

THE LANCET

Microbe

Supplementary appendix

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Chin A W H, Chu J T S, Perera M R A, et al. Stability of SARS-CoV-2 in different environmental conditions. *Lancet Microbe* 2020; published online April 2. [https://doi.org/10.1016/S2666-5247\(20\)30003-3](https://doi.org/10.1016/S2666-5247(20)30003-3).

Table. Stability of SARS-CoV-2 at different environmental conditions.

A) Temperature*

| Time | Virus titre (Log TCID ₅₀ /mL) | | | | | | | | | |
|---------|--|------|------|------|------|------|------|------|------|------|
| | 4°C | | 22°C | | 37°C | | 56°C | | 70°C | |
| | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD |
| 1 min | N.D. | N.D. | 6.51 | 0.27 | N.D. | N.D. | 6.65 | 0.1 | 5.34 | 0.17 |
| 5 mins | N.D. | N.D. | 6.7 | 0.15 | N.D. | N.D. | 4.62 | 0.44 | U | - |
| 10 mins | N.D. | N.D. | 6.63 | 0.07 | N.D. | N.D. | 3.84 | 0.32 | U | - |
| 30 mins | 6.51 | 0.27 | 6.52 | 0.28 | 6.57 | 0.17 | U | - | U | - |
| 1 hr | 6.57 | 0.32 | 6.33 | 0.21 | 6.76 | 0.05 | U | - | U | - |
| 3 hrs | 6.66 | 0.16 | 6.68 | 0.46 | 6.36 | 0.19 | U | - | U | - |
| 6 hrs | 6.67 | 0.04 | 6.54 | 0.32 | 5.99 | 0.26 | U | - | U | - |
| 12 hrs | 6.58 | 0.21 | 6.23 | 0.05 | 5.28 | 0.23 | U | - | U | - |
| 1 day | 6.72 | 0.13 | 6.26 | 0.05 | 3.23 | 0.05 | U | - | U | - |
| 2 days | 6.42 | 0.37 | 5.83 | 0.28 | U | - | U | - | U | - |
| 4 days | 6.32 | 0.27 | 4.99 | 0.18 | U | - | U | - | U | - |
| 7 days | 6.65 | 0.05 | 3.48 | 0.24 | U | - | U | - | U | - |
| 14 days | 6.04 | 0.18 | U | - | U | - | U | - | U | - |

B) Surfaces*

| Time | Virus titre (Log TCID ₅₀ /ml) | | | | | | | | | |
|---------|--|------|--------------|------|-------------------|------|-------------------|------|-------|------|
| | Paper | | Tissue paper | | Wood | | Cloth | | Glass | |
| | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD |
| 0 min | 4.76 | 0.10 | 5.48 | 0.10 | 5.66 | 0.39 | 4.84 | 0.17 | 5.83 | 0.04 |
| 30 mins | 2.18 | 0.05 | 2.19 | 0.17 | 3.84 | 0.39 | 2.84 | 0.24 | 5.81 | 0.27 |
| 3 hrs | U | - | U | - | 3.41 | 0.26 | 2.21 [#] | - | 5.14 | 0.05 |
| 6 hrs | U | - | U | - | 2.47 | 0.23 | 2.25 | 0.08 | 5.06 | 0.31 |
| 1 day | U | - | U | - | 2.07 [#] | - | 2.07 [#] | - | 3.48 | 0.37 |
| 2 days | U | - | U | - | U | - | U | - | 2.44 | 0.19 |
| 4 days | U | - | U | - | U | - | U | - | U | - |
| 7 days | U | - | U | - | U | - | U | - | U | - |

