Department of Homeland Security
Office of Inspector General

FEMA Response to Formaldehyde in Trailers

(Redacted)

Notice: The Department of Homeland Security, Office of the Inspector General, has redacted this report for public release.

OIG-09-83

June 2009

Office of Inspector General

U.S. Department of Homeland Security
Washington, DC 25028

June 26, 2009

Preface

The Department of Homeland Security Office of Inspector General was established by the *Homeland Security Act of 2002* (Public Law 107-296) by amendment to the *Inspector General Act of 1978*. This is one of a series of audit, inspection, and special reports prepared as part of our oversight responsibilities to promote economy, efficiency, and effectiveness within the department.

This report addresses the strengths and weaknesses of the Federal Emergency Management Agency's decision making, policy, and procedures related to the issue of formaldehyde in trailers purchased by the agency to house victims of the 2005 Gulf Coast hurricanes. It is based on interviews with employees and officials of relevant agencies and institutions, direct observations, and a review of applicable documents.

The recommendations herein have been developed to the best knowledge available to our office, and have been discussed in draft with those responsible for implementation. We trust that this report will result in more effective, efficient, and economical operations. We express our appreciation to all of those who contributed to the preparation of this report.

Richard L. Skinner
Inspector General

Table of Contents/Abbreviations

Table of Contents/Abbreviations

Abbreviations

ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ATSDR	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
CFO	Chief Financial Officer
CMO	Chief Medical Officer
COTR	Contracting Officer's Technical Representative
DHS	Department of Homeland Security
DOJ	Department of Justice
EA	External Affairs
EPA	Environmental Protection Agency
FCO	Federal Coordinating Officer
FEMA	Federal Emergency Management Agency
FOIA	*Freedom of Information Act*
HHS	Department of Health and Human Services
HUD	Department of Housing and Urban Development
IAA	interagency agreement
IARC	International Agency for Research on Cancer
JFO	Joint Field Office
KO	Contracting Officer (more commonly abbreviated as CO)
MH	mobile home (or manufactured housing)
MHOPS	Mobile Homes Operations
NASA	National Aeronautics and Space Administration
NIOSH	National Institute for Occupational Safety and Health
OCC	Office of Chief Counsel (FEMA)
OGCR	Office of Gulf Coast Recovery
OHA	Office of Health Affairs (DHS)
OSHA	Occupational Safety and Health Administration

ppb	parts per billion
ppm	parts per million
QA	quality assurance
QC	quality control
RVIA	Recreation Vehicle Industry Association
SOW	Statement of Work
STEL	Short-Term Exposure Limit
THU	temporary housing unit
TRO	Transitional Recovery Office
TT	travel trailer
TWA	Time-Weighted Average
USPHS	United States Public Health Service
VOC	volatile organic compound

OIG

Department of Homeland Security
Office of Inspector General

Executive Summary

Nearly one-third of the trailers provided to victims of hurricanes Katrina and Rita were eventually projected to have significant potential formaldehyde problems. Federal Emergency Management Agency (FEMA) officials, in our opinion, did not take sufficiently prompt and effective action to determine the extent of the formaldehyde problem in the emergency housing units once they were aware that such a problem might exist. FEMA officials let nearly a year pass while working with other agencies to analyze which of two methods for reducing formaldehyde levels in never-occupied units was most effective. At the end of that year, they had learned that ventilation was more effective than temperature control at reducing formaldehyde levels, but that both were effective – information that was already widely known, including by FEMA officials, before the study began.

The FEMA study of unoccupied units not only failed to address the occupied units that were of most concern, but its results were not fully disclosed. Although FEMA subsequently arranged for the Centers for Disease Control and Prevention (CDC) to perform a study of formaldehyde levels in occupied trailers, FEMA caused delays that blocked the study's progress on two occasions. In general, in our opinion, FEMA did not display a degree of urgency in reacting to the reported formaldehyde problem, a problem that could pose a significant health risk to people who were relying on FEMA's programs.

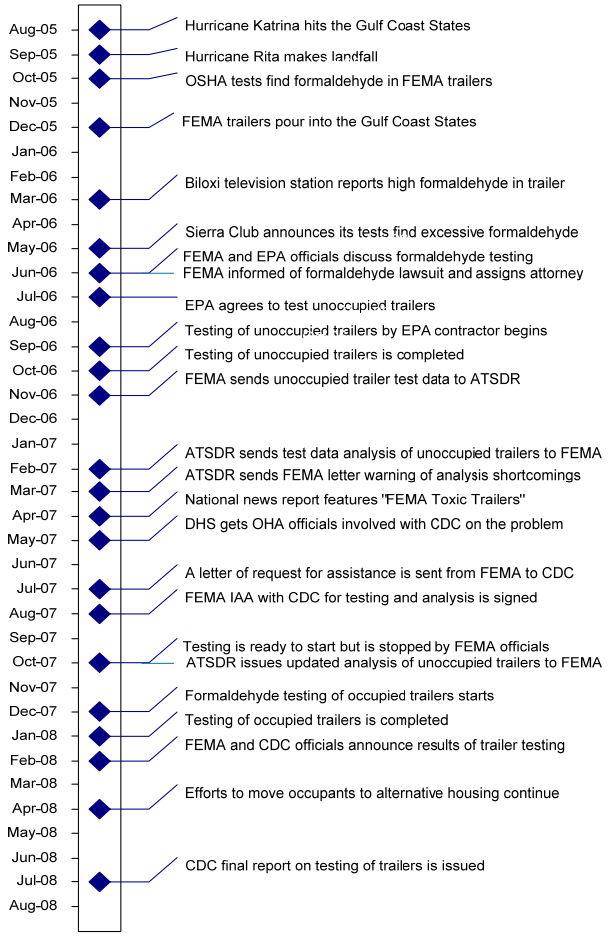
Furthermore, FEMA did not have a formal policy or procedure to deal with resident complaints about health problems caused by formaldehyde in trailers. This caused confusion and inconsistencies in the manner in which complaints were treated.

In the absence of a formal policy, an informal policy of providing used trailers to those who complained evolved. However, without an effective testing program, the needs of occupants who were

reluctant to complain would not surface. Also, without test results indicating which type of trailer was lowest in formaldehyde, FEMA could inadvertently replace one problematic trailer with another problematic unit. Had FEMA known the details that a study of formaldehyde in occupied units would have produced, they could have opted to replace all high-formaldehyde-emitting units with better types of units (park models, mobile homes, or travel trailers from better-performing manufacturers).

As shown in the following timeline, information concerning the extent of formaldehyde in occupied FEMA units was not available until February 2008, more than 2 years after many of the affected residents moved into FEMA housing units. Effective action to obtain such information commenced only after the media reaction to formaldehyde in FEMA trailers grew to disturbing levels, causing senior DHS management to involve the medical professionals of DHS' Office of Health Affairs (OHA) and the CDC. Unfortunately, delays in producing a necessary authorizing letter and the lack of existing agreements between FEMA and the CDC resulted in more than 6 months of negotiations and preparations before a study could be undertaken. Moreover, just as the CDC contractor was about to start testing the trailers, FEMA became concerned that it did not have a public communications strategy for the Congress, media, and trailer occupants once the study results were announced. Instead of addressing this issue while the study was being conducted, FEMA officials had CDC stop the contract before testing began. This caused another 2-month delay. The formaldehyde testing was finally conducted in late December 2007 and early January 2008. Because of the delays, the test results may have underestimated the extent of formaldehyde exposure that residents had experienced in the trailers. Most of the units were 2 years old by the time of the testing, and the testing was conducted during the winter months when formaldehyde levels are lowest.

A TIMELINE OF KEY EVENTS IN THE DEVELOPMENT OF THE FEMA TRAILER FORMALDEHYDE ISSUE



Since the results of the formaldehyde testing were announced, FEMA officials have continued their efforts to develop safer emergency housing. Also, FEMA and CDC have promoted ongoing efforts to address the causes and effects of excessive formaldehyde in trailers.

For the future, FEMA needs to: (1) design and implement better policies and procedures for identifying and correcting health and safety issues as they develop; (2) ensure management officials properly coordinate with professional staff and have access to relevant information; (3) establish agreements to obtain needed medical advice and testing and analysis assistance for health and safety problems; and, (4) establish policies that require and enable responsible FEMA officials to address health and safety issues in a timely manner.

Introduction and Background

On February 14, 2008, approximately 29 months after Hurricane Katrina victims were first placed in FEMA trailers, the FEMA Administrator and the CDC Director held a joint press conference to announce the preliminary results of FEMA-sponsored CDC testing of FEMA travel trailers and mobile homes in Louisiana and Mississippi. At that conference, the CDC Director stated they had found approximately one-third of the housing units had formaldehyde levels that could cause irritation and symptoms such as runny nose, cough, or even breathing problems for those residents who were vulnerable to formaldehyde, such as very young children, older people, or individuals who already had airway diseases. Furthermore, formaldehyde levels in around 5% of the FEMA units were so high that even residents without such vulnerabilities could experience formaldehyde-related respiratory symptoms. The FEMA Administrator then announced:

> "*As a result of these preliminary findings, FEMA is going to continue our aggressive action to provide for the safety and well-being of the residents of these travel trailers by finding alternative housing*."

In addition, in response to a question about future emergency housing plans, he stated:

> "*We will not ever use trailers again. We may use mobile homes…But we will not use trailers again.*"

The CDC study, which was released in its final version on July 2, 2008, found that while travel trailers generally had significantly higher average formaldehyde levels than park models and mobile homes, some units of all three types of emergency housing tested at more than 100 parts per billion (ppb) of formaldehyde, and the overall mean for the units tested was 77 ppb. The study noted that formaldehyde readings tend to decrease as a trailer ages and be higher during warmer weather. As a result, the CDC study's results–which were measured during the winter and after the trailers had been lived in for about 2 years–may under-represent the long-term exposure levels of FEMA trailer residents. The report concluded:

> "*On the basis of the data reported here and in previous scientific reports and publications about adverse health effects associated with exposure to elevated formaldehyde levels, CDC recommended that FEMA relocate Gulf Coast residents displaced by hurricanes Katrina and Rita and still living in trailers.*"

FEMA Trailers

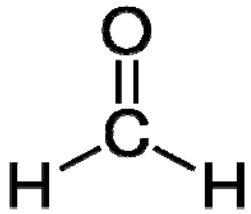
As a result of hurricanes Katrina and Rita, which struck the Gulf Coast in late August and September 2005, more than 300,000 homes were destroyed and approximately 700,000 people were displaced. Some of the displaced were able to move back into residences after minor repairs. Many others returned to find homes and apartments that had been obliterated or severely damaged by wind and water, which would require months to repair. FEMA immediately began moving emergency housing units into the Gulf Coast states to allow individuals and families to move out of shelters and into trailers that were located either on homeowners' lots or in FEMA group sites or commercial "trailer parks" for many former renters. Some homeowners relocated to the group sites and commercial trailer parks, just as some former renters relocated in FEMA trailers placed on private land that they or others owned. Meeting the needs of the displaced Gulf Coast residents was a massive task. FEMA used most of its existing usable inventory of housing, purchased existing unused trailers from dealers throughout a large part of the country, and contracted for the construction of new units to be built to FEMA specifications. The first FEMA trailers were moved into the Gulf Coast region on September 3, 2005, and the first unit was occupied on September 10, 2005. By August 2006, FEMA had procured approximately 144,000 travel trailers, park models, and mobile homes. Combining these with prior purchases, FEMA had about 203,000 units in its inventory, most of which were used in the Gulf Coast states.

A FEMA Trailer Group Site

FEMA had three basic emergency housing unit types (referred to, in the aggregate, as "trailers" for the purposes of this report) for the victims of hurricanes Katrina and Rita:

Mobile Homes (MH) 	These are more formally called "manufactured housing," but will be referred to as mobile homes throughout this report to avoid confusion with other types of housing that are manufactured in factories. The mobile homes are wider than 8 feet or longer than 40 feet for a total area of more than 320 square feet. FEMA mobile homes are typically 14 x 60 feet, a total of 840 square feet, and have three bedrooms. Mobile homes are designed as permanent housing and are regulated by the U.S. Department of Housing and Urban Development (HUD).
Travel Trailers (TT)  FEMA-spec (government contract) travel trailer  Off the Lot (commercial) travel trailer	These are trailers designed to provide temporary living quarters for recreational purposes. They have size limits, such as 8 feet wide and up to 35 feet long, or 280 square feet, and are designed to be towed by a private vehicle. Travel trailers are considered vehicles rather than residences, are usually regulated by state transportation authorities, and therefore do not fall under HUD regulations. FEMA travel trailers typically have one bedroom and a small sleeping alcove.
Park Models 	These are in-between travel trailers and mobile homes in character. They are generally more than 320 square feet. They may be regulated by state transportation authorities, but are not governed by HUD standards. FEMA Park Models are typically 12 x 36 feet, a total of 432 square feet, and have two bedrooms.

Formaldehyde



Formaldehyde (H_2CO) can be a health problem in some trailers and also has been found to be a problem in other types of residences. Formaldehyde is a colorless strong-smelling gas that is found in nature and is even produced in small amounts by the human body as a normal part of metabolism. It is also an important and widely used industrial chemical in the production of fertilizer, some paper products, plywood, and a variety of household items including permanent press fabrics, some household cleaners, and cosmetics. Gas cookers and open fireplaces produce formaldehyde, as does cooking fish and, especially, smoking. Most people are exposed to a major source of formaldehyde in the air pollutants we breathe, with automobile exhaust being a primary source.

Many building products that contain formaldehyde resins can "off-gas" (emit) formaldehyde gas for years, although the off-gassing decreases over time. Building materials that can produce formaldehyde include particleboard used as subflooring or shelving, fiberboard used in cabinets and furniture, and plywood wall panels. Some types of urea formaldehyde foam insulation, which are now seldom used, are heavy emitters of formaldehyde. Trailers, especially new units, can expose people to higher levels of formaldehyde, because formaldehyde gas is emitted by some of the materials used in these units and some trailers have less effective ventilation and air-exchange systems than conventional homes. In 1984, HUD instituted limits on the formaldehyde off-gassing that is permitted in materials used in mobile homes. The goal at the time was to have mobile homes with formaldehyde levels that were less than 400 ppb resulting from these restrictions. HUD restrictions on mobile homes do not apply to the manufacture of travel trailers and park models, but some manufacturers of such units have said that they follow the HUD standard for materials in constructing their units. It has long been recognized that higher concentrations of formaldehyde emissions occur in residences that have relatively stagnant air, high temperatures, or high humidity.

Past studies by the CDC and others have shown that people encounter a wide range of formaldehyde levels and exposure. In an outdoor rural setting, an individual might be exposed to no more than .2 ppb of formaldehyde. This rises to 2–6 ppb in suburban outside air, and an individual who lives in a heavily populated area or near industries can be faced with outside air having 10–20 ppb formaldehyde. Outside air in the

vicinity of a traffic jam can have levels of formaldehyde exceeding 50 ppb. Because formaldehyde is released from many home components and home products, there is usually more formaldehyde present indoors than outdoors. However as the following table shows, concentrations of formaldehyde also vary widely in indoor air.

Past Formaldehyde Findings in Housing Studies

Year	Housing Studied	Average (ppb)	High (ppb)
1985	Conventional homes	40	140
1985	Apartments and condos	84	290
1999	Arizona homes	17	332
2000	Manufactured homes	34	unknown
2000	Site-built homes	36	unknown
2005	Conventional homes	17	unknown
2005	Mobile homes	16–25	unknown

Formaldehyde levels in typical residences likely have declined since the 1980s, when the first two studies were performed and when HUD standards for mobile homes were set. The factors that would contribute to such a reduction include the reduced presence of urea formaldehyde foam insulation and reduced emissions levels from the types of composite wood products now being used. The 1999 study of 189 homes in Arizona found a much lower formaldehyde level of 17 ppb with a high of 332 ppb. The 2000 study found mean formaldehyde levels of 34 ppb in new "manufactured homes" and 36 ppb in new "site-built homes." The 2005 study of 184 single-family homes in three cities found mean formaldehyde levels of 3 ppb in ambient air, 17 ppb in conventional homes, and 16–25 ppb in mobile homes.

Effects of Formaldehyde

Regardless of the level of exposure, formaldehyde exposure can be a health threat. One of the possibilities is the risk of cancer. As the CDC reported in the July 2, 2008, study of FEMA trailers:

> "The carcinogenicity of formaldehyde has been extensively studied during the last 30 years. In June 2004, the International Agency for Research on Cancer (IARC) reclassified formaldehyde from 'probably carcinogenic to humans' to 'carcinogenic to humans.' IARC has concluded that formaldehyde exposure causes nasopharyngeal cancer. However, the National Institutes of Health Toxicology Program has not adopted IARC's classification change and continues to classify formaldehyde as 'reasonably anticipated to be a carcinogen in humans' and states that 'How to quantitatively relate measured air levels of formaldehyde to cancer risk is uncertain. Because many other factors play a role in the development of cancer and because formaldehyde is ubiquitous in the environment, no definitive level can be established that places humans in a "high-risk" category. The safest way to reduce risk for cancer is to limit exposure.'"

CDC officials told us that the risk of cancer from formaldehyde is not a threat that has a plateau below which one is safe and above which one is vulnerable; rather, it is a threat that just steadily increases with exposure.

