**Supplementary Information**

**Contrasting effects of hypoxia on copper toxicity during development in the three-spined stickleback (*Gasterosteus aculeatus*)**

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**TABLES**

*S1 - Generalized linear models for the combined effects of hypoxia and copper on stickleback mortality*………………………………………………..…………………………………….S2

S2- *Generalized linear models for the combined effects of hypoxia and copper on hatching rates*…………………………………………………………………………………………..S3

**Table S1.** Generalized linear models for the relationships between mortality with copper concentration, air saturation and the copper/air saturation interaction. Minimum adequate models for proportion mortality using a quasibinomial error structure are shown. A) Embryo mortality curves following exposure to copper under normoxia or hypoxia throughout development, B) Mortality curves following exposure to copper under normoxia or hypoxia during the larval stage of development. (Significance codes: \*\*\* P<0.001, \*\* P<0.01, \* P<0.05)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Coefficient (± SE)** | | | |
| **Intercept** | **Copper** | **Air Saturation** | **Copper /Air Saturation Interaction** |
| **a)** | | | | |
| **1-25 hpf** | -7.24 (±1.08)\*\*\* | NS | NS | NS |
| **1-49 hpf** | -5.98 (±0.72)\*\*\* | 22.86 (±6.18)\*\*\* | NS | NS |
| **1-73 hpf** | -7.02 (±0.70)\*\*\* | 36.17 (±5.09)\*\*\* | 1.12 (±0.37)\*\* | NS |
| **1-97 hpf** | -5.92 (±0.61)\*\*\* | 31.41 (±4.57)\*\*\* | 1.05 (±2.98)\*\* | NS |
| **1-121 hpf** | -4.69 (±0.41)\*\*\* | 33.55 (±3.4)\*\*\* | 0.89 (±3.50)\*\*\* | NS |
| **1-145 hpf** | -4.14 (±0.37)\*\*\* | 33.78 (±3.38)\*\*\* | 0.54 (±0.25)\* | NS |
| **1-169 hpf** | -3.72 (±0.33)\*\*\* | 35.60 (±3.49)\*\*\* | NS | NS |
| **1-193 hpf** | -3.86 (±0.34)\*\*\* | 41.43 (±0.34)\*\*\* | NS | NS |
| **1-217 hpf** | -3.18 (±0.33)\*\*\* | 52.04 (±4.51)\*\*\* | -1.29 (±0.26)\*\*\* | NS |
| **b)** | | | | |
| **145-169 hpf** | -5.86 (±0.50)\*\*\* | 53.00 (±4.57)\*\*\* | 1.48 (±0.33)\*\*\* | NS |
| **145-217 hpf** | -3.70 (±0.88)\*\*\* | 100.44 (±22.24)\*\*\* | -2.06 (±0.85)\*\*\* | NS |

**Table S2.** Generalized linear models for the relationships between hatching with copper concentration, air saturation and the copper/air saturation interaction. Minimum adequate models for proportion hatching using a quasibinomial error structure are shown. Data from the continuous embryo exposure, the proportion of hatched embryos from 145 to 169hpf, 145- 193hpf and 145-217hpf. (Significance codes: \*\*\* P<0.001, \*\* P<0.01, \* P<0.05)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Coefficient (± SE)** | | | |
| **Intercept** | **Copper** | **Air Saturation** | **Copper / Air Saturation Interaction** |
| **145-169 hpf** | 2.99 (±0.38)\*\*\* | -36.18 (±6.07)\*\*\* | NS | NS |
| **145-193 hpf** | 3.76 (±0.61)\*\*\* | -32.39 (±8.81)\*\*\* | NS | NS |
| **145-217 hpf** | 5.38 (±0.58)\*\*\* | -56.06 (±7.76)\*\*\* | 0.77 (±0.34)\* | NS |