



Science with A Spark

Fun, Practical Learning for Homeschoolers

Environmental Health: From Exposure to Effect

A year-long environmental science course that follows pollutants, toxins, radiation, and climate stressors from the outside world into the body — tracing how each exposure reaches and damages specific organ systems. Each semester includes three hands-on labs and an independent student project. (Full Credit, HS)

1st Semester

Unit 1: Air Pollution and the Respiratory System

- Week 1: Students learn how the respiratory system works and what PM2.5 and ground-level ozone are — and why they matter once they're inside your lungs.
- Week 2: Students explore how repeated exposure damages airways and lung tissue, the role of inflammation, and the long-term health risks of chronic air pollution exposure.
- Week 3: Respiratory System Lab — students measure airflow through model lungs representing different mechanisms of respiratory damage and connect the data to how each condition physically changes lung function.

Unit 2: Microplastics and the Digestive & Urinary System

- Week 4: Students learn what microplastics are, where they come from, and how they enter the food and water supply through multiple environmental pathways.
- Week 5: Students explore how the digestive and urinary systems process ingested particles, what happens when particles cannot be broken down or excreted, and where microplastics accumulate in tissue.
- Week 6: Microplastics Lab — students filter simulated water samples from multiple sources, examine residue under magnification, and compare particle counts to evaluate what the results mean for everyday exposure.

Unit 3: UV Radiation and the Skin

- Week 7: Students learn about the electromagnetic spectrum, the difference between UV-A and UV-B, how the ozone layer filters incoming radiation, and why thinning ozone raises the stakes for skin damage.

- Week 8: Students explore how UV radiation penetrates skin layers and damages DNA, how melanin provides protection and why it varies, and how cellular repair mechanisms work and when they fail.
- Week 9: UV Protection Lab – students test which materials block UV radiation using UV-sensitive beads and a blacklight, then investigate whether water exposure compromises sunscreen effectiveness.

Independent Project & Semester Wrap Up

- Week 10: Students identify one environmental pollutant or stressor present in their daily life, research which body system it targets, how it causes harm, and what is currently known about safe or risky exposure levels.
- Week 11: Students present their findings – see the Independent Project Guide.
- Week 12: Review – Game Show Style

2nd Semester

Unit 4: Heavy Metals and the Nervous System

- Week 1: Students learn what heavy metals are, how they are concentrated through industrial activity, and how they enter the body through multiple pathways.
- Week 2: Students explore how heavy metals cross the blood-brain barrier, disrupt neurotransmitter signaling, and cause developmental and neurological damage – using Flint, Michigan as a detailed case study in what happens when lead enters a water supply.
- Week 3: Water Testing Lab – students test and compare water samples from multiple sources, then connect their results to what they learned about how contaminants enter the body.

Unit 5: Endocrine Disruptors and the Hormonal System

- Week 4: Students learn how the endocrine system works, what hormones regulate, and how feedback loops keep the system in balance.
- Week 5: Students explore chemical mimicry – how environmental compounds like BPA, phthalates, and pesticides interfere with hormone signaling – and why timing of exposure often matters more than dose.
- Week 6: Endocrine Disruptor Lab – students analyze the ingredients in a personal care product against an endocrine disruptor database, then test how chemical properties determine what the body absorbs.

Unit 6: Climate, Heat, and the Cardiovascular System

- Week 7: Students learn how the cardiovascular system regulates body temperature through vasodilation, blood flow redistribution, and sweat production – and what happens physiologically when heat stress overwhelms those mechanisms.
- Week 8: Students explore climate change and rising temperatures, urban heat islands, and cardiovascular mortality data from major heat events – examining what the numbers reveal about heat as a public health threat.
- Week 9: Heat Stress Lab – students measure heart rate, oxygen saturation, and skin temperature at rest, immediately after exercise, and at intervals through recovery, then graph their recovery curves and connect the patterns to the cardiovascular mechanisms from this unit.

Independent Project & Semester Wrap Up

- Week 10: Students research one environmental health issue affecting their community or a community of their choosing, identifying the pollutant, the body system it targets, what is known about health outcomes, and what is or isn't being done about it.
- Week 11: Students present their findings – see the Independent Project Guide.
- Week 12: Review – Game Show Style

Ready to dive in? Start with Semester 1 and follow the science from your first breath of city air all the way to the heat your heart feels on a summer afternoon. Enroll through STEP-UP.