| Time | Banknote | | Stainless steel | | Plastic | | Mask, inner layer | | Mask, outer layer | |
|---------|----------|------|-----------------|------|---------|------|-------------------|------|-------------------|------|
| | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD | Mean | ±SD |
| 0 min | 6.05 | 0.34 | 5.80 | 0.02 | 5.81 | 0.03 | 5.88 | 0.69 | 5.78 | 0.10 |
| 30 mins | 5.83 | 0.29 | 5.23 | 0.05 | 5.83 | 0.04 | 5.84 | 0.18 | 5.75 | 0.08 |
| 3 hrs | 4.77 | 0.07 | 5.09 | 0.04 | 5.33 | 0.22 | 5.24 | 0.08 | 5.11 | 0.29 |
| 6 hrs | 4.04 | 0.29 | 5.24 | 0.08 | 4.68 | 0.10 | 5.01 | 0.50 | 4.97 | 0.51 |
| 1 day | 3.29 | 0.60 | 4.85 | 0.20 | 3.89 | 0.33 | 4.21 | 0.08 | 4.73 | 0.05 |
| 2 days | 2.47 | 0.23 | 4.44 | 0.20 | 2.76 | 0.10 | 3.16 | 0.07 | 4.20 | 0.07 |
| 4 days | U | - | 3.26 | 0.10 | 2.27 | 0.09 | 2.47 | 0.28 | 3.71 | 0.50 |
| 7 days | U | - | U | - | U | - | U | - | 2.79 | 0.46 |

C) Disinfectants*

| Disinfectant (Working concentration) | Virus titre (Log TCID ₅₀ /mL) | | |
|---|--|---------|---------|
| | 5 mins | 15 mins | 30 mins |
| Household bleach (1:49) | U | U | U |
| Household bleach (1:99) | U | U | U |
| Hand soap solution (1:49) | 3.6 [#] | U | U |
| Ethanol (70%) | U | U | U |
| Povidone-iodine (7.5%) | U | U | U |
| Chloroxylenol (0.05%) | U | U | U |
| Chlorhexidine (0.05%) | U | U | U |
| Benzalkonium chloride (0.1%) | U | U | U |

D) pH*

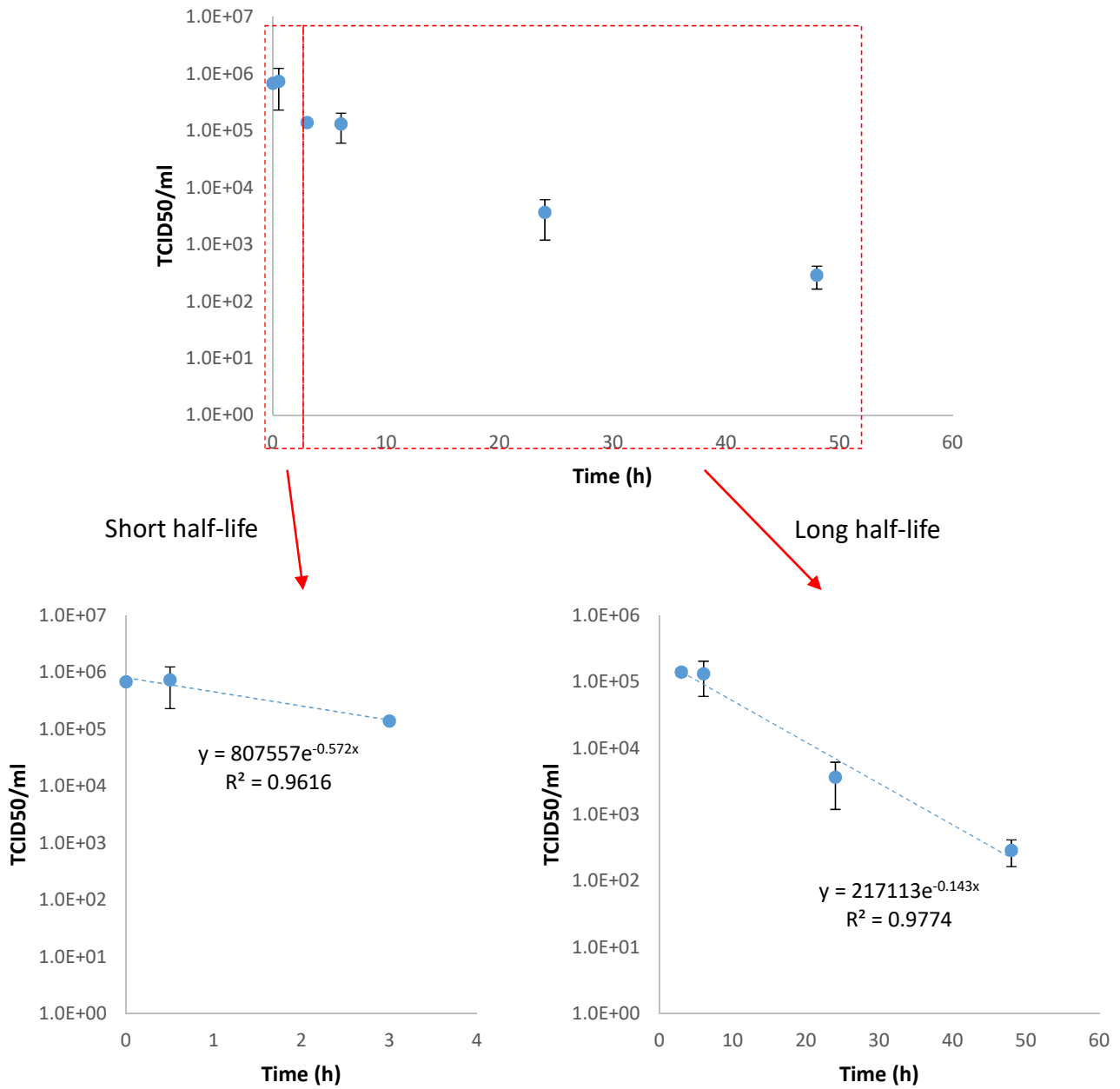
| pH (60 mins) | Virus titre (Log TCID ₅₀ /mL) | |
|-----------------|---|------|
| | Mean | ±SD |
| 3 | 5.55 | 0.25 |
| 4 | 5.67 | 0.36 |
| 5 | 5.73 | 0.04 |
| 6 | 5.75 | 0.08 |
| 7 | 5.58 | 0.22 |
| 8 | 5.70 | 0.14 |
| 9 | 5.54 | 0.44 |
| 10 | 5.51 | 0.11 |

