

Beyond Belief

A critique of
'Beliefs About the Health Effects of "Thirdhand" Smoke and Home Smoking Bans'

by Christopher Snowden

For many years, the concept of 'thirdhand smoke' was reserved for political satirists and stand-up comedians. In January 2009, however, the laughter stopped.

Thirdhand smoke is, according to *the New York Times*:

"the invisible yet toxic brew of gases and particles clinging to smokers' hair and clothing, not to mention cushions and carpeting, that lingers long after second-hand smoke has cleared from a room. The residue includes heavy metals, carcinogens and even radioactive materials that young children can get on their hands and ingest, especially if they're crawling or playing on the floor." (1)

Dr Winickoff, a Boston pediatrician, put it rather more strongly in an interview with *Scientific American*:

"Smokers themselves are also *contaminated*...smokers actually *emit toxins*." (2)

And to the BBC, he said:

"The dangers of third-hand smoke are very real - when you smoke - *any place* - toxic particulate matter from tobacco smoke gets into your hair and clothing." (3)

Dr. Winickoff has had a high profile since he co-authored a paper in the journal *Pediatrics* which brought thirdhand smoke to the attention of the mainstream media. But the real inspiration behind the new scare is his colleague Prof. Georg Matt.

Matt, a psychology lecturer at San Diego University, has been on the trail of third-hand smoke for five years. His first foray into this virgin territory came in 2004 when he published 'Households contaminated by environmental tobacco smoke: sources of infant exposures' in the *Tobacco Control* journal (4). That study failed to generate any press interest and thirdhand smoke remained a joke until the summer of 2006, when Matt made another effort to promote it. Perhaps spotting a silly season story in the making, the thirdhand smoke theory was reported in Britain with sensational headlines such as 'Hugging can expose infants to smoking health risk' (*The Scotsman*) and "Even smoking outside can harm your baby' (*The Daily Mail*).

In the 2004 study, Matt's team found nicotine levels to be twice as high in the bedrooms of children whose parents claimed not to smoke outdoors than in the bedrooms of nonsmokers' offspring. The implication was that even if a mother smoked at the bottom her garden, she was bringing in dangerous toxins that would double her child's risk of developing smoking related diseases. And yet the doses in either case remained exceptionally small. The bedrooms of nonsmokers had nicotine concentrations of 0.09 mcg/m³ whilst the children of smokers had concentrations of 0.22 mcg/m³.

To provide some perspective, the legal limit of workplace exposure in the US is 500 mcg/m³, some 2,500 times more than was found in the smokers' households. The reality was that nicotine levels in the bedrooms of a completely nonsmoking family's house are effectively zero and a doubling or trebling makes no real difference. It would take a paranoid hypochondriac to believe that such sub-microscopic traces pose a threat to health.

In truth, Matt's 'discovery' owed more to the ability of expensive scientific apparatus to detect particles even when they can be only counted in parts per *trillion*.. The fact that he was able to detect nicotine in an astonishing 97% of *nonsmoking* households bore testament to the wonders of modern technology but was it conceivable that these trace levels represented risk?

According to the notorious Surgeon General's report of 2006 there was indeed reason to believe that such minute quantities could be life-threatening. In the course of the press conference staged to publicise the report, Surgeon General Richard Carmona famously announced:

"There is no safe level of exposure to secondhand smoke."

Lest anyone misunderstand what he was getting at, he added:

"Stay away from smokers." (5)

The idea that there was no safe level of secondhand smoke turned the laws of science on their head. The first rule of toxicology is that the dose makes the poison. All substances are toxic at high enough levels just as they are harmless, even beneficial, at lower levels.

Most of us understand that coffee contains benzene, water contains arsenic and that televisions pump out radiation but we don't let it worry us since the levels of these highly carcinogenic toxins are too low to pose a threat to our health. Apparently only one substance disobeys this law of toxicology: secondhand smoke.