One CDC official has been quoted as saying that there is no safe level of exposure to formaldehyde in trailers:

> "*Any level of exposure to formaldehyde may pose a cancer risk, regardless of duration.*"

However, given the ubiquitous nature of formaldehyde in an industrialized nation, such a warning statement only lets people know that there is no residence, and in fact no place, where they can be guaranteed safe from formaldehyde's potential long-term effects. While accepting the above warnings, we have had to focus this review on the more quantifiable acute health effects of formaldehyde.

The shorter-term acute health effects of formaldehyde exposure vary by individual, but overall are more definable than the chronic risk of cancer. CDC described these risks in its July 2, 2008, report of formaldehyde in FEMA trailers:

"Symptoms from acute exposure to formaldehyde commonly manifest as irritation of the throat, nose, eyes, skin, and upper respiratory tract. This upper respiratory tract irritation can exacerbate symptoms of asthma and other respiratory illnesses…. Acute and chronic health effects of exposure to formaldehyde vary by individual. At 800 ppb, nearly everyone develops some acute irritative symptoms; however, formaldehyde-sensitive persons have reported symptoms at levels around 100 ppb. Additional studies have found health effects at 100 ppb in sensitive persons chronically exposed to formaldehyde."

The CDC report also said that most individuals detect the odor of formaldehyde only when concentrations reach 500 ppb; therefore, some individuals can experience symptoms without being able to detect the odor of formaldehyde.

Some experts believe that 300 ppb is another possible decision point in the evaluation of formaldehyde in residences. In trailers that are above that level, the CDC director stated "*even people without vulnerability might experience some respiratory symptoms if they spent time in those homes*."

Formaldehyde Standards

Although workplace standards and recommendations for allowable exposures to formaldehyde have been implemented to protect workers who are exposed to formaldehyde, there is far less guidance as to what levels should be avoided in residences. The only federal standard for formaldehyde is the Occupational Safety and Health Administration (OSHA) "allowable time-weighted average" for allowable exposure to formaldehyde in workplaces, which is 750 ppb for 8 hours.

There are no standards for formaldehyde exposure in residences. A standard that is acceptable in the workplace could be inappropriate for a residential setting, where there are more likely to be children, the elderly, and persons who are not healthy, and where most individuals spend more hours each day than in their workplace. HUD standards governing the materials that are acceptable in mobile homes had a 1984 target of keeping formaldehyde exposures in mobile homes below 400 ppb. However, HUD standards do not apply to travel trailers or park models, and a 400 ppb level is far higher than many experts currently recommend. Apart from these limited standards, there are some recommendations and guidance from federal agencies but they tend to vary widely.

The following table sums up some of the opinions and recommendations concerning formaldehyde published by federal agencies:

Federal Government
Formaldehyde Goals, Standards and Targets

Occupational Regulatory Agencies

Department of Labor, Occupational Safety and Health Administration (standards)

- 0.75 parts per million (ppm) (750 ppb)–Time Weighted Average (TWA) for 8 hours exposure to formaldehyde.
- 2.0 ppm (2000 ppb) – Short-Term Exposure Limit (STEL) for 15 minutes without suffering health effects.

Environmental Regulatory Agencies

U.S. Environmental Protection Agency (recommendations)

- 0.1 ppm (100 ppb) and above of formaldehyde exposure will cause watery eyes; burning sensations in the eyes, nose and throat; nausea; coughing; chest tightness; wheezing; skin rashes; and allergic reactions.
- 0.9 ppm (900 ppb) or above formaldehyde exposure for more than 8 hours in a lifetime is dangerous.

Consumer Regulatory Agencies

U.S. Consumer Product Safety Commission (recommendation)

- Formaldehyde exposures above 0.1 ppm (100 ppb) will cause watery eyes; burning sensations in the eyes, nose and throat; nausea; coughing; chest tightness; wheezing; skin rashes; and allergic reactions.

Housing Regulatory Agencies

Department of Housing and Urban Development, Office of Manufactured Housing (targeted goal and standards for components)

- 0.4 ppm (400 ppb) – Targeted maximum for ambient levels of formaldehyde in manufactured housing.

Scientific/Public Health Agencies

Department of Health and Human Services, National Institute of Occupational Safety and Health (recommendations)

- .016 ppm (16 ppb) TWA for 8 hours exposure to formaldehyde.

Causes of Formaldehyde Problems in FEMA Trailers

Prior to hurricanes Katrina and Rita, complaints about formaldehyde levels in FEMA trailers had not surfaced and, therefore, FEMA officials were unaware that this should have been an issue of concern. Furthermore, because this was never an issue of concern in past disasters, the contracts under which FEMA obtained the trailers did not contain protections against excessive formaldehyde concentrations. Nor were the FEMA production oversight and product acceptance procedures sufficient to ensure that trailers did not contain unacceptable levels of formaldehyde.

The FEMA trailers provided to the Gulf Coast states following hurricanes Katrina and Rita encountered a "perfect storm" for the development of formaldehyde problems:

- All of the units were some form of manufactured housing and therefore tended to have more of the manufactured wood products that can emit formaldehyde gas.
- Most of the units were travel trailers, which are not designed to be permanent residences, tend to have a higher proportion of formaldehyde-emitting products per volume of internal air space and also usually have less capable ventilation systems.
- Most of the trailers were new and a great percentage were brand new, having been hurried from the factory to the then-homeless residents rather than sitting in a dealer's lot for a period of time as trailers usually do.
- The manufacturers had been under pressure to speed the delivery of quickly completed units to the Gulf Coast; such quick assembly can lead to problems such as wider gaps in seams of covering materials, allowing increased formaldehyde emissions.
- Almost all the trailers were going to locations that were unusually hot and humid during much of the year, creating two of the prime factors in increasing formaldehyde levels.
- Ideally, units should be ventilated and air-conditioned to reduce formaldehyde levels, but it is difficult and expensive to do both at once during the summer in the Gulf Coast.
- Residents are also advised to spend more time outside to limit their exposure to formaldehyde; but in the crowded, often barren, multiple-trailer group sites where many families were placed, it was probably more pleasant to remain inside, especially for people with mobility problems.
- Smoking and cooking can contribute markedly to indoor formaldehyde levels in any residence, but the effect would be compounded in residences having as small a volume of air as the FEMA trailers.
- The susceptibility of individuals to formaldehyde varies, with children, the elderly, and persons with prior health problems being most vulnerable. High numbers of each of these vulnerable population groups were living in FEMA trailers.

In retrospect, it is not surprising that formaldehyde problems would develop in FEMA trailers. Many of the FEMA trailers, whether purchased from dealers or manufactured, were vulnerable to high formaldehyde levels. Most of the "off the lot" models that were purchased from dealer inventory right after the hurricanes were built and sold under regulations that placed no limits on formaldehyde levels. Only the mobile homes had regulations governing formaldehyde; travel trailers and park models that were commercially available had not been required to meet any maximum formaldehyde level standards. When FEMA contracted for the production of "FEMA-spec" mobile homes the contract specifications required that: "*These units must meet and comply with all appropriate HUD requirements, regulations, standards, and guidance.*" Among the applicable HUD standards was the requirement that materials used in mobile home construction must meet HUD restrictions on formaldehyde off-gassing. But the HUD restrictions, as drafted in 1984, were only intended to keep formaldehyde concentrations in mobile homes below 400 ppb; current mobile homes would generally test well below that level. When the FEMA-spec mobile homes were finally tested in January 2008, none of the units tested at more than 400 ppb of formaldehyde.

The FEMA contracts for the production of travel trailers required that "units" shall meet industry standards. The contracts did not cite the HUD standards concerning formaldehyde in materials, which apply only to mobile homes. Nor had such mobile home standards been required of FEMA travel trailers in the past. Some CDC officials told us that even if the travel trailer materials had been required to meet HUD standards, the smaller interior airspace relative to formaldehyde-emitting materials and the weaker ventilation systems of some of these units could still have resulted in higher formaldehyde concentrations than in mobile homes. When FEMA did test the travel trailers in January 2008, six units from four different manufacturers were found to have formaldehyde concentrations greater than 400 ppb. It is unclear whether occupants' habits such as smoking, may have affected these results.

Interior of a typical FEMA-spec travel

The quality control/quality assurance (QC/QA) processes that FEMA put in place for the trailer procurement contracts were not designed to prevent excessive formaldehyde in FEMA trailers. FEMA had four inspectors, but they were at the plant of only one of the manufacturers. In any case, excessive formaldehyde levels were not among the items that the FEMA inspectors were looking for. Although pre-acceptance inspections were conducted at FEMA's receiving points,

such as the Hope, AR, storage and staging facility, formaldehyde levels were not among the conditions that were examined.

Conclusions

The FEMA mobile homes were produced under contracts that would limit the amount of formaldehyde that was off-gassed by their materials, but might not result in units that had currently acceptable levels of formaldehyde. Travel trailers produced under FEMA contracts were not restricted at all in the levels of formaldehyde they might have. The QA/QC procedures in place during the manufacture of the units would not have prevented excessive formaldehyde levels, and the FEMA inspection and acceptance procedures would not have detected excessive formaldehyde levels. The travel trailers obtained on the commercial market did not offer any better protection against excessive formaldehyde levels. FEMA has taken steps to address some of these problems, but we recommend institutionalizing improvements for all emergency housing units.

Recommendations

We recommend that FEMA:

Recommendation #1: Include specifications in contracts for future purchases of mobile homes, travel trailers, and park models that provide for acceptable maximum formaldehyde levels in units that are delivered.

Recommendation #2: Establish quality assurance/quality control requirements to ensure that excessive formaldehyde levels will be prevented, and institute inspection procedures to detect and reject units with unacceptable formaldehyde levels.

FEMA Responses to the Developing Formaldehyde Problem

As formaldehyde problems started to surface, information concerning the nature and extent of the formaldehyde problem was not promptly relayed to appropriate FEMA officials. FEMA officials were not initially aware of the seriousness of the problems that some residents of FEMA trailers were encountering. Based on the information available, FEMA officials may have believed that they acted appropriately to respond to the formaldehyde issue. In hindsight, however, it is now clear that they should have reacted in a more timely manner to determine the extent and cause of the formaldehyde problem and taken a more aggressive approach to correcting the problem. In the future, FEMA needs to have protocols in place to ensure that indications of potential health or safety problems for FEMA clients are promptly addressed, i.e., determine the nature and extent of the problem, prescribe effective remedial actions to address the problem, and notify all affected clients. FEMA also needs to institute training on how to handle health and safety issues as part of the training provided to FEMA employees who have direct contact with FEMA clients.

Early Indications of Formaldehyde Problems

The first indications of possible formaldehyde problems in FEMA trailers came in October 2005, just 1 month after trailers were first shipped to the Gulf Coast region. Between October 2005 and January 2006, OSHA officials conducted more than 100 formaldehyde tests in the Gulf Coast region, many of which were conducted in FEMA trailers. OSHA's apparent focus of the tests was to determine whether there were any problems with workplace safety. Some of the trailers tested had high formaldehyde readings. For example, three FEMA trailers that were tested by OSHA officials in Purvis, MS, on November 11, 2005, had formaldehyde level readings of 280, 520, and 590 ppb. OSHA gave these results to officials of the contractor managing the site where the trailers were located. However, the results were not forwarded by the contractor to FEMA officials. Finally, on March 21, 2006, OSHA officials faxed FEMA the results of the more than 100 formaldehyde tests that had been conducted at various sites. Many of those tests had results that indicated formaldehyde problems, but FEMA safety officers and other FEMA officials said that they had not been previously aware of the tests, let alone the problematical results.

On March 16, 2006, a Biloxi, MS, television station reported on a local couple who were having formaldehyde problems with the FEMA trailer they had received in December. The couple said that after living in the trailer, they had developed burning eyes, scratchy throats, and sinus

headaches. They had bought an air purifier and had tried ventilating the trailer, but nothing brought them relief from these symptoms.

On April 6, 2006, one of the FEMA contractors hired a testing company to analyze the formaldehyde levels in a Baxterville, MS, FEMA trailer in which occupants had experienced formaldehyde symptoms, such as burning eyes, since first occupying the trailer in February. After testing the trailer for 8 hours with the air-conditioning off, the testing company reported that formaldehyde readings exceeded 1,000 ppb. The company reported: "*These data show that both the OSHA and NIOSH* [National Institute for Occupational Safety and Health] *limits for formaldehyde were exceeded in this FEMA trailer.*"

On April 11, 2006, the Mississippi FEMA staff reported the case of a locally purchased FEMA trailer that was tested for formaldehyde at the request of the occupant. They reported that when the testing was performed with the windows closed and the air-conditioning off, the end result was above OSHA workplace standards, and that "*the tester himself developed eye-watering symptoms of exposure.*"

On May 17, 2006, allegations that the problem with formaldehyde in FEMA trailers might be widespread were nationally publicized when the Sierra Club announced:

> "*A new study conducted by the Sierra Club shows that the indoor air quality of FEMA trailers contains excessive levels of formaldehyde, a carcinogen that can cause various forms of cancer with repeated exposure. The Sierra Club has tested the indoor air of 31 FEMA trailers in Mississippi and Louisiana to determine formaldehyde levels. Only two tests were at or below the 0.1 parts per million* [100 ppb] *maximum safety limit recommended by the EPA and the American Lung Association. Several trailers were more than three times over the limit.*"

FEMA Officials' Reactions to the Formaldehyde Issue

Some FEMA officials tended to discount the Sierra Club findings. They noted that the announcement had not provided details concerning the testing procedures and wondered whether the procedures followed in the Sierra Club tests might have led to higher readings than would have been the case with other procedures. One FEMA official commented on May 18, 2006:

"*I just can't understand why out of 15,000 trailers we had in Florida during the 04/05 response/recovery that we didn't have one complaint about formaldehyde. It's really strange that in Louisiana they don't have a single one either, and that no one complained until the press got this one guy in Mississippi, and now we have a number of complaints in MS. Really strange!*"

Other FEMA officials, however, had already recognized that the best way to answer any questions related to the Sierra Club report and determine the extent and nature of the problem facing FEMA and its clients was for FEMA to have the appropriate formaldehyde testing conducted as soon as possible. And media inquiries soon were received asking:

"*Will FEMA start doing their own testing of Formaldehyde in TT's* [travel trailers]*?*"

This was not the first time the concept of testing to determine the nature, extent, and causes of any formaldehyde problem in FEMA trailers had been raised. Following the March 16, 2006, television report about the couple who were experiencing formaldehyde problems with their FEMA trailer, FEMA officials in the Gulf Coast region exchanged emails concerning what actions were called for. One asked if random testing of trailers could be required of manufacturers. Another recommended:

"*...either MHOPS* [Mobile Home Operations] *or Logistics needs to test units from various manufacturers to see if there are any patterns or only an isolated incident.*"

One of the FEMA field attorneys noted the issues that Gulf Coast officials faced:

He added that:

In another email, 7 days later, the same official noted:

[redacted]

By May 16, 2006, some FEMA officials were notified of the dangers and potential consequences of excessive formaldehyde exposure. On that day, a FEMA safety officer sent out an email to regional officials in Alabama with a 1½-page information sheet titled "Formaldehyde" from the Environmental Health Center of the National Safety Council. The information sheet noted that formaldehyde in excess of 100 ppb can cause "*watery eyes; burning sensations in the eyes, nose and throat; nausea; coughing; chest tightness, wheezing; skin rashes; and other irritating effects.*" It further noted that sensitive people can experience effects below 100 ppb and that the World Health Organization recommends that exposure should not exceed 50 ppb. The information also included a warning that: "*Formaldehyde has caused cancer in laboratory animals and may cause cancer in humans; there is no known threshold level below which there is no threat of cancer. The risk depends upon amount and the duration of exposure.*"

On June 13, 2006, a Mississippi Sierra Club official wrote the Acting Assistant Administrator, Disaster Assistance Directorate, to warn him:

> "*…94 percent of FEMA trailers tested by Sierra Club recently in Mississippi had formaldehyde levels over the safety limits set by EPA.*"

She recommended that:

> "*…since FEMA consistently denies there is a problem, FEMA should undertake testing to prove that formaldehyde levels are not a concern*."

Before the Sierra Club results were announced, some Mississippi FEMA officials had already attempted to establish a formaldehyde-testing program. By May 4, 2006, Mississippi FEMA officials had announced that:

> "*The JFO* [Joint Field Office] *here in Mississippi is instituting a formaldehyde testing program and we will be testing for formaldehyde fumes in our trailers.*"

The Mississippi FEMA officials had submitted a contract request to institute such a program but it was going slowly because the contracting

office had a very limited staff. On May 23, 2006, the contracting contact person had announced that he still did not have a contract for formaldehyde testing because his office had kept putting the request "*on the back burner.*" They could get a contract at any time, but he wrote:

> "*Safety has given the contractor personnel responsible for taking the phone calls, instructions on how to respond to requests for testing. The instructions are basically, ventilate the trailer. Safety does not recommend testing. We can do a contract, but the general consensus is we are opening a can of worms.*"

The official requesting the formaldehyde testing was apparently not convinced and the next day emailed:

> "*OK, let's get it started today. Please get with Contracting, Safety, OGC* [now OCC] *and* [management official] *and let's get a SOW* [Statement of Work] *written, accomplish a 60-1 and get it to contracting. This is a hot issue, getting hotter each day.*"

The immediate response from the contracting officer was:

> "*I'm getting conflicting messages here; the safety officer is still recommending not to do testing and has not been given any guidance from the FCO* [Federal Coordinating Officer] *or Chief of Staff to do so. He makes a good case for not testing and I believe if someone is pushing this, that person needs to hear what the safety officer has to say. The bottom line here is that if someone has a trailer that they can't live in because of odors, then MHOPS needs to give them a new trailer. Testing is not going to make the odor go away.*"

This appears to have convinced the requesting official, who responded:

> "*This does make some sense here. If they have a trailer that is causing discomfort then we may need to send them one that has been around for a while. Testing will only confirm that there is a problem. We need to fix the problem rather than apply a band-aid.*"

With the collapse of that testing effort, there would not be any significant or widespread FEMA testing of formaldehyde in occupied units for more than 18 months.