* All the virus titres were titrated using Vero-E6 cells. All experimental studies were done in three independent triplicates. Detection limit of a typical TCID₅₀ assay is 100 TCID₅₀/mL, except reactions containing hand soap/chloroxylenol (detection limit: 10³ TCID₅₀/mL) or reactions containing povidone-iodine/chlorhexidin/benzalkonium chloride; detection limit: 10⁴ TCID₅₀/mL because of their cytotoxic effects. N.D.: not done, U: undetectable.

[#] Only one of the triplicate reactions was positive in the TCID₅₀ assay.

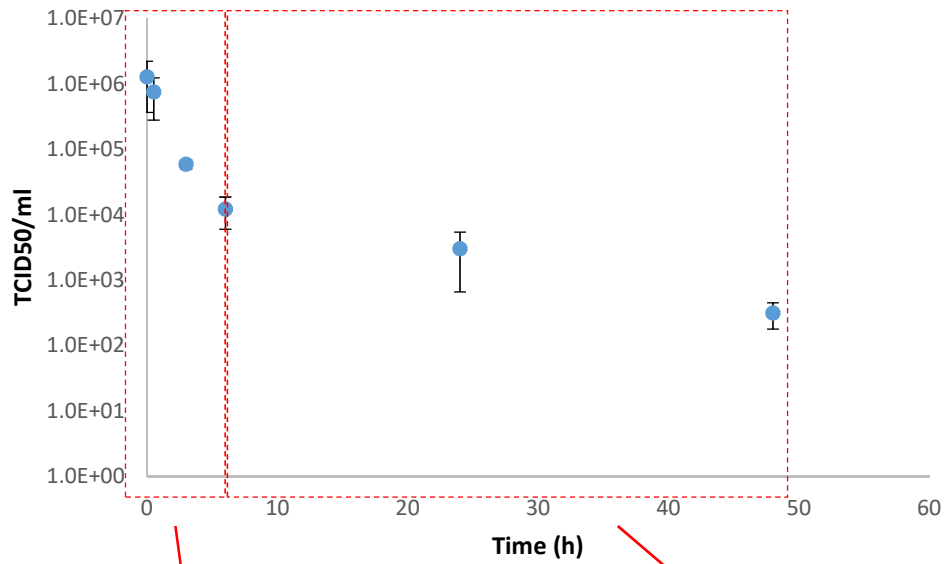
Appendix: Biphasic decay of infectious SARS-CoV-2 population

