Public Written Comments

Submitted to PCAST

July 13, 2016 to Sept 23, 2016

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From: B Wise
To: [redacted]-PCAST
Subject: President"s Council of Advisors on Science and Technology (PCAST) Webcast Question
Date: Wednesday, July 13, 2016 11:10:53 AM

Are there any plans to discuss the issues and challenges facing minorities now working in STEM fields.

Efforts focused on increasing the number of girls and underrepresented minorities will not be seen for 15+ years, and there is no guarantee of success. Based on current data, there is a leaky pipeline of students entering STEM but not graduating with jobs in this area.

Most approaches to this problem are fundamentally unsound, because they have more educators and corporate leaders involved than actual STEM workers. They are the most important voices in this process. This imbalance in participation has resulted in the present situation, which will continue unless a paradigm shift occurs to include the people who understand what working in STEM really means.

Black Women in Science and Engineering - BWISE is working hard to impact this change and would be honored to be involved in this dialogue.

Sincerely,

Erika
[redacted]

From: Audrey Adams
To: [redacted]
Subject: PCAST Drinking Water Study - A water problem sometimes overlooked
Date: Thursday, July 21, 2016 9:37:40 PM
Attachments: - Kyle"s Fluoride Story for EPA (Parts 1-2-3) 7-5-16.pdf
+Issacson NRC - Views on Fluoridation.pdf

Dear PCAST committee,

On July 5th I sent an email to Joel Beauvais at EPA and had intended to send it to the PCAST committee at the same time. I just noticed my error and am sending it to you now. Thank you for considering my input. ~ Audrey Adams

From: Audrey Adams [redacted]
Sent: Tuesday, July 05, 2016 10:03 PM
To: [redacted]
Subject:

Dear Mr. Beauvais and PCAST committee,

I just read Mr. Beauvais' excellent blog post of 4/26/16 titled Moving Forward for America's Drinking Water that references the PCAST Drinking Water study. I'd like to take a few minutes of your time to talk about a water problem that very few in government leadership consider.

There is an ever-increasing number of people, including children, who experience serious acute reactions to the chemicals, including fluoridation chemicals, in tap water. Most sufferers do not even consider that tap water may be the cause, however. Those same people also react to chemicals in air and food---many have the MTHFR gene mutation (for starters), making it far more difficult to detoxify these chemicals that are ubiquitous once added to our municipal water.

- **I am attaching a copy of "Kyle's Fluoride Story" about my autistic son's experiences in order help you understand what is happening in America's households to helpless children and adults who literally cannot tolerate chemicals in our tap water. Kyle's story doesn't prove any contribution of fluoride to autism causation and doesn't intend to---I'm a mom, not a scientist. Instead, Kyle's story is about the severe pain and suffering that some people---especially on the autism spectrum---are experiencing because of the U.S. fluoridation policy.**

I'd also like to remind you that the 2006 NRC Report sponsored by the EPA on fluoride in drinking water recognized the brain impact of fluoridation chemicals. It says, "More research is needed to clarify fluoride's biochemical effects on the brain" (page 222) and, "The possibility has been raised by the studies conducted in China that fluoride can lower intellectual abilities. Thus, studies of populations exposed to different concentrations of fluoride in drinking water

should include measurements of reasoning ability, problem solving, IQ, and short- and long-term memory." (page 223)

As a mother of an adult autistic child, I strongly recommend you review the attached 2007 position statement written by 2006 NRC panelist, Dr. Robert Isaacson on the impact of fluoridation chemicals on brain function. Now, 10 years later, more than 50 human studies of fluoride worldwide have shown neurodevelopmental harm to the brain and reduced IQ. In 2015, a Canadian study of U.S. children found that "each 1% increase in artificial fluoridation prevalence in 1992 was associated with approximately 67,000 to 131,000 additional ADHD diagnoses from 2003 to 2011".
http://ehjournal.biomedcentral.com/articles/10.1186/s12940-015-0003-1

How many studies are needed before our public health agencies take action to end a policy that completely ignores current science on brain effects, individual health circumstances, and serious physical intolerances to the medicated tap water?

I am sure you are aware that the rate of autism has skyrocketed from roughly 1 in 5,000 three decades ago to 1 in 45, according to the CDC's November 2015 report. Whether or not you know the exact numbers is not important. What IS important is that a frightening number of our children are being brain damaged by ***something***, while no agency admits to knowing what the cause(s) are. Other childhood neurodevelopmental disorders are also steeply increasing with little understanding of the causes.

Never was there a time when the Precautionary Principle was more imperative in public policy.

If public health agencies don't know WHAT the cause(s) of autism are, then they must treat any chemical administered in tap water to 100% of the population as if it ***could be*** a contributor to this public health disaster, worsening the pain and suffering of millions.

For the sake of our children---our future---please understand that children and adults, with and without autism or ADHD, are suffering from fluoridation chemicals added purposefully to public water. Teeth never have been, and never will be, more important than a baby's precious brain.

Thank you for considering Kyle's story of agonizing pain---vastly improved by the removal of fluoridated water---as you work toward your mission to "protect human health and the environment." Please share this email and attachments with the entire committee and any other decision makers that might help the plight of families like mine.

Audrey Adams

- PS: I am fully aware that the EPA claims that it does not regulate fluoridation chemicals added to public water and that the FDA is equally adamant that their agency is not responsible for fluoridation, resulting in no regulatory agency oversight of fluoridation policy, nor any regulation of the toxic chemicals used. I am also aware that the EPA has not acted on the 2006 NRC recommendation that the EPA contaminant level of 4 ppm MCL/MCLG was not protective of health.

See:
2014 legal analysis by Prof. Rita Barnett-Rose: http://works.bepress.com/rita_barnett/3/
2014 legal memo from Nader Hasan and scientific affidavit of Dr. Kathleen Thiessen: http://momsagainstfluoridation.org/sites/default/files/Fluoridation-Legal-Opinion-June-24-14.pdf

regardless of age or overall health.

Increasing the problems that can be induced by fluorine in its different forms is its ability to enhance the effects of other toxins to which we are exposed. For example, fluorides in the drinking water accelerate the absorption of lead, aluminum, and silicon into the body and brain.

The toxic effects of lead have been known for hundreds of years. In recent years the focus of attention has been on the learning deficits lead produces in children. The mechanisms proposed for the induction of this effect are not known entirely but there is evidence that many of the most important neurotransmitters of the brain are being affected. These include alterations in dopaminergic, cholinergic, and glutaminergic systems as well as in the "supportive" glia cells of the brain. There is also evidence that lead toxicity may go beyond impairments of intelligence. Indeed, lead toxicity may produce behavioral changes that include loss of impulse control and a related increase in the frequency of violent acts.[5]

The health hazards associated with enhanced incorporation of lead are not induced by all fluorides but primarily, and maybe only, by the addition of a silicofluoride to our drinking water. The fluoride most often added to our drinking water is hexafluorosilicic acid. This fluorosilicate dissociates when it enters the body. One component contains silicon and another fluorides. As a consequence when silicofluorides are added to our drinking water there are really two toxic hazards: one coming from the fluoride and another from the silicon. Silicon can produce its own toxic effects including the formation of solids (silica and silicates) that can lodge anywhere in the body. In addition the silicon portion also can generate destructive hydroxyl ions in many organs including the brain. The brain damage caused by the production of these free radicals has been related to anti-social behavioral

My Views on the Fluoridation of Water

Robert L. Isaacson
Distinguished Professor of Psychology
Binghamton University

A note on terminology: **Fluorine** is an element in the halogen group as are chlorine and iodine. Of all the known elements, fluorine is the most chemically reactive, most powerful oxidizing, and most electronegative element. It is a stronger oxidizing element than ozone. It reacts with many compounds at room temperature. It is never found in its pure form in nature.
Fluoride: Any combination of fluorine with another element or chemical group of elements. Thus, the addition of fluorides to the drinking water can indicate the addition of a large number of chemical agents. The most commonly used fluorides for this purpose are sodium fluoride, NaF, and compounds that contain both fluorine and silicon. Such agents are collectively called "Fluorosilicates." They include fluorosilicic acid, fluorosilicate, hydrofluosilicic acid, and hexafluorosilicic acid.

In 2003 when I accepted an invitation to join the National Research Council's Committee formed to evaluate the EPA standards for the amount of fluoride that should be allowed in our drinking water, I had no fixed opinion on whether or not fluoride should be added to drinking water. Probably I was asked to serve on the committee because I had organized a series of experiments published between 1993 and 1998 using rats to study the effects of chronic administration of aluminum fluoride in their drinking water. My primary interest was in the effects of aluminum on the brain and behavior. Aluminum fluoride was used because fluoride facilitates the passage of aluminum into the brain. At the time, aluminum was considered by a number of scientists to be an important factor in Alzheimer's disease. Scientists are still actively investigating this possibility. Our studies had to include the investigation of the effects of the fluoride since the aluminum and the fluoride readily become associated after ingestion. In essence we wanted to know the effects of the aluminum, fluoride, and the aluminum-fluoride complex. [1]

In my more than three years working on the National Research Council Committee I learned about the many influences fluoride has on the nervous system and the brain. I also learned about the variety of ways in which people become exposed to it and the work that had been done in trying to determine if fluorides were a hazard to human health and well being. The results and recommendations of this Committee were published late in 2006.[2] Slowly, I came to the conclusion that there were strong experimental and clinical indications that fluorides present health hazards to people in many ways. The more I learned, the more I became convinced that the addition of fluorides to drinking water was, and is, a mistake. Accordingly, I decided to share some of my conclusions with any who might wish to know them.

