**Supplemental Information**

Data analyses of the concentration of TiO2 nanoparticles on the gills of the mussels indicated a significant time effect, no significant treatment effect, and no significant interaction effect between these two independent variables (two-way ANOVA; Table 2; Figure S1A). Multiple pairwise comparisons indicated that the concentration of TiO2 on the gills immediately after the 2-hour feeding exposure (0-hour) was significantly greater than that on the gills after 6, 24, 72, and 120 hours of exposure (p < 0.05). No significant differences in concentration were found on the gills sampled at 6, 24, 72, and 120 hours post-feeding (p > 0.1). Data analyses of the concentration of TiO2 nanoparticles on the gills of the oysters indicated no significant time or treatment effects, and no significant interaction effect between these two independent variables (two-way ANOVA; Table 2; Figure S1B).

Analyses of the concentration of TiO2 NPs in the faeces of mussels and oysters indicated a significant time effect, and no significant treatment effect between these two independent variables (two-way ANOVA; Table 2; Figures S2A and S2B). The only exception was that mussel faeces demonstrated a significant interaction effect while oyster faeces showed no significant interaction effects. Pairwise comparisons of both the mussel and oyster faeces indicated that the concentration of TiO2 NPs in the faeces decreased significantly at each time interval over a 72-hour period (Tukey's, p < 0.01). In addition, only mussel faeces at the 24-hour time interval showed significant differences between the concentration of TiO2 NPs in the marine snow and freely-suspended treatments (Tukey's, p < 0.05). No significant differences were found between faeces sampled at 72 hours and 120 hours, post-exposure in either species (p > 0.1).

**Table S1.** Amount of TiO2 nanoparticles taken up by mussels and oysters immediately after exposure (time 0 post-exposure; treatments pooled). This example demonstrates how masses of TiO2 were standardized to the dry mass of tissues and faeces. Values for mass of TiO2 taken up were used to calculate mass balance presented in Figure 3. Values for other times were handled in a similar manner. Data are grand means ± standard error.

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| **Species**  **Sample Type** | **Mass of TiO2**  **(mg)** | **Mass of Sample**  **(g)** | **Standardized Values (mg/g)** | **n** |
| Mussel |  |  |  |  |
| Gill | [5.4 ± 3.37] x 10-3 | [5.1 ± 0.34] x 10-2 | [1.1 ± 0.06] x 10-1 | 18 |
| Visceral Mass | [1.2 ± 0.33] x 10-1 | [8.2 ± 0.59] x 10-2 | 1.5 ± 0.38 | 18 |
| Faeces | 1.4 ± 0.09 | [3.6 ± 0.17] x 10-3 | 403.3 ± 17.68 | 90 |
| Oyster |  |  |  |  |
| Gill | [7.0 ± 6.31] x 10-3 | [1.4 ± 0.11] x 10-1 | [4.8 ± 4.10] x 10-2 | 16 |
| Visceral Mass | [1.9 ± 1.13] x 10-1 | [2.1 ± 0.23] x 10-1 | [8.7 ± 4.05] x 10-1 | 16 |
| Faeces | 2.3 ± 0.37 | [6.0 ± 0.48] x 10-3 | 364.2 ± 50.43 | 81 |

**Fig. S1.** Concentration of TiO2 NPs on the gills of mussels (A) and oysters (B) in three different treatments over time (note difference in scale). Bars designated by different letters are significantly different at p < 0.05. ND indicates no titanium was detected. Data are means ± standard error (n = 4-6). Snow = NPs incorporated into marine snow; Unrolled = NPs aged in seawater for the same length of time as those in the marine snow treatment but not incorporated into marine aggregates; Free = NPs suspended in seawater just prior to the start of the experiment.

**Fig. S2.** Concentration of TiO2 NPs in the faeces collected from mussels (A) and oysters (B) in three different treatments over time (note difference in scale). Bars designated by different letters are significantly different at p < 0.05. Capital letters denote differences in time, whereas lower case letters show differences between treatments within a given time. Data are means ± standard error. Number of replicates (n) are as follows (mussel, oyster): t0= 30, 24-29; t6= 23-24, 24; t24= 17-18, 18; t72= 11-12, 12-13; t120= 6, 6. Snow = NPs incorporated into marine snow; Unrolled = NPs aged in seawater for the same length of time as those in the rolled treatment but not incorporated into marine aggregates; Free = NPs suspended in seawater just prior to the start of the experiment.