Supplementary Table S1. The estimated dermal exposure assessment of the target impurities by alcohol based hand sanitizers (μg/kg-bw/day)

| | | methanol | acetone | 1-propanol | 2-butanol | Ethyl Acetate | isobutanol | 1-butanol | acetal | 3-methyl-1-butanol | 1-pentanol | benzene | acetaldehyde |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Application amount (3g/day) Body weight (24.6 kg) 2~11 years old | Mean | 1.78E+00 | 5.52E-01 | 8.21E-01 | 1.69E+00 | 3.21E+00 | 8.83E-01 | 1.25E+00 | 3.44E+00 | 5.67E-01 | 1.61E-01 | 1.03E-01 | 2.73E+00 |
| | GM | 4.77E-01 | 5.58E-03 | 6.11E-03 | 1.04E-02 | 1.40E-02 | 5.67E-03 | 6.22E-03 | 8.38E-03 | 4.09E-03 | 2.94E-03 | 9.38E-04 | 1.50E-03 |
| | Max | 3.89E+01 | 7.48E+00 | 1.29E+01 | 4.45E+01 | 5.28E+01 | 2.04E+01 | 2.65E+01 | 4.73E+01 | 8.92E+00 | 8.88E+00 | 4.14E+00 | 5.23E+01 |
| | min | 3.22E-01 | 1.95E-03 | 1.95E-03 | 3.41E-03 | 2.93E-03 | 2.93E-03 | 2.44E-03 | 1.34E-03 | 1.34E-03 | 2.44E-03 | 6.10E-04 | 1.22E-04 |
| | Median | 3.22E-01 | 1.95E-03 | 1.95E-03 | 3.41E-03 | 2.93E-03 | 2.93E-03 | 2.44E-03 | 1.34E-03 | 1.34E-03 | 2.44E-03 | 6.10E-04 | 1.22E-04 |
| Application amount (3g/day) Body weight (64.2 kg) 11~21 years old | Mean | 6.83E-01 | 2.12E-01 | 3.14E-01 | 6.46E-01 | 1.23E+00 | 3.38E-01 | 4.78E-01 | 1.32E+00 | 2.17E-01 | 6.17E-02 | 3.95E-02 | 1.05E+00 |
| | GM | 1.83E-01 | 2.14E-03 | 2.34E-03 | 3.98E-03 | 5.36E-03 | 2.17E-03 | 2.38E-03 | 3.21E-03 | 1.57E-03 | 1.12E-03 | 3.59E-04 | 5.76E-04 |
| | Max | 1.49E+01 | 2.87E+00 | 4.94E+00 | 1.71E+01 | 2.02E+01 | 7.83E+00 | 1.02E+01 | 1.81E+01 | 3.42E+00 | 3.40E+00 | 1.59E+00 | 2.00E+01 |
| | min | 1.23E-01 | 7.48E-04 | 7.48E-04 | 1.31E-03 | 1.12E-03 | 1.12E-03 | 9.35E-04 | 5.14E-04 | 5.14E-04 | 9.35E-04 | 2.34E-04 | 4.67E-05 |
| | Median | 1.23E-01 | 7.48E-04 | 7.48E-04 | 1.31E-03 | 1.12E-03 | 1.12E-03 | 9.35E-04 | 5.14E-04 | 5.14E-04 | 9.35E-04 | 2.34E-04 | 4.67E-05 |
| Application amount (3g/day) Body weight (80 kg) >21 years old | Mean | 5.48E-01 | 1.70E-01 | 2.52E-01 | 5.19E-01 | 9.88E-01 | 2.72E-01 | 3.84E-01 | 1.06E+00 | 1.74E-01 | 4.95E-02 | 3.17E-02 | 8.40E-01 |
| | GM | 1.47E-01 | 1.71E-03 | 1.88E-03 | 3.19E-03 | 4.30E-03 | 1.74E-03 | 1.91E-03 | 2.58E-03 | 1.26E-03 | 9.03E-04 | 2.88E-04 | 4.63E-04 |
| | Max | 1.20E+01 | 2.30E+00 | 3.96E+00 | 1.37E+01 | 1.62E+01 | 6.28E+00 | 8.16E+00 | 1.45E+01 | 2.74E+00 | 2.73E+00 | 1.27E+00 | 1.61E+01 |
| | min | 9.90E-02 | 6.00E-04 | 6.00E-04 | 1.05E-03 | 9.00E-04 | 9.00E-04 | 7.50E-04 | 4.13E-04 | 4.13E-04 | 7.50E-04 | 1.88E-04 | 3.75E-05 |