Even though some safety officers had recommended against testing occupied units, FEMA Occupational Safety and Health officers did continue to test unoccupied units in FEMA staging areas to ensure that employee formaldehyde exposure levels were below the OSHA permissible exposure limit. However, we were told even that effort ended after FEMA officials told Occupational Safety and Health Office headquarters officials to have all such testing stopped. More than a year later, the Occupational Safety and Health Office was finally allowed by senior FEMA officials to resume testing to protect FEMA employees.

FEMA officials did make some attempts to identify the extent of the formaldehyde problem, but they did so by trying to get an accurate tally of complaints from occupants rather than testing occupied units. However, such information was not formally tracked, and on July 21, 2006, FEMA local officials had been directed to not put the growing number of formaldehyde complaints in to the National Emergency Management Information System "*because it may not be true.*" By early October 2006, the total number of formaldehyde complaints to date was estimated to have been 50 in Mississippi and 20 in Louisiana. These figures were later used as an ongoing tally, but FEMA's informal system could not determine an accurate estimate of the number of occupants having problems from formaldehyde in their trailers. A more accurate estimate of the number of occupants reporting problems from formaldehyde can be found in the August 10, 2007, formaldehyde factsheet put out by the FEMA Disaster Assistance Directorate. According to the factsheet, as of August 9, the FEMA hotline for emergency housing occupants had answered 8,238 calls concerning formaldehyde. Of those callers, 913 requested to move out of their trailer and receive rental assistance, 1,554 applicants requested to have their trailer tested for formaldehyde, 2,247 had called just to report specific health concerns such as burning eyes and respiratory problems, and 362 applicants requested to exchange their trailer for another FEMA trailer. These totals may reflect multiple calls from one occupant.

FEMA Policies on Addressing Formaldehyde Problem Cases

FEMA policies regarding what was to be done for individuals who complained of adverse effects from formaldehyde in their trailers were unclear and FEMA clients were not treated consistently. In June 2006, the stated policy was that individuals who complained about formaldehyde should be directed to air out their units and run their air-conditioners, and:

> "*As a final recommendation, we would swap out the unit for a used, renovated unit which would not present the off-gassing*

> *problems experienced in the new units…. Further, OGC* [now OCC] *has advised that we do not do testing, which would imply FEMA's ownership of this issue.*"

In mid July 2006, however, a FEMA official who was trying to get a swap of a used unit for residents who were having health problems from formaldehyde fumes was told by a senior FEMA official that such swap requests could not be approved unless there was medical documentation in the applicant's files.

On July 19, 2006, FEMA OCC officials advised:

These policies were apparently not clearly and extensively communicated. In August 2006, local FEMA officials who had been told to "*make sure they do all the recommended actions*" before a swap complained:

> "*We have had little direction in dealing with formaldehyde issues. What are the recommended actions and policies for dealing with these issues?*"

Eight months later, there was apparently still some confusion in the field as to what the policy was and one FEMA official described telling a resident in April 2007 that:

> "*…no way were we going to swap a TT* [travel trailer] *just because it smelled like formaldehyde.*"

Some FEMA officials took the above "hard line" position even though FEMA staff had reported on how bad the effects of the formaldehyde fumes could be. For example, on October 13, 2006, a FEMA employee reported on a visit to a travel trailer whose occupant had complained of formaldehyde fumes:

> "*Contacted her by phone and obtained permission to enter the TT. It is a nice cool day outside and was nice and cool in the TT, but after about 5 minutes in the unit my nose/sinus began to burn. Have been out of the unit for approx. 15 minutes and still have burning sensation in my nostrils. Don't believe this unit would be a healthy environment for young children.*"

On March 22, 2007, the FEMA Mobile Home Operations Maintenance Coordinator issued "*guidelines to handle applicant request for 'Formaldehyde Issue'*."

> "*First visit the applicant at the unit. Document your findings. Explain the procedure to ventilate the unit by opening the windows and letting the air flow. This appears to have the most positive effect. ...Have the applicant ventilate for 48 hours. ...If the applicant is still experiencing formaldehyde-related problems inform the applicant we will swap the unit for a previously occupied unit that did not have any formaldehyde problems.*"

By June 12, 2007, the issue was settled because FEMA policy had been changed to:

> "*Where a complaint involving formaldehyde comes through, the unit involved is to be deactivated. Rather than offering a replacement TT, a rental unit is to be offered instead.*"

This policy was formalized on July 31, 2007, in the "FEMA Interim Direction on use of Temporary Housing Units," which mandated that when the current eligible occupant of any FEMA-owned travel trailer or park model requested a replacement, he or she would be offered rental assistance or, if available, a mobile home – but not a replacement trailer.

It is clear that the lack of a definitive, consistent, and well-promulgated FEMA policy resulted in some cases of problem trailers not being handled consistently. In May 2006, a Louisiana resident and his family became ill, reportedly from the formaldehyde in their trailer. They were told to ventilate but that did not cure the problem. The occupant moved his family into a hotel at his own expense and requested a swap of trailers. However, he had a difficult time swapping trailers because FEMA officials wanted a doctor's "excuse" and worried about setting a precedent. In another case, a Long Beach, MS, trailer occupant who had lung disease had to sleep in her car after her physician told her to stay out of her trailer. She had called maintenance more than once about the problem, but had not received an effective response. Long Beach FEMA officials also reported the case of another woman who was told that a maintenance and deactivation contractor would only tell her to open the windows and air the place out. Another resident called about formaldehyde problems in October 2006 and February 2007, but maintenance did not follow-up on either complaint. Finally, the resident was in contact with a television news organization, and they widely publicized his case.

FEMA Efforts to Assist Trailer Residents With Formaldehyde Complaints

In general, despite the lack of a clear policy to address formaldehyde problems, most local FEMA officials appeared to respond well to complaints from residents. Gulf Coast FEMA officials told us that, while they were not specifically trained in addressing health issues, they listened and were as responsive as possible, to residents' complaints of problems with FEMA trailers. Many FEMA employees who assisted the trailer occupants were themselves local residents who had been displaced into trailers and understood very well the problems of living in a trailer. According to the available emails concerning formaldehyde problems, most FEMA employees did what they could to assist those with problems in a setting where the lack of available housing severely limited the options they had available. FEMA officials did move those who complained of formaldehyde problems into replacement units when it became clear that ventilating the unit would not correct the problem. Because of the lack of testing, however, FEMA staff could not predict which units would have problems, so residents were moved into used units that staging-area staff tried to clean thoroughly before releasing. There were many instances where officials worked to get priority treatment for replacement of units that had been observed to be particularly bad.

FEMA local officials also worked to inform trailer occupants concerning how to minimize the formaldehyde problem most effectively in their trailers. In July and August 2006, more than 268,000 brochures were distributed to FEMA trailer occupants in all of the affected states. The brochures emphasized that the first thing that residents could do was to ventilate the unit by opening doors and windows. The other effective action was to keep temperatures moderate and lower the humidity. These steps would, of course, require running the units' air conditioners, which use a lot of electricity, especially when doors and windows are open. However, some residents could not afford the expense of using a lot of electricity. FEMA local employees pointed out this problem, and some tried to find a way for FEMA to pay for electricity in the units to enable or encourage residents to keep the formaldehyde levels down. But they were notified that the regulations do not allow for this, and that:

> "*The only way we pay utilities is if the TT is part of the pad lease agreement that utilities are included.*"

Some local employees even got themselves in "hot water" for attempting to deal with the formaldehyde problems. One employee wrote on August 30, 2006, concerning a unit that appeared to have a particularly high level

of formaldehyde. He thought the unit might make a good "case study" for examining the formaldehyde problem, and was apparently concerned that such a unit not be placed back in service where it might be issued to another family. He wrote that:

> "*Once deactivated we will mark the unit as 'non-habitable' and ship to BR staging area. If you would like to have the unit tested, we can track and provide information, etc. Otherwise we will designate it for the 'boneyard'.*"

A FEMA official responded:

> "*I am very concerned that you are recommending a level of habitability for the units when no other federal agency has set a threshold for residential formaldehyde levels. ...While we would like for you to identify units that were swapped for formaldehyde complaints, I would like to ask that you do not make suggestions of 'non-habitable' and recommendations for putting units in 'boneyards' in the future without engaging* [appropriate FEMA officials]."

The employee who had written the original email replied that he was:

> "*Sorry if I got things stirred up - just trying to take care of business.*"

Nearly 1 year later, on July 20, 2007, the FEMA Administrator wrote a memorandum to all FEMA employees announcing:

> "*Over the last two months, FEMA has significantly increased its focus on formaldehyde-related health concerns raised by Gulf Coast disaster victims. ...Earlier this week, I was troubled to learn that some FEMA employees may have not acted with the speed and sensitivity I expect in addressing the concerns raised by some victims of Hurricanes Katrina and Rita. I will deal with these issues swiftly. FEMA's first priority is the health and welfare of disaster victims we serve. Anything less is totally unacceptable. I know that the FEMA team I am privileged to lead does hold sacred this same commitment*."

This message should have provided some satisfaction to the many FEMA employees who had been doing their best to identify the cause and extent of the formaldehyde problem and to assist those who were affected by it in their residences.

Effects of FEMA's Initial Responses to Formaldehyde

The consequences of FEMA's initial decision not to undertake testing to determine the cause and extent of formaldehyde problems in occupied units are difficult to assess. There were not many alternatives to the FEMA trailers for those who wanted to remain in the Gulf Coast area. Perhaps, had the extent and seriousness of the formaldehyde problem been made known through prompt and timely testing, more residents would have vacated the trailers. Most, however, would probably have remained. Some residents might have then been more likely to follow the advice to ventilate and air-condition, but many probably could not afford to do so. At the least, more residents would have been aware of the seriousness of the formaldehyde problem and might have sought assistance. The FEMA relief system in place depended on the occupants to complain about problems with their units in order to get assistance. However, some people are not prone to complaining and may have just quietly endured adverse health conditions. For example, in May 2006 a Mississippi FEMA official reported that:

> "*...I happened to go over to see a Sergeant in the Army National Guard the other day on other FEMA business and he happened to mention that he has had a FEMA trailer for 5 or 6 months now and he has had problems with smell, sore throat, burning eyes; he says he airs out the trailer every day but it only helps for a little while and then it is worse than ever. Seems like after a few weeks of airing the problem should be gone. I am not an expert but it doesn't sound right. He knows it's formaldehyde. This guy served in Iraq and says he's lived in worse and doesn't want to look a gift horse in the mouth. But it seems a shame he has to live under those conditions.*"

Such individuals who are not prone to complaining might have come in for assistance had FEMA tested the types of trailers they occupied and informed all residents of the seriousness of the formaldehyde problems. Other individuals who might have been more likely to come forward for help are those persons who are sensitive to formaldehyde, including persons with preexisting conditions such as asthma. Many "sensitive" individuals have conditions that are aggravated by levels of formaldehyde that are below the level at which formaldehyde can be smelled. Therefore, without any testing, they might not have been aware that the formaldehyde in their trailers was a reason their health conditions were deteriorating.

Conclusions

FEMA has an obligation to its clients to inform them whenever there is the possibility of health or safety problems inherent in their use of FEMA products or programs. In addition, FEMA should provide residences that are reasonably safe for the occupants. Appropriate FEMA officials did not immediately learn of the formaldehyde problems that were first identified in FEMA trailers. When they did learn of the formaldehyde problems, nearly a year passed before any testing program was started and nearly 2 years passed before occupied trailers were tested and the occupants were informed of the extent of formaldehyde problems and potential health threats in their trailers. FEMA field staff did what they could to help those residents who complained of problems, but they were hindered by the paucity of available options and by the lack of a consistent and well-promulgated policy on what corrective actions should be taken.

Recommendations

We recommend that FEMA:

Recommendation #3: Promulgate a policy that any issue or problem that might affect the health and safety of occupants of emergency housing must be quickly forwarded to the responsible headquarters offices as defined in this new policy.

Recommendation #4: Train FEMA and contractor "front-line" employees who have contact with disaster victims on how to respond to health and safety issues.

Recommendation #5: Establish a policy that whenever a health or safety issue arises concerning its clients, all reasonable actions will be taken to determine the nature, cause, extent, and consequences of the problem.

Recommendation #6: Whenever a problem might affect the health and safety of FEMA clients, such as occupants of emergency housing, promulgate consistent and effective guidance to the field concerning how to address such problems.

Formaldehyde Testing Effort for Unoccupied Trailers

Once FEMA officials instituted a formaldehyde testing effort, it focused on determining the extent of formaldehyde in new, unoccupied trailers and on methods to reduce those levels rather than focusing on, or giving equal focus to, identifying the extent of the formaldehyde problem in occupied units and the causes of those problems. Several management issues slowed the progress of this unoccupied-units testing program. When the initial results of the tests of unoccupied units were superseded by a cautionary letter from the testing authority, this was not conveyed to the appropriate FEMA officials. This may have resulted in pronouncements to Congress and the public that were more optimistic concerning the nature of the formaldehyde problem than was warranted, and possibly delayed the development of a testing program for occupied trailers.

Initiation of a FEMA Formaldehyde Testing Program

On June 27, 2006, an extensive exchange of emails took place among senior FEMA staff in the Gulf Coast area and headquarters concerning a FEMA trailer resident who had died in his trailer at a site in St. Tammany Parish, LA. The resident was reported to be an older man who had heart problems, and there was no reason to conclude that his death was due to the formaldehyde level in his trailer. However, his neighbors had said that he told them he was reluctant to use his air-conditioner because he was afraid it would make the formaldehyde worse. This tragic event, and the concerns it raised, caused those FEMA officials who had advocated testing for formaldehyde in order to determine the full nature of the problem to once again raise this issue. One FEMA official noted:

> "*In addition, we need to move past OGC* [now OCC] *objections to possible testing and move forward with our safety notice (similar to the one HUD uses for Mobile Homes). I believe this issue is well past the point of 'wait and see.*"

The Acting Assistant Administrator, Disaster Assistance Directorate, responded that he had discussed the situation and supported the concept of tasking EPA to perform a full assessment of the formaldehyde problem and make recommendations.

On June 28, 2006, officials from FEMA, EPA, the United States Public Health Service (PHS), and CDC/ATSDR held a conference call.[1] One of the goals of the conference call was to identify an organization to test the air quality of the deceased's unit and determine whether random sampling of all FEMA trailers was necessary. Among the resolutions agreed upon in the conference call were:

> "*FEMA Safety is to investigate and sample* [the deceased's trailer], *Request that the Consumer Product Safety Commission vet FEMA trailers against the industry standard*" [and] "*Identify an independent, non-governmental agency to conduct tests of indoor air quality and evaluate policies*."

On July 7, 2006, another conference call concerning a formaldehyde-testing program was scheduled. In a briefing document to prepare for that call, the authors wrote that, because of health concerns and press articles concerning FEMA housing units, FEMA staff had entered into discussions with CDC/ATSDR and EPA regarding the advisability of, and recommended procedures for, random formaldehyde testing. But there were concerns expressed that air quality testing might not be an effective strategy because:

> "*There is a lack of consensus among various agencies regarding acceptable levels of formaldehyde.…The results can be influenced by many outside factors, such as new furniture or draperies, smoking in the unit with no ventilation…New units less than two months old will frequently show higher levels of formaldehyde….*"

During a July 11, 2006, conference call, some experts warned that preliminary research indicated that a health baseline for formaldehyde would probably be much lower than expected and the formaldehyde levels that would be found in testing could be much higher than the health baseline level. During the call, it was agreed to run tests that could "*establish the difference between ventilated and unventilated units.*" This would be done by pulling together a valid sample of unused units from each manufacturer, leaving half the units closed up for 2 weeks, running the air-conditioners in the other units for 2 weeks, and then testing all the units. This plan would evolve and become more detailed over the next 2 months, but it remained the basic concept for testing these never-occupied trailers.

[1] The Centers for Disease Control and Prevention (CDC) and Agency for Toxic Substances and Disease Registry (ATSDR) are separate agencies, but both are divisions of the Department of Health and Human Services (HHS) and have the same senior leadership.

Conduct of Testing of Unoccupied Units

By July 18, 2006, EPA officials had developed and submitted to FEMA a proposed "Quality Assurance Sampling Plan for Formaldehyde Sampling at FEMA Temporary Housing Units." FEMA officials reviewed the plan and raised some concerns, including who would perform the "data management-result interpretation and recommendations," and whether there would be enough unused units available to produce a valid sample of each manufacturer's units.