Fluorine-containing compounds can affect every living animal and person. Exposure to fluorides can come from the air, the water, and the foods we eat. Fluoride compounds were long used as insecticides. They were especially effective for ants and roaches. Their containers were always boldly marked as a poison and there were warnings on the label to keep them well away from children. This is mentioned only to note that for many years fluorides have been considered to be major health hazards.

In regard to health the total accumulation of fluorine in the body is important. Only about half of the amount of fluorides taken in by a person is excreted. The rest stays in the body. Toxic effects are determined by the amount of fluoride stored in the body, current exposure level, and age at the time of exposure. In addition each person has his or her own tolerance level for fluorides. Once this level is exceeded however, dysfunctions of body and/or brain will occur. How these dysfunctions will be expressed depends on the genetic makeup and past experiences of the person. Another factor

that helps determine a person's sensitivity to fluoride is their age. Both the very young and the very old are most likely to be adversely affected after exposure to fluorides.

As noted, different people exhibit a wide range of toxic reactions to fluorides. Some people affected by fluorides complain of general weakness and chronic fatigue, others complain of cramp-like pains in the abdomen, or nausea. Still others express toxin-induced effects by diminished vision, headaches, migraine attacks, or pains in muscles and joints. These fluoride effects have been described in books by Leo Spira (1950, 1959)[3] and George Waldbott and his associates (1978).[4] It is difficult to determine whether or not a given set of symptoms is a consequence of fluoride intake. It is first necessary to rule out the presence of other diseases that could produce the observed symptoms. A correct diagnosis is best shown by repeated observations of an individual when drinking pure water or water contaminated with a fluoride. These exposures must last for periods of a week or two under conditions in which the patient doesn't know which type of water is being consumed. If the symptoms disappear when the person is drinking pure water and return with the resumption of drinking the fluoride-treated water, this is evidence that the problems arise from the fluoride. Leo Spira and George Waldbott and his associates used this type of experimental approach in their research.

Since people vary so much in their sensitivities to fluorides and also in the nature of their symptoms caused by this toxin, determination of a uniform "safe" level of exposure for everyone is impossible. In a way, fluorides are like ozone: there is no really "safe" level that would protect everyone. The Congressional Safe Drinking Water Act instructed that the level of fluoride in drinking water should be set so as to be safe for *everyone*

actions and violence.[6] Recently data from 327 towns and cities, some having fluoridated water and others not, have been compared in terms of crime rates. All the communities with fluoridated water had substantially higher rates than did those with non-fluoridated water. This indicates that fluorides can act to enhance the damage being done by other toxins.

The impairment of intelligence from lead toxicity is now well established. It is possible that fluorides can produce negative effects on measured intelligence also. The country devoting the greatest attention to this possibility is China.

As of February 2007, several groups of Chinese investigators had published over 20 scientific papers on this topic. Scientists from many different areas of China participated in these investigations. The children studied in these reports ranged in age from 4 to 14. All were tested by the same or very similar standardized I.Q. tests. Overall the results came from children tested at different places, at different ages, and tested by different investigators. All the results from China have found that communities with high levels of fluoride in their drinking water have fewer children scoring at the "bright" end of the intelligence spectrum than communities with low or no level of fluoride. Since China does not fluoridate their drinking water, the Chinese studies compare the I.Q. scores of children from towns and school areas that differ in the amount of fluoride naturally present in their water supplies. While not all of Chinese studies were perfectly designed, the large number of studies showing the same pattern of results calls for our attention. A negative effect of fluoride on intelligence seems to be a possibility.

Other studies in China have indicated that fluoride exposure in the drinking water of mothers during the 6th to 8th months of pregnancy can

produce anatomical changes in the fetal brains. There are also reports of impaired responsiveness to visual and auditory stimuli in babies in the first three days after birth induced by the intake of fluoridated water by young mothers during gestation.[7]

The ingestion of fluoride tends to increase the uptake of aluminum by the brain. In the studies done in my laboratory the increase in aluminum in the brains of rats was *not* a function of the amount of aluminum fluoride given the animals in their drinking water. The smallest dose of aluminum fluoride produced about the same amount of aluminum in the brain as a dose 10 or even a 100 times larger. A small amount of fluoride seems capable of opening aluminum pathways to a maximal degree. It is of great interest that the relative risk of having Alzheimer's disease is increased when individuals had high amounts of aluminum in the brain coupled with low amounts of fluoride.[8] Another observation of interest is that aluminum by itself may not exert toxic affects on the nervous system. It may only become a toxin after joined together with a fluoride to become an aluminum fluoride.[9]

The chronic administration of fluorides in rats produces changes in the microscopic structure of the brain. There were significant losses of cells in areas of the hippocampus and the neocortex. Many apparently dead or dying cells were found in areas analogous to locations in which similar dying cells are found in the brains of Alzheimer's patients.

A common and, perhaps universal, characteristic of dementia is a reduction of aerobic metabolism in the brain. The blood supply reaching the brain is the primary supplier of oxygen and nutrients. Reductions in this sole source of brain energy can be due to a number of physical or chemical changes. When the brains of animals chronically exposed to aluminum fluoride were examined histologically, deposits of aluminum-based crystals

were found along the walls of both large and small blood vessels in the brain. Similar deposits were also found in the center of many vessels suspended by collagen fibers. These deposits decreased the normal transfer of oxygen from the red blood cells to the brain since they must have created turbulence in its blood flow. It is of historical interest that Alois Alzheimer, the man for whom a type of dementia was named, noted that most patients with this disorder suffered from atherosclerosis in addition to other brain anomalies. This condition is one in which there are deposits formed on the sides and in the center of arteries in the brain. The deposits disrupt the flow of blood to the brain often cause severe brain damage.

Brain functions are entirely dependent on the availability of oxygen. The brain itself consumes 20% of all the oxygen used by the entire body. The brain area most affected by the reduction in oxygen availability is the forebrain. The lower centers of the brain, namely the midbrain and hindbrain, are more resistant to oxygen deprivation. This is why the higher functions of the brain are the first to be affected, as well as the most affected, by oxygen deprivation. Basic motor and visceral functions are often spared even in patients with profound interruptions of normal blood supplies to the brain.

One of the best-known chemical alterations produced by fluorides is a reduction in cholinesterases, including acetylcholinesterase. Fluorides also directly affect the actions of many of other important neurotransmitters in the brain. Fluorides seem to have a special attraction to acetylcholine. Nerve cells that synthesize this transmitter have numerous projections to many forebrain areas, including the neocortex and deeper areas of the brain that provide information to the neocortex.

Not only do fluorides change the amount of the acetylcholine in the

brain, they selectively block certain receptors that respond to this transmitter. Fluoride reduces the number of one type of "nicotinic receptors" for acetylcholine. Some other nicotinic subtypes are not affected.[10] Added to all of the other alterations in structure and function of the brain caused by fluorides, the opportunity for mental and behavioral changes are almost limitless.

While the cholinergic system of the brain has been most studied in regard to the effects of fluoride, it is not the only neural transmitter affected. It is likely that all neural transmitter systems are affected by fluoride intake, directly or indirectly. Other anomalies related to fluoride intake are found in many other chemical systems of the brain.

During the period from 1956 to 1963, the endocrinologist, Ionel Rapaport, presented evidence of a link between fluoride exposure and the numbers of babies born with Down's syndrome, (Trisomy 21). For a number of years the only follow up to his work was in the form of epidemiological comparisons between the number of births of such children both to mothers living in fluoridated drinking water vs. the number of such born to mothers births in or non-fluoridated drinking water areas. The demographics of the two or more areas being compared were not fully taken into account in most of the studies. Maternal ages were also not taken into consideration. Overall, the "follow up" studies to Rapaport's report were not decisive but none of them failed to rule out his original findings.

Furthermore, a determination of fluoride effects using standard epidemiological procedures cannot provide convincing information. This is because it is impossible to find populations virtually the same in all regards except for the amount of fluoride in their drinking water. Another problem arises from the difficulty in accurately determining the number of Down's

syndrome children born. Some investigators use the number of birth certificates on which the attending physician notes that the baby had Down's syndrome. Other investigators use only closed hospital records made sometime later. Still other investigators use both. Neither method is perfect. The use of entries on hospital records would seem to be the most accurate method since physicians seldom enter the nature of possible deformities like Down's syndrome on birth certificates after delivery. Indeed because of the possibility of making a mistake from delivery, the diagnosis is not often made until a determination can be made by laboratory results.

Probably the best collection of relevant data comes from a study of births of children born in two areas of Atlanta, Georgia, as reported by Erickson et al. in 1976. Two different estimates of the number of Down's children and normal children were presented. One estimate of Down's syndrome births was made by the examination of copies of birth certificates and the other was based on hospital records. A re-examination of Erickson's data by Burgstahler[11] showed an overall enhancement of Down's syndrome births to mothers from the fluoridated area. Later, in 1998 Takahashi did a fine grain analysis of data from a number of sources that included the corrected numbers from the 1966 Erickson report.[12]
In the Takahashi report a clear-cut relationship between fluoride exposure and the number of affected children was found in mothers 30 years of age and younger. Recently, Juan C. Molino[13] and I using only data from hospital records found the same age-fluoride-Down's syndrome birth effect.

