Attachment 19

Expert Report of William J. Meggs, MD, PhD, FACMT, FACEP

In the matter of
New Indy Paper Mill Litigation

I. Introduction

The following is the report of my opinions concerning general medical causation in the New Indy Paper Mill litigation matter, which includes *Kennedy v. New Indy Catawba LLC et al*, 21-cv-01704-SAL (D.S.C) and *United States v. New Indy Catawba LLC*, 21-cv-02053-SAL (D.S.C.)

I am a medical doctor, clinician and researcher specializing in the area of human medical toxicology. I hold an academic appointment as Professor and Chief of the Division of Toxicology at East Carolina University School of Medicine in Greenville, North Carolina. My educational background includes a BS degree in physics from Clemson University, a PhD degree in physics from Syracuse University, and a MD degree in medicine from the University of Miami. I completed a residency in internal medicine at the University of Rochester, a fellowship in allergy and immunology at the National Institutes of Health, and a fellowship in Medical Toxicology at New York University. I am board certified in the specialties of medical toxicity, internal medicine, emergency medicine and allergy and clinical immunology. I have practiced medicine since 1980. My clinical practice concentrates primarily on the diagnosis and treatment of people who have been exposed to toxic substances and allergens. I have undertaken extensive research in the field of toxicology, including research concerning the effects of irritants on the human airway. I am the editor of *Toxicant Induction of Irritant Asthma, Rhinitis, and Related Conditions*, published by Springer Verlag in 2013. I was the recipient of the American College of Medical Toxicology 2010 Award for outstanding contributions to toxicology research. In 2011, I received the East Carolina University Lifetime Achievement Award in Research and Creative Activities. I have contributed approximately one hundred articles and textbook chapters to the medical and scientific literature.
The opinions expressed herein are accurate to a reasonable degree of medical probability. All opinions expressed herein are based on the information currently available, and I reserve the right to supplement the opinions as more information is discovered or becomes available.

A. Scope of Retention

I have been retained by the law firm Schochor, Federico & Staton, PA, 1211 St. Paul Street, Baltimore, MD 21202, to offer an opinion of causation concerning residents exposed to hydrogen sulfide, methyl mercaptan, methyl disulfide and dimethyl disulfide (all four collectively known as Total Reduced Sulfur or TRS) and methanol from the operations of the defendants' pulp and paper mill in Catawba, South Carolina.

II. Opinions

My opinions regarding this case are summarized as follows:

General Causation:
Hydrogen sulfide is a dangerous gas that is produced from decay of organic matter, including the production of pulp using the kraft process and wastewater and sludge lagoons treating wastewater from kraft pulp and paper mills. Both acute and chronic exposures can be dangerous. Hydrogen sulfide is severely irritating to the respiratory tract at low levels, particularly in sensitive populations, and is also a cellular toxin that poisons the ability of cells to oxidase nutrients to produce energy. Acute and chronic exposures cause irritation of the lining of the eyes and respiratory system, leading to shortness of breath, burning of the nose and sinuses, swelling of membranes, impaired oxygen delivery to the blood stream, and fluid accumulation in the lungs. Exposures can cause an offensive odor, sleep disturbance, and olfaction paralysis and fatigue. There is considerable individual variability in the odor threshold for hydrogen sulfide in humans; the thresholds can range from 0.0005 to 0.3 ppm so that many persons have their quality of life negatively impacted by the noxious odor at levels below levels considered safe. Chronic exposure can permanently damage the respiratory system, leading to chronic irritant asthma, rhinitis, and sinusitis. In severe exposures, coma, seizure and death can occur. Even at low levels, exposures can exacerbate pre-existing respiratory conditions such as asthma and are known to lead to increases hospital admissions for respiratory disease. Chronic exposures can cause impairment in neuropsychological function, cognition, and pulmonary function (ATSDR hydrogen sulfide, Kilburn, 1995, 2003, 2012, 2012; Giotti; Micromedex, Hydrogen Sulfide; Richard 1995, Sahar 2010).

