

Agenda Item Number:

**ORANGE COUNTY BOARD OF HEALTH
AGENDA ITEM SUMMARY**

Meeting Date: 1/27/2016

Agenda Item Subject: E-Cigarettes: Secondhand Aerosol

Attachment(s): E-Cigarettes: Secondhand Aerosol (slide presentation)

Staff or Board Member Reporting: Jonathan Thornburg, PhD, Director of Exposure and Aerosol Technology, RTI International

Purpose: Action
 Information only
 Information with possible action

Summary Information: Dr. Thornburg will present the state-of-the-science on risks associated with the aerosol emitted from electronic cigarettes. He will describe the structure of the devices, the main components of the aerosol, and what is known about the associated health risks with an emphasis on those related to secondhand exposure.

Recommended Action: Approve
 Approve & forward to Board of Commissioners for action
 Approve & forward _____
 Accept as information
 Revise & schedule for future action
 Other (detail):



E-Cigarettes and Vapor Products: State of the Science

Jonathan Thornburg, Ph.D.
Director of Exposure and Aerosol Technology
RTI International
jwt@rti.org
919-541-5971

So What?



Global E-Cigarette Sales Surpass \$6 Billion

HOME » FINANCE » NEWS BY SECTOR » **RETAIL AND CONSUMER**

Vaping takes off as e-cigarette sales break through \$6bn

E-cigarettes are soaring in popularity and have started to steal smoking quitters away from nicotine replacement products such as patches and gum



The Telegraph



The UK is the world's second largest market for vaping device sales. Photo: ALAMY

E-Cigarettes Are a Pressing Global Health Issue



**World Health
Organization**



FCTC

WHO FRAMEWORK CONVENTION
ON TOBACCO CONTROL

**Conference of the Parties to the
WHO Framework Convention
on Tobacco Control**

Sixth session
Moscow, Russian Federation, 13–18 October 2014
Provisional agenda item 4.4.2

**FCTC/COP/6/10
21 July 2014**

Electronic nicotine delivery systems

Report by WHO

INTRODUCTION

1. This document was prepared in response to the request made by the Conference of the Parties (COP) at its fifth session (Seoul, Republic of Korea, 12–17 November 2012) to the Convention Secretariat to invite WHO to examine emerging evidence on the health impacts of electronic nicotine delivery systems (ENDS) use and to identify options for their prevention and control, for

Youth E-Cigarette Use Surpasses All Other Tobacco Products

The New York Times

Use of E-Cigarettes Rises Sharply

By SABRINA TAVERNISE APRIL 16, 2015

Email

Share

Tweet

Save

More

Kenny, a high school senior in Weston, Va., likes to puff e-cigarettes during study sessions with friends after school. James, a senior at Fauquier County, Va., uses them outside of school. A sophomore from Westchester County, N.Y., uses them while hiking with friends.

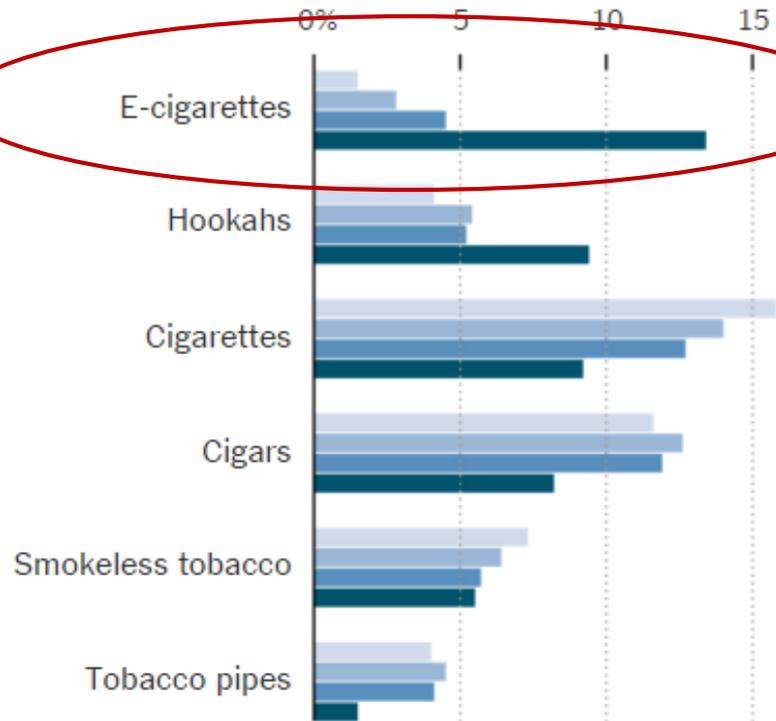
E-cigarettes have arrived in the life of the American teenager.