In his eagerness to wage war on cigarettes - a product that Carmona said he would like to see made illegal - the Surgeon General's office had laid the foundations for a retreat into anti-science and the door was opened to thirdhand smoke.

It is apt, then, that the new thirdhand smoke 'study' begins by citing the now-retired Surgeon General:

"The 2006 Surgeon General's report on involuntary smoking concluded that more than 126 million people are exposed to secondhand smoke (SHS), 50,000 deaths per year are caused by SHS, and there is no "safe" level of exposure." (6)

Setting the scene, the authors then provide a list of substances found in tobacco smoke accompanied by nasty-sounding products that also contain them.

"According to the National Toxicology Program, these 250 poisonous gases, chemicals, and metals include hydrogen cyanide (used in chemical weapons), carbon monoxide (found in car exhaust), butane (used in lighter fluid), ammonia (used in household cleaners), toluene (found in paint thinners), arsenic (used in pesticides), lead (formerly found in paint), chromium (used to make steel), cadmium (used to make batteries),

and polonium-210 (highly radioactive carcinogen)."

There was a time when serious scientific journals were able to list chemicals without having to explain them to their readers. That time, it seems, has now passed. Dr Winickoff upped the baby-talk when talking to *Scientific American*. Asked the question: "What do you consider the most dangerous compound in cigarette smoke?" he replied:

"I would say cyanide, which is used in chemical weapons. It actually interferes with the release of oxygen to tissues. It competitively binds to hemoglobin.

Basically people with cyanide poison turn blue.... [And] arsenic, that is a poison used to kill mammals. We [used to] use it to kill rats.

And there it is in cigarette smoke." (7)

None of the six authors are chemists or toxicologists. Three of them are social psychologists, one has a master's degree in English and the other two are pediatricians with a background in tobacco control. Remarkably, for a study so overburdened with authors, there is no new research in Matt's paper. Everything within its six pages is based upon a 2005 telephone survey that is conducted every year by the Social Climate Survey of Tobacco Control, with one question taking centre stage:

"One question was asked to assess health belief about thirdhand smoke.

Respondents were asked whether they strongly agreed, agreed, disagreed, or strongly disagreed with the following statement:

"Breathing air in a room today where people smoked yesterday can harm the health of infants and children."

Respondents who strongly agreed and agreed with this statement were categorized as holding the belief that thirdhand smoke harms the health of children."

The findings of the study/survey, as reported by the press, were that:

"His team surveyed more than 1,500 households, asking smokers and non-smokers about their

attitudes. They found that while 95% of non-smokers and 85% of smokers agreed that direct inhalation of second-hand smoke was harmful to children, just 65% of non-smokers, and 43% of smokers believed the same for "third-hand" smoke."

As this quote from the BBC indicates, the media reacted with shock that "just 65%" of the public knew that thirdhand smoke was harmful. But why should anyone believe in a concept that had only just been invented? The BBC itself had never before mentioned it, nor had most other news organisations. There was no evidence at all that tobacco particles lodged into carpets and clothing posed a threat to health and Georg Matt's study neither provided any nor cited any.

The nearest thing to evidence against thirdhand smoke had been a solitary study that claimed that cognitive skills were poorer amongst children whose parents smoked outdoors than amongst the children of nonsmokers. The study was highly questionable since it assumed that thirdhand smoke 'exposure' accounted for the difference between the children's abilities when social and genetic factors were more likely to have been at work. Indeed, there is a small but growing body of evidence that suggested that nicotine improves cognitive function (8).

Either way, no further study has appeared to support it and, more to the point, no study has ever shown thirdhand smoke to be deleterious to physical health. Oddly, the more obvious 'smoking related' diseases of the heart and lungs have been wholly ignored by thirdhand smoke researchers.

Throughout the paper, the authors appear indifferent to the fact that no evidence exists to support their theory. As the title of the study indicates, they are more interested in whether the belief in thirdhand smoke will encourage home smoking bans.