A) Glass



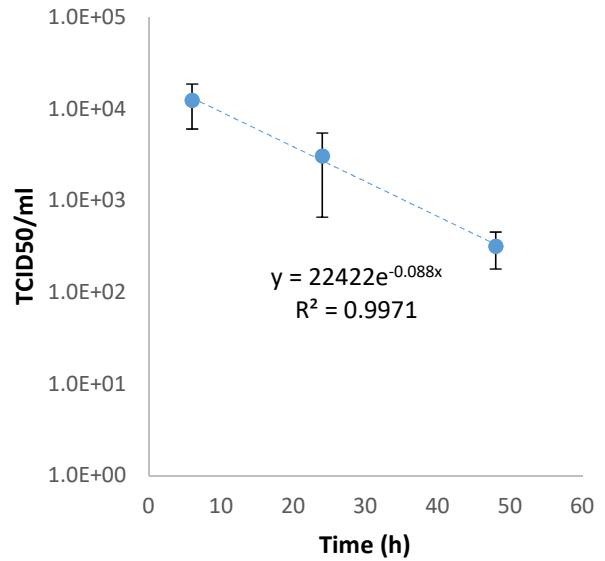
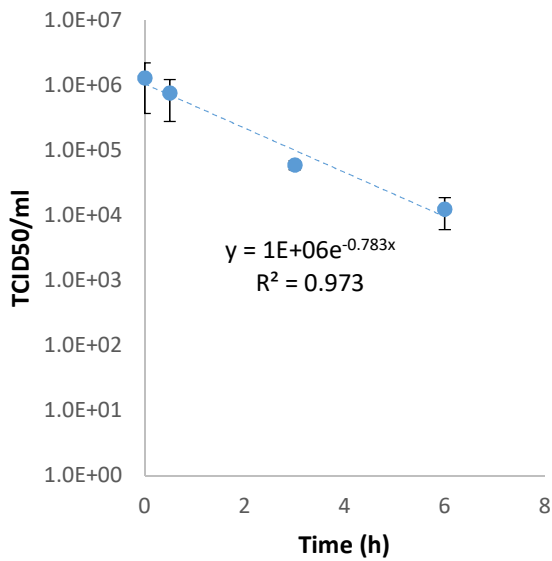
Half-life of free infectious SARS-CoV-2: 0 - 3 hr, $T_{1/2} = 1.2$ hr
3 hr - 2d, $T_{1/2} = 4.8$ hr

