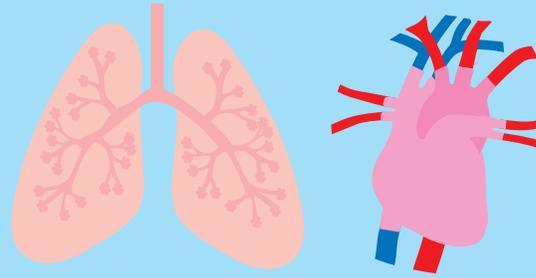


The activities in this family guide are adapted from actual experiments conducted on Everest in 2007 by Dr. Mike Grocott, Dr. Denny Levett and the rest of the Caudwell Xtreme Everest team. Their goal: to save lives in the intensive care units where they work, through a better understanding of how the body reacts to low oxygen levels. On January 8, 2009, the *New England Journal of Medicine* published "Arterial Blood Gases and Oxygen Content in Climbers on Mt. Everest." The scientists measured the lowest human blood oxygen level ever recorded. For more information, visit xtreme-everest.co.uk. For updates on the scientists' research or more family guides from this series, email jboxer@slsc.org. And don't miss *Return to Everest*, a giant screen film from MacGillivray Freeman coming in 2012.

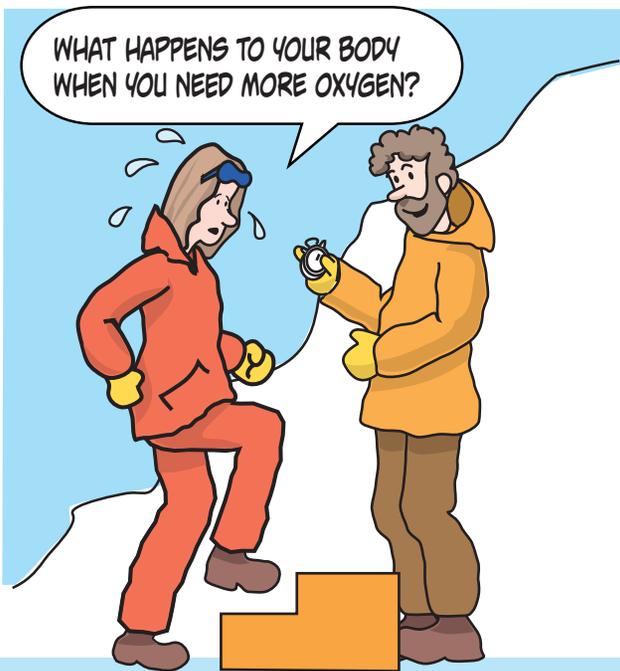
written by Jennifer Boxer
illustrated by Dennis Smith



What happens to your body when you need more oxygen?

In respiration, the lungs give your body oxygen it needs for any activity, even lying around. The average respiration or breathing rate, if your age is 7 years or older, is 12 to 24 breaths per minute. If you are doing a step test, your body is working and so you need more oxygen. Your lungs take in more air and your respiration rate goes up. When you feel your pulse, you are feeling the throbbing of your arteries as your heart muscle pumps blood through your body. If your age is 10 years or older, the average pulse rate is in the range of 60 to 100 beats per minute. Your pulse speeds up when you play basketball because your heart moves more oxygen to your organs through your blood. Xtreme Everest scientists are testing the hypothesis that when people are in low oxygen conditions, their bodies change the way they use oxygen and cells of organs become more efficient at using the small amount of oxygen they have.

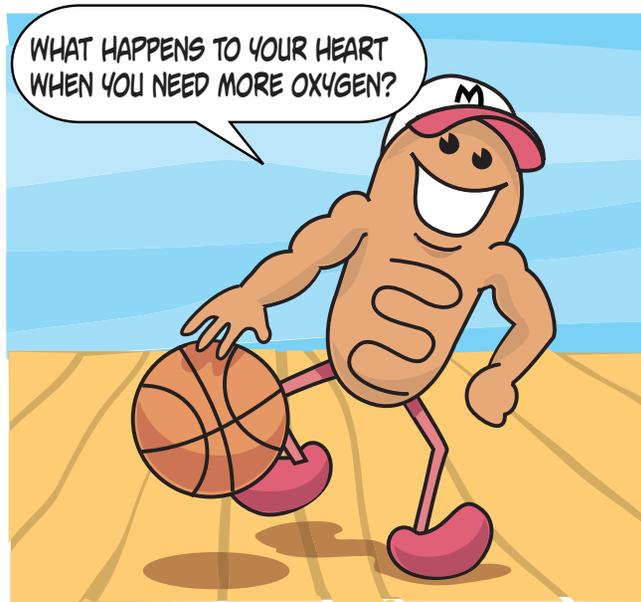




You will need:

stopwatch, stair steps or a small platform about 12" high that you can step on, a partner

- The first part of this activity is very relaxing. All you have to do is set your stopwatch for 60 seconds, lie quietly on the floor, push the start button and count how many times you breathe in and out.
- The number of breaths you take in a minute is your respiration or breathing rate. How do you think it will change after you exercise?
- Now, set the stopwatch for 2 minutes and go up and down the stair, saying "up, up, down, down, up, up, down, down" to keep an even rhythm. When 2 minutes are up, stop and check your respiration rate again. How has it changed?
- Repeat the same activity, but this time it's your partner's turn. How do your respiration rates compare?
- What do the changing respiration rates tell you that your body is doing?



You will need:

stopwatch, basketball, room to run, a partner

- To feel your pulse, put your index and middle finger on the inside of your wrist. When you get the beat, ask your partner to time you with the stopwatch.
- When your partner says "go," start counting every time you feel a beat. Ask your partner to say "stop" after 15 seconds.
- To find out your beats per minute, multiply your number by 4. Athletes have such strong hearts that their pulse can be as low as 40 beats per minute.
- Now, grab your basketball and dribble and run for one minute. When one minute is up, sit back down and take your pulse again. What is your number this time?
- Repeat the same activity, but this time it's your partner's turn. How do your pulse rates compare?
- The heart is a hard-working muscle. Don't believe it? Try squeezing your hand as many times per minute as your pulse rate. Your heart muscle has to do that all the time, without taking any breaks!



You will need:

your curiosity, a doctor, nurse or science center staff person who can show you how medical equipment works

- The pulse oximeter measures your heart rate and how much oxygen is in your blood. It clips onto your finger. A normal oxygen level is in the high 90s. On Everest, they measured the lowest human blood oxygen reading ever recorded.
- The blood pressure cuff measures how well your heart is pumping. When the cuff squeezes your arm, the blood flow is cut off for a little while. When it releases, the doctor uses the stethoscope to listen to it starting to flow again. A blood pressure reading might be 120/80. 120 is the flow under pressure, and 80, when relaxed.
- The Xtreme Everest scientists used a special exercise bike at their lab in England and on Everest to measure how the body reacts to heavy exercise at sea level and at 29,000 feet.
- When you or a family member is at the doctor's office, ask about the medical equipment you see around you. To find out more about the Xtreme Everest experiments, visit xtreme-everest.co.uk.