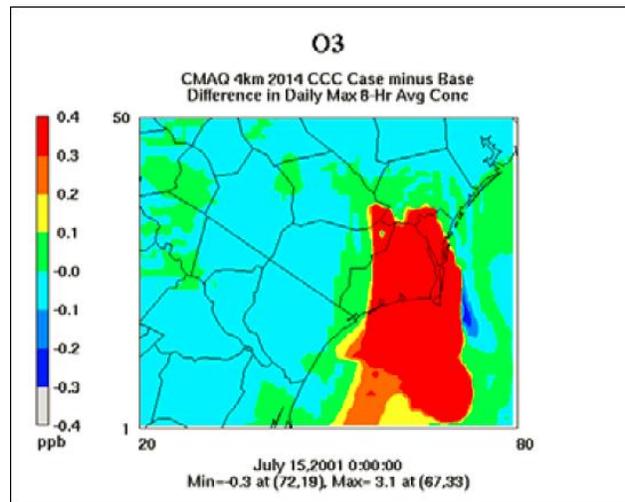


## Health Effects of Cement Kiln Pollution on Cardiovascular Disease

Emissions from Titan's Cement plant carry the potential to cause a wide range of detrimental health effects, especially with regards to cardiovascular disease. A type of microscopic soot known as fine particulates is perhaps the most damaging form of pollution that Titan plans to emit at its Castle Hayne facility, and a multitude of studies in the past decade have conclusively found it to be a direct cause of cardiovascular disease.<sup>1</sup> Although New Hanover County's average fine particulate levels are currently within EPA guidelines,<sup>2</sup> they have often reached levels at which harmful health effects have been documented in humans,<sup>3</sup> and could put air concentrations in excess of more stringent, health-based standards finalized by the EPA in January 2013.<sup>4</sup> According to a 2011 independent health study by ICF International, Titan's permitted annual release of 160 tons of fine particulates (or 877 pounds emitted daily) is expected to increase the region's rate of cardiovascular disease.<sup>5</sup>

- According to the EPA, numerous scientific studies have linked particle pollution exposure to a variety of cardiovascular problems, including premature death in people with heart disease, heart attacks, and irregular heartbeat.<sup>6</sup>
- The EPA's Integrated Science Assessment for Particulate Matter, released in 2010, concluded that short-term exposure to fine particulates was a direct cause of cardiovascular effects and premature death.<sup>7</sup> An independent analysis of Titan's health impacts by ICF International concluded that approximately one premature death could be expected per year as a result of Titan's permitted emissions of particulate matter.<sup>8</sup>
- According to the New Hanover County Health Department, over 25% of deaths in New Hanover County resulted from heart disease in 2011.<sup>9</sup> Additionally, the American Lung Association's 2012 State of the Air Report estimates that 52,000 people in New Hanover County already suffer from some form of cardiovascular disease.<sup>10</sup>
- A landmark study by Brook, et al. in 2010 found that exposure to fine particulates over just a few hours to weeks can trigger heart attacks and other cardiovascular problems. Longer-term exposure at high levels was found to reduce life expectancy by several months to a few years. The good news was that reductions in fine particulate levels were associated with decreases in cardiovascular mortality within a time frame as short as a few years.<sup>11</sup>
- A 2012 study published in *Environmental Health Perspectives* by Crouse, et al. used nationwide data to evaluate the risk of mortality associated with long-term exposure to fine particulates. They found a strong connection between cardiovascular-related deaths and levels of fine particulates well below those already being recorded in the Castle Hayne area.<sup>12</sup> Based on data from this study and a 2011 analysis of Titan's health impacts,<sup>13</sup> people residing near Titan's plant could expect as much as a 2.4% increase in deaths from ischemic heart disease as a result of Titan's particulate plume.

- In 2012, Mustafic, et al. released a study showing that short-term exposure to high levels of nitrous oxides, sulfur dioxide, fine and coarse particulates, and carbon monoxide were significantly associated with increases in heart attack risk.<sup>15</sup> Aside from sulfur dioxide, Titan would be the county's second-largest source for each of these pollutants.
- A 2012 study by Devlin, et al. found that high exposure to ozone in humans showed increases in compounds that indicate the kind of inflammation that plays major role in heart disease. Researchers also observed decreases in proteins that can dissolve blood clots that may form along artery walls and observable changes in heart rhythm.<sup>16</sup>
- Additionally, Titan is permitted to emit over 3,000 tons of carbon monoxide per year, making it the second-largest stationary source in New Hanover County. The EPA states that carbon monoxide is particularly harmful to people with heart disease, clogged arteries, or congestive heart failure because it significantly limits the blood's ability to carry oxygen. For a person with heart disease, exposure to even low levels of carbon monoxide may cause chest pain, increased heart rhythm irregularities and make it difficult to exercise.<sup>17</sup>



This figure, from a 2011 health report conducted by ICF International, shows the expected emission "plume" from Titan Cement, in this case ozone. While the plant's fine particulate emissions are expected to play a larger role in heart disease associated with the added pollution, studies have also linked ozone to serious cardiovascular complications.<sup>14</sup>

<sup>1</sup> US Environmental Protection Agency. Integrated Science Assessment for Particulate Matter (Final Report). US Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, 2009.

