Air Pollution, Oxidative Stress, & Antioxidants

The M-LEEaD Center's Community Engagement Core (CEC) increases awareness and understanding of environmental impacts on human health.

Stakeholder Advocacy Board members include:

- Community Health and Social Services
- Detroit Health Department
- Detroit Hispanic Development Corporation
- Detroiters Working for Environmental Justice
- Eastside Community Network
- Ecology Center
- Henry Ford Health System
- Imagine Creative Opportunities Now
- Michigan Environmental Justice Coalition
- We the People of Detroit

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Air Pollution comes from many different sources. In Detroit, the Michigan Department of Environment, Great Lakes, and Energy tracks air pollution at about 60 industrial facilities— including an oil refinery, steel mills, wastewater treatment plant, and many manufacturing sites.[1] Also, as the largest land border crossing in the U.S., Detroit has a network of border plazas, highways, railways, and intermodal sites to support transport of goods on ships, trucks, and trains.[2] [3] These industrial facilities and this transportation network produce pollutants such as particulate matter, nitrogen oxides, sulfur dioxide, and carbon dioxide.[4] [5] This air pollution can increase oxidative stress in the human body [6] [16]

Oxidative stress occurs when there is an imbalance in our cells due to either an increase in free radicals and/or a decrease in antioxidants.[7] Pollution from industrial and transportation sources may increase the amount of free radicals in the body.[7] [8] Over time this disruption in the balance between free radicals and antioxidants can injure our tissues. Oxidative stress has been linked to a number of illnesses, including some forms of cancer, cardiovascular disease, obesity, diabetes, Alzheimer's disease, eye diseases, and lupus.[6] [7] [12] Intake of antioxidants may help to prevent or reduce oxidative stress in the human body.[9]

Antioxidants are a class of substances, including Vitamin C, E, and beta-carotene, that can counter free radicals. Foods rich in antioxidants include many berries, nuts, beans, and vegetables. Research is underway to find out if and how antioxidant supplement pills counter oxidative stress. Most experts agree that eating foods rich in antioxidants is an effective way to prevent or reduce oxidative stress.[9] [10] [11]

Why is Policy Change Important?

Policymakers play a key role in supporting environments that allow us to be healthy. On the following page we build on the body of evidence about oxidative stress to suggest several policy goals that could help to reduce oxidative stress and its health effects in Michigan. Based on research findings from scholars at the University of Michigan and elsewhere, the following policies could help to reduce oxidative stress and its related health effects in Detroit and Southeast Michigan.

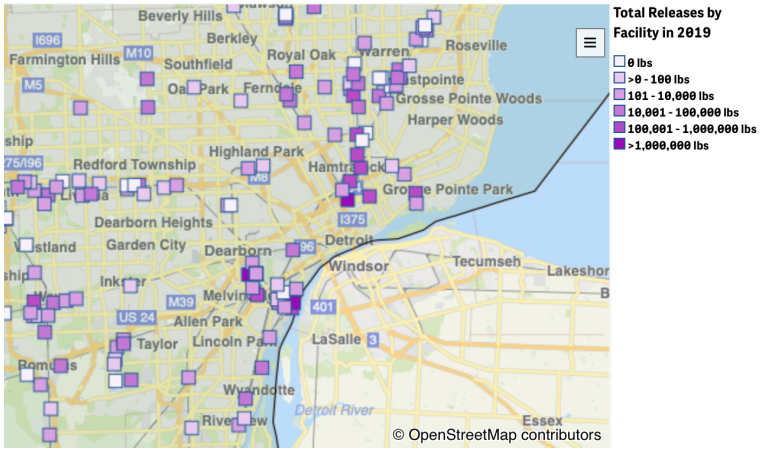
Decrease exposure to air pollution from industrial and transportation sources to reduce oxidative stress [6] [12] [17]:

- Require and enforce reduced emissions from industrial sources;
- Create and enforce truck routes that avoid residential neighborhoods;
- Develop zoning regulations to ensure industry and high traffic areas are not developed near homes, schools, parks, day care centers, and residential neighborhoods;
- Retrofit diesel engines, reduce idling, and implement other strategies to reduce traffic emissions;
- Develop and enforce regulations that limit bus and car idling outside of schools;
- Require and incentivize buffers, including sound walls, trees and other vegetation between pollutant sources (e.g. freeways, industries) and homes, schools or health care facilities nearby.

Increase availability of antioxidants to counter air pollution's effects on oxidative stress [10] [11] [13] [14] [15]:

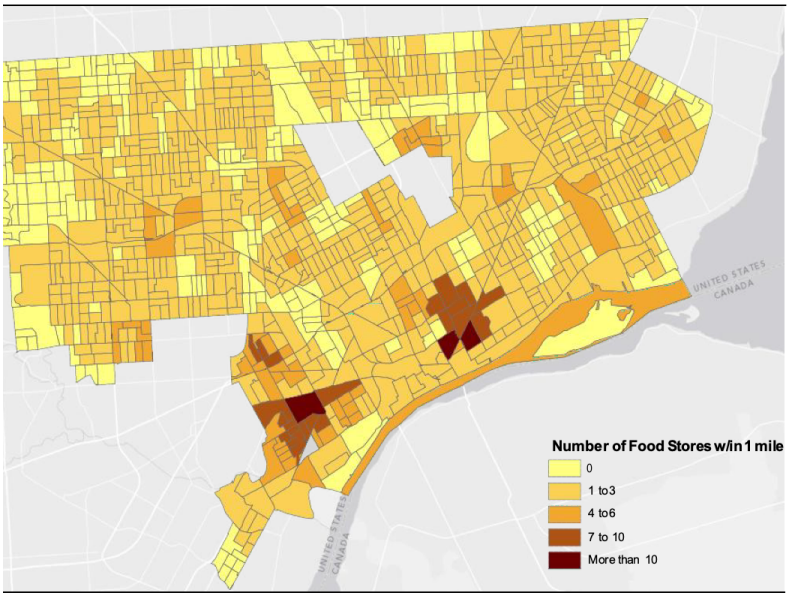
- Provide financial incentives to full service grocers to locate in regions with poor food access and poor air quality;
- Provide financial incentives for small grocers and markets to carry foods rich in antioxidants and participate in food assistance programs (e.g., SNAP);
- Support urban gardening initiatives, providing education and resources for soil testing and remediation;
- Develop school policies that require healthy food options for breakfast, lunch, and after school programs;
- Fund agencies involved in nutrition education, food assistance, and food delivery programs, to increase access to, and knowledge of, antioxidants.

Major Industrial & Transportation-Related Sources of Air Pollution in Detroit, Michigan



The symbols indicate the pounds of toxic chemicals released by facilities in the area. The Toxic Release Inventory tracks chemicals that cause, cancer or other chronic human health effects, significant adverse acute human health effects, and significant adverse environmental effects.
Source: Toxic Release Inventory, U.S. Environmental Protection Agency (2019).

Food Store Density by Census Tract in Detroit, Michigan



Source: Michigan Department of Agriculture, 2012

Please see http://mleead.umich.edu/Coec_Fact_Sheets.php for the citations included in this factsheet.

The *Michigan Lifestage Environmental Exposure and Disease (M-LEEaD) Center promotes collaboration among UM environmental health researchers and communities. Researchers work together to advance knowledge of environmental health issues that affect community members in Detroit and Southeast Michigan.*
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