Permanent damage caused by exposures to hydrogen sulfide can occur with an acute high dose exposure, recurrent exposures, and chronic exposures. The guidelines for chronic exposure to hydrogen sulfide are extremely low and reflect the horrific danger to humans exposed to even low levels of this noxious gas. The United States Environmental Protection Agency derived a chronic inhalation reference concentration for hydrogen sulfide of only 0.001 parts per million (0.002 mg/meter cubed). This is only 1 part of hydrogen sulfide in a billion parts of air and in essence amounts to any exposure.

Of note, standards do not apply to sensitive populations, including very young children, elderly, and individuals with respiratory diseases such as chronic obstruction pulmonary disease, emphysema, asthma, rhinosinusitis, and inhalational allergies such as pollens, molds, and dust mites. Residents exposed to hydrogen sulfide from slaughterhouse waste lagoons in South Sioux City and Dakota City, Nebraska, had associations between hospital visits for respiratory disease including asthma and hydrogen sulfide levels. On the day after the population experienced high hydrogen sulfide levels (defined as greater than 30 parts per billion, which is less than ATSDR's Minimal Risk Level for hydrogen sulfide of 70 ppb or less averaged over 24 hours) in adults or total sulfide levels in children, hospital visits for asthma increased (Campagna et al., 2004). Nasal symptoms and cough were found to be significantly increased in communities exposed to hydrogen sulfide and other sulfur compounds from a paper mill in South Karelia, Finland, relative to a control community (Jaakkola et al, 1990).

Neurological symptoms reported in exposure to low concentrations of hydrogen sulfide include incoordination, poor memory, hallucinations, personality changes, and anosmia (loss of sense of smell) (ATSDR. Toxicological Profile for Hydrogen Sulfide.). A study compared adverse health effects in two communities exposed to chronic, low-levels of hydrogen sulfide from industrial sources, including waste water treatment ponds, to health effects reported by residents in three reference communities in which there were no industrial sources of hydrogen sulfide. The symptoms related to the central nervous system had the highest iterated odds ratio (i.e., 12.7; 95% confidence interval = 7.59, 22.09), followed by the respiratory category (odds ratio = 11.92; 95% confidence interval = 6.03,25.72), and the blood category (odds ratio = 8.07; 95% confidence interval = 3.64,21.18) (Legator et al, 2001).

Hydrogen sulfide is not stored in the body and does not accumulate in human tissues. However, toxic effects are cumulative with recurrent exposures. When inhaled, hydrogen sulfide causes inflammatory damage to the lining of the respiratory system that then becomes remodeled in such a way that the respiratory system becomes more reactive to subsequent exposures to hydrogen sulfide and other irritants. A feedback loop occurs that continues the damage. Reactive airways dysfunction syndrome (Chronic asthma developing from an exposure) has been reported in association with hydrogen sulfide (Cormier et al., 1996). Hydrogen sulfide is a cellular toxin that causes death of nerve cells. Neurological symptoms become clinically significant when a threshold of nerve damage occurs.

Methyl mercaptan is a noxious gas with a disgusting odor (ATSDR, mercaptan). In addition to the adverse impact on quality of life due to its noxious odor, it is an irritant gas that can irritate mucus membranes in the respiratory system, eyes, and skin (Key et al, 1977).

Methyl disulfide (like dimethyl disulfide) causes "serious" eye irritation and respiratory irritation, (Fisher Scientific, Methyl disulfide Material Safety Data Sheet). It has a noxious odor described as a "stench" that can adversely impact quality of life.