By a July 20, 2006, FEMA, EPA and CDC/ATSDR conference call, the details of the testing plan were starting to be worked out, including how many units to test and from what sources. The notes for the conference call state that there was:

> "*Discussion about whether the testing will be done with the units open or with just the air conditioner. Initial proposal was just for the air conditioner. Point was made that the formaldehyde will not dissipate without the windows being open.*"

The conference call notes also state that there was:

> "*No resolution as to how testing will be accomplished and what we are trying to achieve. Discussion will continue regarding the variables and when and how long each variable will be tried during the testing process.*"

Through successive conference calls, the testing plan was worked out in more detail by late July. The basic plan was to define the formaldehyde levels on various models in a controlled test and then:

> "*...perform several actions (open windows for a specific time, run fans, control humidity) and measure the effect on the formaldehyde level.*"

There were some problems in finding enough unused trailers from each manufacturer for each test, but by September 8, 2006, the main remaining problem was the provision of electrical power to each of the units that was to be tested. The power company wanted the payment account in place before the meters were installed and powered up. Also, the contractor selected to wire the trailers had not completed the work and had to have the completion date for the contract extended. However, these problems were addressed, and by September 19, 2006, EPA's contractor had started testing the 96 selected trailers. Each trailer would be initially tested to

establish a baseline formaldehyde level and then be retested after ventilation or air-conditioning steps were completed. By October 19, 2006, EPA Region 6 reported that the EPA contractor had all of the agreed-upon data, but that problems in the analysis would delay delivery of the data from the contractor to EPA for approximately 1 week. EPA expected to deliver the database to FEMA around November 13, 2006.

Analysis of Formaldehyde Tests of Unoccupied Units

CDC/ATSDR agreed to analyze the data package provided by EPA and its contractor and offer recommendations based on the data set. Since there was no existing interagency agreement between FEMA and the CDC under which this analysis could be performed, the responsible program office started working on all of the necessary documents, including a possible acquisition plan, on October 26, 2006. However, by November 4, 2006, CDC/ATSDR officials concluded that they could "*complete the task before an IAA* [interagency agreement] *could go through the approval process*," and agreed to interpret the test results without an established IAA. FEMA had designated an attorney to be responsible for the class action litigation alleging personal injuries related to formaldehyde in FEMA trailers. In that capacity he received the raw data during Thanksgiving week from EPA. Thereafter, the data was forwarded by FEMA officials to CDC/ATSDR and arrived December 1, 2006. FEMA officials initially stated that they expected a final analysis from CDC/ATSDR around December 11, 2006, but once CDC/ATSDR officials received the EPA packet they told FEMA that it would take longer than anticipated to complete the analysis.

On February 1, 2007, the CDC/ATSDR Health Consultation "Formaldehyde Sampling at FEMA Temporary Housing Units" was sent to FEMA from the Acting Associate Director; Office of Terrorism, Preparedness and Emergency Response; National Center for Environmental Health/ATSDR. The analysis was 14 pages long, and as the cover letter noted:

> "In summary, the opening of windows and vents was effective in reducing formaldehyde concentrations below levels of health concern. Running the heating, ventilation and air conditioning systems did not provide adequate air exchanges to adequately reduce the formaldehyde concentrations. A combination of ventilation methods may be necessary to reduce formaldehyde concentrations below levels of health concern for sensitive individuals. FEMA has not requested ATSDR to evaluate longer term formaldehyde concentrations in trailers or health concerns related to potential exposures."

The FEMA attorney who had received the CDC/ATSDR report sent it to a limited number of FEMA officials. In general FEMA officials interpreted the report to say, as one FEMA official concluded:

> "*…the tests confirmed that we do not have a major issue with the formaldehyde but we are probably too casual in our communications with our applicants* [residents] *regarding proper ventilation.*"

Problems With the Initial Analysis Report

However, 6 weeks later, on March 17, 2007, the Associate Director; Office of Terrorism, Preparedness and Emergency Response; National Center for Environmental Health/ATSDR sent the FEMA attorney who had received the "Formaldehyde Sampling at FEMA Temporary Housing Units Health Consultation" a letter that expressed concerns with that report as issued. This letter, which was actually signed by the Associate Director, as opposed to the previous letter, which had been signed by an acting official, stated:

"I am writing in follow-up to my previous correspondence last month on behalf of the CDC National Center for Environmental Health/Agency for Toxic Substances and Disease Registry.

It has just come to my attention that the Health Consultation 'Formaldehyde Sampling at FEMA Temporary Housing Units' has been completed without a policy review by our senior technical staff. I am concerned that this health consultation is incomplete and perhaps misleading.

Formaldehyde is classified as 'reasonably anticipated to be a human carcinogen.' As such, there is no recognized 'safe level' of exposure. Thus, any level of exposure to formaldehyde may pose a cancer risk, regardless of duration. Failure to communicate this issue is possibly misleading, and a threat to public health. I had discussed this issue several months ago in a review of the public statement derived from the Toxicological Profile that FEMA proposed. I specified at that time that this statement contained no mention of the cancer risk and that should be a public health concern.

Thank you for your consideration of this issue and please feel free to contact me. Failure to speak to the long-term cancer risk regarding formaldehyde exposure irrespective of duration is of particular concern."

In October 2007, ATSDR would issue "An Update and Revision of ATSDR's February 2007 Health Consultation: Formaldehyde Sampling of FEMA Temporary-Housing Trailers, Baton Rouge, Louisiana, September-October 2006." This update was approximately three times the length of

the original report and, in addition to reporting the data of the first consultation; it contained a great amount of additional information, including that which was referred to in the second letter.

The CDC/ATSDR letters had both been sent to one FEMA attorney because the CDC/ATSDR officials still understood him to be their contact point at FEMA as he had been for the test results. While the FEMA attorney who received these letters shared the first letter with appropriate FEMA officials, he did not share the second, or revised, letter. According to the FEMA attorney, the cautionary second letter was consistent with previous communications that results from CDC should not be "over read." Not being aware of the second letter, FEMA officials reassured Congress and the public of the safety of FEMA trailers in statements that do not reflect the content of the second letter and that might not have been made if they had been aware of the content of the second letter. For example, on March 23, 2007, the Acting Assistant Administrator, Disaster Assistance Directorate, sent a letter to a congressional committee responding to the committee's questions. In that letter he stated:

> "*At this point, FEMA is not aware of any significant health risks to the residents of these trailers*."

On May 10, 2007, the Associated Press quoted a FEMA spokesperson as saying:

> "*We have no need, and we see no need, to question the reliability and safety of the trailers.…As long as residents can properly ventilate their units, there is no significant health hazard, little if any.*"

On July 3, 2007, the "FEMA Forward" newsletter was quoted as stating that it is a myth that FEMA must remove formaldehyde from travel trailers because:

> "*The agency's study of air samples collected from travel trailers in the Gulf area shows that formaldehyde emission levels in the units can be significantly reduced through adequate ventilation*."

The FEMA attorney, however, said he was not aware that FEMA officials had made such public statements.

Role of the FEMA Attorney in the Formaldehyde Testing Program

The FEMA attorney involved in the formaldehyde issue since early on in its development became a point person for the issue. On June 14, 2006, the FEMA Associate General Counsel for Litigation sent an email to FEMA officials that read, in part:

> "*A class action suit seeking injunctive and monetary relief from FEMA and trailer manufacturers was filed last week. Administrative tort claims also were filed*."

He then named the attorney, referred to in this report as the "FEMA attorney", who:

> "*…is handling the matter for OGC* [now OCC]. *The program should not be dealing with applicants on the formaldehyde issue without first coordinating with* [the FEMA attorney] *and DOJ* [Department of Justice]."

Later that day, a FEMA official wrote an email related to formaldehyde in trailers that included:

> "*This came up at the Senate. Has the agency conducted our own testing of the units? If not, we need to do so ASAP and put this issue to rest or remove people from harm. I don't want to rely on non-fed testing. We also need an information campaign on what we are doing about the potential issue and our eventual findings to include temporary and permanent remedies*."

One of the recipients of his email, a FEMA attorney in the Gulf Coast area, forwarded the message to the FEMA attorney with the message:

> "*Please see the email from* [the FEMA official] *below – you weren't copied so I didn't know if you had seen it*."

On June 15, 2006, the FEMA attorney sent an email to the drafter of the email concerning testing, the Gulf Coast FEMA attorney who had forwarded him the testing email, and the Associate General Counsel for Litigation, which read:

> "*Do not initiate any testing until we give the OK. While I agree that we should conduct testing, we should not do so until we are fully prepared to respond to the results. Once you get results and*

should they indicate some problem, the clock is running on our duty to respond to them."

On June 16, 2006, FEMA OCC recommended that:

On June 27, 2006, as part of the discussions addressing how to perform testing that was to be conducted by the EPA, a FEMA official asked the FEMA Gulf Coast Recovery Office whether they were taking the lead in resolving the formaldehyde issue. A Gulf Coast recovery official responded:

"*Yes, Gulf Coast Recovery will take the lead, in coordination with the TROs* [Transitional Recovery Office] *and HQ Recovery.*"

Within 15 minutes, the Associate General Counsel for Litigation sent an email to the two officials who had exchanged the emails and to more than 30 other FEMA officials stating that:

"*Please be aware that there is active pending litigation on the formaldehyde issue. FEMA activities related to testing, etc., must be coordinated with OGC* [now OCC] *and DOJ.* [The FEMA attorney] *is the OGC* [now OCC] *attorney assigned to the case.*"

The FEMA attorney was closely involved in the testing program once OCC put out the informal order that he was to be part of all communications. For example, the FEMA attorney was involved in discussions regarding how often the EPA contractor was to test each of the unoccupied units and how the units were to be coded so the testers would not know the manufacturer of each. But the FEMA attorney told us that he had no authority to direct how the EPA conducted its tests or decide which trailers to test, and did not direct EPA's testing. Once the tests were completed, EPA was to give all of the raw data to the FEMA attorney. He would be the FEMA official holding the data and would be the individual responsible for sending the data to CDC/ATSDR for analysis. The FEMA attorney received the results from EPA officials by November 21, 2006, and CDC/ATSDR received the results from him by December 1, 2006. There was a 1-week delay in the forwarding of the data because the FEMA attorney did not know to whom in CDC/ATSDR to send the results for analysis. When CDC/ATSDR completed the analysis, their product

was to be sent to the FEMA attorney, who was to serve as their contact at FEMA. The CDC/ATSDR letter that would accompany that product to the FEMA attorney would eventually note:

> "*Per your request, the data and the subsequent analysis of the data has not been shared with anyone other than* [two CDC/ATSDR staff]."

The control held by the FEMA attorney over the testing data information is shown in a December 1, 2006, report by a FEMA official of her conference call with the attorney. She reported that he had said that he:

> "*Reviewed the raw data 'in a very non-scientific manner.' It appeared overall, there were low levels of airborne contaminants of formaldehyde found in the samples collected and analyzed by the EPA. Ventilation is the primary method in which to reduce formaldehyde in the trailers.*"… "*The data was duplicated and forwarded to* [the contact person] *of the CDC.*" He had then reiterated that "*if the media or another government agency ask questions pertaining to formaldehyde*" they were to be referred to FEMA OCC.

The FEMA attorney may not have been in charge of the testing program, but he served as point of contact for study information, and that may have affected FEMA in its public announcements.

Effects of the FEMA Attorney's Role in the Program

The extent of the effects of having the FEMA attorney in a position of control in the formaldehyde testing of unoccupied residences is not very clear. There was a 1-week delay in getting the test data to CDC. However, CDC/ATSDR officials told us that their subsequent data analysis was not interfered with. The fact that the attorney controlled the receipt of data and analysis from CDC had an adverse effect because the second letter which should have cautioned FEMA officials about the reliance that could be put on the first letter and report, was not distributed or discussed by the attorney. This may have caused or allowed FEMA officials to make assurances about the safety of the FEMA trailers that were later shown to be incorrect. FEMA's appearance and reputation were also damaged with the public disclosure in the national press of the FEMA attorney's directive:

"*Do not initiate any testing until we give the OK.*[2]*…Once you get results and should they indicate some problem, the clock is running on our duty to respond to them.*"

These comments were eventually released to Congress in response to a congressional request and were carried in newspapers, with the result that FEMA was portrayed as more concerned with legal liabilities than the health of its clients.

Effects of Testing Unoccupied Units Rather Than Occupied Units

The decision by FEMA officials to test unoccupied trailers in order to analyze two mitigation strategies rather than testing occupied trailers to determine the cause, nature, and extent of the formaldehyde health threat had significant negative repercussions. Tests on unoccupied units concluded that maximum ventilation of trailers was effective and was more effective than merely cooling units with air-conditioning and limited ventilation—in effect, the study proved in the tested trailers what was already generally known. The Consumer Product Safety Commission had been advising trailer occupants since at least 1997 that the first way to reduce formaldehyde was to, "*Bring large amounts of fresh air into the home. Increase ventilation by opening doors and windows and installing an exhaust fan(s).*" Other health and safety organizations, including CDC offices, had provided similar advice. Even FEMA, in brochures that were distributed in July and August 2006, well before the testing was conducted, had advised residents under the heading "*What can I do to reduce my exposure to formaldehyde in my travel trailer?*" to "*Increase ventilation. You can reduce your exposure to formaldehyde by bringing more outdoor air into your home. Open windows and doors whenever possible.*" Although the benefits of the testing of unoccupied units were therefore limited, the real cost, apart from the funds that were spent, was that occupied units were not tested to determine the potential formaldehyde threat and would not be tested for more than a year after the testing of unoccupied units.

Causes of the Manner in Which the Testing Program Was Managed

Some FEMA officials told us that the program offices were really in control of the program, but the FEMA attorney played a key role. From the beginning of the testing effort, the program office and OCC both

[2] The major press article left out the intervening text of "*While I agree that we should conduct testing, we should not do so until we are fully prepared to respond to the results.*"

supported testing, but for different reasons. In late August 2006, a news network submitted a *Freedom of Information Act* (FOIA) request for the formaldehyde testing results.

FEMA attorneys took the position that:

> "*The testing was undertaken because FEMA was sued…. The testing is covered under the following exception to FOIA #5 and has been prepared in anticipation of litigation and is covered under deliberative process privilege, the attorney work product privilege and the attorney client privilege.*"

In other words, the testing responded to a legal issue and the results were not publicly releasable.

The Acting Assistant Administrator, Disaster Assistance Directorate, responded:

> "*For the record, we initiated this testing before we were sued.*" [And wrote to his staff] "*Is that right? I was not aware of any litigation when you first proposed engaging the EPA to test.*" The Recovery staff responded: "*I don't know if we were aware of the litigation when we began working with EPA (it certainly wasn't the driving factor). I will need to review my email archives for actual dates.*"

Since the FEMA attorney received the formaldehyde analysis from CDC/ATSDR, he was also the only person who received the second CDC letter that called into question the reliance that should be placed on the first letter and report. When he did not release the second letter to other FEMA officials, they proceeded to make optimistic statements about the safety of the FEMA trailers that they might not have made if they had all the relevant information.

We have been given several reasons for the decision to test unoccupied trailers rather than occupied trailers including that other agencies were resistant to conduct testing, especially of occupied units. FEMA officials told us that unoccupied units were tested first because that was necessary to establish a protocol for testing occupied units. However, the standard protocol for testing for formaldehyde is an established NIOSH protocol that existed long before the testing of the FEMA trailers. CDC officials told us that this NIOSH protocol was used in the tests of occupied units that were to be conducted in December 2007, and that no additions to that protocol from the FEMA/EPA testing of unoccupied units were needed or

used in that testing. Some officials who were engaged in the test planning for unoccupied units and in the analysis of those results told us that they believed that the testing of unoccupied units was needed to establish a baseline for the subsequent testing of occupied units. However, such a baseline is not referred to in the test results of occupied units and, in any case, this would not have prevented testing of occupied units from being conducted simultaneously with the testing of unoccupied units rather than more than a year later.

At the time the testing was announced to the public, the FEMA News Desk stated that:

> "*The agency has specifically asked for and received from the Environmental Protection Agency (EPA) an air monitoring and sampling plan that is intended to validate scientifically, methods that can be used to reduce the presence of formaldehyde in travel trailers.*"

The FEMA Public Affairs Office sent out talking points stating:

> "*The purpose of the study is to provide scientific support for methods that can be used to reduce the presence of formaldehyde in trailers. Specifically, the results will be used to identify activities we can take and that we can instruct the occupants to take to lower the levels of formaldehyde.*"

FEMA officials used the following similar language to describe the program to the DHS Secretary and to a congressional committee chairman:

> "*The test plan will identify a variety of activities to reduce levels, such as opening the windows for 15 minutes every morning, with testing to take place after each of the different activities.*"

These announcements all leave the impression that some groundbreaking research will test a variety of different activities and options for effectively reducing formaldehyde in trailers – research that might conceivably be worth postponing the analysis of formaldehyde problems in occupied units. However, after discussions between FEMA and EPA officials, the actual EPA test plan for unoccupied trailers accepted by August 22, 2006, called for only testing two variables: the airborne formaldehyde concentration when ventilation is provided by open windows, static vents and exhaust fans; and the airborne formaldehyde concentrations when ventilation is provided by open static vents and the air temperature and

humidity are controlled through the use of the home's air-conditioning system. While these were certainly valid options to test, they were already recognized as being among the priority steps to take to reduce formaldehyde levels in trailers and were hardly the groundbreaking research on a variety of options that were described by FEMA officials.