In his report Takahashi extended the analysis of his data through the use of a regression analysis. He wanted to determine if there could be any dose that would not increase the likelihood of having a Down's syndrome child. According to his calculations there was no such dose. All doses of

fluoride caused some enhancement of the likelihood of a woman having such a child. There are other data supporting the idea that fluorides can induce genetic alterations. Evidence indicating biochemical interactions of fluoride with the genetic mechanisms of cell division are presented in the NRC report on Fluoride in the Drinking Water. (See Endnote 2)

When the possible benefits and possible dangers of fluoride are considered there really is no comparison. Consider the following: There is no known benefit of adding any form of fluoride to our drinking water. Who would want to increase chances of having a less than perfect child? Who would wish to take a chance on a possible reduction of their own mental capacity? Who would want to have their personality altered by fluoride induced alterations in their brain chemistry? Who would want to increase their odds of developing Alzheimer's disease? Eliminating the addition of fluoride to our drinking water would remove these possibilities. The cost of doing this is zero. In fact it would enrich the communities now adding fluorides to their drinking water.

Endnotes

1. Varner, J. A., Huie, C. W., Horvath, , W. J., Jensen, K. F., and Isaacson, R. L. (1993) Chronic AlF_3 administration: II. Selected histological observations. Neurosci. Res. Comm. 13:99-104.Varner, J. A., Jensen, K. F., Horvath, W. J. and Isaacson R. L. (1998) Chronic administration of aluminum fluoride or sodium fluoride to rats in drinking water: alterations in neuronal and cerebrovascular integrity. Brain Res., 784: 284-298.Varner, J. A., Horvath, W. J., Huie, C. W., Naslund, H. R., and Isaacson, R. L. (1994) Chronic aluminum fluoride administration. Behav. Neural Biol., 61: 233-241.Isaacson, R. L., Varner, J. A., and Jensen, K. F. Toxin-induced blood vessel inclusions caused by the chronic administrations of aluminum and sodium fluoride. Ann. NY Acad. Sci., 825:152-166.

2. The final report of the committee was published by the National Academies Press in December 2006, entitled "Fluoride in drinking water." It can by obtained from the National Academies Press and by special order from any bookstore. The electronic link to the NRC/NAS publication sites:

http://nap.edu/catalog/11571.html.

3. Spira, L. The drama of fluorine, archenemy, of mankind. Milwaukee: The Lee Foundation for Nutritional Research, 1950, 1959.

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5. Masters R. D., Coplan, M.J. Association of silicofluoride treated water lead with elevated blood lead. Neurotoxicology, 2000. 21:1091-1100. Masters, R. D., Coplan M. J. A dynamic, multifactoral model of alcohol, drug abuse and crime: Linking neuroscience and behavior to toxicology. Soc. Sci. Information, 1999, 38: 591-624.

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7. Du Li. (1992) The effect of fluorine on developing human brain. Chinese Journal of Pathology, 21:218-20. Li Jing, Yao L., Shao, Q-L, and Wu, C-Y. (2004) Effects of high fluoride level on neonatal neurobehavioral development. Chinese Journal of Endocrinology, 23: No.5.

8. Belovjovic, G., Jakovlevic, B. (1999) Aluminum and Alzheimer's disease. Spr. ArArh. Celok 126: 283-289.

9. Strunecka, A. (1999) Aluminum plus Fluoride: a new deadly duo. Dement. 1: 2-3.

10. Long, Y-G, Wang, Y-N, Chen, J., Jiang, S-F, Nordberg, A., and Guan, Z-Z. (2002) Chronic fluoride toxicity decreases the number of acetylcholine receptors in the rat brain. Neurotox. Terat, 23: 751-757.

11. Burgstahler, A. W. (1966) Fluoridated water and Down's syndrome. Long abstract of a report of the 21st Conference of the International Society for Brain Research, Budapest.

12. Takahashi, K. (1998) Fluoride-linked Down syndrome births and their estimated occurrence due to water fluoridation. Fluoride, 31: 61-73.

13. Juan Carlos Molina is the Director of the Ferryra Research Institute at the University of Cordoba, Argentina, as well as holding his distinguished professor position there. He also is a visiting research professor at Binghamton University.

not intended to provide medical advice but rather for the sharing of knowledge and opinions of the author. Decisions about health advice should be based on a personal one-on-one basis with an appropriate physician.

Robert L. Isaacson

[redacted]

KYLE'S FLUORIDE STORY

By Audrey Adams
January 5, 2016

PART ONE - What I didn't know hurt him

I'm the mom of a delightful young man with autism, Kyle, age 30, who is severely hypersensitive to fluoride. I didn't know it for the first 14 years of his life and I didn't even know of the countless other chemical sensitivities. We've traveled a very long and painful road together, his pain physical and my pain emotional when I couldn't help him.

When Kyle was in his early teens, 13-14, he was in pain constantly, all over, but especially his head, the back of his neck and his extremities (hands, feet, lips, tongue). The chronic pain had skyrocketed after what I'll call a "toxological event" at age 13 from a horrific reaction to a doctor prescribed OTC treatment that is completely benign to most people, or rather, benign to most people *without* autism.

He cried inconsolably when the pain in his fingers got so bad that he couldn't play his beloved cello in the orchestra at school. He had to quit playing piano, too, and he could barely hold a fork to eat. There were mysterious pain "peaks", especially in the middle of the night, but other times, too. He screamed and raced around the house as if pursued by killer bees. His school sent him home repeatedly with horrific headaches. At night the house shook wildly with the leg-pounding on the bed that was more like a 4-hour grand mal seizure than "restless leg". His screaming was deafening. So little sleep....

We went to 8 medical specialists and not one of them could diagnose the source of the pain, let alone help relieve it. Tylenol guaranteed a full-blown migraine the next day so was useless, as were other pain-relievers. I became aware that he was completely intolerant of chemicals in the air and his food, so I changed his entire diet to organic, stopped using any cleaners or scented products and got the school to cooperate with a low-chemical environment. He only drank water---nothing else.

With all of these changes over the next year, he improved, but still had pain every day, with screaming, racing, jumping, sweating, heart racing---gasping from the exertion...and crying, begging me to "Make it go away!"

In 2000 a mom with two autistic teenagers first suggested to me that fluoride in tap water might be a problem for Kyle (as it was for her children) and recommended reverse osmosis or spring water. Once implemented, Kyle had a profound improvement in 3 days. Our lives improved dramatically.

No, he was not (is not) completely free of all pain---sadly, unexpected chemicals lurk everywhere. But by providing Kyle with fluoride-free water, chronic pain was no longer the 24/7 "norm", so detecting the other chemical triggers was finally more achievable and allowed much greater success at avoidance. Fluoride remains the worst, and most difficult, to avoid. It took me many years to understand the many sources of fluoride, and to fully realize the extent of Kyle's sensitivity to it.

PART TWO - Showers that hurt

There are many who believe that acute transdermal fluoride poisoning by showering or bathing in fluoridated tap water is simply impossible. In 2008 I was one of them. After 8 years of of hauling thousands of gallons of reverse osmosis and spring water to my home, I was still a non-believer that a shower could harm Kyle. I used a carbon shower filter to protect him from chlorine fumes, and although I knew fluoride would not be filtered out, I naively thought it could not be absorbed through the skin. I had a strong bias against such a possibility because of the potential added burden to me.

Compared to those insanely hard, painful years prior to our initial "fluoride discovery", Kyle was doing decently in 2008 and I thought I was an expert at protecting him from chemicals by then. It turned out that I still had a whole lot to learn.

His vastly improved quality of life had enabled him to work a part-time office job at Highline Community College. But I was stumped about morning headaches he'd been having and had multiple conversations with his doctor about it. We investigated various possible causes---was it mold? Or something in his completely organic, highly specialized breakfast? My detective skills failed me. Each morning he woke up without a headache, but before he left for work his head was throbbing.

We were rescued again by another mother of an autistic teenager. During our first 3-hour conversation, she talked about her son's fluoride hyper-sensitivity, and her own which was even much worse. She told me of a visit to Seattle, and one bath in fluoridated water there that resulted in nasty red, itchy welts at the bath water line and below, which then bled and peeled over the next 2 weeks. I began to wonder about my own mysterious itchy rash---tiny red bumps on my scalp, chest and back---and began to wonder about Kyle's morning headaches.

The next day I had Kyle skip his morning shower. No morning headache. Then I had him shower before bed. Déjà vu! It had been many years since Kyle's once-common, middle of the night bedroom "earth-shakes"---wildly pounding, so-called "restless legs" and many hours of screaming. Now, seeing it again, I remembered that back in those old days I gave him Epsom Salt baths before bed to reduce pain...in fluorinated (but de-chlorinated) water.

I stopped the showers entirely the next week and heated bottled water on the stove for my 220 pound grown man to sponge-bathe. No morning headaches. I conducted several more "shower trials", still using the carbon shower filter, and all were followed by head pain around 5-15 minutes after showering (even before any food had been eaten). I tried the evening shower only once more, with the same screaming aftermath into the middle of the night. Clearly, the pain was much worse with the bedtime showers, but I have no idea why.

Over the next 6 months or so, I tried many different shower filters, but none protected Kyle from fluoridation chemicals enough to avoid the after-shower headaches, so I continued to heat water on the stove.

When we'd go camping, I'd call ahead about the fluoridation status. Campgrounds almost never have added fluoride, but do have chlorine. Kyle does not get headaches when showering at campgrounds with no fluoride. Once, I neglected to check a campground water source. I always buy gallons of spring

water for drinking and cooking when we travel, but I had Kyle take a shower, assuming it was safe. His painful reaction is still vivid in my mind as one of his worst, lasting into the next day. I asked the park ranger and, yes, the campground had fluoridated municipal water. Guilt tortures me at such times.