B) Banknote



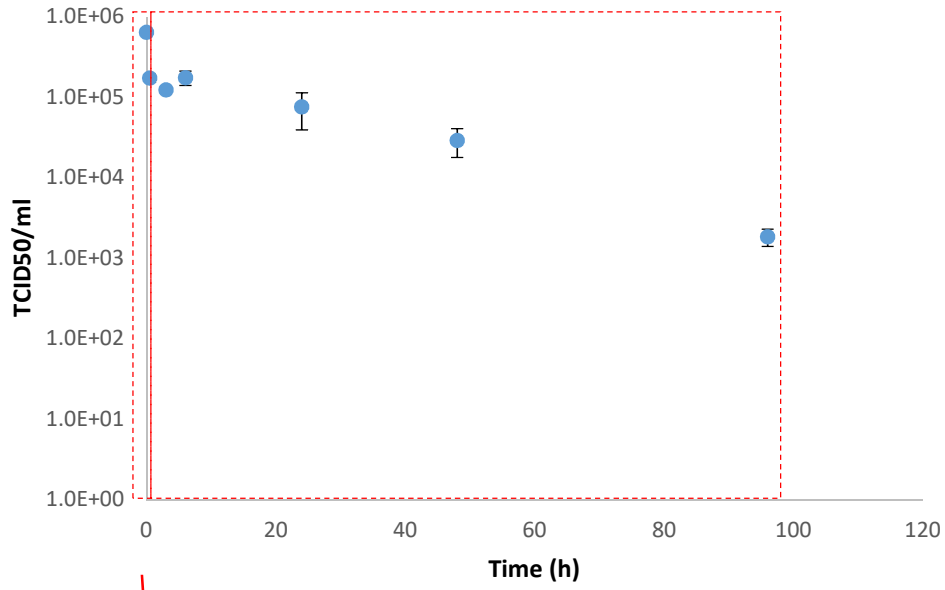
Short half-life

Long half-life



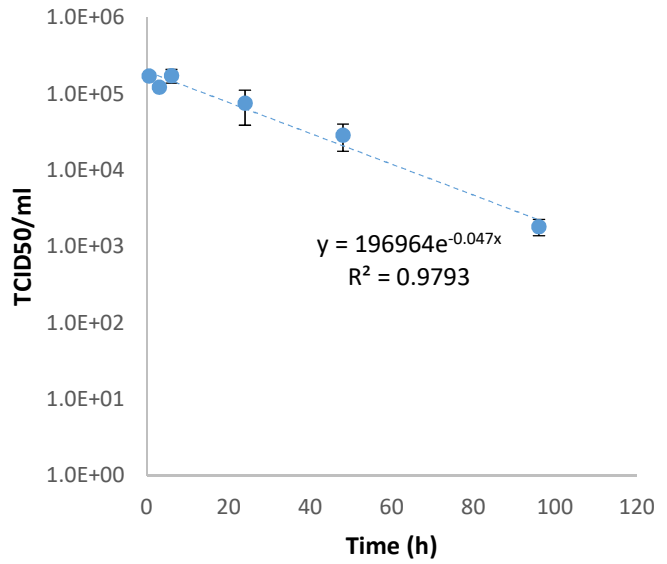
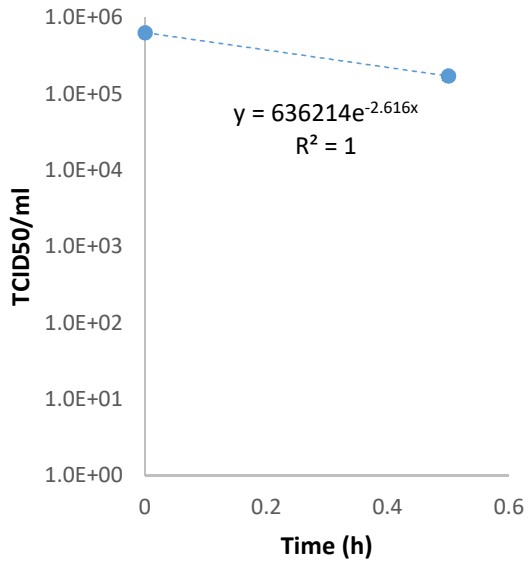
Half-life of free infectious SARS-CoV-2: 0 - 6 hr, $T_{1/2} = 0.9$ hr
 6 hr - 2d, $T_{1/2} = 7.9$ hr