| | Median | 9.90E-02 | 6.00E-04 | 6.00E-04 | 1.05E-03 | 9.00E-04 | 9.00E-04 | 7.50E-04 | 4.13E-04 | 4.13E-04 | 7.50E-04 | 1.88E-04 | 3.75E-05 |
| Application amount (9g/day) | Mean | 5.34E+00 | 1.66E+00 | 2.46E+00 | 5.06E+00 | 9.64E+00 | 2.65E+00 | 3.74E+00 | 1.03E+01 | 1.70E+00 | 4.83E-01 | 3.09E-01 | 8.19E+00 |
| | GM | 1.43E+00 | 1.67E-02 | 1.83E-02 | 3.11E-02 | 4.20E-02 | 1.70E-02 | 1.87E-02 | 2.51E-02 | 1.23E-02 | 8.81E-03 | 2.81E-03 | 4.51E-03 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Body weight (24.6 kg) | Max | 1.17E+02 | 2.24E+01 | 3.87E+01 | 1.34E+02 | 1.59E+02 | 6.13E+01 | 7.96E+01 | 1.42E+02 | 2.67E+01 | 2.66E+01 | 1.24E+01 | 1.57E+02 |
| | min | 9.66E-01 | 5.85E-03 | 5.85E-03 | 1.02E-02 | 8.78E-03 | 8.78E-03 | 7.32E-03 | 4.02E-03 | 4.02E-03 | 7.32E-03 | 1.83E-03 | 3.66E-04 |
| 2~11 years old | Median | 9.66E-01 | 5.85E-03 | 5.85E-03 | 1.02E-02 | 8.78E-03 | 8.78E-03 | 7.32E-03 | 4.02E-03 | 4.02E-03 | 7.32E-03 | 1.83E-03 | 3.66E-04 |
| Application amount (9g/day) | Mean | 2.05E+00 | 6.35E-01 | 9.43E-01 | 1.94E+00 | 3.69E+00 | 1.02E+00 | 1.43E+00 | 3.96E+00 | 6.52E-01 | 1.85E-01 | 1.18E-01 | 3.14E+00 |
| | GM | 5.48E-01 | 6.41E-03 | 7.03E-03 | 1.19E-02 | 1.61E-02 | 6.52E-03 | 7.15E-03 | 9.64E-03 | 4.70E-03 | 3.37E-03 | 1.08E-03 | 1.73E-03 |
| Body weight (64.2 kg) | Max | 4.47E+01 | 8.60E+00 | 1.48E+01 | 5.12E+01 | 6.07E+01 | 2.35E+01 | 3.05E+01 | 5.43E+01 | 1.02E+01 | 1.02E+01 | 4.76E+00 | 6.01E+01 |
| | min | 3.70E-01 | 2.24E-03 | 2.24E-03 | 3.93E-03 | 3.36E-03 | 3.36E-03 | 2.80E-03 | 1.54E-03 | 1.54E-03 | 2.80E-03 | 7.01E-04 | 1.40E-04 |
| 11~21 years old | Median | 3.70E-01 | 2.24E-03 | 2.24E-03 | 3.93E-03 | 3.36E-03 | 3.36E-03 | 2.80E-03 | 1.54E-03 | 1.54E-03 | 2.80E-03 | 7.01E-04 | 1.40E-04 |
| Application amount (9g/day) | Mean | 1.64E+00 | 5.09E-01 | 7.57E-01 | 1.56E+00 | 2.96E+00 | 8.15E-01 | 1.15E+00 | 3.18E+00 | 5.23E-01 | 1.48E-01 | 9.50E-02 | 2.52E+00 |
| | GM | 4.40E-01 | 5.14E-03 | 5.64E-03 | 9.58E-03 | 1.29E-02 | 5.23E-03 | 5.74E-03 | 7.73E-03 | 3.77E-03 | 2.71E-03 | 8.65E-04 | 1.39E-03 |
| Body weight (80 kg) | Max | 3.59E+01 | 6.90E+00 | 1.19E+01 | 4.11E+01 | 4.87E+01 | 1.89E+01 | 2.45E+01 | 4.36E+01 | 8.23E+00 | 8.19E+00 | 3.82E+00 | 4.83E+01 |
| | min | 2.97E-01 | 1.80E-03 | 1.80E-03 | 3.15E-03 | 2.70E-03 | 2.70E-03 | 2.25E-03 | 1.24E-03 | 1.24E-03 | 2.25E-03 | 5.63E-04 | 1.13E-04 |
| >21 years old | Median | 2.97E-01 | 1.80E-03 | 1.80E-03 | 3.15E-03 | 2.70E-03 | 2.70E-03 | 2.25E-03 | 1.24E-03 | 1.24E-03 | 2.25E-03 | 5.63E-04 | 1.13E-04 |
