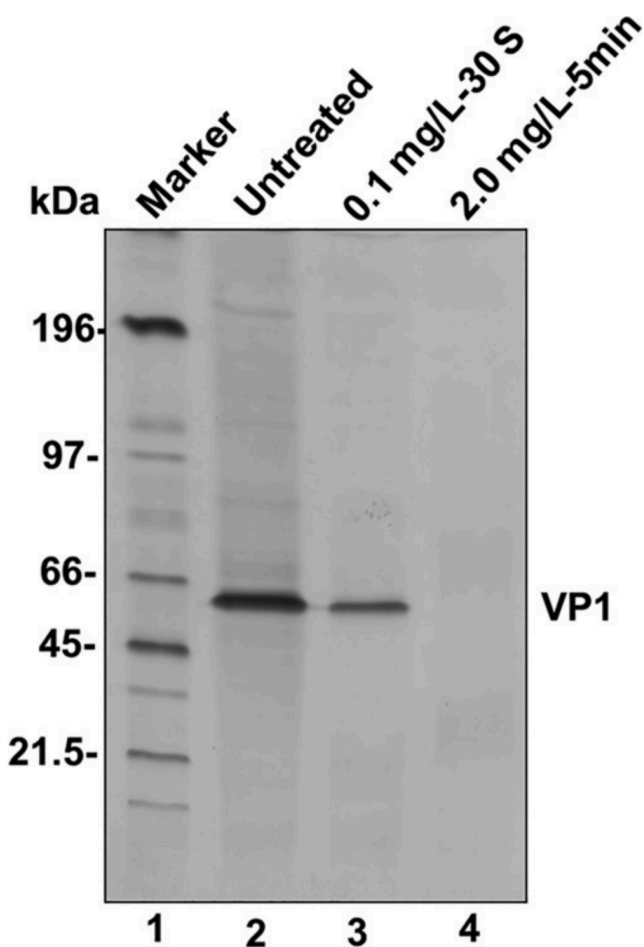
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FIG 3



Detection of MNV-1 major capsid protein using SDS-PAGE. Purified MNV-1 was treated with ClO_2 gas at 0.1 mg/liter for 30 s and at 2 mg/liter for 5 min. Major capsid protein (VP1) of untreated and treated viruses was analyzed by 12% SDS-PAGE, followed by Coomassie staining.

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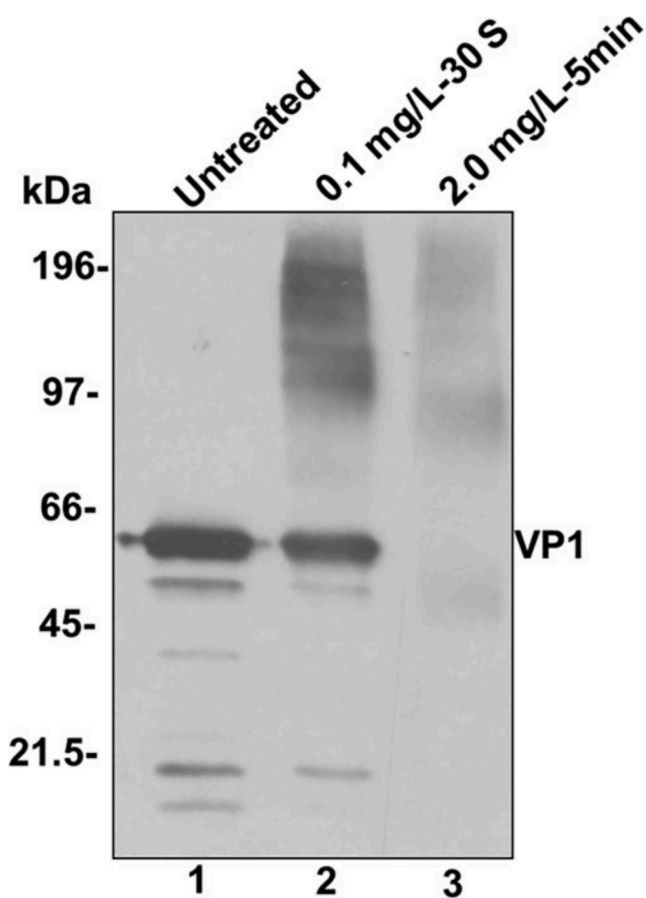
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FIG 4



Western immunoblotting analysis of MNV-1 major capsid protein. Purified MNV-1 was treated with ClO₂ gas at 0.1 mg/liter for 30 s and at 2 mg/liter for 5 min. Identical amounts of untreated and treated samples were separated by SDS-PAGE and subjected to Western blot analysis using rabbit anti-MNV VP1 polyclonal antibody.

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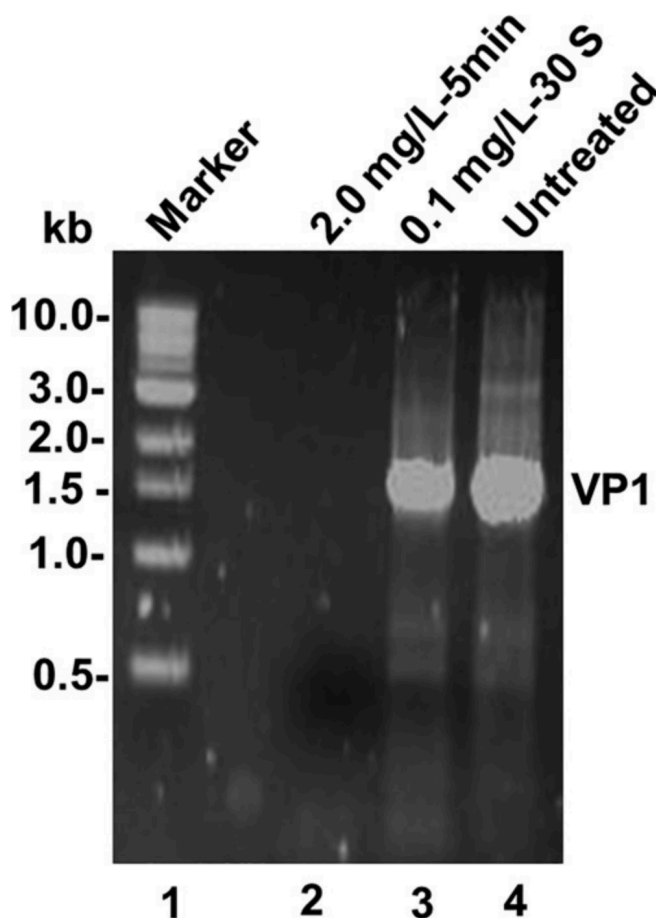
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FIG 5



Effect of ClO_2 gas on MNV-1 genomic RNA. MNV-1 genomic RNA was extracted from either untreated or ClO_2 gas-treated MNV-1. The VP1 gene of MNV-1 was amplified by one-step RT-PCR. The PCR product was then visualized on a 1% agarose gel with ethidium bromide staining.

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