C) Stainless steel



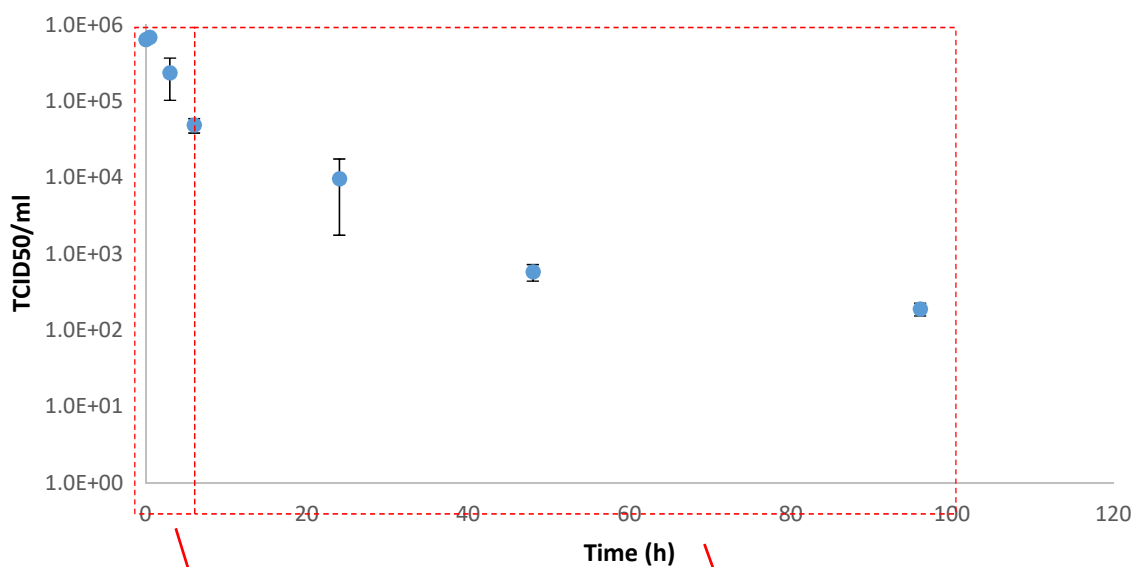
Short half-life

Long half-life



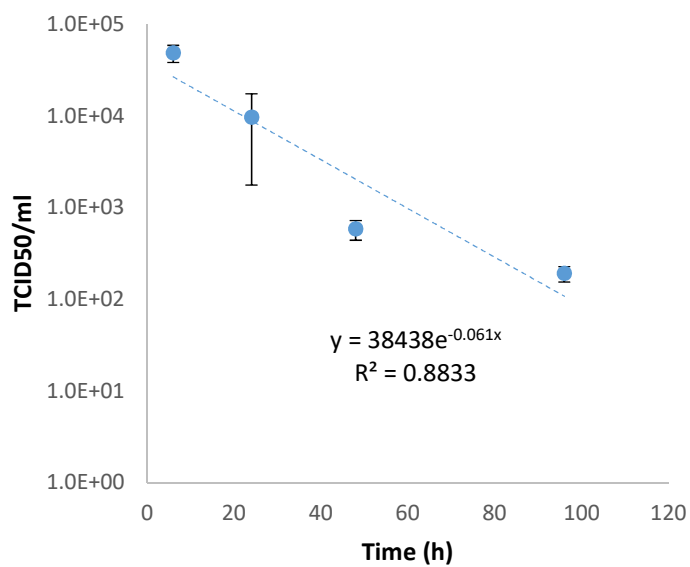
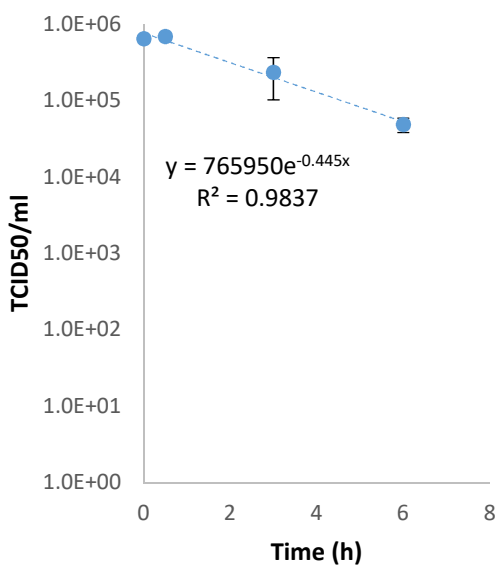
Half-life of free infectious SARS-CoV-2: 0-30 min, $T_{1/2} = 0.3$ hr
 30 min - 4d, $T_{1/2} = 14.7$ hr