<sup>2</sup> ICF International, 2011. Air Quality and Health Impacts Assessment for Southeastern North Carolina.

<http://stoptitan.org/resources/documents/ICFPublicHealthReport.110711.pdf>

<sup>3</sup> Brook et al., 2010. Particulate Matter Air Pollution and Cardiovascular Disease: An Update to the Scientific Statement from the American Heart Association.

*Circulation: Journal of the American Heart Association.*

<sup>4</sup> US Environmental Protection Agency, 2013. 40 CFR Parts 50, 51, 52 et al.:

National Ambient Air Quality Standards for Particulate Matter; Final Rule. Federal Register, Vol. 78. <http://www.gpo.gov/fdsys/pkg/FR-2013-01-15/pdf/2012-30946.pdf>

<sup>5</sup> ICF International, 2011. Air Quality and Health Impacts Assessment for Southeastern North Carolina.

<http://stoptitan.org/resources/documents/ICFPublicHealthReport.110711.pdf>

<sup>6</sup> US Environmental Protection Agency, 2013. Particulate Matter Health Effects. <http://www.epa.gov/pm/health.html>

<sup>7</sup> US Environmental Protection Agency. Integrated Science Assessment for Particulate Matter (Final Report). US Environmental Protection Agency, Washington, DC, EPA/600/R-08/139F, 2009.

<sup>8</sup> ICF International, 2011. Air Quality and Health Impacts Assessment for Southeastern North Carolina.

<http://stoptitan.org/resources/documents/ICFPublicHealthReport.110711.pdf>

<sup>9</sup> New Hanover County Health Department, 2012. 2012 State of the County Health Report. <http://www.nhcgov.com/Health/health-reports/Documents/2012%20State%20of%20The%20County%20Health%20Report>.

<sup>10</sup> American Lung Association, 2012. State of the Air Report. <http://www.stateoftheair.org/2012/states/north-carolina/new-hanover-37129.html>

<sup>11</sup> Brook et al., 2010. Particulate Matter Air Pollution and Cardiovascular Disease: An Update to the Scientific Statement from the American Heart Association.

*Circulation: Journal of the American Heart Association.*

<sup>12</sup> Crouse, Dan L., et al., 2012. Risk of Nonaccidental and Cardiovascular Mortality in Relation to Long-term Exposure to Low Concentrations of Fine Particulate Matter: A Canadian National-Level Cohort Study. *Environmental Health Perspectives.*

<sup>13</sup> ICF International, 2011. Air Quality and Health Impacts Assessment for Southeastern North Carolina.

<http://stoptitan.org/resources/documents/ICFPublicHealthReport.110711.pdf>

<sup>14</sup> Devlin, Robert B., et al., 2012. Controlled Exposure of Healthy Young Volunteers to Ozone Causes Cardiovascular Effects. *Circulation: Journal of the American Heart Association.* <http://circ.ahajournals.org/content/early/2012/05/18/CIRCULATIONAHA.112.094359.full.pdf>

<sup>15</sup> Mustafic, Hazrije, et al., 2012. Main Air Pollutants and Myocardial Infarction: A Systematic Review and Meta-analysis. *Clinical Review.*

[http://cleanaircarolina.org/wp-content/uploads/2012/06/2012\\_myocardial-infarction\\_research.pdf](http://cleanaircarolina.org/wp-content/uploads/2012/06/2012_myocardial-infarction_research.pdf)

<sup>16</sup> Devlin, Robert B., et al., 2012. Controlled Exposure of Healthy Young Volunteers to Ozone Causes Cardiovascular Effects. *Circulation: Journal of the American Heart Association.* <http://circ.ahajournals.org/content/early/2012/05/18/CIRCULATIONAHA.112.094359.full.pdf>

<sup>17</sup> US Environmental Protection Agency, 2009. Factsheet: Environmental Hazards Weigh Heavy on the Heart.

[http://www.epa.gov/aging/resources/factsheets/ehwhh/ehwhh\\_english\\_100-F-09-043.pdf](http://www.epa.gov/aging/resources/factsheets/ehwhh/ehwhh_english_100-F-09-043.pdf)