Our review of most of the FEMA emails concerning formaldehyde that were exchanged between late 2005 and early 2008 leads to another possible reason for testing unoccupied units rather than testing the trailers that were actually occupied and whose residents' health might be threatened. Once testing for formaldehyde levels in occupied units was completed, FEMA would need to be able to tell the occupants what the test results actually meant and how much of a health risk the occupants were taking by remaining in the trailers. The key problem that FEMA officials faced was that there were no standards for residential formaldehyde safety levels against which to compare the results. After testing, FEMA would only be able to tell the occupants: "Here are the results and they might mean you are at risk." When the results of testing occupied units were finally released in 2008, the conclusions were not too different from this statement.

FEMA officials at various levels expressed, on different occasions, this fear of what to do with the information and what to tell the occupants. FEMA officials sought usable safety standards for trailer formaldehyde levels from several organizations on several occasions, including from a CDC-convened experts panel. However, FEMA officials did not succeed in getting any organization to view producing such guidance as its role or responsibility, or in getting the standards that it needed. These were needed not only to demonstrate the real meaning of any tests of occupied units that might be conducted, but also to design the standards for future FEMA housing units in order to provide safe residences for occupants.

Conclusions

The testing of unoccupied trailers was somewhat delayed by several factors. The role that the FEMA attorney played harmed the public's perception of FEMA. The attorney's position that: "*Once you get results and should they indicate some problem, the clock is running on our duty to respond to them*" may have created a negative public image of FEMA's efforts to address the formaldehyde problem. Moreover, the attorney's sole possession of information may have allowed FEMA officials to give incorrect assurances concerning formaldehyde safety in FEMA trailers.

Whenever there are serious allegations of health and safety problems affecting FEMA clients, the initial steps should include determining whether the problem is real and the cause, extent, and nature of the threat. In this case, these steps would have required testing the formaldehyde levels in the occupied units before, or at least concurrent with, the testing of the unoccupied units. The reasons given for testing the unoccupied units first are not sufficiently convincing to overcome the general principle that determining the extent and nature of health and safety threats should always be a priority. However, the absence of any standards for what is a safe level of formaldehyde acceptable in a FEMA travel trailer, although not a sufficient reason for delaying the testing of occupied trailers, is a major health and safety problem and obstacle. HUD standards address what materials can be used in mobile homes but do not address what level of formaldehyde is acceptable in such a unit–and these standards do not work for travel trailers. In addition, the apparent 1984 HUD formaldehyde goal of 400 ppb does not appear to satisfy the safety demands that are being made of FEMA.

There will always be some formaldehyde in trailers, but FEMA officials need to know what constitutes acceptable and safe levels for the trailers provided to occupants. FEMA is not the agency responsible for determining such residential formaldehyde standards and its staff does not have the capability to do so. Nor were FEMA officials able to determine just what organization can and will fulfill such a need. However, these formaldehyde standards are definitely needed to ensure the safety of future occupants of FEMA trailers. Such standards would also help to provide for the health and safety of occupants of non-FEMA travel trailers, park models, and mobile homes, and would be of great use to consumers when they are purchasing such units.

Recommendation

We recommend that FEMA:

> **Recommendation #7:** Establish clear policy over the decision making processes related to matters of health and safety. This policy should mandate that responsible program and management officials make decisions after obtaining and considering all appropriate professional advice, including opinions and input from medical, scientific, and legal experts. Moreover, FEMA should ensure that responsible program officials and managers have access to critical information and advice related to the health and safety effects of all FEMA programs.

Formaldehyde Testing Effort for Occupied Trailers

A testing program to examine the seriousness and extent of the health threat of the formaldehyde problem in occupied FEMA trailers in the Gulf Coast region was initiated in May 2007, partly due to heightened congressional interest in these matters and after a senior DHS official directed health specialists from DHS' Office of Health Affairs (OHA) to become involved in the problem. OHA quickly started to work with CDC officials to develop the plans for an appropriate comprehensive testing program. However, there were lengthy FEMA delays in producing the documents necessary to conduct the testing. The testing program was initially delayed until October 2007. The testing effort was further delayed by 2 months when a senior FEMA official decided that FEMA was not prepared for the possible results and stopped the contract. By the time testing was conducted, it was early winter, when formaldehyde levels and, therefore, test results were likely to be lower because of the weather. Nevertheless, the test results were serious enough to cause the FEMA Administrator and the CDC Director to hold a press conference to announce the results and efforts to move the remaining occupants out of FEMA trailers.

Initiation of the Testing Program for Occupied Trailers

The process of testing occupied trailers did not start until outside events and outside officials put pressure on FEMA officials. On May 1, 2007, a major national news program featured an episode titled "Toxic Trailers." The feature addressed formaldehyde problems in FEMA trailers, and stated "*epidemiologic studies have established quite clearly that there's an increased risk of cancer, especially cancer of the nasal sinuses.*" The news feature also discussed a Mississippi pediatrician's conclusion that the persistent colds, pneumonias, and sinus and ear infections being suffered by some of his young patients might be related to the fact that every one of them was living in a FEMA trailer.

On May 17, 2007, a senior DHS official emailed the Chief Medical Officer (CMO), the Administrator, and the Deputy Administrator of FEMA:

> "*Can you work with FEMA to do a quick assessment of the facts associated with this story and let me know what you think? Is this a real medical concern? If so, how serious? Remedy?*"

Eight minutes later, the Acting Administrator for the Disaster Assistance Directorate also emailed the CMO:

> "*Reference yesterday's CBS report that a Bayou Le Batre physician has identified what he believes is an ailment trend among travel trailer residents, which he attributes to formaldehyde. While the study we commissioned on the formaldehyde problem by CDC and EPA would seem to dispute that, I am nevertheless interested in arranging to have a formal federal medical assessment of this individual's evidence and claims, to determine their validity and if further health and safety actions on the part of FEMA may be warranted. Before reaching out to the obvious candidate agency, HHS, request your recommendation on an approach*."

Later that day, the FEMA Deputy Administrator emailed the head of OHA:

> "*We've previously had CDC conduct a study. Welcome fresh look from* [the head of OHA] *and his team.***"**

That same day, the CMO emailed a CDC official:

> "*ATSDR did a nice environmental exposure study in response to a FEMA request…which showed conclusively that ventilating a new trailer could obviate the problems with new, manufacturing-related formaldehyde concentrations. We may need some further suggestions from a clinical tox perspective, and wonder how we might go about enlisting the help of you and your associates with expertise in the matter, hopefully to put it to rest, but more importantly to make sure we are not missing anything.*"

FEMA officials were apparently still unaware of the second CDC letter, which limited the reliance that should be placed on the first ATSDR study.

By May 18, 2007, the CMO was able to email FEMA officials that he had been in contact with CDC and had appointed an OHA team to work with CDC and others "*to get to the ground truth on this.*"

Meanwhile, FEMA officials in the Gulf Coast were reporting that, after being down during the winter, complaints about formaldehyde were picking up, with 28 complaints in the past couple of days:

> "*Further, occupants are now starting to request that we test their unit for formaldehyde levels.*"

FEMA Gulf Coast officials reported their plan was to explain to occupants that their workforce was not qualified to do formaldehyde testing and instead continue to recommend ventilation and swapping units when that did not work and added:

> "*But, we need this position to be confirmed with HQ and the Chief Medical Office.*"

The Acting Assistant Administrator, Disaster Assistance Directorate, replied:

> "*Don't have a strong opinion on this. Will support whatever response/interdiction strategy OGCR* [Office of Gulf Coast Recovery] *and OHA jointly determine.*"

By May 25, 2007, the OHA team and CDC had already reached initial agreement on a series of actions that were needed to address the formaldehyde problem. These consisted of a statistically valid sampling of occupied trailers looking at formaldehyde and other volatile organic compounds (VOCs), a medical evaluation through interviews with trailer occupants, a toxicological review recommending target levels based on past and ongoing research, and an engineering review looking for long term engineering solutions for formaldehyde in trailers. Thus, the critical questions concerning the health threat in occupied trailers were now being asked after more than a year.

By May 30, 2007, after discussions with CDC and FEMA officials, the OHA team had further defined the areas of inquiry that CDC would be requested to perform. These areas included how the government should determine whether excessive levels of formaldehyde or other substances were contributing to noted adverse health effects on residents of FEMA-provided travel trailers; the reasonable target levels for mitigating both long-term and short-term health effects; whether the CDC recommended that occupants be relocated from trailers that cannot be mitigated to the above recommended level; the practical trailer engineering mechanisms to reach the target levels; and the continuing mitigation requirements recommended by the CDC, such as testing and monitoring formaldehyde

levels in occupied trailers. The following day the OHA team and FEMA officials discussed the plan in detail with CDC officials.

By June 6, 2007, a FEMA executive summary of the four tasks to be requested of CDC was complete. These were:

1.	"Determine the levels of certain air quality measures (including formaldehyde, molds and airborne bacteria) for a representative sample of these trailers, under actual use conditions, in order to assist FEMA in making short-term risk management decisions concerning continued habitation of these trailers. The goal of this requirement is to determine actual conditions in the field."
2.	"Develop a protective indoor air level for formaldehyde for various time-of-residence periods, to help inform FEMA in risk management decisions concerning immediate and future habitation of travel trailers."
3.	"Identify any practical mechanisms or engineering solutions for these trailers to reach target levels that would ensure safety/health of residents."
4.	"Determine whether there is an association between poor indoor air quality in FEMA trailers and adverse health effects in children who live in these trailers."

FEMA Delays in Obtaining Testing Assistance From CDC

Problems with FEMA administrative procedures significantly delayed the agreements needed for CDC to proceed with the project, which, in turn, delayed the start of testing by about 6 weeks.

As early as June 7, 2007, one of the FEMA officials involved in the testing program had emailed the Acting Assistant Administrator, Disaster Assistance Directorate, asking whether, now that the definition of the tasks to be performed by CDC was complete, someone could start drafting the "*appropriate FEMA task document for CDC.*" CDC officials told us that they had notified FEMA early on that CDC would not be able to start any substantive work without the proper authorizations from FEMA, especially a letter of request to the CDC Director from the FEMA Administrator, and funding documents. The Acting Assistant Administrator, Disaster Assistance Directorate, immediately emailed the appropriate persons, including a note that:

> "*We need to quickly formalize a funding mechanism with CDC, to support their engagement in the formaldehyde issue.*"

By June 15, 2007, a proposed letter from the FEMA Administrator to the CDC Director requesting engagement of CDC in addressing the four formaldehyde issues had been drafted, and the Administrator and his deputy had been briefed on the formaldehyde issues and the proposal for

CDC involvement. By June 19th, a few changes had been made to the draft request letter for CDC and by June 25th, FEMA staff reported that they hoped the letter would go out the next week. Meanwhile funding documents for the requested CDC effort were also being completed, since "*the real task will not begin until the IAA* [interagency agreement] *is in place.*"

On July 2, 2007, a copy of the draft letter was sent to CDC with the note that there might still be changes in the letter, but probably not in scope. CDC, of course, needed more than just a "likely-to-get-out" draft request before they could proceed. By July 3rd, the FEMA staff who were in contact with CDC were asking to know when the letter might be signed since the CDC staff who were writing their own Director's response letter "*want to be ready to respond quickly.*"

By July 10, 2007, the head of the OHA team was emailing the Acting Assistant Administrator, Disaster Assistance Directorate, warning that since a congressional committee was scheduling a formaldehyde hearing for the next week:

> "*I think this is all the more reason that we need to do whatever can be done to get CDC their official start letter from FEMA.*"

One of the FEMA contacts for the letter then wrote: "*Letter is in final concurrence. Pushing to have final signed ASAP.*" But that same day other FEMA staff reported: "*The letter to CDC is mired in bureaucracy.*"

On July 11, 2007, the Deputy Assistant Secretary, DHS OHA, emailed the FEMA Deputy Administrator to mention that he had been talking to the head of the OHA formaldehyde team:

> "*…after we heard about the invitation to testimony that you have for next week.* [The head of the team] *mentioned that the letter from FEMA going to the CDC requesting CDC's help with the environmental study, etc., has not been sent yet as the cost analysis and clearance process had not been completed. …Evidently the CDC has also been asked by the committee what it is doing to work with FEMA on the issue…*"

The FEMA Deputy Administrator then emailed the Acting Assistant Administrator, Disaster Assistance Directorate*:*

> "*What's the story on this letter to CDC? Have we not sent it? Is there an issue?*"

To which the Acting Assistant Administrator responded:

> "*Our staff continue to work with the CFO* [Chief Financial Officer] *to establish a funding vehicle for this effort. Will have a more detailed update later.*"

On July 20, 2007, the CDC received the hard-copy letter from the FEMA Administrator to the CDC Director. It had taken approximately 45 days from the time that FEMA finalized the tasks to be requested of CDC until the CDC received the letter requesting that the tasks be performed.

Testing Program for Occupied Trailers Commences

Once the necessary FEMA documentation was completed, the formaldehyde-testing program moved forward. By the end of July, CDC officials had completed a site visit to the Gulf Coast area to "*gather information in order to draft a protocol and sampling plan.*"

However, by early August 2007, it became clear that CDC would need to use contractors for the testing that was planned, since the CDC NIOSH element would not be able to perform the required testing activity. This may have led to additional delays. FEMA reported that CDC would have a challenge getting these tests contracted because of the "*timing in relationship to end of fiscal year*." On August 16, 2007, the FEMA interagency agreement with CDC was completed. By September 10, 2007, some FEMA officials were already requesting that the contracting officer issue a delinquency notice to CDC because testing had not started as scheduled. As other FEMA officials had noted: "*we are losing some of the best time of the year to test as the heat and humidity are high.*" By October 12, 2007, CDC had announced the contract for testing of FEMA trailers and had selected a contractor to perform the tests. Testing was scheduled to begin in the Gulf Coast region in late October, and the testing contractor proceeded to get staff and equipment on site to commence the testing. And then the testing program came to a complete stop.

FEMA Officials Stop the Testing Program for Occupied Trailers

Even after the CDC contractor was in place, FEMA officials' concerns about what their strategy should be once the testing results became public caused FEMA to halt the testing effort before it could get underway. This resulted in yet another delay, nearly 2 months in this case, in the testing of occupied units.

For many months, FEMA officials had discussed what test results would mean and what could and should be said about the results of testing in occupied units. As far back as August 2006, a FEMA official had written Texas FEMA staff, who had wanted to test their occupied trailers for formaldehyde, that:

> "*…my concern* [is] *that even with the test, what are you going to use to determine if it is OK or not? There are no standards for residential safety and FEMA is not an agency to set one*."

On September 24, 2007, the FEMA Deputy Administrator emailed the OHA and FEMA officials involved in the testing effort:

> "*…are the NIOSH and CDC efforts different or the same? Are they going to work just with unoccupied trailers or with occupied? Travel trailers only or also with mobile homes? Is the RVIA* [Recreation Vehicle Industry Association] *resolution applicable to TTs? Is that the point? On the CDC assessment, is its primary objective how to help us with inventory or to gain information that will help us ensure the safety of disaster victims? I would like a timeline of what to expect from who and when. We meet with the Secretary tomorrow. Would be worthwhile to provide an update. Will need this info to ensure that I understand where we are.*"

The next day the Deputy Administrator, having received a response including a timeline that predicted the testing would be conducted from October 7 to 20, 2007, emailed the same officials:

> "*Looks like sampling completed on Oct 20th, but analysis will not be provided to FEMA until mid-December. Is that correct? What is the communications plan? It would seem that our largest communications challenge will come once we have the sampling analysis. Yet, presuming that we want to communicate the results of the sampling, how can we have the comms plan two weeks ahead of the sampling assessment? You are working in MS with CDC. Presume that sampling will take place in LA as well. I am still looking for something that will define level of 'safe' so that results of sampling have useful value.* [OHA team] *indicates the expert panel will not provide that clarity, but may provide 'relative risk' information, for whatever that means. I am concerned that we have not given enough discussion of where we will be at the end of sampling. I am concerned that we will have sampling data, but won't know how to apply it. We likely will not have 'safe' but will have 'relative risk'. What is that? How do we think,*

communicate and develop policy? I would like to have this discussion now as opposed to end of October. I would like to meet with you and [OHA] *on this issue when able. Once again, I appreciate the issue of deploy-dispose, but am more focused on safety aspects and ability to communicate those issues to current and previous occupants of these housing units*."