When we'd visit relatives in Oregon with no fluoridation, but with chlorination, there were no after-shower headaches. Same with motels---in fluoridated towns, headaches followed the shower. In non-fluoridated motels, even in the absence of a chlorine filter, he did not get headaches after showering.

Now that I was connecting the fluoride dots, I also noticed that my itchy rash disappeared after 3-4 days of no fluoridated showers and returned about a week after resuming. Oddly, I've never seen a similar rash on Kyle, but I have since talked to several other women who also get tiny red itchy bumps on their scalp from fluoridated showers. Could we be reacting to a different fluoridation contaminant, I wonder?

Kyle's respite provider, a young woman who has a sister with Down Syndrome, experiences gut pain when drinking fluoridated water and has many food and chemical sensitivities herself.

After all those months of bottled water sponge baths, I finally found a shower filter that removes enough of the fluoridation chemicals for Kyle to be able to shower IF we do all 4 of these things: 1) limit the shower to 4 minutes; 2) use warm water, not hot; 3) keep water pressure at the lowest possible, about 1 gal/min; and 4) change filter at 3 months, not 6 as the manufacturer suggests.

PART THREE - What's wrong with that turkey?!...and other food troubles

The trouble with food is that it is very inconsistent. Fluoride is never labeled unless on a dental product. I had been completely unprepared to safely feed my profoundly chemically sensitive---but hungry---teenage autistic son. I learned as I went and, since I had stopped his chronic 24/7 pain by halting his fluoridated drinking water, I could finally see the results of my food mistakes...and rather quickly.

I remember a particular trip---I was taking an intimidating stack of paperwork regarding Kyle's disability to a state agency. As we drove, Kyle was calm and happy...that is, until he ate the "natural" protein bar I handed him. In barely more than a minute, Kyle's 220 pound frame was madly butt-pounding the seat next to me (that's what happens when you "jump" while still wearing a seat belt---he's compliant with rules). My car was literally jumping down the road. It was hard to control the car, but impossible to control my son---screaming in pain, heart pounding, sweating profusely. It was a terrible day, but it did get the attention of the otherwise bored state worker as we arrived. I didn't know then that the chocolate in the "natural" protein bar could contain high levels of fluoride due to pesticides.

Another food event, this time Thanksgiving, when Kyle was in his early 20's. There were 14 eager eaters and I had had the (not so) bright idea of cooking an "all natural" turkey breast instead of a whole bird. The very few ingredients on the label were all safe. Kyle adores family, but he cherishes food above nearly all things. He was the first one eagerly seated at the Thanksgiving table and, without waiting, helped himself to the turkey I had just put on the table. In approximately 5 bites' time (for Kyle that's about 60 seconds), he shot up out of his chair, instantly screaming, running, jumping, all over the house---heart pounding so hard it was literally visible through his shirt---cherry red ears and large red blotches on his face, neck and chest. He didn't stop for about a half hour when he finally collapsed on the couch,

panting and sweating, in pain. He finally slept, unable to eat. Everyone was traumatized. I hadn't even spiced the meat. So what on earth was wrong with that turkey breast?!

FAN's website answered my question---it advised to avoid "mechanically deboned poultry", due to high fluoride content. About 2 years later I bravely (or stupidly) tried organic chicken breast. Kyle had an identical reaction, but much less severe and not as long. The next day I called the 800 number on the chicken package and learned that the very same mechanical deboning method is used for organic poultry. Kyle can eat any poultry still on the bone, organic or conventional, with no pain.

The good news is that I can describe certain events that were the result of ***acute*** fluoride exposures ONLY because Kyle is not suffering from ***chronic*** fluoride toxicity from fluoridated water anymore.

And thanks to my awareness of fluoride due to Kyle's hyper-sensitivity, I made some discoveries about my own reactions to fluoride ingestion that I would not have understood otherwise. I do not get headaches (and I don't scream and jump either!), but I do get mild to very severe pain in certain joints---specifically, the joint that was at the lowest point during sleep (whichever hip) or the joint most used during the day---about 4-5 hours after consuming certain non-organic chocolate products.

I do not have arthritis, but I do love chocolate and I have experienced more than a dozen acute arthritic-like pain events (over several years' time) for stupidly eating conventional chocolate. Sometimes even just tiny amounts of it. Unfortunately, it's like Russian Roulette with chocolate because many conventionally grown cocoa products are okay while others can be very high in fluoride, depending on the (unlabeled) pesticide levels. But the only way I can determine with certainty that the pain was caused by a specific food item is to wait a month or more, and free of any pain, then re-test that same chocolate product on myself. Unfortunately, I have positively confirmed the pain culprit every time I have done this, which really takes the fun out of chocolate.

I wasn't brave enough, however, to re-test myself when I had a horrible reaction to organic green tea. I knew both green and black tea can be very high in fluoride, but I had a momentary lack of judgment. (Organic tea can be better, but wasn't this time.) I drank it in late morning and, according to my own special "fluoride clock" started feeling an uncomfortable right shoulder at 2-ish and crying in pain by 5pm. As I often do, I had been "mousing" on the computer all day, right-handed. Tea was the only unusual thing that day. From these, and other events, it appears that ingested fluoride settles in my "weakest link" of the moment. Completely unscientific, I know, but I have no wish to be a lab rat.

Pain from fluoride is a very mysterious thing and I don't pretend to understand it, but I do want to stress that if a person is chronically exposed to fluoride---for example by drinking tea, mocha lattes or fluoridated water every day---they cannot know for sure that seemingly unrelated chronic symptoms are **not** caused by the "stack" of fluoride sources.

I am aware that our experiences prove nothing to anyone outside of our household. I am merely reporting. I have no answers except avoidance, which can be done, but only if you've learned many hard lessons to get there. Most families with autistic children (and adults) have not yet discovered what I have learned. Fluoride and fluoridation chemicals beg to be researched, especially for chemically sensitive people like myself, my son, my daughter, and all those on the autism spectrum. But waiting for research is no excuse for continuing a public health policy that causes such pain to vulnerable people.

From: Martinez, Mike [redacted]
To: [redacted]
Subject: PCAST
Date: Thursday, September 1, 2016 4:55:37 PM

I'm curious,

What experience does any of the Presidential advisory committee have to make them subject matter experts qualified to discuss intelligently any Forensic Science disciplines yet alone be qualified as experts to defend Forensic Science in the court of law? Especially since we have almost 600 of the top Forensic Experts in the US sitting on the Organization of Scientific Area Committees for Forensic Science (OSAC) working on the development of standards. Many of whom are working on standards in the very areas this advisory committee has targeted.

I'm sure this advisory committee fully understands the ramifications your opinion based report will cause. Requiring an empirical number to all Forensic disciplines clearly demonstrates a of a lack of understanding not only what a real Forensic subject matter expert does in applying scientific methodology and deductive reasoning, but it also shows a lack of understanding on the Philosophical principles from which the nature of science is created on. Statistical applications for a numerical value will not give meaningful scientific validity to an observable event in science, just ask any astrophysics or geologist on your global warming working group. The basis of science was founded on Philosophical logician models emphasizing the need for observable (subjective) events. Empiricism will not give the answer this panel seems to believe.

I can only assume this is politically motived and shameful.

Michael V. Martinez

[redacted]

From: Lexie Moser
To: [redacted] PCAST
Subject: Comment
Date: Thursday, September 1, 2016 5:26:18 PM

It was suggested that automated imaging analysis would be the answer to moving pattern sciences from subjective to objective. It appears that yes, at least in the field of firearms and toolmarks, digital microscopes and surface mapping technologies are the direction that we are heading. At the AFTE 2016 New Orleans meeting, Erich Smith of the FBI presented studies in which they applied 3D topographical methods to older proficiency tests. The results obtained using the confocal microscopy combined with CCFMAX were then compared to the results from the examiners who took the proficiency tests using traditional comparison microscopy. They concluded that the new technology was able to ascertain the "correct" answer, just like examiners have been doing for decades with comparison microscopes. Does this not then back validate everything that has been done over the last several decades using traditional methods?

Lexie Moser
Quality Assurance Manager
[redacted]

From: Barry A. J. Fisher
To: [redacted]-PCAST
Subject: Comment on the PCAST Forensic Science Public Call
Date: Thursday, September 1, 2016 5:07:42 PM

In the interim, while research is being undertaken, should "feature comparison" testimony be accepted by the court? Your recommendations seem to state that.

Many aspects of science are neither black nor white and subject matter experts are need to explain to the court the meaning of such information. Indeed, historically, that is how expert witnesses began to be used in court cases.

If issues such as error rates, frequencies of occurrence, etc. are unavailable, does that mean that there is no probative value for triers of fact to consider. Even limited information could assist them in deciding about a case?

I seems to me, that if experts explained the strengths and weaknesses of their testing protocols and conclusions, such information would none-the-less be helpful to the court.

Kind regards,

Barry A. J. Fisher, M.S., M.B.A.
Retired Crime Laboratory Director, Los Angeles County Sheriff's Department
Past President of the American Academy of Forensic Science; the International Association of Forensic Science; and the American Society of Crime Laboratory Directors.

[redacted]

From: John Buckleton
To: [redacted]
Subject: response to PCAST report
Date: Friday, September 2, 2016 2:41:20 PM

Comments on the PCAST REPORT TO THE PRESIDENT Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods – John Buckleton

Thursday, September 02, 2016

The comments in this statement are my own and do not necessarily represent the views of my organisation.

