



# C8 Science Panel

## C8 Probable Link Reports

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One part of the Settlement was the creation of a Science Panel, consisting of three epidemiologists, to conduct research in the community in order to evaluate whether there is a probable link between PFOA exposure and any human disease. A "probable link" in this setting is defined in the Settlement Agreement to mean that given the available scientific evidence, it is more likely than not that among class members a connection exists between PFOA exposure and a particular human disease. In each case a report was prepared and filed with the Court, with the conclusion and a summary of the evidence for it. The reports were submitted several at a time on four occasions. These are listed below with links to the full submitted reports.

### October 29, 2012

Below are summaries and links to five probable link evaluation reports submitted to the Wood County Court in Parkersburg, West Virginia under the C8 Settlement.

#### Probable Link Evaluation of Heart Disease

Heart diseases considered in this Probable Link Evaluation are diagnosed high blood pressure (hypertension), diagnosed high cholesterol (hypercholesterolemia), and coronary artery disease.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is a probable link between exposure to C8 (also known as PFOA) and diagnosed high cholesterol, but there is not a probable link between exposure to C8 and diagnosed hypertension or coronary artery disease.

**Download Report:** [Probable Link Evaluation of Heart Disease](#)

#### Probable Link Evaluation of Kidney Disease

Chronic kidney disease is diagnosed when the kidneys lose their ability to effectively remove waste and excess fluids from the body. Chronic kidney disease and end-stage renal disease are rare conditions. Chronic kidney disease can be classified from blood tests as a reduced estimated glomerular filtration rate ( $<60 \text{ mL/minute}/1.73\text{m}^2$ ). This evaluation does not include kidney cancer which the C8 Science Panel has considered and determined there is a probable link between kidney cancer and PFOA.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and chronic kidney disease.

**Download Report:** [Probable Link Evaluation of Kidney Disease](#)

#### Liver Disease

Two classifications of liver disease are presented in this evaluation: all liver diseases (including hepatitis) and a narrower group comprising enlarged liver, fatty liver disease (both alcoholic and non-alcoholic) and cirrhosis. Liver cancer is not included as the C8 Science Panel previously considered this with other cancers.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and liver disease.

**Download Report:** [Probable Link Evaluation of Liver Disease](#)

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### **Probable Link Evaluation of Osteoarthritis**

Osteoarthritis is a progressive disorder of the joints caused by gradual loss of cartilage, resulting in joint pain and stiffness. It is quite common as people age and affects a sizable proportion of the population to varying degrees. Rheumatoid arthritis was not considered in this evaluation as it was previously considered by the Science Panel in the Probable Link report regarding autoimmune disease.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and osteoarthritis.

**Download Report:** [Probable Link Evaluation of Osteoarthritis](#)

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### **Probable Link Evaluation of Parkinson's Disease**

Parkinson's disease is a neurological disorder of the brain that leads to shaking (tremors) and difficulty with walking, movement, and coordination. Although it is rare, it is the one of the most common of the neurodegenerative disorders. Other major neurodegenerative diseases not evaluated are the quite rare amyotrophic lateral sclerosis (AML, also known as Lou Gehrig's disease) and Alzheimer's disease, both of which could not be assessed effectively using any of the study designs that were available.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and Parkinson's disease.

**Download Report:** [Probable Link Evaluation of Parkinson's Disease](#)

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### **July 30, 2012**

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Below are summaries and links to six probable link evaluation reports submitted to the Wood County Court in Parkersburg, West Virginia under the C8 Settlement.

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### **Probable Link Evaluation of Autoimmune Disease**

Autoimmune diseases are diseases in which one's body's immune system attacks oneself. These diseases are generally relatively rare. They are not usually fatal but are incurable diseases which cause serious chronic discomfort and may be disabling. We considered the five most common autoimmune diseases that occur in the Mid-Ohio Valley. It should be noted that some of these diseases, such as inflammatory bowel disease, are likely to involve both auto-immunity and other non-autoimmune processes.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is a probable link between exposure to C8

(also known as PFOA) and ulcerative colitis, and find no probable link between PFOA and any of the other autoimmune diseases (rheumatoid arthritis, lupus, type1 diabetes, Crohn's disease, or multiple sclerosis).

**Download Report:** [Probable Link Evaluation of Autoimmune Disease](#)

The detailed results summarized in the probable link report have now been published in an open access paper: Steenland K, Zhao L, Winqvist A, Parks C. Ulcerative colitis and perfluorooctanoic acid (PFOA) in a highly exposed population of community residents and workers in the mid-Ohio valley. Environ Health Perspect. 2013 Aug;121(8):900-5.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3734500/pdf/ehp.1206449.pdf>

Also provided here is some [supplementary information](#) on exposure levels used in the categorical analyses in the paper.