On October 21, 2007, having viewed the October 19th Weekly Update on formaldehyde testing, the Deputy Administrator wrote:

"*Thanks for the update. Have some concern for proper launch of test of occupied TTs. Will want assurance that we are ready, and opportunity to advise on Hill and at DHS. Still concerned we will have validated testing results and no standard to which apply. Presume 1.0 ppm will become de facto standard. Want to discuss before green light is given to proceed.*"

The Acting Assistant Administrator, Disaster Assistance Directorate responded:

"*1.0 ppm too high, at least as a standard for future purchases. We are using .015 as our current de facto standard for new purchases. This is .001 ppm below the NIOSH cellular-effect level. If we select a current habitation safety standard above .015, we will need to defensibly reconcile the two.*"

The next day, a FEMA official coordinating formaldehyde efforts wrote:

"*The numbers that are 'out there' are 0.1ppm, which is the NASA* [National Aeronautics and Space Administration] *standard and is further supported by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). The California Air Resources Board and Dept. of Health have set 0.1ppm as their 'action guideline,' meaning above that requires active mitigation. In the absence of a medical/scientific agency coming forward with a contrary number, as you suggest 0.1 ppm will likely become the de facto standard. I've asked DHS* [the OHA team] *to come over this week for a discussion on risk, the standard and what we might expect from the Expert Panel. I propose we have this discussion before considering approval of the CDC Sampling Plan. And we have not yet seen a draft of that sampling plan.*"

The Deputy Administrator responded:

> "*All good info. I do want a discussion here before a sampling plan is approved. Want to ensure that we have our media and Hill message ready, are engaged with our State partners, and have DHS up to speed. We need to look forward to anticipate the readings we are going to get, compared to the 0.1 ppm standard, and how we are going to respond when and if that level is exceeded. This is a big deal that merits a brief to the Chief* [FEMA Administrator] *to gain his approval. I've included* [a public affairs officer] *on this email to ensure that this ratchets up on the agenda in External Affairs.*"

One week later, on October 29, 2007, the CDC liaison with FEMA emailed several of his FEMA official contacts:

> "*I received a telephone call on Friday from* [the OHA team leaders] *in which they told me that in briefing the* [FEMA Deputy Administrator] *that a decision had been made that FEMA wanted to put our sampling on hold until they could determine a 'level of exposure number for formaldehyde that all or most reasonable people would consider safe.' This being necessary in case we found numbers in our sampling that it was determined would preclude further occupancy of the unit. I need something official from you as project officer that relays this request to me so that I can contact our contractor and put them on hold again. You know that we made an accommodation last week and delayed the project for a week at your request so that FEMA could do messaging around the sampling issue; this delay will no doubt cause our contractor some hardship and I would expect that they will charge the contract due to expenses that they have and will incur as a result of this delay. Please let me know ASAP what your wishes are.*"

Later that day, the FEMA formaldehyde project coordinator emailed the Deputy Administrator:

> "*This is a courtesy notification that we have initiated the action to stop CDC work on the assessment of occupied trailers until we have an approved FEMA engagement plan. We are aware that action may result in additional costs beyond the planned contract and we accept that. Tuesday we will back up the initial verbal notification with written notification via the KO/COTR* [Contracting Officer/Contracting Officer's Technical

Representative] *mechanisms. In the meantime we have worked with our EA* [External Affairs] *staff and the CDC EA staff to draft a 'Response to Query Only' statement on the reason for the delay.*"

The Deputy Administrator replied:

"*I am fine with the stop-work notification. As we discussed last week, this is a big step in our process that I do not think we are ready in all respects to take.*"

The FEMA Public Affairs Office would later issue the following statement:

"*Testing was to have begun the first week of November, but previously scheduled appointments have been postponed until health and environmental experts finalize the testing process and action levels for responding to the results of the testing are determined.*"

CDC officials told us that the contract they had with the contractor on site in the Gulf Coast to conduct testing did not allow for the type of stop-work order that FEMA officials wanted. The contract had to be canceled using the standard clause that allows contracts to be canceled "*at the convenience of the Government.*" In such cases, the government has to compensate the contractor for the expenses it has incurred to date in the contract. In this case, once the contractor had pulled back its equipment and staff from the testing area, the total cost to the government for canceling the contract came to approximately $150,000.

Testing Effort for Occupied Trailers Gets Completed

When FEMA officials were ready for the testing process to continue, CDC re-advertised for contractors to conduct the testing in the Gulf Coast area. On November 16, 2007, the CDC contact emailed FEMA officials:

"*Please be assured that we are proceeding with all haste to put in place a new contract for the formaldehyde sampling of the 500 units in MS and LA, and at the present time we have adequate funds to proceed to contract.*"

On December 11, 2007, he notified FEMA that:

> "*The contracting officer has just notified me that an award of the contract for the testing in occupied FEMA temporary housing units has just been made to…a large environmental testing firm.*"

CDC officials told us that, because they were fortunate in getting more competition when they competed this second effort at a testing contract, the second bid award was significantly lower than the first award had been; the savings more than covered the approximately $150,000 in close-out charges that had to be paid for canceling the first contract.

Formaldehyde testing of 519 randomly selected occupied trailers in Mississippi and Louisiana started on December 21, 2007, and was completed on January 23, 2008. From that date, the contractor had 10 days to wrap up its work and get the database to CDC. CDC officials had planned to complete their analysis in 10 to 14 days.

On February 14, 2008, 22 months after early reports of formaldehyde problems from occupants of FEMA trailers, the FEMA Administrator and the CDC Director held the press conference to announce preliminary results of FEMA-sponsored CDC testing of FEMA trailers and mobile homes in Louisiana and Mississippi. At that conference, the CDC Director stated that CDC had found approximately one-third of the housing units had formaldehyde levels that could cause irritation and symptoms such as runny nose, cough, or even breathing problems for residents who were vulnerable to formaldehyde such as young children, older people, or individuals who already have airway diseases. Furthermore, around 5% of the FEMA units had formaldehyde levels that were so high that even residents without vulnerabilities could experience such formaldehyde-caused symptoms. The FEMA Administrator then announced that:

> "*As a result of these preliminary findings FEMA is going to continue our aggressive action to provide for the safety and well-being of the residents of these travel trailers by finding alternative housing.*"

In addition, he stated in response to a question about future emergency housing plans:

> "*We will not ever use trailers again. We may use mobile homes…But we will not use trailers again.*"

The CDC study was released as interim findings on February 29, 2008, and in its final version on July 2, 2008. The following table, which is slightly abridged from page 24 of the CDC final report, presents an overview of the results of the formaldehyde tests.

CDC Formaldehyde Test of Occupied Trailers

	Brand	***Number in Stratum***	***Number in Sample***	***Formal-dehyde GM[1] (ppb)[2]***	***Range (ppb)***	***Weighted Percentage***	
						>= 100 ppb	***>= 300 ppb***
Travel Trailers	*Gulf Stream*	14,624	123	104	3−590	56%	9%
	Forest River	3,220	36	82	17−510	42%	6%
	Fleetwood	2,371	47	39	3−140	6%	0%
	Fleetwood CA	1,699	39	43	7−300	13%	3%
	Pilgrim	1,584	39	108	25−520	51%	3%
	Keystone	1,395	38	102	23−480	53%	11%
	Other	15,637	38	74	11−330	37%	3%
	Type Total[3]	40,530	360				[redacted]
Park Models	*Silver Creek*	224	53	33	3−170	6%	0%
	Other	809	37	48	11−160	16%	0%
	Type Total	1,033	90				[redacted]
Mobile Homes	*Cavalier*	921	42	78	14−320	36%	2%
	Other	4,486	27	53	11−120	4%	0%
	Type Total	5,407	69				[redacted]
Grand Totals		**46,970**	**519**	**77**	**3−590**	**38%**	**5%**

Notes

1. GM-geometric mean
2. ppb-parts per billion (Divided by 1000 to get parts per million)
3. Type totals include summations.

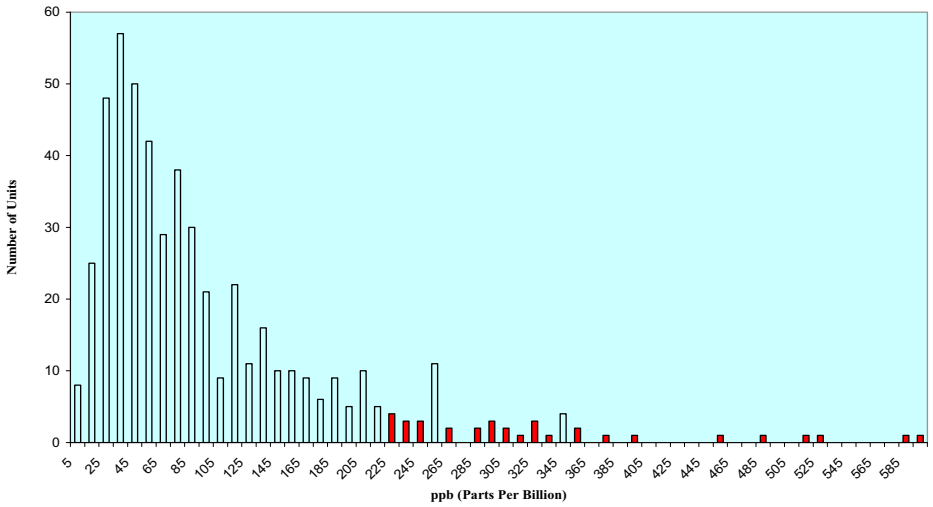
[redacted]

Source: DHS-OIG abridgement of a table in the *Final Report on Formaldehyde Levels in FEMA Supplied Travel Trailers, Park Models, and Mobile Homes* issued by the Centers for Disease Control and Prevention on July 2, 2008.

Of the 519 mobile homes, park models, and travel trailers tested, more than 170 units (approximately one-third) showed formaldehyde concentrations at or in excess of 100 ppb, "*the level at which health effects have been described in sensitive persons.*" Twenty-one of the units tested, more than 4%, had readings of more than three times that level, or greater than 300 ppb. Six of the trailers tested had formaldehyde readings in

excess of 400 ppb. The overall mean formaldehyde reading for the units tested was 77 ppb, with a range of 3 ppb to 590 ppb of formaldehyde.

Number of Units Tested by Formaldehyde Concentration at Each Level



The tested levels varied greatly by type of unit and by manufacturer. In general, travel trailers had significantly higher average formaldehyde levels than park models and mobile homes, but all types of units tested had some units that tested at greater than 100 ppb.

Also, different travel trailer manufacturers' units had very different levels of formaldehyde. The lowest mean reading for a manufacturer of travel trailers was 39 ppb, with a range of 3 to 140 ppb, while the highest mean for a manufacturer of travel trailers was 108 ppb, with a range of 25 to 520 ppb. Of the six travel trailer manufacturers that supplied the most units to FEMA, only 6% of the best-performing manufacturer's units exceeded 100 ppb and none exceeded 300 ppb, and of the second-best manufacturer's units, 13% exceeded 100 ppb and 3% exceeded 300 ppb. More than half of the tested units from the three poorest performing manufacturers exceeded 100 ppb; 51%, 56%, and 53%, respectively. In addition, more of their units exceeded 300 ppb in the tests; 3%, 9%, and 11% respectively.

Park model manufacturers' units fared better than most travel trailer manufacturers in formaldehyde testing. The single separately tested manufacturer of park model units had a mean of 33 ppb of formaldehyde for its units tested, with a range of 3 to 170 ppb. Only 6% of its units exceeded 100 ppb in testing and none exceeded 300 ppb. A combined group of park models from other manufacturers, whose units were less

used by FEMA, had a mean of 48 ppb and a range of 11 to 160 ppb. Sixteen percent of this group tested at greater than 100 ppb, but none tested at greater than 300 ppb.

Mobile home testing results were higher than park model results but lower than the results of most travel trailer manufacturers. The only separately tested manufacturer of mobile homes had a mean of 78 ppb of formaldehyde, with a range of 14 to 320 ppb. More than one-third of its units exceeded 100 ppb of formaldehyde in the tests, and 2% of its units tested at greater than 300 ppb. Since fewer mobile homes from other manufacturers were used in the Gulf Coast region, their units were grouped together in one test group. That combined group had a mean of 53 ppb, with a range of 11 to 120 ppb. Only 4% of these units tested at greater than 100 ppb and none tested at greater than 300 ppb.

In general, CDC's formaldehyde study shows a fairly wide range of exposure levels. All of the park models tested had a mean result of less than 50 ppb, as did the travel trailers of the two best-scoring manufacturers. The two groups of mobile homes tested both had means that were in excess of 50 ppb, but not by as much as the four poorest-scoring manufacturers of travel trailers, three of whom had tested units with a mean of more than 100 ppb. The mixed group of mobile homes was the best of the tested groups in percentage of units scoring more than 100 ppb, with only 4% doing so. However, the best-scoring manufacturer of park models and the best-scoring manufacturer of travel trailers tied with only 6% of their tested units scoring greater than 100 ppb, while the only individually tested manufacturer of mobile homes had 36% of its units test at greater than 100 ppb.

The CDC study also noted that formaldehyde readings are higher during warmer weather and tend to decrease as a trailer ages. The CDC results, which were measured during the winter and only after the trailers had been lived in for about 2 years, may therefore under-represent the long-term exposure levels of FEMA trailer residents. The report concluded:

> "*On the basis of the data reported here and in previous scientific reports and publications about adverse health effects associated with exposure to elevated formaldehyde levels, CDC recommended that FEMA relocate Gulf Coast residents displaced by hurricanes Katrina and Rita and still living in trailers.*"

Causes of Delay in the Testing Effort for Occupied Units

FEMA administrative procedures and a lack of planning on how to announce the results of testing and its implications delayed testing of

occupied units by nearly 4 months. But this appears to have been more the result of a lack of management effort rather than an intentional effort to delay testing until winter.

We did not conclude that FEMA officials were trying to delay the CDC testing to a time when the results would be better. Although delaying the testing until the cooler weather of December and January probably did result in lower formaldehyde readings than would have been the case if the testing had been conducted in late summer or early fall, there is no evidence that FEMA officials delayed the process in order to obtain such lower formaldehyde results. Lower formaldehyde readings from testing would not necessarily have worked to FEMA's interests. As one FEMA official noted in an email to other FEMA officials:

> "*Conventional wisdom suggests that FEMA is withholding information to keep occupants in the trailers, yet in fact nothing is further from the truth.…Cynics would argue that is why we've 'delayed' testing until the cooler weather. Again, untrue. …FEMA doesn't need to test. We want Katrina victims out of travel trailers. We have acknowledged that there may be elevated levels of formaldehyde. The industry and their consumers have known this for years. And we don't dispute that elevated formaldehyde levels have health effects. We have already researched and recommended mitigation strategies and urged occupants to work with us to explore and accept alternate housing options. Unfortunately, the remaining occupants are overwhelmingly reluctant to accept the options. Short of testing, and requiring federal actions, we are running out of administrative authorities to move or house these remaining Katrina victims. In the meantime, we are working closely with CDC to try and articulate a federal standard, and continue to lead research in mitigation strategies. This is just being smart as the largest block consumer and holder of travel trailers. It is not FEMA's place to determine 'safe.' It would be nice to have defined for us a 'safe' level for future application of future THUs* [temporary housing units] *or disposal of current THUs. But the public health community should test, apply the results to the body of scientific knowledge and communicate guidance to all consumers and occupants, including FEMA.*"

Even though we did not find any indications that FEMA officials wanted to delay the conduct of testing, actions and lack of action by FEMA officials significantly delayed the testing of occupied units. In general, there was no urgency to test occupied units until a senior DHS official

directed that medical professionals from the OHA become involved in the process. Before that time, most of the key officials' experience, focus, goals, and frameworks of reference were in the areas of disaster recovery, legal liabilities, emergency housing, or scientific studies. Their primary focus over the prior 14 months of formaldehyde-related efforts was, unfortunately, not on the medical conditions of the occupants of the trailers. But, within 10 days of assigning medically qualified OHA staff to the formaldehyde problem, FEMA's focus finally came to rest on the key actions that were needed. These included a statistically valid sample of occupied trailers being tested for formaldehyde and other VOCs, a medical evaluation through interviews with trailer occupants, a toxicological review recommending target levels based on past and ongoing research, and an engineering review looking for long-term engineering solutions for formaldehyde in trailers. Having officials with the right background and expertise helped FEMA focus its formaldehyde effort on the critical issues.

But even after FEMA began to focus on the critical issues, it would be 5 months before the first step of testing occupied trailers was ready to commence. Most of that time was needed to work out administrative details between FEMA and CDC because there was no existing interagency agreement in place between FEMA and CDC to undertake this type of health study. FEMA was not able to respond adeptly to such a situation calling for quick administrative action. It took more than 6 weeks to issue a formal request to CDC asking for their assistance. CDC officials, while not critical of FEMA, told us that they were rather surprised at how long it took FEMA to get the formal letter of request to CDC, considering that FEMA officials had acted as if the matter was urgent. Furthermore, CDC officials had to keep asking FEMA to "*shake loose*" the letter that they had previously warned was necessary to get the effort underway.

FEMA actions delayed CDC testing, but did not otherwise significantly interfere with it. We asked all of the CDC officials that we interviewed whether FEMA officials had in any way tried to influence the scientific conduct or outcomes of the study. Every one of the CDC officials we interviewed stated that in no way had FEMA officials made any attempt whatsoever to influence the scientific conduct or outcomes of the formaldehyde study. There had only been some minor conflicts concerning public affairs efforts.

Once the testing process was in place, a questionable FEMA decision set the process back by another 2 months. The Deputy Administrator caused work on the testing of occupied units to be stopped just as testing was

about to begin, resulting in the testing contract being canceled for the convenience of the government and resulting in more than an 8-week delay before another contract could be issued and a contractor put in place. The Deputy Administrator had the testing stopped because, in the absence of needed standards for "safe" levels of formaldehyde in trailers, it would be extremely difficult to communicate to the occupants of trailers just what degree of health threat they were facing. Also a plan was needed for how FEMA would respond and what actions it would take if the testing found that formaldehyde levels exceeded acceptable levels. In addition, the Deputy Administrator wanted to have a "message" ready for Congress and the media. All of these issues could and should have been anticipated prior to the commencement of the testing efforts, or could have been completed concurrently with the testing process. In any case, there never was, and still has not been, a determination of what constitutes a "safe" level of formaldehyde in travel trailers, and testing eventually went forward under a second contract without any such determination.