"We hypothesized that belief about the harmful health effects of thirdhand smoke would be associated with higher rates of strict no-smoking policies within the home."

Since the ends justifies the means in the world of tobacco control, thirdhand smoke is useful if it helps to modify the public's behaviour and of little interest if it doesn't. Whether the theory is actually valid or not is of secondary importance. Like a religion, thirdhand smoke is about faith, not science, for there is no science to mention. The study itself is called '*Beliefs About the Health Effects of "Thirdhand" Smoke and Home Smoking Bans*' and it is around

beliefs that the study revolves.

Despite a conspicuous lack of hard, or even soft, science, a host of news organisations including ABC, *The Telegraph*, *The New York Times*, NBC, the BBC, *The Toronto Star* and *The Chicago Tribune* rushed to report the shocking news that one third of the population were unaware of the perils of thirdhand smoke. Although most journalists had never heard of the term until they were sent the press release, they feigned surprise at the appalling statistics that "only 65%" of the public were mindful of thirdhand smoke. No one wanted to admit that they, too, had never heard of the perils of thirdhand smoke.

It was a masterstroke by Georg Matt and his team. Their greatest weakness was that thirdhand smoke was almost universally unrecognised even as a concept. Worse still, it had not one shred of evidence to support it. Ingeniously, they turned these weaknesses into their strengths. Like the tailors who made the emperor's new clothes, the authors dared the media to admit that they were ignorant of thirdhand smoke and, winning the bluff, blasted the idea into the public consciousness.

This study breaks new ground by using the opinions and beliefs of random members of the public as a substitute for scientific evidence. In recent years, the anti-smoking movement has been accused of conducting science by press release; bypassing the scientific process to influence public opinion. The movement's first study of 2009 displays a bold new tactic: using public opinion to bypass science.

PART TWO

Is thirdhand smoke a plausible health threat?

As has been made clear, there is no biological, toxicological or epidemiological evidence to suggest that thirdhand smoke poses any threat to health. The closest thing we have to a scientific study on the subject appeared in 2004 and was also co-authored by Georg Matt.

In it, levels of nicotine found in the smokers' living rooms were reported to be 0.32 mcg/m³ compared to 0.10 mcg/m³ in the nonsmokers'. Levels of cotinine (a bio-marker for tobacco smoke - and an anagram of nicotine) were found to be between 0.33 ng/ml and 0.43 ng/ml in the children of nonsmokers.

Amongst the children of smokers who did not smoke in the home, cotinine levels fell between 2.47 ng/ml and 3.49 ng/ml. According to Matt, this seven-fold increase is proof of "persistently high levels of tobacco toxins" in the homes of smokers who do not smoke in the house. Although it is quite possible that this is the result of undeclared smoking in the home by some subjects, Matt *believes* that it is the result of "off-gassing" from tobacco smoke that has been absorbed into the hair and clothes of smokers. He explicitly refers to these trace quantities as Environmental Tobacco Smoke (ETS) ie. secondhand smoke.

"ETS contamination and ETS exposure were 5–7 times higher in households of smokers trying to protect their infants by smoking outdoors than in households of non-smokers."

"To our knowledge, this is the first study to document that surfaces, dust, and air are contaminated in homes of smokers with infants. Infants of smokers are at risk of ETS exposure in their homes through dust, surfaces, and air."

Sheer speculation of course, but the fact that nicotine was detected in no fewer than 97% of the non-smoking households raises an interesting question. In the study, nicotine is used as a marker for secondhand smoke. The fact that the homes of smokers had two or three times the level nicotine found in the non-smoking households (even when the smoking took place outside) is considered significant by the authors. But the fact remains that even homes lived

in entirely by nonsmokers have measurable levels of nicotine and, by Matt's logic, of ETS. Are they also at risk? Is everyone at risk?