| Application amount (13.5g/day) | Mean | 8.02E+00 | 2.48E+00 | 3.69E+00 | 7.59E+00 | 1.45E+01 | 3.97E+00 | 5.61E+00 | 1.55E+01 | 2.55E+00 | 7.24E-01 | 4.63E-01 | 1.23E+01 |
| | GM | 2.15E+00 | 2.51E-02 | 2.75E-02 | 4.67E-02 | 6.30E-02 | 2.55E-02 | 2.80E-02 | 3.77E-02 | 1.84E-02 | 1.32E-02 | 4.22E-03 | 6.77E-03 |
| Body weight (24.6 kg) | Max | 1.75E+02 | 3.37E+01 | 5.80E+01 | 2.00E+02 | 2.38E+02 | 9.20E+01 | 1.19E+02 | 2.13E+02 | 4.01E+01 | 4.00E+01 | 1.87E+01 | 2.35E+02 |
| | min | 1.45E+00 | 8.78E-03 | 8.78E-03 | 1.54E-02 | 1.32E-02 | 1.32E-02 | 1.10E-02 | 6.04E-03 | 6.04E-03 | 1.10E-02 | 2.74E-03 | 5.49E-04 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2~11 years old | Median | 1.45E+00 | 8.78E-03 | 8.78E-03 | 1.54E-02 | 1.32E-02 | 1.32E-02 | 1.10E-02 | 6.04E-03 | 6.04E-03 | 1.10E-02 | 2.74E-03 | 5.49E-04 |
| Application amount (13.5g/day) | Mean | 3.07E+00 | 9.52E-01 | 1.41E+00 | 2.91E+00 | 5.54E+00 | 1.52E+00 | 2.15E+00 | 5.94E+00 | 9.78E-01 | 2.78E-01 | 1.78E-01 | 4.71E+00 |
| | GM | 8.23E-01 | 9.61E-03 | 1.05E-02 | 1.79E-02 | 2.41E-02 | 9.78E-03 | 1.07E-02 | 1.45E-02 | 7.05E-03 | 5.06E-03 | 1.62E-03 | 2.59E-03 |
| Body weight (64.2 kg) | Max | 6.71E+01 | 1.29E+01 | 2.22E+01 | 7.68E+01 | 9.11E+01 | 3.52E+01 | 4.57E+01 | 8.15E+01 | 1.54E+01 | 1.53E+01 | 7.15E+00 | 9.02E+01 |
| | min | 5.55E-01 | 3.36E-03 | 3.36E-03 | 5.89E-03 | 5.05E-03 | 5.05E-03 | 4.21E-03 | 2.31E-03 | 2.31E-03 | 4.21E-03 | 1.05E-03 | 2.10E-04 |
| 11~21 years old | Median | 5.55E-01 | 3.36E-03 | 3.36E-03 | 5.89E-03 | 5.05E-03 | 5.05E-03 | 4.21E-03 | 2.31E-03 | 2.31E-03 | 4.21E-03 | 1.05E-03 | 2.10E-04 |
| Application amount (13.5g/day) | Mean | 2.47E+00 | 7.64E-01 | 1.14E+00 | 2.33E+00 | 4.44E+00 | 1.22E+00 | 1.73E+00 | 4.76E+00 | 7.85E-01 | 2.23E-01 | 1.42E-01 | 3.78E+00 |
| | GM | 6.60E-01 | 7.72E-03 | 8.46E-03 | 1.44E-02 | 1.94E-02 | 7.85E-03 | 8.61E-03 | 1.16E-02 | 5.66E-03 | 4.06E-03 | 1.30E-03 | 2.08E-03 |
| Body weight (80 kg) | Max | 5.38E+01 | 1.03E+01 | 1.78E+01 | 6.16E+01 | 7.31E+01 | 2.83E+01 | 3.67E+01 | 6.54E+01 | 1.23E+01 | 1.23E+01 | 5.74E+00 | 7.24E+01 |
| | min | 4.46E-01 | 2.70E-03 | 2.70E-03 | 4.73E-03 | 4.05E-03 | 4.05E-03 | 3.38E-03 | 1.86E-03 | 1.86E-03 | 3.38E-03 | 8.44E-04 | 1.69E-04 |
| >21 years old | Median | 4.46E-01 | 2.70E-03 | 2.70E-03 | 4.73E-03 | 4.05E-03 | 4.05E-03 | 3.38E-03 | 1.86E-03 | 1.86E-03 | 3.38E-03 | 8.44E-04 | 1.69E-04 |

GM: geometric mean

* samples which were non detected were calculated with the value of detection limit divided by the square root of 2.