Usually, such an arbitrary stop-work and contract cancellation order could have cost the government significant damages. However, in this case it worked out favorably because the second contract's costs were lower than the first by more than the amount in damages that had to be paid to the first contractor. More important though, terminating the first contract delayed the testing process until winter when formaldehyde levels and, therefore, test results would be lower and delayed the announcement of the formaldehyde conditions to occupants by another 2 months.

Conclusions

Initiating testing of occupied trailers to determine the nature, causes, extent, and impact of the formaldehyde problem took far longer than necessary. Part of the reason is that the officials who were originally managing the program did not have the medical background or focus to take the necessary actions in an effective and expeditious manner, although they did attempt to reach out to scientific experts. Whenever FEMA clients face health or safety problems, it is important that qualified consultants quickly be made part of the problem management team. In the case of health issues, this means bringing in medically qualified persons. Once OHA personnel were part of the management team, they were able to help FEMA focus its efforts on medical priorities, as was appropriate in this case. OHA may not always have adequate resources to assist FEMA in such cases, but FEMA needs access to the type of expertise that they brought to the team.

Health issues are a frequent component of disasters, and FEMA has interagency agreements to address many related health program needs. However, there was no such agreement in place for performing the types of testing and analysis that were needed in the case of the FEMA trailers' formaldehyde problems. It is likely that such problems and needs will occur in the future. Given the amount of time and problems encountered in putting a single individual agreement in place, it would be beneficial to have a standing interagency agreement to provide such testing services in the future.

The decision to stop testing occupied trailers to work on improving the FEMA message and provide trailer occupants with meaningful information explaining how to apply the data was not justified by the circumstances. The necessary preparation should have been done long before testing commenced or could have been done concurrently while allowing testing to go forward. Testing to determine the prevalence, extent, and nature of health threats should not be held up in order to develop or improve messages.

Recommendations

We recommend that FEMA:

> **Recommendation #8:** Develop a standing agreement with OHA or another organization to provide medical consultants as needed to help design approaches for dealing with client health issues in FEMA operations.
>
> **Recommendation #9:** Establish a standing interagency agreement with the CDC or another qualified agency to provide testing and evaluation services for future health threat issues.
>
> **Recommendation #10:** Develop policy and related guidelines that make clear that identification and analysis efforts related to health threats to FEMA clients are not to be stopped or held up except when absolutely necessary.

Epilogue – Actions and Efforts Related to Formaldehyde in Trailers After the February 14, 2008, News Conference

Although the scope of this report ends with the February 14, 2008, formaldehyde news conference, FEMA has subsequently continued efforts to address the formaldehyde problem and has instituted new efforts. There also have been a number of ongoing efforts and some new joint efforts with CDC. These efforts were outside the scope of our review and many are ongoing and still changing.

All of the occupants whose trailers had been part of the formaldehyde testing by the CDC contractor were encouraged to have an individual "explanation session" with CDC and FEMA officials. CDC and FEMA representatives visited the occupants of the trailers and described how their unit had fared in the tests, what the test results implied, and what housing options were available to them. In addition, FEMA offered formaldehyde testing to all of the occupants whose units had not been included in the original sample of 519 trailers, but only when they requested such testing. The testing was conducted by the same firm that had performed the testing of the 519 units in the original tests, but under a FEMA contract rather than a CDC contract. As of October 15, 2008, the occupants of more than 3,500 FEMA trailers had taken advantage of this offer.

FEMA's goal was to find alternative housing for all residents of temporary housing units in the Gulf Coast area. Many of the occupants were in trailers that had been located on their property while they repaired their homes. Some of the occupants had completed repairs to the point where they could move back into their homes. It was not that difficult for those individuals to give up their trailer. But others were not so fortunate. Repairs to their homes were not yet complete because of disputes over insurance payments, the slowness of some assistance programs, the extent of damage to their residences, or other problems. Many of those individuals did not want to give up their FEMA trailers and move to alternative housing. Doing so would make it more difficult to complete the repairs to their homes, and some feared that moving away from their partially finished homes would leave them vulnerable to vandals and thieves. Other occupants of FEMA trailers were located on group or commercial sites. Many of those individuals and families had been renters before the hurricanes hit. Many were low-income families who were faced with the fact that much of the low-cost rental stock had been destroyed and the remaining rental properties had greatly escalated in price as a consequence of the reduced supply. FEMA offered alternative housing, such as FEMA-funded rentals and motel rooms, but many were reluctant to take these offers owing to doubts about what would happen to them when FEMA rental assistance was discontinued.

Nevertheless, FEMA and local officials were successful in transferring most trailer occupants back into their private residences or to alternative rented houses,

apartments, or motels. By October 15, 2008, only 11,461 households remained in FEMA trailers.

FEMA is also working to develop a supply of emergency housing units that do not present significant formaldehyde problems. Some of the existing FEMA housing stock, particularly mobile homes, park models, and travel trailers from some manufacturers, have lower formaldehyde levels.

All of the FEMA mobile homes were required to be constructed to HUD standards, including HUD restrictions on formaldehyde. Meeting those standards, however, does not mean that a unit will be below a formaldehyde level that is acceptable to FEMA. The HUD standards were originally designed to keep mobile homes below 400 ppb of formaldehyde. Although the 69 FEMA mobile homes tested by the CDC were below 400 ppb, one was greater than 300 ppb and around 25% of the units tested at more than 100 ppb. FEMA park model units actually fared better than FEMA mobile homes in the CDC tests. None of the 90 park model units tested at more than 300 ppb formaldehyde and only around 10% of the units tested at more than 100 ppb. FEMA officials are having the mobile homes and park models that are in their usable inventory tested for formaldehyde and certified by a qualified contractor. Those units that have results within an acceptable level are being offered to states suffering disasters, such as Iowa after the 2008 floods. The levels of formaldehyde in the units are made known to state officials and the states have the option of rejecting any units that are above their respective acceptable levels.

In addition, FEMA officials have developed specifications and designs for procuring future emergency housing stock that will not pose a formaldehyde threat of more than 16 ppb. Previously, in July 2007, the Acting Assistant Administrator, Disaster Assistance Directorate had directed that the implementation of contract specifications for the new park model units be halted because the plans had included using the HUD mobile home standards for formaldehyde in materials as the standards for the new park models. He directed that: "*Those specs will not suffice. Please suspend any purchases until this issue is resolved.*"

By October 21, 2007, the Acting Assistant Administrator, Disaster Assistance Directorate, had announced, "*We are using .015 as our current de facto standard for new purchases. This is .001 ppm below the NIOSH cellular-effect level.*" There is some question as to the validity of this "cellular-effect" level. CDC officials told us that NIOSH officials made this determination because it was the lowest level that the metering devices available at that time could measure, rather than being based on any particular test data. Nevertheless, the 15 ppb specification, which has been subsequently revised to 16 ppb, is an extremely ambitious specification and if met, would make FEMA trailers among the most

formaldehyde-free of any new trailers. Several trailer manufacturers, in testimony before a congressional committee, testified that they did not believe such a specification would be workable. In August 2008, however, FEMA officials told us that the majority of the park models being produced under the current contract are meeting this standard and that the rest are being sent back to the contractor for corrective work. FEMA's intention is to purchase park models and mobile homes that will all be constructed to the new standard of 16 ppb, or less, in tested formaldehyde readings.

In addition to the testing of the 519 occupied trailers in Louisiana and Mississippi, FEMA and CDC have cooperated in developing further research that examines the causes and effects of the formaldehyde problem. These efforts should lead to future trailers being much safer in terms of formaldehyde.

On April 24, 2008, CDC released a study titled "Assessment of health complaints among pediatric residents living in FEMA temporary housing in Hancock County, Mississippi." The purpose of the study was to determine whether there was a relationship between families living in FEMA trailers and their children having air-quality related illnesses. The study found similar illness patterns between children who had lived in FEMA trailers and children who had not. However, the availability of pre-Katrina data was limited and the fact that all of the children tested would likely have health effects from just living through the hurricane and its aftereffects placed limitations on the study.

In a FEMA and CDC joint effort, sometimes referred to as the "chain-saw study," to examine the causes of formaldehyde in trailers, four travel trailers from four different manufacturers were disassembled and a total of 45 formaldehyde-emitting component parts were shipped to Lawrence Berkeley National Laboratory in California for analysis. The report of this analysis was released on May 8, 2008. Before disassembly, these four units had daytime formaldehyde readings of 35 to 78 ppb. The tests found that 44 of the 45 tested components actually met the HUD standards for components of mobile homes, even though the components of these travel trailers were not required to meet the standards. The study concluded that elevated formaldehyde levels in travel trailers are most likely due to the cumulative effect of too much formaldehyde-emitting material in too small a space with insufficient ventilation, even though construction materials individually meet standards generally used in the building industry.

CDC officials told us of several additional ongoing or planned joint efforts of FEMA and CDC. These include a study of mitigation methods that might be used to reduce the formaldehyde levels of existing trailers; a "chain-saw" study of 10 to 15 more units including mobile homes, park models, and travel trailers to determine what factors allow some to have low levels of formaldehyde and what factors cause others to have high levels; and a study to validate a type of meter

that would allow for quick and easy testing of formaldehyde levels of FEMA trailers in the field. FEMA officials also reported that CDC and FEMA are making an initial combined investment of $14 million on a health registry and children's health study to further examine and monitor the health impacts of formaldehyde on the subject population.

Conclusions

FEMA and CDC have undertaken significant efforts to address current formaldehyde exposure of trailer occupants and improve the formaldehyde exposure in future emergency housing. FEMA offered formaldehyde testing services to current occupants of FEMA trailers and has actively encouraged the occupants to accept alternative housing. FEMA is also working aggressively to develop new low-formaldehyde trailers. These development efforts, if successful, could set new standards of excellence in air quality for trailers in the industry. FEMA and CDC have supported and conducted research that has given new insight into the causes of formaldehyde problems and the steps that need to be taken to address such problems. Planned future research should help address the causes and effects of formaldehyde exposure and may assist in the development of much-needed residential formaldehyde standards.

Management Comments and OIG Analysis

FEMA concurred with all of the recommendations we offered to improve efforts to promote and protect the health and safety of its clients. During the audit and after our fieldwork, FEMA officials took steps to address formaldehyde and other health and safety issues in emergency housing units. Based on FEMA's comments and actions to date, all of the report's recommendations have been resolved. FEMA will apprise us of its progress in implementing all of the recommendations within 90 days. We will close each recommendation when FEMA provides evidence that the recommendation has been fully implemented.

Two issues raised in FEMA's response to our draft report merit further clarification. FEMA officials believe the report was "unreasonable" in stating that "the contracts that FEMA entered into to purchase housing units did not result in units that had currently acceptable levels of formaldehyde." We agree that FEMA contracting officers at the time of purchase did not have knowledge of the problems that subsequently developed or of the importance of addressing such problems. We believe, however, that the report presents a reasonable analysis of one of the factors that allowed trailers with formaldehyde problems into the FEMA housing supply. Analysis of such factors is appropriate to determining what the causes of the formaldehyde problems were and what corrective actions would be needed for the future.

FEMA officials also believe "the report does not adequately emphasize the compelling fact that there were no established formaldehyde standards for travel trailers and no consensus in the health and regulatory communities as to what constituted acceptable residential formaldehyde levels." We agree that there is a lack of formaldehyde standards for travel trailers and confusion as to acceptable residential standards. We believe, however, that issue is appropriately addressed in the "Formaldehyde Standards" section of the report.

Appendix A
Purpose, Scope and Methodology

This review was mandated by Congress under the terms of the *Consolidated Appropriations Act, 2008* (PL 110-161). Specifically, the 2008 Appropriations Omnibus Explanatory Statement provided that:

> "*The IG is directed to investigate the Federal Emergency Management Agency's (FEMA) policies and processes regarding formaldehyde in trailers purchased by the agency to house disaster victims. The IG shall investigate the process used by FEMA* to *collect and respond to health and safety concerns of trailer occupants; whether FEMA adequately notified occupants of potential health and safety concerns; and whether FEMA has proper controls and processes in place to deal with health and safety concerns of those living in trailers following disasters. The IG is to report its findings to the Committees on Appropriations, including any recommendations.*" (Page 1026) and
>
> "*Additionally, the Committees on Appropriations direct the Inspector General to report to the Committees on Appropriations, the Senate Committee on Homeland Security and Government Affairs, and the House Transportation and Infrastructure Committee regarding FEMA's decision-making regarding formaldehyde in trailers.*" (Page 1077)

The objectives of our review were to determine: (1) how some of the FEMA emergency housing came to have formaldehyde problems; (2) when FEMA officials learned of the formaldehyde problems in the housing units; (3) what was done to protect housing residents and prevent further problems; and, (4) why it took as long as it did for FEMA officials to determine the extent of the formaldehyde problems in FEMA emergency housing units.

The scope of our review included all FEMA actions and other significant events relating to formaldehyde in FEMA emergency housing units (mobile homes, travel trailers, and park models trailers) from procuring the first emergency housing units in the wake of Hurricane Katrina in early September 2005 through the joint FEMA/CDC press conference announcing the results of formaldehyde testing on February 14, 2008. We also sought relevant information related to those actions taken subsequent to that date that are clearly related to the reported actions and events. That additional information is reported in the epilogue section.

We reviewed available files and documents relating to formaldehyde in FEMA emergency housing units, including all available FEMA email

documents from the period under review that included reference to the topic of formaldehyde. Quotes from these emails are referred to throughout this report. Because emails frequently have common errors of spelling or grammar, corrections were made as appropriate. However, in no case was the meaning or content of any email modified.

We interviewed responsible officials from pertinent FEMA offices, including the Disaster Assistance Directorate, the Office of the Chief Counsel, the Logistics Management Directorate, the Occupational Safety and Health Office, the Gulf Coast Recovery Office, the Louisiana Transitional Recovery Office, and the Mississippi Transitional Recovery Office. We also interviewed officials from the DHS Office of Health Affairs, CDC, and ATSDR.

We conducted fieldwork in Washington, DC; New Orleans and Baton Rouge, LA; Biloxi, MS; and Atlanta, GA. We conducted our review from February through October 2008 under authority of the *Inspector General Act of 1978*, as amended, and according to the *Quality Standards for Inspections* issued by the President's Council on Integrity and Efficiency.

The findings and recommendations in our report were prepared independently of any pending or anticipated litigation, and our report was not drafted to satisfy the evidentiary standards of a court of law. It is the position of DHS that nothing in the OIG report is an admission for purposes of litigation.

August 29, 2005 – Hurricane Katrina made landfall on the Louisiana/Mississippi state line.

September 3, 2005 – The first FEMA trailers arrived in the Gulf Coast region.

September 10, 2005 – The first FEMA trailer in the Gulf Coast region was occupied.

September 24, 2005 – Hurricane Rita made landfall on the Texas/Louisiana state line.

November 11, 2005 – OSHA conducted formaldehyde tests on unoccupied FEMA trailers in Purvis, MS.

March 16, 2006 – A Biloxi television station reported on formaldehyde problems in a FEMA trailer. FEMA officials were quoted by the press as requesting that…"*if anyone suspects a serious problem* [with formaldehyde] *to call the FEMA maintenance number at 1-866-877-6075.*"

April 6, 2006 – A testing company found unacceptable formaldehyde levels in an occupied FEMA trailer.

April 11, 2006 – A FEMA contractor tested a trailer's formaldehyde levels at the occupant's request. The results were high.

May 17, 2006 – The Sierra Club issued a press release and reported they had tested occupied FEMA trailers, and formaldehyde levels, in most, ranged from approximately 100 ppb to more than 300 ppb.

June 13, 2006 – Sierra Club officials wrote to the Acting Assistant Administrator, Disaster Assistance Directorate, and recommended that FEMA test trailers to determine formaldehyde levels, supplement manufacturers' warnings, and tell trailer occupants to vent their units.

June 14, 2006 – FEMA OGC received Hillard v. United States, et al., Civ. Action No. 06-2576 (E.D. La.) and the case was assigned to a FEMA litigation attorney. The Hillard plaintiffs asserted that the trailers provided by FEMA contained dangerous levels of formaldehyde and sought class action status, $1 billion in damages, and injunctive relief. FEMA OGC advised that because of the lawsuit, FEMA persons dealing with

applicants on formaldehyde issues must coordinate with the FEMA litigation attorney assigned to the case and the Department of Justice.

June 14, 2006 – In response to concerns regarding whether a disaster victim's death might be related to formaldehyde in a trailer, a FEMA official sent out an email: "*Has the Agency conducted our own testing of the units? If not we need to do so ASAP and put this issue to rest or remove people from harm.*"

June 15, 2006 – FEMA OGC responded: "*Do not initiate any testing until we give the OK. While I agree that we should conduct testing, we should not do so until we are fully prepared to respond to the results. Once you get results and should they indicate some problem, the clock is running on our duty to respond to them.*"

June 16, 2006 – FEMA officials decided to address the complaining occupants on an individual basis. Occupants should be directed to air out their units, run their air conditioners and: "*As a final recommendation, we would swap out the unit for a used, renovated unit which would not present the off-gassing problems experienced in the new units.…Further, OCG has advised that we do not do testing, which would imply FEMA's ownership of this issue.*"

June 27, 2006 – A FEMA official emailed the Acting Assistant Administrator, Disaster Assistance Directorate, and other FEMA officials, and stated that FEMA had to move past OCC's objections to testing and needed to prepare a safety notice for emergency housing unit occupants. The Acting Deputy Administrator for Recovery responded: "*I discussed this with* [FEMA official] *yesterday, and his recommendation, which I support, is to mission assign EPA to do a full assessment of the formaldehyde problem, and make recommendations. Agreed that you should not wait to post notices.*"

June 28, 2006 – EPA, FEMA, and ATSDR officials discussed the concept of formaldehyde testing.