It was disappointing to see the dismissal by the committee of much of the work published by the STRmix developers. They seem to be aware only of some of the published body of work [1-33]. The dismissal appears to be a veiled accusation of bias, which challenges both our scientific integrity and the scientific journal review process. The STRmix developers all get no material benefit direct or indirect from STRmix. We are all salaried employees of our respective states and we certainly try to do honest reporting.

In addition to the considerable published work, internal validation studies have been undertaken by every laboratory that is now using STRmix in casework. These now number 11 in the US, 6 in Australia, one each in Canada, England, Scotland, Ireland and New Zealand. These labs perform their own validation studies as required by their accreditation. In many cases this has been done more than once for different multiplexes or different versions of the software. These validations meet or exceed the SWGDAM guidelines [34]. The laboratories adopting STRmix are professionals working within a quality assurance framework and as such are able to judge the performance of STRmix. In addition to the labs currently employing STRmix in forensic casework there are many labs part way through validations. Laboratory specific validation results are not published, and it unlikely a journal would publish them. The committee could argue that they had no way of knowing but they could have asked or inferred that the labs currently using STRmix must have done an internal validation.

It should be noted that SWGDAM [34] and ISFG [35-37] both support the use of probabilistic genotyping without the unreasonable underestimation of capability demonstrated in the PCAST report. SWGDAM is a group of about 70 scientists from across the US and international guests. It represents a broad body of people with strong knowledge of the forensic use of DNA. The ISFG DNA commissions represent an international body of scientists again with strong knowledge on the subject.

These groups have developed guidelines which address all issues of concern, to establish the reliability of a probabilistic genotyping system and any limitations thereof. Laboratory standard operating procedures are developed based on the results of internal validation conducted by each user laboratory.

PCAST suggest that analyses should be done without knowledge of the number of contributors. We have deliberately used the wrong number in several publications to test the effect [1, 15, 18]. Certainly the title of one of these should have attracted attention: *The effect of the uncertainty in the number of contributors to mixed DNA profiles on profile interpretation*. In addition it is a SWGDAM requirement to try alternate propositions, usually one too many and one too few contributors and this has also been done by the internal

validations.

PCAST simply have the wrong number of mixtures reported in Bright et al. [38]. They state 31 and it is 93. These are 2 to 4 person mixtures with total template from 10-500pg. This study goes to 10:1. There are **264** true donor comparisons and **17,000** false donor tests.

This would be a tiny fraction of the test mixtures run in STRmix by ourselves and others. We have now examined the performance to 250:1. The result as the trace becomes very low or absent is that the LR tends to 1. This is correct.

Other publications where the true mixture composition was known include, but are not limited to:

1. Identifiler **94** H_p true, **3,077,734** H_d true [15]
2. Identifiler™ *in silico* **54** H_p true **54,000** H_d true [39]
3. Varying **21** H_p true **123,230,000** H_d true [2].
4. Identifiler **50** H_p true [20]
5. Identifiler **240** H_p true [40]

A sample of unpublished internal validations are listed in Appendix 1. The FBI alone have done 500+ mixtures and over 60,000 tests covering a broad, comprehensive range of mixtures representative of casework. This included casework samples both authentic and simulated are included in validations.

PCAST have significantly underestimated the amount of work done on 4 and 5 person mixtures and at ratios greater than that implied by the 20% given in the recommendation. These studies show that the limitation to 3 person mixtures with the minor (presumably the smallest of three) at or above 20% is a massive understatement of the capabilities of STRmix and we believe the other probabilistic genotyping methods.

Independent studies have been attempted but were affected by politicking of the parties other than STRmix. In some cases pressure has been applied. However some have been presented see for example: http://www.cstl.nist.gov/strbase/pub_pres/ISFG2013advanced-Coble.pdf

It is again disappointing to see a committee of this standing relying on the tabloid newspaper article about the miscode that affected Queensland. Again they could have asked for further information to better understand the issue. Perhaps they could question why it was Queensland that was mainly affected when most labs in Australasia were already using STRmix. The answer is that it related to the way that Queensland Health were using STRmix. Queensland have subsequently changed their protocols.

In summary I suggest that insufficient research was undertaken by the committee. The simplest course was to ask us. The conclusions of the committee are incorrect, damaging, and need to be revisited.

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Appendix 1: A Summary of some Internal validations

Forensic Science South Australia (additional to published material)

Profiler Plus
1 person 10 x 1 Hp true
2 person 70 x 2 Hp true
3 person 90 x 3 Hp true

Northern Territory Forensic Science Service

During verification of STRmix we put through 36 mixtures that had either 2p, 3p or 4p contributing.

Erie County validation

Identifiler

2 person 24 Hp true, Hd true 200 per mix
3 person 23 Hp true, Hd true 200 per mix
4 person 16 Hp true, Hd true 200 per mix
Fusion
2 person 17 Hp true, Hd true unknown
3 person 19 Hp true, Hd true unknown
4 person 14 Hp true, Hd true unknown

66 adjudicated ID Plus cases and 28 adjudicated Fusion cases were tested.

San Diego Police Department

Twenty four single source samples as well as two, three, four, and five-person mixtures (a total of 186 mixtures) were created as part of the GlobalFiler validation. The mixtures samples were designed for STRmix that had a range of contributor compositions – from balanced mixtures to mixtures where there are one or two contributors that are the source of most of the DNA in the mixture. There are also mixtures in every set that have at least one contributor dropping out.

In the mixture study, different ranges of template DNA were targeted. The high level samples were prepared such that the average RFU for the highest percentage contributor was between 3K and 10K RFU. The mid-range samples were prepared such that the average RFU for the highest percentage contributor was between 1K and 3K RFU. The low level samples were prepared such that average RFU for the lowest percentage contributor had between 200 and 500 RFU.

The validation samples were used to assess the MCMC process used by STRmix to deconvolute the mixtures. The validation samples were evaluated for the percent contribution of each contributor which was compared to the results from the STRmix MCMC. The evaluation of the STRmix MCMC was also done by determining whether the correct

genotypes included in the genotype probability distribution, whether correct combination was in the top 99%, and whether the STRmix genotype possibilities were intuitive.

Sensitivity and Specificity

A subset of the 2-, 3-, and 4-person mixtures created as part of the GlobalFiler validation were used for STRmix sensitivity (the ability to correctly identify a true contributor) and specificity (the ability to exclude known non-contributors) testing. A database file containing DNA profiles used in the validation was created based on the STRmix file requirements. The file contained 76 known DNA profiles. This database file was used to test the subset of mixture samples for sensitivity and specificity.

2-person mixtures

Ten 2-person mixtures were deconvoluted using STRmix. After running the mixtures through STRmix the deconvolution results were compared to the database file of 76 individuals. Each 2-person mixture resulted in likelihood ratios favoring inclusion for the individuals known to comprise the mixtures. All other non-contributors in the database had likelihood ratios of zero (i.e., excluded).

3-peron mixtures

Seventeen 3-person mixtures were deconvoluted using STRmix. After running the mixtures through STRmix the deconvolution results were compared to the database file of 76 individuals. In eight of the mixtures, including two of the low level mixtures, all non-contributors had likelihood ratios of zero (i.e., exclusion). In the remaining nine mixtures, the non-contributors all had negative log likelihood ratios favoring exclusion.

4-person mixtures

Sixteen 4-person mixtures were deconvoluted using STRmix. These were mixtures that included high, mid, and low level mixtures with a range of contributor proportions. Seven of the mixtures had contributors with dropout. After running the mixtures through STRmix, the deconvolution results were compared to the database file of 76 individuals. All sixteen of the 4-person mixtures resulted in the inclusions of the individuals known to comprise the mixtures. In addition to the correct inclusions, one mixture (mixture ID: 4-63) also had a single non-contributing profile from the database that also resulted in a likelihood ratio that favored inclusion. When the result was conditioned on the contributor with the highest contribution, that non-contributor was excluded as a possible contributor to the mixture.

Adjudicated Cases

Six adjudicated cases with a sexual component (sex crimes and child abuse) were selected because these cases contained samples known to have mixtures of DNA, are representative of the types of cases encountered, had a high probative value, and represented a range of previously validated DNA typing kits (Profiler Plus, COfiler, Identifiler, and Identifiler Plus) for comparison to the GlobalFiler DNA typing kit. One additional case with a sexual component did not have prior DNA typing of the evidence or the victim's reference, but had multiple samples for testing with a range of mixture proportions.

US Army Criminal Investigation Laboratory validation

Identifiler Plus/3130xl

42 ground truth mixtures were prepared covering 2- (x18), 3- (x12), and 4- (x12) contributors.

These were all amplified in replicate (total of 84 samples) at various templates and contributor proportions to include trace contributor(s) with dropout.

Studies with these mixtures were to assess the reliability and limitations of the software and to better predict the LR outputs for interpretation guidelines. These studies evaluated the mixture deconvolution tool, proposition settings (i.e. number of contributors, Type 1 and Type II errors), reproducibility, and sensitivity.

In addition, 204 single source samples were evaluated through Model Maker for peak variance and in determining LSAE. Of these, 64 profiles were from non-probative casework data (i.e. partial, degraded, and preferentially amplified) to better model the variance observed in actual casework.

FBI Laboratory validation

Identifiler Plus, 3130xl, AT=50 RFU, drop-in=0 (27 cycles). With the exception of the N-1 Contributor study as noted below, typing data were generated from laboratory-prepared single-source and mixed DNA samples. Adjudicated case data were also evaluated as specified. Many amplifications/analyses were replicated (not indicated).