In summary, to a reasonable degree of medical certainty, the exposures to unacceptable levels of hydrogen sulfide, methyl mercaptan, methyl disulfide and dimethyl disulfide (collectively known as Total Reduced Sulfur or TRS) and methanol has caused increased illnesses in the exposed population. Further, the ATSDR's Minimal Risk Level for hydrogen sulfide of 70 ppb or less averaged over 24 hours does not apply to this population. It is not a safe level for sensitive populations. Also, when there are complex mixtures with synergistic toxicities such as the hydrogen sulfide, methyl mercaptan, methyl disulfide and dimethyl disulfide that the plaintiffs were exposed to, there are no established minimum risk level that would be below quoted levels for individual exposures.

III. Materials Reviewed

Documents in Appendix A
Articles cited in Appendix B

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Sept 26, 2021
Date

Appendix A. Materials Reviewed.

Complaint filed June 8, 2021 and Amended Complaint filed August 11, 2021 in *Kennedy v. New Indy Catawba LLC et al*, 21-cv-01704-SAL (D.S.C)
Complaint filed July 12, 2021 in *United States v. New Indy Catawba LLC*, 21-cv-02053-SAL (D.S.C.)
South Carolina Department of Health and Environmental Control Order to Correct Undesirable Level of Air Contaminants issued to New-Indy Catawba, LLC, dated May 7, 2021
U.S, Environmental Protection Agency Clean Air Act Emergency Order issued to New-Indy Catawba, LLC d/b/a New-Indy Containerboard, dated May 13, 2021

Appendix B. References

ATSDR. Toxicological Profile for Hydrogen Sulfide and Carbonyl Sulfide. https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=389&tid=67
ATSDR. Toxicological Profile for Hydrogen methyl mercaptan. https://www.atsdr.cdc.gov/ToxProfiles/tp139.pdf
Cormier Y, Coll B, Laviolette M, Boulet LP. Reactive airways dysfunction syndrome (RADS) following exposure to toxic gases of a swine confinement building. Eur Respir J 1996:9:1090-1091.

Fisher Scientific. Safety Data Sheet for methyl disulfide. https://www.fishersci.com/store/msds?partNumber=AC430821000&productDescription=METHYL+DISULFIDE%2C+ACROSE+100ML&vendorId=VN00032119&countryCode=US&language=en
Giotti TD. Hydrogen sulfide: advances in understanding human toxicity. Int J Tox 29(5):569-581.
Jaakkola JJ, Vilkka V, Marttila O, et al. 1990. The South Karelia air pollution study. The effects of malodorous sulfur compounds from pulp mill on respiratory and other symptoms. Am Rev Respir Dis 142:1344-1350.
Key MM, Henschel J, Butler RN, et al. 1977. Occupational diseases. A guide to their recognition. Washington, DC: National Institute for Occupation Safety and Health, 310-312.

Kilburn KH. Human impairment from living near confined animal (hog) feeding operations. J Environ Public Health 2012;
Kilburn KH. Effects of hydrogen sulfide on neurobehavior. South Med J. 2003;96:639-46.

Kilburn KH, Thrasher JD, Gray MR. Low level hydrogen sulfide exposure and central nervous system dysfunction. Toxicol Ind Health. 2010;26:387-405. doi: 10.1177/0748233710369126. Epub 2010 May 26.

Kilburn KH, Warshaw RH. Hydrogen sulfide and reduced-sulfur gases adversely affect neurophysiological functions. Toxicol Ind Health. 1995 Mar-Apr;11(2):185-97.

Legator MS, Singleton CR, Morris DL, et al. 2001. Health effects from chronic low-level exposure to hydrogen sulfide. Arch Environ Health 56(2):123-131.

Micromedex, hydrogen sulfide, accessed October 9, 2018.

Richardson DB. Respiratory effects of chronic hydrogen sulfide exposure. Am J Ind Med 1995; 28: 99-108.

Sahar AF, Nirmeen AK, Cognitive function changes among Egyptian sewage network workers Toxicol Ind Health. 2010; May;26(4):229-38. doi: 10.1177/0748233710364966. Epub 2010 Mar 17.