Use of the devices among middle- and high school students tripled from 2013 to 2014.

BROOKLYN
NOW PLAYING

Estimated share of high school students who used tobacco in the preceding 30 days, by product

'11 '12 '13 '14



Source: National Youth Tobacco Survey, 2011-14

By The New York Times

105 COMMENTS



E-Cigarettes Are a Pressing Domestic Health Issue

The New York Times

BUSINESS DAY | THE NEW SMOKE

280 COMMENTS

E-Cigarettes, by Other Names, Lure Young and Worry Experts

By MATT RICHEL MARCH 4, 2014

E-Cigarettes That Don't Look It

Like a cigarette, e-cigarettes, e-hookahs and vape pens: cigarette, these are unregulated by the F.D.A. They come in flavors like waffle, vanilla cupcake, and peppermint blast.

Cigarette



e-Cigarettes



Njoy
Traditional Flavor



Blu
Regular

Flavors come in a

Vap



The
e-H
incit

BUSINESS DAY | THE NEW SMOKE

Some E-Cigarettes Deliver a Puff of Carcinogens

By MATT RICHEL MAY 3, 2014



Public Opinion Recommends E-Cigarette Regulation

The New York Times

BUSINESS DAY | THE NEW SMOKE

280 COMMENTS

E-Cigarettes, by Other Names, Lure Young and Worry Experts

By MATT RICHEL MARCH 4, 2014

E-Cigarettes That Don't Look It

Like a cigarette, e-cigarettes, e-hookahs and vape pen: cigarette, these are unregulated by the F.D.A. They come in flavors like waffle, vanilla cupcake, and peppermint blast.