D) Plastic



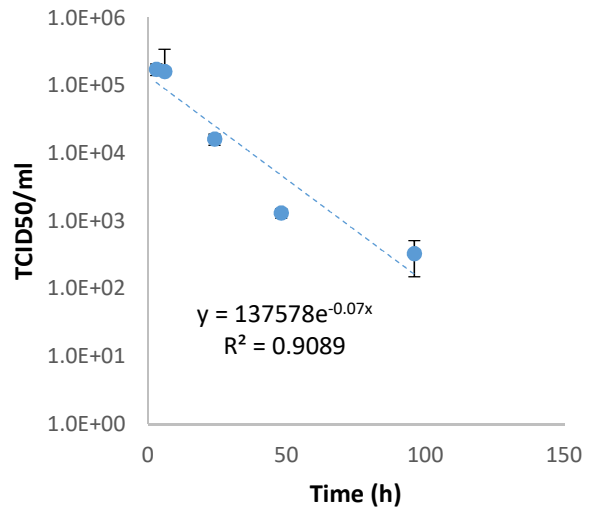
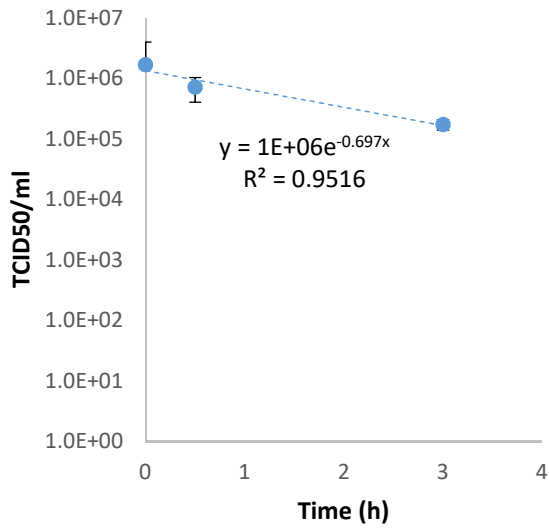
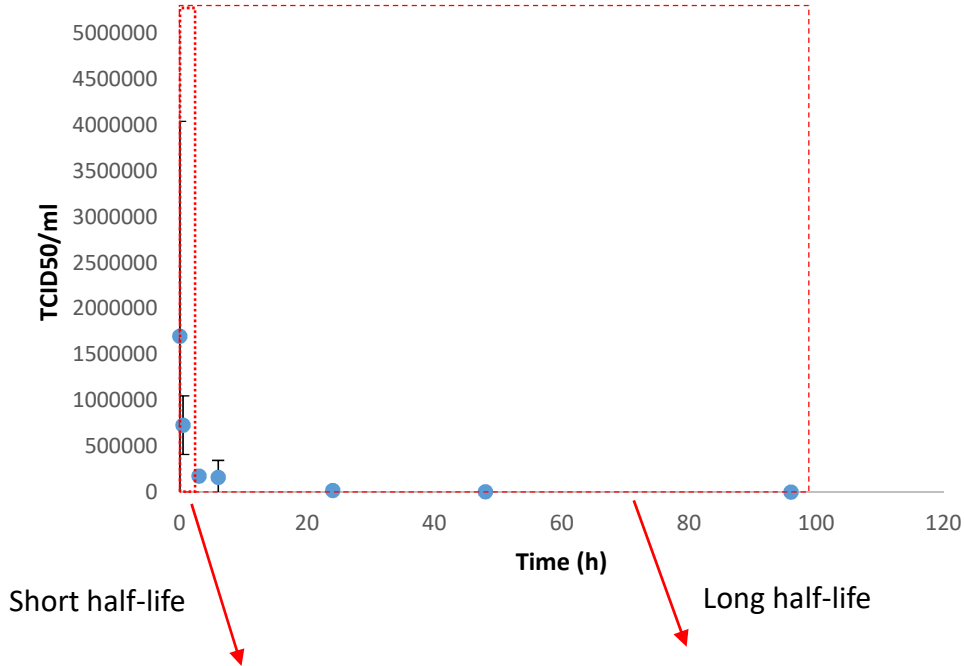
Short half-life