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**Probable Link Evaluation of Infectious Disease**

Common infections include coughs, colds, flu, and other infections. These infections were classified into different categories according to severity, site, and probable etiology. In terms of severity, infections were defined as minor/seasonal (cold, sinus infection, flu, and sore throat), medium severity (cold sore, bronchitis, ear, tooth, mouth, gastrointestinal, and skin infection), and severe infections (pneumonia, shingles, and meningitis). Respiratory infections included cold, sinus infection, flu, sore throat, bronchitis and pneumonia; gastrointestinal infections included mouth, tooth and gastrointestinal tract infection; "other sites" included cold sore, shingles, meningitis, and ear and skin infections. Infections were also classified as of viral/probable viral aetiology (cold, sore throat, flu, cold sore, bronchitis, shingles, ear and gastrointestinal infections) and of bacterial/probable bacterial aetiology (sinus, mouth, tooth, and skin infections).

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and common infections, including influenza, in children or adults.

**Download Report:** [Probable Link Evaluation of Infectious Disease](#)

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**Probable Link Evaluation of Neurodevelopmental Disorders in Children**

The Science Panel addressed the possibility that PFOA may affect risk of neurodevelopmental disorders in children, including attention deficit hyperactivity disorder (ADHD) and learning disabilities. We assessed IQ; reading and math skills; language, memory and learning; visual-spatial processing; and attention using standardized instruments for measuring these realms.

On the basis of epidemiologic and other data available to the C8 Science Panel, we conclude that there is a not probable link between exposure to C8 (also known as PFOA) and neurodevelopmental disorders in children, including attention deficit disorders and learning disabilities.

**Download Report:** [Probable Link Evaluation of Neurodevelopmental Disorders in Children](#)

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**Probable Link Evaluation of Respiratory Disease**

Asthma and COPD (chronic obstructive pulmonary disease or chronic obstructive airways disease) are both inflammatory lung diseases and although acute exacerbations may be triggered by viral or bacterial

infections, the etiology of the diseases is thought to be primarily non-infectious. Asthma is an immune-mediated inflammatory disease.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and asthma or chronic obstructive airways disease (COPD).

**Download Report:** [Probable Link Evaluation of Non-infectious Lung Disease \(Asthma and Chronic Obstructive Pulmonary Disease - COPD\)](#)

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### **Probable Link Evaluation of Stroke**

This report considers stroke, also referred to as a cerebrovascular accident, which is defined as the sudden death of brain cells resulting from inadequate blood flow. This can result from blockage of an artery supplying blood to the brain or leakage of blood into the brain tissue. Symptoms vary and may include paralysis, loss of speech or memory, and loss of consciousness.

On the basis of epidemiologic and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and stroke.

**Download Report:** [Probable Link Evaluation of Stroke](#)

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### **Probable Link Evaluation of Thyroid Disease**

Thyroid hormones play important roles in regulating metabolism, growth, and development. The pituitary gland produces thyroid-stimulating hormone which regulates the production of thyroid hormones, as needed. There are several major disorders of the thyroid gland, but the most common ones are hypothyroidism and hyperthyroidism. Hypothyroidism is a condition in which the thyroid gland does not make enough thyroid hormone, i.e. the thyroid gland is under-active. In contrast, if the thyroid is too active, it makes more thyroid hormones than the body needs; this disease is known as hyperthyroidism.

On the basis of epidemiological and other data available to the C8 Science Panel, we conclude that there is a probable link between exposure to C8 (also known as PFOA) and thyroid disease.

**Download Report:** [Probable Link Evaluation of Thyroid Disease](#)

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### **April 16, 2012**

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Below are summaries and links to two probable link evaluation reports submitted to the Wood County Court in Parkersburg, West Virginia under the C8 Settlement.

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### **Probable Link Evaluation of Cancer**

On the basis of epidemiologic and other data available to the C8 Science Panel, we conclude that there is a probable link between exposure to C8 (also known as PFOA) and testicular cancer and kidney cancer but not any of the other cancers that were considered.

**Download Report:** [Probable Link Evaluation of Cancer](#)

(Note this report was replaced with an updated version on 28 Nov 2012, which corrects a typographic error on page 8)

The detailed results summarized in the probable link report have now been published in an open access paper: Barry V, Winquist A, Steenland K. Perfluorooctanoic acid (PFOA) exposures and incident cancers among adults living near a chemical plant. Environ Health Perspect. 2013 Nov-Dec;121(11-12):1313-8.  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3855514/pdf/ehp.1306615.pdf>

Also provided is some [supplementary information](#) on exposure levels used in the categorical analyses in the paper.