July – August 2006 – More than 268,000 formaldehyde brochures were sent to trailer occupants. The brochure described formaldehyde, its effects, and actions occupants should take to reduce formaldehyde levels.

September 18, 2006 – An EPA contractor commenced testing never-occupied trailers at baseline and under two ventilation methods: by

running the air-conditioning with the bathroom vents open and by opening the windows and vents.

October 19, 2006 – The testing of unoccupied units by an EPA contractor was completed and the contractor processed the preliminary data.

Late November 2006 – FEMA received the EPA testing data and forwarded the data approximately 1 week later to ATSDR for analysis.

February 1, 2007 – ATSDR sent their "Health Consultation" report on the analysis of EPA testing results to FEMA stating: "*In summary, the opening of windows and vents was effective in reducing formaldehyde concentrations below levels of health concern.*"

March 17, 2007 – ATSDR sent a letter to FEMA warning that the February 1, 2007, "Health Consultation" report did not address the fact that formaldehyde may cause cancer, the report had been completed without a policy review by the senior technical staff, and the report was incomplete and perhaps misleading.

March 22, 2007 – The FEMA Mobile Home Operations (MHOPS) Maintenance Coordinator issued revised formaldehyde guidelines to MHOPS Field Staff for handling complaints.

March 23, 2007 – A FEMA official informed Congress that FEMA was not aware of any significant health risks to trailer occupants.

May 1, 2007 – A national news report aired a feature titled "Toxic Trailers."

May 17, 2007 – A senior DHS official sought DHS OHA involvement in the problem and OHA contacted CDC regarding testing of occupied trailers.

May 18, 2007 – A conference call was held with CDC regarding the formaldehyde issue. DHS OHA, on behalf of FEMA, continued formaldehyde discussions with CDC officials to shape the questions that needed to be addressed.

June 12, 2007 – Policy was released directing the replacement of formaldehyde problem trailers with rental housing rather than with used trailers.

July 13, 2007 – FEMA sent a letter to the CDC Director formally requesting assistance in designing additional tests related to formaldehyde and enhanced strategies for mitigation.

July 20, 2007 – The formal letter of request from FEMA for CDC assistance in testing and analysis of occupied trailers was received at CDC.

July 31, 2007 – The FEMA Administrator issued an Interim Direction announcing several additional steps FEMA was taking to address formaldehyde concerns and to work more closely with occupants who may have concerns about formaldehyde exposure including an information portal for formaldehyde concerns and the provision of rental housing to replace trailers.

August 16, 2007 – The FEMA interagency agreement with CDC for testing and analysis of occupied trailers was signed.

October 2007 – The revised and updated version of the February 2007 ATSDR "Health Consultation" addressing the testing of unoccupied trailers was issued.

October 29, 2007 – FEMA officials caused a stop-work order to be placed on the testing of occupied trailers.

December 11, 2007 – CDC awarded a new contract for testing occupied units.

December 21, 2007 – The testing of occupied units commenced.

January 23, 2008 – The testing of the 519 occupied trailers was completed.

February 14, 2008 – The FEMA Administrator and the CDC Director held a joint press conference announcing the results of testing occupied trailers.

February 29, 2008 – The interim CDC report on testing of occupied units was released.

April 24, 2008 – The CDC report on assessment of children's health was released.

May 8, 2008 –The CDC contracted report on the testing of trailer components for formaldehyde emissions was released.

July 2, 2008 – The final CDC report on the testing of occupied trailers was released.

Appendix C
Consolidated List of Recommendations

We recommend that FEMA:

Recommendation #1: Include specifications in contracts for future purchases of mobile homes, travel trailers, and park models that provide for acceptable maximum formaldehyde levels in units that are delivered.

Recommendation #2: Establish quality assurance/quality control requirements to ensure that excessive formaldehyde levels will be prevented, and institute inspection procedures to detect and reject units with unacceptable formaldehyde levels.

Recommendation #3: Promulgate a policy that any issue or problem that might affect the health and safety of occupants of emergency housing must be quickly forwarded to the responsible headquarters offices as defined in this new policy.

Recommendation #4: Train FEMA and contractor "front-line" employees who have contact with disaster victims on how to respond to health and safety issues.

Recommendation #5: Establish a policy that whenever a health or safety issue arises concerning its clients, all reasonable actions will be taken to determine the nature, cause, extent, and consequences of the problem.

Recommendation #6: Whenever a problem might affect the health and safety of FEMA clients, such as occupants of emergency housing, promulgate consistent and effective guidance to the field concerning how to address such problems.

Recommendation #7: Establish clear policy over the decision making processes related to matters of health and safety. This policy should mandate that responsible program and management officials make decisions after obtaining and considering all appropriate professional advice, including opinions and input from medical, scientific, and legal experts. Moreover, FEMA should ensure that responsible program officials and managers have access to critical information and advice related to the health and safety effects of all FEMA programs.

Recommendation #8: Develop a standing agreement with OHA or another organization to provide medical consultants as needed to help design approaches for dealing with client health issues in FEMA operations.

Recommendation #9: Establish a standing interagency agreement with the CDC or another qualified agency to provide testing and evaluation services for future health threat issues.

Recommendation #10: Develop policy and related guidelines that make clear that identification and analysis efforts related to health threats to FEMA clients are not to be stopped or held up except when absolutely necessary.

U.S. Department of Homeland Security
Washington, DC 20472

FEMA

MAY 13 2009

MEMORANDUM FOR: Matt Jadacki
Deputy Inspector General
Office of Emergency Management Oversight
Office of Inspector General

FROM: Robert A. Farmer
Acting Director
Office of Policy and Program Analysis

SUBJECT: Comments on OIG Draft Report, *Action and Inaction – FEMA Responses to Formaldehyde in Trailers*

Thank you for the opportunity to review and comment on the Office of Inspector General's (OIG's) subject draft audit report. We appreciate the extensive time and effort that went into your review of this matter, and concur with the draft report's ten recommendations. We also appreciate the OIG's acknowledgement of the positive steps that FEMA has taken to address these issues, including those taken well-before publication of this report. Nevertheless, this letter does provide additional comments and requests for changes to the report.

The report states that the contracts that FEMA entered into to purchase temporary housing units did not result in units that had currently acceptable levels of formaldehyde. This statement can only be made in hindsight. As the report acknowledges, when FEMA issued the contracts to purchase the units for temporary housing, and inspected and accepted the units, FEMA officials "would not have been aware of these levels of formaldehyde." There was no known formaldehyde issue to address and therefore no established standards. Our contracts were to purchase units built to meet or exceed industry standards and existing codes. Based on FEMA's long history of using trailers in prior disasters with no systemic air quality concerns, there was no reasonable basis for FEMA to suspect that a significant formaldehyde issue existed. Further, there were no current health advisories or product alerts from industry or consumer groups that would have made acquisition personnel aware of any concerns for formaldehyde exposure in recreational vehicles. We believe this statement is unreasonable.

FEMA is also concerned that the report does not discuss in greater detail the roles and engagement of the Environmental Protection Agency and the Centers for Disease Control, Agency for Toxic Substances Disease Registry, both of which are charged with protecting human health, and both of which FEMA engaged early in its response to the issue. The report fails to provide a complete

www.fema.gov

picture of the partnership between FEMA and these public health agencies, nor does it accurately reflect appropriate agency roles and responsibilities. Further, the report does not adequately emphasize the compelling fact that there were *no* established formaldehyde standards for travel trailers and *no* consensus in the health and regulatory communities as to what constituted acceptable residential formaldehyde levels.

In a report of this length, in excess of 75 pages, the Executive Summary becomes an extremely important feature and should better reflect the more balanced presentation contained in the body of the report. The Executive Summary fails to adequately acknowledge the aggressive FEMA efforts to move people to more viable long-term housing solutions starting well before the formaldehyde issue was identified. Hundreds of households per week were moved to alternative housing during the summer and fall of 2007, before testing began. Further, the number of relocated households often exceeded over a thousand per week.

While we will be providing a detailed corrective action plan with timeframes in our 90-day response, we now provide the following information relative to the ten recommendations:

Recommendation 1: FEMA contracts for future purchase of mobile homes, travel trailers, and park models should have specifications that provide for acceptable maximum formaldehyde levels in units that are delivered.

Response: On April 7, 2009, FEMA announced that it awarded four contracts for the manufacture of low emissions travel trailers that contained construction specifications that provide for greatly reduced formaldehyde limits. FEMA has already developed similar updated specifications for mobile homes and park models.

Recommendation 2: FEMA Quality Assurance/Quality Control requirements should be such that excessive formaldehyde levels will be prevented, and FEMA inspection procedures should be instituted to detect and reject units with unacceptable formaldehyde levels.

Response: FEMA has worked with the Centers for Disease Control (CDC) and DHS Office of Health Affairs (OHA) to write new specifications for temporary housing units, in collaboration with the industry, to identify and restrict high emitting construction materials, developed a construction Indoor Air Quality standard and included ventilation requirements exceeding industry standards. The manufacturer is required to appoint an industry approved third party Industrial Hygienist to conduct 100% air quality tests on each unit prior to acceptance in accordance with the FEMA construction standards. FEMA's national indoor air quality contractor conducts random testing at the manufacturing facility to ensure the third party's results are accurate according to the National Institute for Occupational Safety and Health (NIOSH) testing methods. FEMA's Individual Assistance (IA) Division will continue to work with FEMA's Office of Occupational Safety, Health and Environment (OSHE) who can provide the needed technical subject matter expertise related to occupational standards, regulations, exposure limits, industrial hygiene sampling methodology, and health effects for these requirements.

As an additional quality assurance measure, FEMA is actively working to establish a contract that would provide environmental testing services, including but not limited to formaldehyde, on a

sample of newly purchased housing units, as well as those previously untested units currently in inventory or being returned to inventory for future use.

Recommendation 3: FEMA should promulgate a policy that any issue or problem that might affect the health and safety of occupants of emergency housing must be quickly forwarded to the responsible headquarters offices as defined in the new policy.

Response: Addressing the health and safety concerns of disaster victims, including residents in FEMA housing, is our top priority. We recognize that as an Agency, we need to provide accurate information that brings reassurance and allows families in temporary housing to make informed decisions. FEMA is working with internal and external health and safety components, including DHS OHA and FEMA OSHE to develop guidance related to timely notification of headquarters offices of health and safety issues. FEMA has developed interim guidance on the use of temporary housing units (released March 10, 2008) to be utilized in the event of a health and/or safety risk that impacts the occupants of direct housing units. This guidance is based on lessons learned from Hurricane Katrina and includes the immediate removal of occupants from units where there is a perceived health and/or safety risk, providing an alternative form of temporary housing until the health and/or safety risk can be property assessed, providing access to a CDC hotline to discuss health-related concerns, informing occupants of unit assessment results, and identifying additional housing alternatives as appropriate.

Recommendation 4: FEMA and contractor "front-line" employees who have contact with disaster victims should be trained specifically on how to respond to health and safety issues.

Response: FEMA's Individual Assistance Division will continue to work with FEMA's Office of Occupational Safety, Health and Environment (OSHE) and the Disaster Reservist Workforce Division and will coordinate with DHS OHA to enhance, deliver, and monitor health and safety training for FEMA personnel and contractors who have contact with disaster survivors.

Recommendation 5: FEMA should establish a policy that whenever a health and/or safety issue arises concerning its clients, all reasonable actions should be taken as soon as possible to determine the nature, cause, extent, and consequences of the problem.

Response: Addressing the health and safety concerns of disaster victims, including residents in FEMA housing, is our top priority. We recognize that as an Agency, we need to provide accurate information that brings reassurance and allows families in temporary housing to make informed decisions. FEMA is working with internal and external health and safety components, including DHS OHA, and FEMA OSHE to develop guidance related to timely determination of the nature, cause, extent, and consequences of health and safety issues. FEMA has developed interim guidance on the use of temporary housing units (released March 10, 2008) to be utilized in the event of a health and/or safety risk that impacts the occupants of direct housing units. This guidance is based on lessons learned from Hurricane Katrina and includes the immediate removal of occupants from units where there is a perceived health and/or safety risk, providing an alternative form of temporary housing until the health and/or safety risk can be property assessed, providing access to a CDC hotline to discuss health-related concerns, informing occupants of unit assessment results, and identifying additional housing alternatives as appropriate.

Recommendation 6: Whenever a problem might affect the health and safety of FEMA clients, such as occupants of emergency housing, FEMA officials should promulgate consistent and effective guidance to the field concerning how to address such problems.

Response: FEMA has begun to hold regularly scheduled operations meetings allowing FEMA Headquarters the ability to provide timely guidance to the field should a similar situation arise in the future. Should such a situation occur, FEMA's Individual Assistance Division will coordinate with OSHE, Office of Policy and Program Analysis, and DHS OHA to promulgate the recommended policy as well as the training and standard operating procedures necessary to ensure consistent implementation. FEMA is committed to ensuring that policies, procedures, and training addressed in Recommendations 3, 4, and 5 above and all current policies, procedures, and training incorporate consistent and effective guidance on health and safety issues.

Recommendation 7: FEMA management should establish clear policy over the decision making processes related to matters of health and safety. This policy should ensure that responsible program and management officials make decisions after obtaining and considering all appropriate professional advice, including opinions and input from medical, scientific, and legal experts. Moreover, FEMA should ensure that responsible program officers and managers have access to critical information and advice related to the health and safety effects of all FEMA programs.

Response: FEMA has taken the appropriate steps to initiate and develop a close working relationship with OHA and other agencies such as the CDC to better define the scope of this policy. FEMA's Disaster Assistance Directorate will coordinate with OSHE, Office of Policy and Program Analysis, and DHS OHA to promulgate the recommended policy as well as the training and standard operating procedures necessary to ensure that program staff and management officials have the necessary tools required to address health and safety concerns as they relate to FEMA programs.

Recommendation 8: FEMA should develop a standing agreement with OHA or another organization to provide medical consultants as needed to help design approaches for dealing with client health issues in FEMA operations.

Response: FEMA has established relationships with internal and external health and safety components, including Health and Human Services/Federal Occupational Health (HHS/FOH), CDC, and DHS OHA, to begin exploring partnership options that would include the provision of medical consultation services for clients, employees, and contractors, as appropriate.

Recommendation 9: FEMA should establish a standing Inter-Agency Agreement with CDC or another qualified agency to provide testing and evaluation services for future health threat issues.

Response: FEMA will continue to coordinate with internal and external health and safety components to establish appropriate technical assistance mechanisms for future health and/or safety risks. FEMA currently maintains contracts and/or Inter Agency Agreements (IAAs) with HHS/FOH, CDC and DHS OHA, for testing and evaluation services for formaldehyde and mold within FEMA temporary housing units.

Recommendation 10: FEMA officials should make clear that identification and analysis efforts related to health threats to FEMA clients are not to be stopped or held up except when absolutely necessary.

Response: FEMA concurs with this recommendation and plans to incorporate this direction in the policy that will be developed and issued in response to Recommendations 3, 5 and 6.

Technical comments on the report have been provided under separate cover.

Thank you again for the opportunity to comment on this draft report and we look forward to working with you on other issues as we both strive to improve FEMA.

Department of Homeland Security

Secretary
Deputy Secretary
Chief of Staff for Operations
Chief of Staff for Policy
General Counsel
Executive Secretariat
Director, GAO/OIG Liaison Office
Acting Assistant Secretary for Office of Policy
Assistant Secretary for Office of Public Affairs
Assistant Secretary for Office of Legislative Affairs

Federal Emergency Management Agency

Administrator
Acting Deputy Administrator
Acting Assistant Administrator, Disaster Assistance Directorate
Acting Director, Office of Policy and Program Analysis
Assistant Administrator, Management
FEMA Audit Liaison (Job Code: DC8M01)

Office of Management and Budget

Chief of Homeland Security Branch
DHS OIG Budget Examiner

Congress

Congressional Oversight and Appropriations Committees, as appropriate

Appendix F
OIG Contributors

Kaye McTighe, Director

Donald Norman, Senior Program Analyst

Nigel Gardner, Senior Program Analyst

ADDITIONAL INFORMATION AND COPIES

To obtain additional copies of this report, please call the Office of Inspector General (OIG) at (202) 254-4199, fax your request to (202) 254-4305, or visit the OIG web site at www.dhs.gov/oig.

OIG HOTLINE

To report alleged fraud, waste, abuse or mismanagement, or any other kind of criminal or noncriminal misconduct relative to department programs or operations:

- Call our Hotline at 1-800-323-8603;
- Fax the complaint directly to us at (202) 254-4292;
- Email us at DHSOIGHOTLINE@dhs.gov; or
- Write to us at:
  DHS Office of Inspector General/MAIL STOP 2600,
  Attention: Office of Investigations - Hotline,
  245 Murray Drive, SW, Building 410,
  Washington, DC 20528.

The OIG seeks to protect the identity of each writer and caller.