Sensitivity & Specificity:

- 106 x 2-person (neither, one or both contributors' DNA in the 2-person mixtures were UV-degraded) (0.075 to 1 ng) (20:1 to 1:1): 212 H_p true, 22,504 H_d true
- 66 x 3-person (0.375 to 3 ng) (16:1:1 to 1:1:1): 187 H_p true, 13,625 H_d true
- 84 x 4-person (0.95 to 4 ng) (19:1:1:1 to 1:1:1:1): 336 H_p true, 17,808 H_d true
- 19 x 5-person (0.25 to 2 ng) (10:1:1:2:2 to 1:1:1:1:1): assuming one contributor (major, if present) in both H_p and H_d, 95 H_p true, 4161 H_d true. *Incorrect number of contributors:*

N+1 trials:

- 5 x 1-person, 10 H_p true, 1000 H_d true
- 9 x 2-person, 18 H_p true, 1800 H_d true
- 9 x 3-person, 27 H_p true, 1800 H_d true

N-1 trials:

- 3-person profiles constructed using 1 x 2-person, with a third "contributor" ("child," sharing alleles, so as to appear to underrepresent the true number of contributors) added artificially at 50, 100 & 200 RFU avg, such that:
  3 x 3-person, 18 H_p true, 400 H_d true, includes testing as both 2-person and 3-person.

Allele sharing among mixture contributors:

- 2 x 2-person (1 parent-child, 1 sib-sib), each: (1:10, 1:5, 1:2, 1:1) and (2 to 0.03 ng)
- 5 x 3-person (2 parent-parent-child, 1 sib-sib-sib, 1 parent-child-unrelated, 3 unrelated), each: (1:1:1, 1:2:2, 1:2:4, 1:3:6)

- 7 to 24 propositions were tested for each mixture: H_p including contributors, related non-contributors and unrelated non-contributors, as well as simultaneously hypothesized contributors and non-contributors.

- Both correct and incorrect numbers of contributors were evaluated.

Adjudicated cases:

Nineteen previously examined 2-, 3- and 4-person mixtures were examined using STRmix™ and the results were compared to the reported statistics and conclusions. Each of four known POIs was hypothesized individually as a contributor, regardless of whether the known individual had been previously excluded as a possible contributor. For all STRmix™ analyses, the contributor number was set to the minimum number of contributors previously reported for the mixture (e.g., 3 for a reported "3 or more"). In two instances (a 2-person and a 3-person mixture), the STRmix™ results indicated that the reported minimum number may be incorrect, and the contributor number was increased by 1 for additional STRmix™ analyses. The STRmix™ results were considered with respect to the qualitative verbal equivalent scale.

District of Columbia Department of Forensic Sciences (DC DFS) STRmix™ Validation Summary

The Forensic Biology Unit at the DC DFS validated STRmix™ v2.3.06 using AmpFlSTR® Identifiler® Plus on the Applied Biosystems 3130*xl* Genetic Analyzer according to the applicable validation sections of the FBI's Quality Assurance Standards and the SWGDAM Guidelines for the Validation of Probabilistic Genotyping Systems. This validation was completed on January 7, 2016.

Parameters for STRmix™ were established prior to starting validation studies. These parameters included a new set of color-specific analytical thresholds determined according to the most current published methods. Forty samples from various validation projects and performance checks were used to calculate the thresholds which were then verified using another set of 265 samples. Allele-specific stutter ratios were determined using 102 single source samples previously run for quality assurance. The saturation parameter was set at 7000 relative fluorescence units (rfu) based on 60 samples which were amplified from 0.03125ng to 4ng. Allele variance, stutter variance and locus specific amplification efficiency parameters were determined by the Model Maker using 10 samples amplified 10 times from 0.1ng to 1.0ng (100 samples total).

Validation studies were then conducted using the established parameters to evaluate the performance of STRmix™. Two single source samples amplified at low level target quantities (0.025ng to 0.4ng) were interpreted to show that the most supported genotypes received the highest weights. Additionally, the likelihood ratio for one of the samples was calculated by hand and compared to the value calculated by STRmix™ to confirm concordance. Seventy-two (72) two-person, thirty-two (32) three-person and seventy-two (72) four-person mixtures amplified at various ratios and targets were interpreted under different conditions including different hypotheses, assuming a true contributor, assigning one additional/less contributor. Comparisons were made to true contributors and a database of approximately 300 non-contributors. All data produced the following expected results:

1. As the complexity of a mixture increased due to additional contributors or low peak heights, the weightings applied by the software decreased.

2. The software was able to reliably resolve mixtures and correctly determine contributors and non-contributors. False inclusions and exclusions were only observed

in samples with very low peak heights and/or a high number of contributors.

3. The assumption of a true contributor improved the performance of the software by increasing the likelihood ratio for true inclusions and decreasing the likelihood ratio for true exclusions.
4. Assigning one additional/less contributor did not affect the results of the major or minor contributors in the mixtures; however some false inclusions and exclusions were obtained for trace level contributors.

From: Ed Greene
To: [redacted]-PCAST
Subject: Very Interested the use of Children"s Apps with Seniors
Date: Tuesday, September 6, 2016 12:38:30 AM

Enjoyed the recent report.

I'm trying to understand if there are any children's apps, or any people who use children apps, to help adults who are not as able to recall people or experiences.

I've recently been involved U.S. Department of Education Ready to Learn grant focused school readiness, social studies, early math and early literacy skill through playful learning experiences. I think that they way they are designed they could promote intergenerational conversation with grand children, memories about childhood experiences including recall related to remembering something they may have forgotten and/or can't articulate verbally. It would be great to see if there are effects on social, cognitive, language development.

The PlaySets, use a narrator who guides or suggests ways to think about or reflect on experiences. The apps do not clutter the experience with excessive background noise or artwork; they characters don't engage in lots of talking, They provide a doable and funny educational and instructional experiences. Although the PlaySets (as we call our apps) have been designed for 3-5 year-olds, they are designed with developmentally sound principles of knowledge and skill development. Having shared this perspective with someone pursuing intergenerational experiences that include the very young child (birth to age five), and senior citizens under the same roof, she thought the PlaySets would be interesting to use to encourage "here and now" experiences that can be shared between the older adult and the young child.

I'm seeking a chance to talk with gerontologists, aging specialists and child and human development practitioners who might be pursuing this focus or would like to talk more about it.. Check out the iTunes store on your iPad; once their "search" for Pocoyo PlaySet. These are prototypes that have been designed with a purpose but offer a template that could be adapted for special populations and programs. http://www.teacherswithapps.com/pocoyo-playsets-have-arrived/

Let me know what you think and if you'd like to explore digital media technology projects. Also, I'm interested in working with seniors and young children in Hispanic community programs.

If you have any grad students or Interns working with you who might want to do some surveys of researchers and journal articles, or to create a senior thesis or graduate project, let me know.

Thanks, Ed Greene [redacted]

From:	Gittelson, Simone N. [redacted]
To:	FN-OSTP-PCAST
Cc:	John Buckleton; Guthrie, William F [redacted]
Subject:	Comment on section 5.1 Executive Office of the President President's Council of Advisors on Science and Technology draft REPORT TO THE PRESIDENT Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods
Date:	Wednesday, September 14, 2016 3:29:51 PM

Comment on section 5.1 Executive Office of the President President's Council of Advisors on Science and Technology draft REPORT TO THE PRESIDENT Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods

John Buckleton[1,2], Simone Gittelson[2], William Guthrie[2]

[1] Institute of Environmental Science and Research Ltd, Private Bag 92021 Auckland, New Zealand

[2] National Institute of Standards and Technology, 100 Bureau Drive, MS 8980
Gaithersburg, MD 20899, USA

The comments in this statement are our own and do not necessarily represent the official position or policies of the National Institute of Standards and Technology or the Institute of Environmental Science and Research.

September 14th, 2016

Dear PCAST,

We would like to bring to your attention that the PCAST's draft repeats an error from NRC II [1] in the sentence: *A 1996 NRC report concluded that* **the true probability** *was likely to be within a factor of 10 of the calculated value.* (*emphasis added*)

The study referred to in NRC II indicates that different product rule estimates usually differed by less than a factor of 10 from each other. This is different from saying that "the true probability" is within a factor of 10 of the assigned profile probabilities. This difference is not a trivial matter. It is incorrect to imply that the "true probability" is a known quantity or that we can know that an estimate is within a factor of 10 of this quantity.

More specifically, a probability only exists particular to an individual at a given time. It may be informed by both statistical analysis and empirical studies, and depends on model choices, the population, and other assumptions, as done in NRC II.

We thank you for considering these comments.

Most sincerely,
John Buckleton, Simone Gittelson and William Guthrie

[1] NRC II. National Research Council Committee on DNA Forensic Science, The Evaluation of Forensic DNA Evidence. Washington, D.C.: National Academy Press; 1996.

[redacted]

From: Dr. Mark W. Perlin [redacted]
Sent: Friday, September 16, 2016 2:47 PM
To: EN-OSTP-PCAST
Cc: [redacted]
Subject: Commentary on Forensic Science report
Attachments: letter.pdf; ATT00001.txt

Re: Report to the President on "Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods"

Dear PCAST,

I am writing in response to your recent Report on Forensic Science. Attached is a five page letter to your Office that provides substantive commentary on proposed PCAST policies in the forensic area.

This statement is submitted two weeks before your 30 September meeting, as required. Please distribute the document to your advisory group, and consider it part of the public record.

