Notes for meeting 11/7/23

Chapter 1 data on routine metabolic rates of *M. menidia* embryos and newly hatched larvae in different oxygen and CO2 levels

* 7.5 kPa = 2.7 mg/L
* 9.0 kPa = 3.0 mg/L
* 12.0 kPa = 4.0 mg/L
* 23.0 kPa = 7.8 mg/L

From Table 1.2: mean metabolic rates at each oxygen and CO2 level

|  |  |  |  |
| --- | --- | --- | --- |
| ***P*O2**  **(kPa)** | ***P*CO2 (μatm)** | **Mean Embryonic RMR (±s.e.m.)**  **(μmol O2 h-1)** | **Mean Larval RMR (±s.e.m.) (μmol O2 mg-1 h-1)** |
| 23.0 | 400 | 0.022(±0.002) | 0.165(±0.013) |
| 2200 | 0.028(±0.003) | 0.148(±0.018) |
| 4200 | 0.034(±0.003) | 0.174(±0.017) |
| 12.0 | 400 | 0.018(±0.002) | 0.182(±0.019) |
| 2200 | 0.026(±0.002) | 0.179(±0.013) |
| 4200 | 0.025(±0.002) | 0.173(±0.019) |
| 9.0 | 400 | 0.025(±0.004) | 0.126(±0.030) |
| 2200 | 0.022(±0.003) | 0.142(±0.020) |
| 4200 | 0.027(±0.004) | 0.130(±0.024) |
| 7.5 | 400 | 0.025(±0.003) | - |
| 2200 | 0.018(±0.003) | - |
| 4200 | 0.017(±0.002) | - |

Dashes (-) indicate treatments for which too few embryos survived to hatching for larval respirometry to be done.

Figure 1.3: Metabolic rates plotted with respect to oxygen for embryos (A) and larvae (B). Larval metabolic rates are mass-specific but embryonic ones are not.



Chapter 2 data on routine metabolic rates at different CO2 levels (similar to Ch. 1 levels) and Pcrit, the oxygen level at which metabolic rates become oxygen-dependent (fish are oxygen-limited). As in Ch. 1, larval metabolic rates are mass-specific but embryonic ones are not.

Table 2.2: Mean routine metabolic rates and Pcrit in each experiment and at each CO2 level.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | | Ambient pCO2 | Moderate pCO2 | High pCO2 |
| **Routine Metabolism** | **Embryos** | Exp. 1 | 0.0044(±0.00066) | 0.0036(±0.00075) | 0.0030(±0.00043) |
| Exp. 2 | 0.0018(±0.00034) | 0.0027(±0.00023) | 0.0053(±0.00061) |
| **2dph Larvae** | Exp. 1 | 0.29(±0.041) | 0.28(±0.033) | 0.25(±0.047) |
| Exp. 2 | 0.22(±0.020) | 0.18(±0.0082) | 0.25(±0.028) |
| **5dph Larvae** | Exp. 1 | 0.23(±0.016) | 0.17(±0.014) | 0.23(±0.022) |
| Exp. 2 | 0.21(±0.026) | 0.23(±0.012) | 0.14(±0.011) |
| **Pcrit** | **Embryos** | Exp. 1 | 2.44(±0.54) | 3.01(±0.44) | 2.80(±0.32) |
| Exp. 2 | 1.90(±0.21) | 1.90(±0.32) | 2.51(±0.23) |
| **2dph Larvae** | Exp. 1 | 2.04(±0.25) | 1.56(±0.21) | 1.21(±0.26) |
| Exp. 2 | 1.23(±0.29) | 1.42(±0.23) | 1.34(±0.31) |
| **5dph Larvae** | Exp. 1 | 1.23(±0.18) | 0.94(±0.11) | 0.72(±0.17) |
| Exp. 2 | 1.99(±0.29) | 1.65(±0.16) | 1.17(±0.16) |

Figure 2.2: Routine metabolic rates with respect to CO2 at embryo (A), 2-dph larval (B), and 5-dph larval (C) stages.

A diagram of a graph

Description automatically generated with medium confidence

Figure 2.4: Pcrit with respect to CO2 at embryo (A), 2-dph larval (B), and 5-dph larval (C) stages.

A diagram of a graph

Description automatically generated with medium confidence

Lactate mechanism: Getting more energy out of glycolysis but less per input because increase lactate, would change yield coefficient

IGFBP-1 mechanism:

-reduction in demand for sugar if acts like insulin

-in later embryo and larvae, cell demands energy from blood and this reduces demand

-resource + oxygen turns ATP into growth

-oxygen consumption isn’t reduced

-Maybe oxygen is negligible in the growth SU and it’s a single substrate SU

-inhibitor can bind, or it can reduce absorption of substrate, can slow down either binding or conversion.

-Equation 6 for reaction rate, almost Michaelis menten, inhibitor types can either be a multiplier to first or second term. Would be easy to reformulate correction factor. It would have a more transparent connection to DEB concepts.

-Theres another formula that would come from equation 8

-inhibition coefficient is what we would estimate

-can include the inhibition vs damage justification in the paper