Cigarette



e-Cigarettes

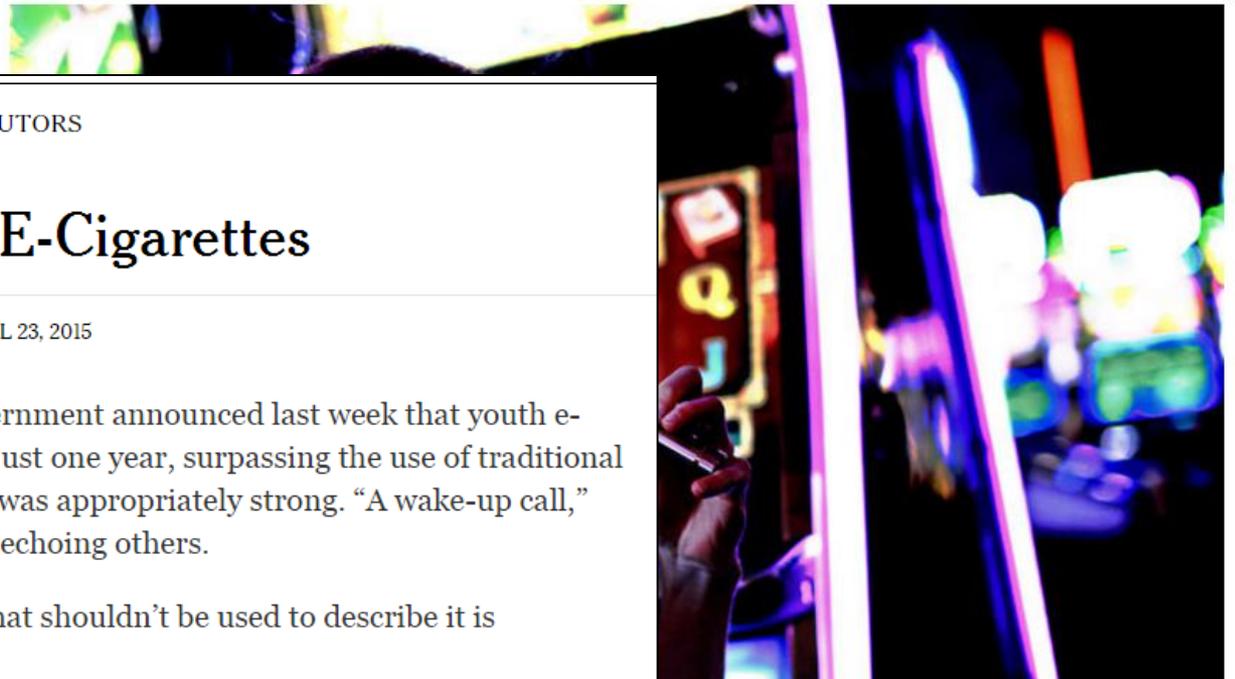


Njoy
Traditional Flavor

BUSINESS DAY | THE NEW SMOKE

Some E-Cigarettes Deliver a Puff of Carcinogens

By MATT RICHEL MAY 3, 2014



The Opinion Pages | OP-ED CONTRIBUTORS

It's Time to Regulate E-Cigarettes

By DAVID A. KESSLER and MATTHEW L. MYERS APRIL 23, 2015

Email

Share

Tweet

WHEN the federal government announced last week that youth e-cigarette use tripled in just one year, surpassing the use of traditional cigarettes, the reaction was appropriately strong. "A wake-up call," said one commentator, echoing others.

We agree. But a word that shouldn't be used to describe it is "surprising."

What Are E-Cigarettes?