Presumably no anti-smoking advocate would claim that a home inhabited by nonsmokers poses a risk to health from firsthand, secondhand or thirdhand smoke. To argue otherwise would be to suggest that risk is universal and inescapable. And yet, 97% of non-smoking homes have measureable quantities of nicotine and the children of nonsmokers have measureable quantities of cotinine. If a nicotine concentration of 0.32 mcg/m³ (ie. a third of a millionth of a gram per cubic metre) suggests the presence of "tobacco toxins", then why should a concentration of 0.10 mcg/m³ be considered safe?

If, as the Surgeon General famously insisted, there is "no safe level of exposure", and if fractions of a microgram represent risk, then even nonsmoking households contain a dangerous level of secondhand smoke. It is a ridiculous notion, but then we are in the realms of the ridiculous.

The common sense answer is that the levels are tiny in the non-smoking households but then they are tiny in the smoking households as well. The cotinine levels of 2 to 3 ng/ml found in the urine of the children of the smokers are extremely low compared to the levels of 300 to 1,500 ng/ml that are typical of smokers. Similarly, while the nicotine level reported in the smokers' homes (0.32 mcg/m³) is slightly higher than that found in the non-smoking homes (0.10 mcg/m³), both are dwarfed by the nicotine levels found in smoky bars (35.5 mcg/m³) and even smoke-free bars (5.95 mcg/m³) (9). According to tobacco control advocates, there is no significant risk for lung cancer below air nicotine levels below 6.95 mcg/m³ ie. 21 times higher than that reported in Georg Matt's 2004 paper (10).

With levels this low, deeming one safe and one unsafe becomes a matter of faith rather than science and it is fitting that the 2009 paper is tilted '*Beliefs About the Health Effects of "Thirdhand" Smoke and Home Smoking Bans*'.

PART THREE

How could 65% of the respondents be aware of thirdhand smoke?

The media attention afforded Georg Matt's 2009 paper implies that ground-breaking research has been carried out. In fact, the study provides just one, rather mundane finding: People who believe that thirdhand smoke is dangerous are more likely to forbid smoking in their homes.

This is hardly earth-shattering news. What is more of a shock is that two-thirds of those surveyed claimed to be concerned about thirdhand smoke. This is odd because, apart from a handful of articles that appeared in the summer of 2006, thirdhand smoke is a new concept to nearly everybody. How, then, were so many people able to be concerned about it?

The answer lies in the question asked in the survey. Thirdhand smoke is not mentioned by name and the concept was not explained to those surveyed. Instead, they were asked the following question:

"Breathing air in a room today where people smoked yesterday can harm the health of infants and children."

Those who agreed with this statement were, as the authors explained, "categorized as holding the belief that thirdhand smoke harms the health of children".

This is rather a leap. The question itself is very vague. It conjures up the image of a smoky room left overnight. The fact that it refers to "people" plural rather than one smoker gives the impression that many cigarettes had been smoked the night before. Considering that the vast majority of respondents agreed that secondhand smoke was hazardous, it is only to be expected that a large number of them would err on the side of caution when dealing with a room in which a number of smokers had congregated the previous evening, particularly when "infants and children" are involved. But this room would be better described as having lingering secondhand smoke rather than "thirdhand smoke".

No mention is made of the more fanciful notion of "tobacco toxins" being carried in from

outdoors on smokers' clothes, hairs and fingernails, even though it was this element that captured the attention of the press when the study was reported. Nor were those surveyed informed that the concept they were invited to embrace included a room that had been smoked in "days, weeks and months earlier."

The respondents were not told that the idea of "tobacco toxins" being harmful at ultra-low levels was no more than a "possibility" (in the words of the final study), nor that the researchers themselves referred to thirdhand smoke only as a "concept". If they had been told that the researchers believed that smokers spread disease "through contaminated dust and surfaces, including the frame of an infant's bed and a smoker's finger" it is fair to guess that far fewer of them would have endorsed the theory.

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