The above figure shows that expired ventilation (VE) increases rapidly at beginning of exercise and then slowly rise toward a steady-state value.

Also, it shows that arterial tension of PO2 and PCO2 didn’t change too much during this type of exercise. However, we can see that arterial PO2 decreases and arterial PCO2 tends to increase little in the transition from rest to steady-state exercise.
These results suggest that the increase in alveolar ventilation at the beginning of exercise is not as rapid as the increase in metabolism.

**Prolonged Exercise in a Hot Environment**

The above figure shows that prolonged exercise in the two different environments that cool/low-relative-humidity environment and hot/high-humidity environment.

The major point of this figure is that ventilation tends to go up during prolonged exercise. This is because blood temperature is increased, directly affecting the respiratory control center.

Also, arterial PCO2 shows little difference in the two environments. This result suggests that a rise in ventilation during exercise in the heat/humid environment is due to an increase in breathing frequency and dead-space ventilation.
**Dead-space ventilation**: Not all air can get into alveoli where the O2 and CO2 exchange. The part of air that is left in the upper respiratory tract does not exchange gas.

**Incremental Exercise**
The above figure shows that an elite male distance runner and an untrained college student during and incremental exercise test. This exercise results in a linear increase in ventilation up to 50% to 75% of O2 max and this has been called the ventilator threshold (Tvent).

In the above figure, there are differences between two subjects to arterial PO2 during heavy exercise. An untrained subject can maintain PO2 level, but, a trained subject decreases at near-maximal work. This reduction in arterial PO2, can be observed in some of healthy, trained athletes who show this marked hypoxemia. This is because both ventilation-perfusion are mismatched and diffusion limitation contributes to exercise-induced hypoxemia in elite athletes. (ventilation-perfusion mismatch is an imbalance between alveolar ventilation and pulmonary capillary blood flow). Reduced amount of time that red blood cells spend in the pulmonary capillary can be caused to diffusion limitation during intense exercise in elite athletes. This short time of red blood cell in the pulmonary capillary is because of high cardiac outputs and short time required for gas equilibrium to be achieved between the lung and blood.

REFERENCE

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