

Ocular effects from Burn Pits in Iraq, Afghanistan, and the Horn of Africa

****NOTICE: this is not official VA or C&P released information, this is just information for you to use in assessing patients with exposure to burn pits compiled by Makesha Sink, OD*****

Information on burn pits:

- Large burn pits have been used throughout the operations in Iraq and Afghanistan to dispose of nearly all forms of waste. It is estimated that such pits, some nearly as large as 20 acres, are or have been located at every military forward operating base (FOB). The pit at Joint Base Balad, also known as Logistic Support Area (LSA) Anaconda, has received the most attention. The burned waste products include, but are not limited to: plastics, metal/aluminum cans, rubber, chemicals (such as, paints, solvents), petroleum and lubricant products, munitions and other unexploded ordnance, wood waste, medical and human waste, and incomplete combustion by-products. Jet fuel (JP-8) is used as the accelerant. The pits do not effectively burn the volume of waste generated, and smoke from the burn pit blows over bases and into living areas.
- DoD has performed air sampling at Joint Base Balad, Iraq and Camp Lemonier, Djibouti. Subsequently, DoD has indicated that most of the air samples have not shown individual chemicals that exceed military exposure guidelines (MEG). Nonetheless, DoD further concluded that the confidence level in their risk estimates is low to medium due to lack of specific exposure information, other routes/sources of environmental hazards not identified; and uncertainty regarding the synergistic impact of multiple chemicals present, particularly those affecting the same body organs/systems. The air sampling performed at Balad and discussed in an unclassified 2008 assessment tested and detected all of the following: (1) Particulate matter (PM-10) (and PM 2.5); (2) Polycyclic Aromatic Hydrocarbons (PAHs); (3) Volatile Organic Compounds (VOCs); and (4) Toxic Organic Halogenated Dioxins and Furans (dioxins). Each of the foregoing is discussed below.

Information from the US Department of Veterans Affairs website:

- Toxins in burn pit smoke may affect the skin, eyes, respiratory and cardiovascular systems, gastrointestinal tract and internal organs. Most of the irritation is temporary and resolves once the exposure is gone. This includes eye irritation and burning, coughing and throat irritation, breathing difficulties, and skin itching and rashes - See more at:
<http://www.publichealth.va.gov/exposures/burnpits/index.asp#sthash.jEyz3Oh6.dpuf>

Below are some agents found in the burn pits from various DoD testing:

1. Some of the PAHs that were tested for and detected are listed below from DoD testing from January through April 2007. ***The side effects listed next to the agents were researched on the OSHA and EPA websites listed at the bottom of the page.***

Acenaphthene- temporary irritation of eyes
Acenaphthylene
Anthracene – temporary eye redness and pain
Benzo(a)
Anthracene
Benzo(a)pyrene
Benzo(b)fluoroanthene
Benzo(b)fluoroanthene
Benzo(g,h,i)perylene
Benzo(k)fluoroanthene
Chrysene
Dibenz(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)
pyrene - temporary redness of eyes
Phenanthrene – temporary eye redness
Naphthalene - Ocular toxicity (cataracts, optical neuritis, lens opacities, retinal degeneration) with longterm exposure and high concentrations

2. The following list reveals some of the VOCs that were tested for and detected at Balad. These results are from DoD testing from January through April 2007. ***The side effects listed next to the agents were researched on the OSHA and EPA websites listed at the bottom of the page.***

Acetone – temporary eye irritation
Acrolein* - temporary eye irritation
Benzene
Carbon Disulfide - ocular changes (blurred vision, retinal microaneurisms, reduced color discrimination) with longterm exposure to high concentrations
Chlorodifluoromethane - temporary blurred vision
Chloromethane – with liquid exposure (blurred/double vision, droopy eyelids, eye twitch; corneal burn)
Ethylbenzene – temporary eye irritation
Hexane – temporary eye irritation
Hexachlorobutadiene*
m/p-Xylene – temporary eye irritation

Methylene Chloride – temporary eye irritation

Pentane – temporary eye irritation

Propylene

Styrene – temporary eye irritation

Toluene – temporary eye irritation, impaired color vision

* Acrolein and Hexachlorobutadiene were, although seldomly, detected far above the MEG ratio—once over 1800 percent above the MEG for Acrolein and over 500 percent above the MEG for Hexachlorobutadiene.

3. Below is a list of the dioxins and furans detected, all reportedly at low doses. **(no ocular side effects found).**

1,2,3,4,6,7,8 HPCDD

1,2,3,7,8,9 HXCDF

1,2,3,4,6,7,8 HPCDF

1,2,3,7,8 PECDD

1,2,3,4,7,8,9 HPCDF

1,2,3,7,8 PECDF

1,2,3,4,7,8 HXCDD

2,3,4,6,7,8 HXCDF

1,2,3,4,7,8 HXCDF

2,3,4,7,8 PECDF

1,2,3,6,7,8 HXCDD

2,3,7,8 TCDD

1,2,3,6,7,8 HXCDF

2,3,7,8 TCDF

1,2,3,7,8,9 HXCDD

octachlorodibenzodioxin

octachlorodibenzofuran

Hypothetical (unofficial) reply/opinion/take home message:

“While burn pit smoke may result in acute ocular irritation, at this time, research conducted by the Institute of Medicine of the National Academies has not shown evidence of any long-term or chronic ocular problems due to burn pit exposure.”

Sources:

1. US Dept of Labor – OSHA chemical sampling information
https://www.osha.gov/dts/chemicalsampling/toc/toc_chemsamp.html
2. US Environmental Protection Agency chemical safety information
<http://www.epa.gov/heasd/chemicalsafety.html>
3. US Department of Veterans Affairs
<http://www.publichealth.va.gov/exposures/burnpits/index.asp>
4. Institute of Medicine of the National Academies: Press Release on 10/31/2011 of effects of exposure to burn pits
<http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=13209>