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Back to the Basics: Diluted Bleach for COVID-19

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35 Since December 2019, a highly pathogenic novel human coronavirus SARS-COV-2 (COVID-
36 19) has emerged from China harboring high transmission rates from human-to-human and
37 persistence on inanimate surfaces.¹ An analysis of 22 studies revealed that human coronaviruses
38 similar to COVID-19 [i.e. Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East
39 Respiratory Syndrome (MERS) coronavirus, and endemic human coronaviruses (HCoV)] can
40 persist on inanimate surfaces like metal, glass or plastic for up to nine days, but are efficiently
41 inactivated by 62-71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within
42 one minute.¹ A study evaluating the stability of COVID-19 and SARS-COV1 by van Doremalen
43 et al.² suggests that COVID-19 may remain viable for hours to days on surfaces made from a
44 variety of materials. To help identify commercial disinfectants against COVID-19, the United
45 States Environmental Protection Agency (EPA) has created a list of adequate products by their
46 EPA registration number.³ Unfortunately, with exponentially rising COVID-19 cases in the U.S.,
47 commercial disinfect supplies are in high demand and will unquestionably be limited in the near
48 future. We will have to get creative with available resources, all the while taking safe precautions
49 to ensure our efforts improve and not worsen the ongoing situation.

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51 Various dilutions of sodium hypochlorite, effectively Dakin's solution, have been tried and true
52 in dermatology and wound care for many years. To achieve the formulation noted by Kampf et
53 al.¹, ~0.1% sodium hypochlorite can be made by a roughly 1:50 dilution of household bleach
54 (~5.25-6% sodium hypochlorite) in tap water.¹ While Kampf et al.'s¹ analysis is a combination
55 of non-COVID-19 studies, we expect the proposed formulation to similarly also disinfect
56 surfaces of the novel coronavirus. The Center for Disease Control and Prevention (CDC) also
57 recommends a roughly 1:50 dilution to disinfect COVID-19, explicitly noting 5 tablespoons

58 (1/3rd cup) bleach per gallon of water or 4 teaspoons bleach per quart of water.⁴ While different
59 dilutions of sodium hypochlorite can vary in their in-vivo fibroblast and keratinocyte
60 cytotoxicity, dilutions of ~0.1% sodium hypochlorite are clinically effective with minimal
61 irritation or sensitization.⁵ One should be mindful that corrosive injury upon mucous
62 membrane/skin contact is possible with excess volumes or mishandling, so appropriate caution
63 and moderation is necessary.⁶ This solution should ideally be used within one month of
64 preparation and stored in a closed, opaque container at room temperature.⁷

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66 While the exact viral load on inanimate surfaces is unknown during an outbreak, it is critical to
67 disinfect frequently touched surfaces.¹ With rapidly diminishing availability of commercial
68 cleaning supplies, simple diluted bleach, which is readily available, can effectively disinfect our
69 clinics, homes, and environment to prevent sustained transmission from inanimate objects. As
70 with many disinfects, minimizing long term skin contact and ensuring good ventilation can
71 minimize clinical toxicity. In Henry Dakin's spirit, we should strive to share with our colleagues
72 the cost-effective, accessible, and relatively safe power of diluted bleach.

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89 Sterile Needles and Bleach. Washington (DC); 1995.

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91 **Abbreviations:** SARS, Severe Acute Respiratory Syndrome Coronavirus; MERS, Middle East
92 Respiratory Syndrome Coronavirus; HCoV, Endemic Human Coronaviruses; EPA, United States
93 Environmental Protection Agency; CDC, Center for Disease Control and Prevention