Thank you for your assistance.

Kind regards. - Mark

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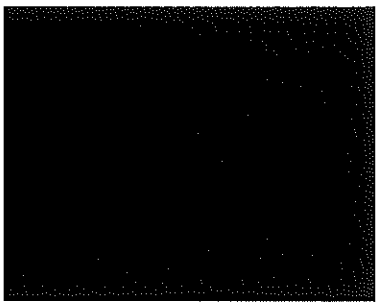
Mark W. Perlin, PhD, MD, PhD
Chief Scientific and Executive Officer
[redacted]

Cybergenetics
[redacted]

Cybergenetics



16 September 2016

Dr. John Holdren, PCAST co-chair
Assistant to the President for Science and Technology
President's Council of Advisors on Science and Technology (PCAST)
Office of Science and Technology Policy
Eisenhower Executive Office Building
1650 Pennsylvania Avenue
Washington, DC 20504

Re: Report to the President on "Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods"

Dear Dr. Holdren,

I appreciate your Council's efforts to shore up the "science" in Forensic Science. I have a few comments on your Report.

1. CPI is a random number

The Combined Probability of Inclusion (CPI) method is less effective than you describe. This subjective way of interpreting DNA mixture data has not been validated, and gives inaccurate match statistics. A recent peer-reviewed article showed that CPI is simply a randomized count of tested loci [1].

2. Independent scientific validation

Science proceeds by empirical testing and peer-reviewed publication. Most peer-reviewed papers in science and technology have coauthors involved in method development or application. Lander writes about Lander's lab, not Botstein's; that is normal science. Independent peer-review, accepted by science and the courts (e.g., Daubert), helps mitigate conflicts of interest, such as funding sources (e.g., NIH grants or federal appropriation).

Forensic developmental validation usually includes a manufacturer in the study and publication (FBI QAS, Section 8). Such peer-reviewed studies often have an independent collaborator, such as a government laboratory. And crime labs conduct their own internal validations to confirm that their DNA technology works as advertised.

Your Report cannot unilaterally impose a novel notion of "independent authorship" for peer-review. That is not how peer-review operates in science and law. The "independence" of peer-review resides in the journals and reviewers, not in the authors.

3. Imposing arbitrary limits

TrueAllele® DNA mixture interpretation [2] has undergone over thirty validation studies. Seven of them are peer-reviewed publications [3-9]; the first one appeared in 2009. Courts have upheld the computer's reliability after ten challenges [10-19]. Defenders use TrueAllele to exonerate the innocent [20].

The objective TrueAllele process achieves your stated goals, and is backed by extensive validation. The defense can test the system for free. You properly decry the use of unfounded cutoffs and subjectivity in DNA interpretation. Yet you propose imposing such arbitrary limits (e.g., number of contributors) on a scientifically validated solution.

4. Remarks on Finding 3, paragraph 2

DNA analysis of complex-mixture samples, probabilistic genotyping

Objective analysis of complex DNA mixtures with probabilistic genotyping software is relatively new and promising approach.

> The TrueAllele approach is not new. The first methods paper was published fifteen years ago [2]. The system was first used in court seven years ago [21]. Over five hundred reports have been filed, in over two thirds of the states. Crime labs have been using their validated systems since 2014.

Before the method can be established as foundationally valid for a broad range of settings, more research is required appropriately to establish the capabilities and limitations of various approaches.

> Yes, scientific methods should "be established as foundationally valid" for their intended application. TrueAllele's capabilities and limitations are well established. "More research" is not required for using this system.

At present, published papers support the foundational validity of analysis, with some programs, of DNA mixtures of 3 individuals in which the contributor in question constitutes at least 20% of the intact DNA in the mixture.

> The published literature supports TrueAllele validity on mixtures of 4 or 5 individuals [5, 6], with fractions down to 1%. The exclusionary statistics needed to defend the innocent require this full range. Statistical inference shows the method is not limited to fixed limits [5]; as data complexity increases, match statistics shrink accordingly.

5. Access to CODIS database

The failure of CPI to interpret DNA mixtures [22] affects CODIS, the FBI's DNA database. CODIS is based on simplistic DNA analysis, imposing a CPI statistical threshold to block DNA mixtures. Most DNA evidence items are mixtures, and most mixtures are not uploaded to CODIS. The failure of CPI mixture interpretation translates into a failure of investigative DNA database search.

Police, defenders, courts and innocence groups share a common problem – FBI regulations prevent them from using CODIS to solve crime. When crime lab mixture interpretation fails, and outsiders produce scientifically validated DNA information, the FBI won't let the better science search CODIS. This is bad science and bad policy that impedes justice and harms innocent people. Your Report should recommend open access to CODIS.

6. Conclusion

Some have a dark view of your Report, seeing it as a partisan attempt to sideline legitimate forensic evidence, disrupt the court system, and pump money into undeserving agencies. The FBI is not a "leader" in forensic science; NIST lacks expertise in modern statistical analysis.

Regardless, your Report sheds light on important issues. Forensic feature-comparison needs more scientific foundation and empirical support. CPI for DNA mixtures has failed.

Fortunately, a decade of "probabilistic" genotyping software development has yielded statistical models of general applicability. Once again, DNA innovation and success point the way to better forensic science.

Sincerely,

Mark W. Perlin, PhD, MD, PhD
Chief Scientific and Executive Officer

References

[1] Perlin MW. Inclusion probability for DNA mixtures is a subjective one-sided match statistic unrelated to identification information. *Journal of Pathology Informatics*, 6(1):59, 2015.

[2] Perlin MW, Szabady B. Linear mixture analysis: a mathematical approach to resolving mixed DNA samples. *Journal of Forensic Sciences*. 2001;46(6):1372-7.

Peer-reviewed validation papers

laboratory data

[3] Perlin MW, Sinelnikov A. An information gap in DNA evidence interpretation. *PLoS ONE*. 2009;4(12):e8327.

[4] Ballantyne J, Hanson EK, Perlin MW. DNA mixture genotyping by probabilistic computer interpretation of binomially-sampled laser captured cell populations: combining quantitative data for greater identification information. *Science & Justice*. 2013;52(2):103-14.

[5] Perlin MW, Hornyak J, Sugimoto G, Miller K. TrueAllele® genotype identification on DNA mixtures containing up to five unknown contributors. *Journal of Forensic Sciences*. 2015; 60(4):857-868.

[6] Greenspoon SA, Schiermeier-Wood L, and Jenkins BC. Establishing the limits of TrueAllele® Casework: a validation study. *Journal of Forensic Sciences*. 2015;60(5):1263-1276.

casework data

[7] Perlin MW, Legler MM, Spencer CE, Smith JL, Allan WP, Belrose JL, Duceman BW. Validating TrueAllele® DNA mixture interpretation. *Journal of Forensic Sciences*. 2011;56(6):1430-1447.

[8] Perlin MW, Belrose JL, Duceman BW. New York State TrueAllele® Casework validation study. *Journal of Forensic Sciences*. 2013;58(6):1458-66.

[9] Perlin MW, Dormer K, Hornyak J, Schiermeier-Wood L, and Greenspoon S. TrueAllele® Casework on Virginia DNA mixture evidence: computer and manual interpretation in 72 reported criminal cases. *PLoS ONE*. 2014:9(3):e92837.

Legal acceptance after challenge

[10] California trial court admitted TrueAllele into evidence in People v. Dupree Langston, Kern County, case number BF139247B, January 10, 2013. (Kelly-Frye)

[11] Indiana trial court admitted TrueAllele into evidence in State v. Dugniqio Forest, Vanderburgh County, case number 82D03-1501-F2-566, June 3, 2016. (Daubert)

[12] Indiana trial court admitted TrueAllele into evidence in State v. Malcolm Wade, Monroe County, case number 53C02-1411-F3-1042, August 3, 2016. (Daubert)

[13] Louisiana trial court admitted TrueAllele into evidence in State v. Chattley Chesterfield and Samuel Nicolas, Parish of East Baton Rouge, case 01-13-0316 (II), November 6, 2014. (Daubert)

[14] Massachusetts trial court admitted TrueAllele into evidence in Commonwealth v. Heidi Bartlett, Plymouth County, May 25, 2016. (Daubert)

[15] New York trial court admitted TrueAllele into evidence in People v. John Wakefield, Schenectady County, indictment number A-812-29, February 11, 2015. (Frye)

[16] Ohio trial court admitted TrueAllele into evidence in State v. Maurice Shaw, Cuyahoga County, case number CR-575691, October 10, 2014. (Daubert)

[17] Pennsylvania Superior Court affirmed TrueAllele admissibility ruling in Commonwealth v. Kevin Foley, Indiana County 2009 trial, establishing a statewide Pennsylvania precedent; 2012 PA Super 31, No. 2039 WDA 2009, filed February 15, 2012. (Frye)

[18] South Carolina trial court admitted TrueAllele into evidence in State v. Jaquard Aiken, Beaufort County, case number 20121212-683, October 27, 2015. (Jones)

[19] Virginia trial court admitted TrueAllele into evidence in Commonwealth v. Matthew Brady, Colonial Heights County, case number CR11000494, July 26, 2013. (Spencer-Frye)

[20] Guerra K. He went to prison for rape: proof of his innocence surfaced 25 years later. *Indianapolis Star*, July 17, 2016.