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### **Probable Link Evaluation of Diabetes**

On the basis of epidemiologic and other data available to the C8 Science Panel, we conclude that there is not a probable link between exposure to C8 (also known as PFOA) and Type II (adult-onset) diabetes.

**Download Report:** [Probable Link Evaluation of Diabetes](#)

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### **December 5, 2011**

Below are summaries and links to four probable link evaluation reports submitted to the Wood County Court in Parkersburg, West Virginia under the C8 Settlement.

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### **Probable Link Evaluation of Birth Defects**

Birth defects are structural malformations in the infant that arise during fetal development. The evidence to evaluate the probable link between PFOA exposure and birth defects comes from various studies, making use of the C8 Health Project data such as serum PFOA levels and self-reported birth defects, and historically estimated PFOA levels. Limited evidence for an increased risk of congenital heart defects with increased estimated serum PFOA was observed in one study, but the Science Panel considered this most likely to be due to chance. In the other studies, either no meaningful associations were found or specific types of birth defects could not be examined due to the small population size.

On the basis of epidemiologic studies and other scientific data available to the C8 Science Panel, the conclusion is that there is not a probable link between exposure to PFOA (C8) and birth defects. For more details, follow the link below.

**Download Report:** [Probable Link Evaluation of Birth Defects](#)

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### **Probable Link Evaluation of Pregnancy-Induced Hypertension and Preeclampsia**

Pregnancy-induced hypertension is defined as significantly elevated blood pressure that begins after the 20th week of pregnancy. Preeclampsia is a specific type of pregnancy-induced hypertension, which is accompanied by leakage of protein into the urine. The evidence to evaluate the probable link between PFOA exposure and pregnancy-induced hypertension comes from various studies using data from the C8 Health Project (such as residential data, measured serum PFOA, and self-reported pregnancy conditions), data from birth certificates, and historically estimated serum PFOA levels. While one study found no association between C8 and pregnancy-induced hypertension, other studies showed a small association. There was also evidence of an association between estimated serum PFOA and pregnancy-induced hypertension based on the continuous exposure indicator.

Measured serum PFOA was weakly and irregularly associated with preeclampsia, an association that was strengthened when the analysis was restricted to more recent pregnancies.

On the basis of epidemiologic and other scientific data available to the C8 Science Panel, the conclusion is that there is a probable link between exposure to PFOA (C8) and pregnancy-induced hypertension. For more details, follow the link below.

**Download Report:** [Probable Link Evaluation of Pregnancy-Induced Hypertension and Preeclampsia](#)

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### **Probable Link Evaluation of Miscarriage and Stillbirths**

Pregnancy loss refers to miscarriage and stillbirth, the former defined as loss of pregnancy before 20 weeks of gestation and the latter at 20 weeks gestation or later. The evidence to evaluate the probable link between PFOA exposure and pregnancy loss comes from various Science Panel studies using C8 Health Project and follow-up data (such as measured serum PFOA and self-reported pregnancy loss), WV Health Dept vital records, and historically estimated serum PFOA. The studies found no association (or essentially none) between pregnancy loss and measured or estimated serum PFOA exposure among these pregnancies.

On the basis of epidemiologic and other scientific data available to the C8 Science Panel, the conclusion is that there is not a probable link between exposure to PFOA (C8) and miscarriage or stillbirth. For more details, follow the link below.

**Download Report:** [Probable Link Evaluation of Miscarriage and Stillbirths](#)

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### **Probable Link Evaluation of Preterm Birth and Low Birth Weight**

Preterm birth is defined as early delivery of an infant before completing 37 weeks of gestation. The evidence to evaluate the probable link between PFOA exposure and pregnancy loss comes from various studies, most of which were Science Panel studies, but also included studies from other populations. These studies used, but were not restricted to, data from C8 Health Project and follow-up study (such as measured serum PFOA and self-reported preterm birth), birth certificate records, and historically estimated serum PFOA. Most studies found no association between preterm birth and measured or estimated serum PFOA. An association with early preterm birth and estimated PFOA was found in one study, although the sample size was small. The results from the studies of other populations found little or no association between measured serum PFOA and preterm birth.

On the basis of epidemiologic and other scientific data available to the C8 Science Panel, the conclusion is that there is not a probable link between exposure to PFOA (C8) and preterm birth or low birth weight. For more details, follow the link below.

**Download Report:** [Probable Link Evaluation of Preterm Birth and Low Birth Weight](#)

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