E-Cigarettes: Types of Devices



E-cigarette Liquids

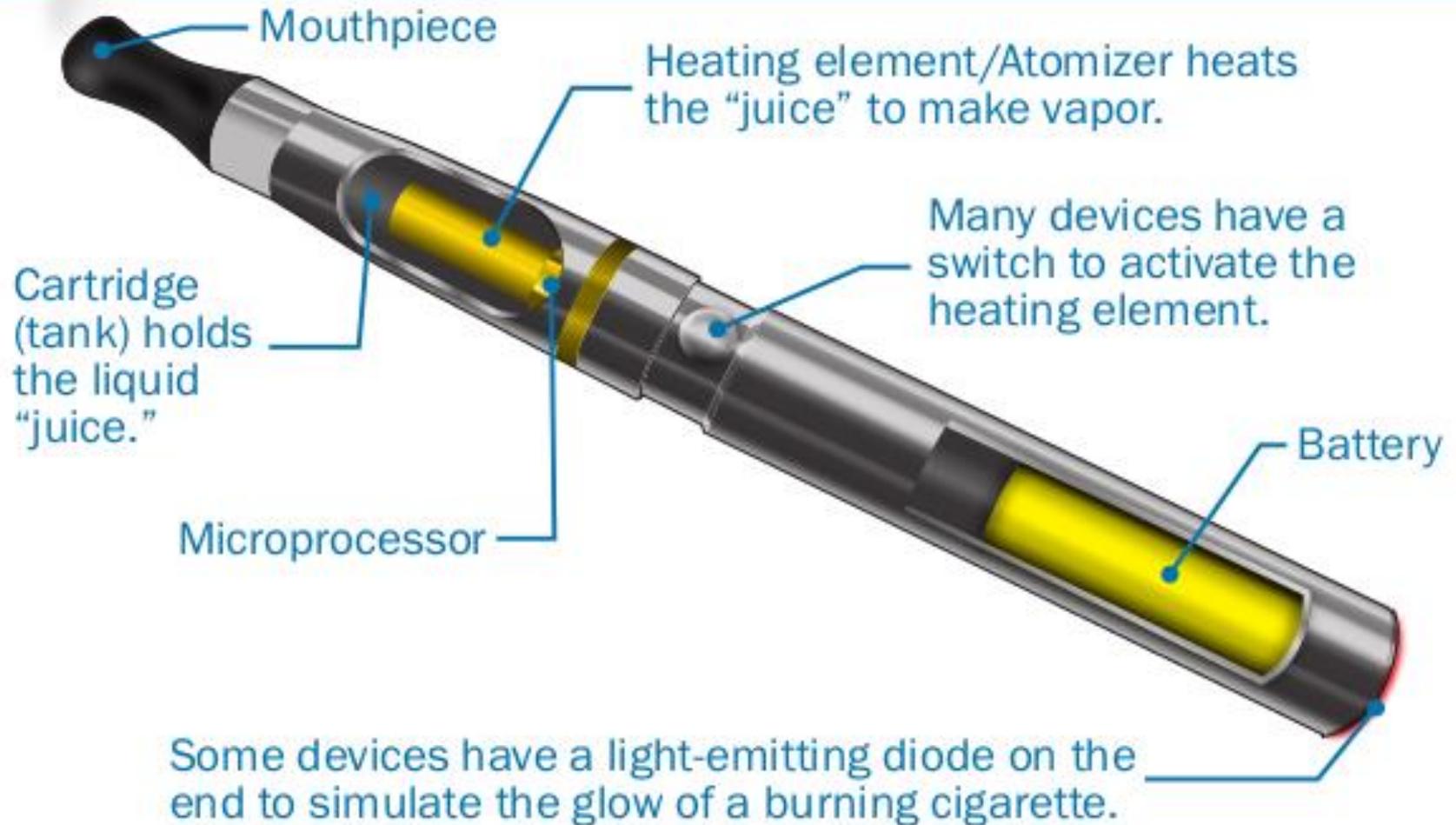


- Available with and without nicotine
- Flavorings
- Carrier liquid is propylene glycol and/or glycerin



How E-Cigarettes Work

Parts of an Electronic Cigarette



What Emissions Do E-Cigarettes Produce?



Terminology

- **Electronic cigarettes generate a mixture of vapors and aerosols**
- A **vapor** is a gas formed by boiling or evaporating a liquid
- An **aerosol** is a solid or liquid particle suspended in a gas, usually air
 - Aerosols are measured in **micrometers (or microns)**
 - A human hair is 50 to 100 micrometers (μm) thick
 - Note that “aerosol” and “particle” are synonyms, both terms will be used inter-changeably