[21] Perlin MW. "The Blairsville slaying and the dawn of DNA computing," in *Death Needs Answers: The Cold-Blooded Murder of Dr. John Yelenic*, A. Niapas, Ed., New Kensington, PA: Grelin Press, 2013. https://www.cybgen.com/information/publication/2013/DNA/Perlin-The-Blairsville-slaying-and-the-dawn-of-DNA-computing/page.shtml

[22] Perlin MW. Failing to interpret DNA mixture evidence, Cybergenetics White Paper, July, 2016. https://www.cybgen.com/information/report/2016/CYB/Perlin-Failing-to-interpret-DNA-mixture-evidence/page.shtml

[redacted]

From: Moms Against Fluoridation <[redacted]>
Sent: Tuesday, September 20, 2016 1:13 PM
To: FN-OSTP-PCAST
Subject: New, deep and broad science must inform outdated policy. The risks are now too big to ignore.

Greetings President's Council of Advisors on Science and Technology:

If Americans are being harmed, our leaders should care. If our children are being harmed, alarm bells should be sounded. If epidemic levels of arthritis, hypothyroidism, osteoporosis and dental fluorosis now exist, these rates should prompt Government to question, investigate and act without delay.

Moms Against Fluoridation, a national non-profit, is writing PCAST members as a group charged with advising our President on the quality of our drinking water. The modern science is clear, and the modern science has informed: drinking artificial fluoridation water chemicals is having systemic and worrisome effects on the health and physiology of our citizens. The old policy of fluoridation is entrenched, the group-think rigid, and the pro-fluoridation lobby well funded, but the science of the effects and of the harm is now very deep and significantly broad.

We ask you to intercede regarding the now known evidence-based science, the retrieved archival documents, and the frank and real faces of Americans who are being harmed by drinking the medicated water with these chemicals. Science got the drinking of artificial fluoridation chemicals wrong in an era long before we understood DNA or the handheld calculator had even been developed (we were still using slide rules). We also got lead wrong in that era. We got asbestos and arsenic wrong. We then got thalidomide wrong. In that era, our best scientists had no idea that fluoridation chemicals could breach the placenta, cross the blood-brain barrier or reduce thyroid function. Science now knows that it can, but policy and habit are stuck.

Just as every member of PCAST supports clean water and knows it is essential to life and optimal health, Moms Against Fluoridation (MAF) is dedicated to ending the endorsed policy. Adding these odorless, unlabeled and corrosive industrial chemicals to drinking water supplies also denies an individual the Right to Informed Medical Consent.

Why are they added? Fluoridation chemicals are added for a hypothesized dental cavity reduction of about a 00.5- 1 cavity over a lifetime. Most now believe that if fluoride were to work, it works topically and not when it is ingested. Drinking these chemicals and bathing every cell, our biome, a fetus and our thyroid with this potent chemical has been shown to have worrisome adverse impacts.

The public water should not be used as a vehicle to deliver a systemic drug to the entire population.

Water fluoridation was proclaimed as "safe" and became widely used long before the advent of sophisticated technologies and any understanding of molecular toxicology or epigenetics. In fact, fluoridation was deemed "safe", absolutely safe, during a period when physicians not only considered smoking a healthful and relaxing habit, but received payment from manufacturers to recommend various brands of cigarettes in advertisements.

Recent science demonstrates that drinking fluoridation chemicals affects virtually all organs of the body with some of fluoridation's most worrisome targets being the developing brains of our young, the endocrine system, enzyme function, and our bones. With the crisis of lead in our drinking water as exposed in Flint, it is also critical to note that fluoridation chemicals can pull lead from water pipes. Artificial fluoridation chemicals are extremely corrosive and can burn through glass, metal, and steel. They dissolve concrete and they are slowly eroding our municipal water infrastructure. Not only are they acids and corrosive, but these EPA classified toxic chemicals, which communities add for the "fluoride", contain lead, arsenic and other co-contaniments (see below). To intentionally add lead seems unthinkable, and yet too few know about this. This needs to be talked about. As we say at MAF: "If we really want to lower the lead in the drinking water, we need to take the corrosives out of the water and halt fluoridation. We need to stop adding something that contains lead and that leaches lead."

Our MAF support team of PhDs, scientists, physicians, civil rights leaders and harmed Americans would be happy to travel to Washington to meet with PCAST. It is past time for the USA to join the 95% of world including most of Europe that refuses to use the public water supply to deliver a drug to their population.

As many of you may know, in the 1940's and 50's sodium fluoride was prescribed to hyperthyroid patients to lower the function of the thyroid. Small daily amounts of fluoride are very effective at reducing the thyroid function. In America, hypothyroidism is "through the roof". How many of you have wives, aunts, sisters or daughters with this condition? Our citizens are now getting these daily dosages that impact their whole body. Arthritis <https://www.youtube.com/watch?v=G5w-JkG3o_0> is also "through the roof". Fluoridated water is well documented as an inflammatory agent. The whole-health costs of fluoridation, now borne by society, are enormous and the human suffering is staggering. The way out of this antiquated and unethical endorsement could be gracious, respectful and simple.

Meet with our team to discuss the science and the endorsed policy that is now directed by non governmental agencies. We hope that this committee will not push this off with "Flint-like" complacency. This is real, and the now known effects are expensive, injurious and harmful.

We suggest for you to view the short film, Our Daily Dose <http://momsagainstfluoridation.org/fluoride-videos/our-daily-dose> for a sample of the modern science, current politics, and misleading marketing of fluoridation. We would like to meet with you to discuss the science, the harm, the ethics and the policy.

Sincerely,

The National Moms Against Fluoridation Team

Moms Against Fluoridation <http://www.momsagainstfluoridation.org/>
Find us on Facebook <http://www.facebook.com/momsagainstfluoridation>

[redacted]

From: [redacted]
Sent: Friday, September 23, 2016 9:23 AM
To: [redacted]
Subject: FW: President's Council of Advisors on Science and Technology (PCAST) Webcast Question for Sept 30th Meeting in DC

Dear Sirs/Madam Chairpersons,

We have reviewed the agenda for the Sept 30th meeting and find total presentation time period is utterly insufficient for any technical dialogue from anyone on the committee let along during the Public comment period.

The Public will stay away as they will feel left out of any decision making ideas, even if you allow Public comment on any laws/rules promulgated down the road. They will still feel left out and not worth of their input, results in national apathy - like the election turn outs,

As a nation we face a very serious water crisis, ranging from no rains to replenish the aquifer's; to server ground water pollution from waste dumps leaching into the water tables used by the majority of nations community water suppliers even if flowing river waters are not available; over use and unnecessary water use which drains resources too quickly. Together with
The lack of leadership/oversight from many State agencies who are required by law to follow Congressional mandates protecting the Water supplies. Even when they are notified and advised, make a courtesy call to a site and no real reports ever come about from these visits, until it is too late. Even Public involvement is never requested or encouraged. The recent example, is the Flint Michigan debacle involving dissolve lead piping getting into the Cities water system and the authorities also fudging data. Now the area has also a huge health problem for the next two generations and locals raised the alarm, being told everything is OK?

No disrespect to the committee's agenda, only the first two items [8:35 and 8:50 AM] appear far more relevant to the resource called" Water/Drinking Water" than the 9:50 AM and 11:45AM agenda items. These second two have
Been pushed around various agency agendas for more than 40 years with no finalized results or working end goals. The last one is the usual Data Collection and Technology along with Justice, all of which never
Resurfaces again in any future studies or remedies, but must be allowed for recorded history.

Our groups recommendation is to start the meeting by requesting to know, who will possibly be speaking or wishes to give comment during any of the presentations. This then would set the tone for the meetings time schedule and not rush the program. Including having the meeting available as a full Webinar so those public members can either call in live or send in live typed questions due to distances or where they reside.

There are engineers/scientists who have working ideas and resolutions for many of the water crises problems, easily implemented and does not require years of study, like the NJ DWQI has done since starting in 2000 and published in July 2015 a huge convoluted technical report. Recently republished this August 2016 with some drastic recommendations. Yet every time a company wanted to offer a remedy the EPA/DWQI's around the nation said it was OK they were looking into these contaminations [more than 8,000 on a list but missing a large number, such as PFOA/PFOS and 1,4 Dioxane along with Hex Valent Chrome-6 to mention just a couple] and are coming up with recommendations when they finish- 15+ years!

All these are and have been associated with illnesses nationwide, especially certain types of cancers.

The committee should be recommending that the EPA/DWQI's set up a fully funded laboratory to allow and demonstrate public-industry water cleaning and filtration technologies. That can be demonstrated as being able to remove safely and clean up any waters presented for public drinking water use. Without a huge barrier of red-tape and Bureaucratic interference,
Which will again discourage public participation due to onerous paperwork and documentation/records being included. Example allow say a special type of home filter to be set up in the lab and run for whatever time period the company or person recommends. The lab collects the data and shares it with all the 50 State agencies and if at
The end of the test. It meets all the criteria for given clean drinkable water then let it be used and sold onto the market without any further bother other than say every four years undergo a retest incase the contaminant ratios change and the filter needs a change to its structure/capability!

Everyone is then a winner by concentrating on real world solutions and not these continuous studies that are currently being done all over the nation an in the Universities with no positive end results at taxpayer's expense, some of which we do require as pure research. Involvement of any person must be considered and given the proper consideration.

We would appreciate this email comment be included in the Sept 30th 2016 meeting minutes and possible a brief comment from the Co-Chairs at the start of the meeting. Time Is against many water systems if solutions are not pursued from all angles, just in the Medical Health Costs and bottled water is not the answer!

Sincerely yours,

Geoff

[redacted]

[redacted]