Long half-life



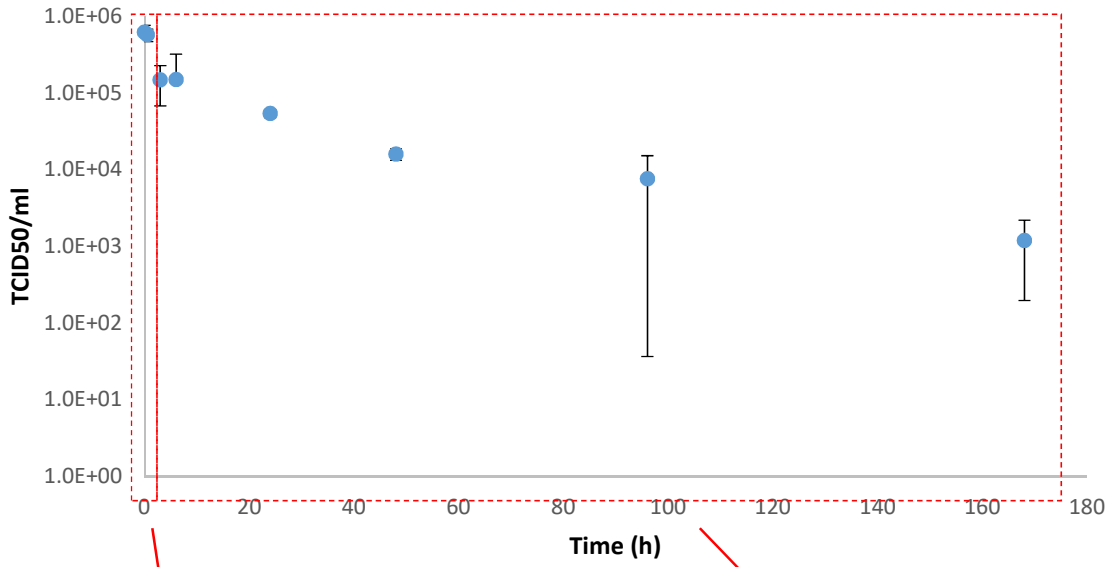
Half-life of free infectious SARS-CoV-2: 0 - 6 hr, $T_{1/2} = 1.6$ hr
 6 hr - 4 d, $T_{1/2} = 11.4$ hr

E) Mask, inner layer



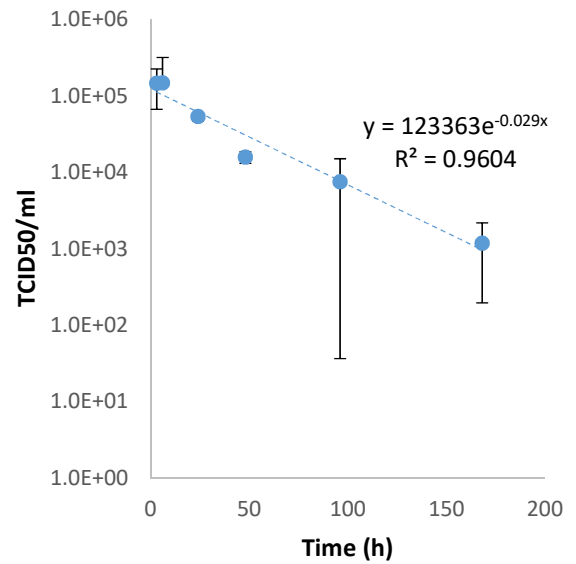
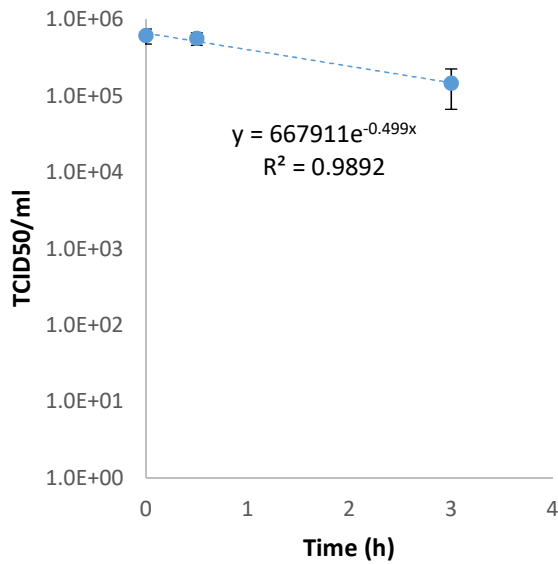
Half-life of free infectious SARS-CoV-2: 0-3hr, $T_{1/2} = 1.0\text{hr}$
 6hr-4d, $T_{1/2} = 9.9\text{hr}$

F) Mask, outer layer



Short half-life

Long half-life



Half-life of free infectious SARS-CoV-2: 0 - 3 hr, $T_{1/2} = 1.4$ hr
 3 hr - 7 d, $T_{1/2} = 23.9$ hr