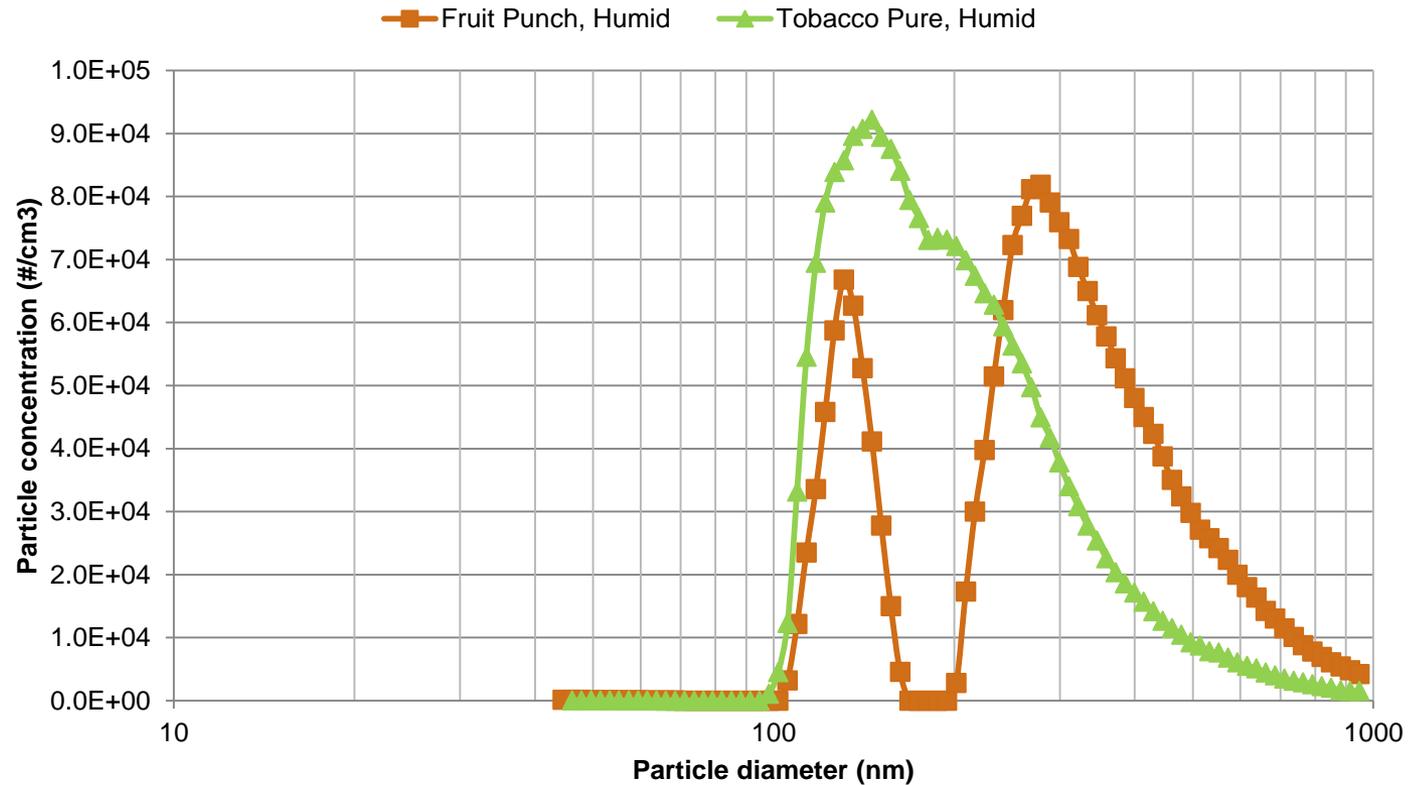
Composition of E-Cigarette Emissions

Chemical Class	Purpose	Bulk Liquid	Aerosol	Gas
Nicotine	Active ingredient	•	•	•
Glycerin and glycol	Carrier liquid	•	•	•
Alkylated cyclic compounds ^a	Artificial flavors	•	•	•
Phenolic compounds ^b	Preservative	•	•	•
High molecular weight aromatics ^c	Artificial colors	•		

^aEthyl maltol, 2-methyl naphthalene, and 2-tert-butyl-p-cresol present, ^bBHA and BHT present, ^cOnly in “fruit punch” flavored liquid.

Particle Size of E-cigarette Emissions

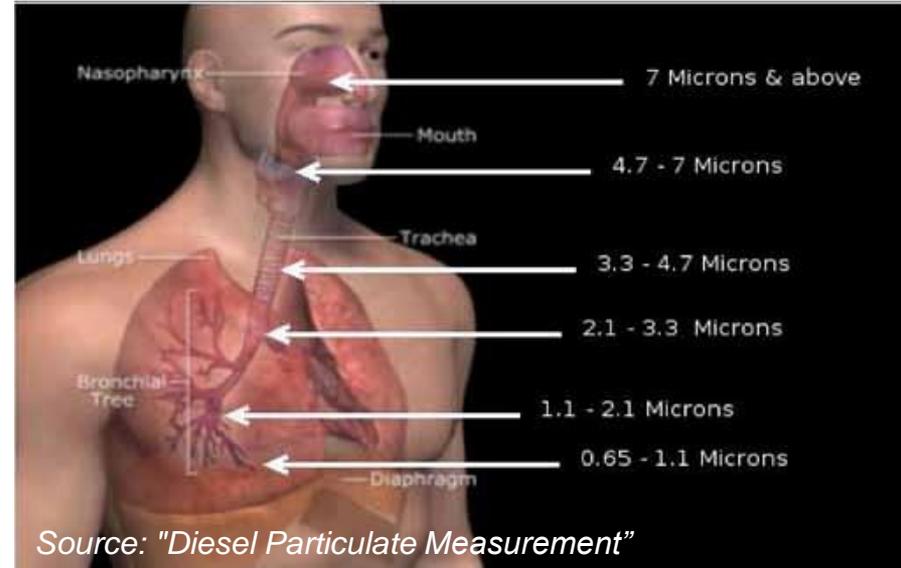
- Particles are small (< 1000 nm)
- Size varies with the type of e-liquid used



Particle sizes produced by two different e-liquids

Why is Particle Size and Concentration Important?

- Size determines **where** the particles deposit in our lungs
- Concentration determines how **many** particles deposit in our lungs

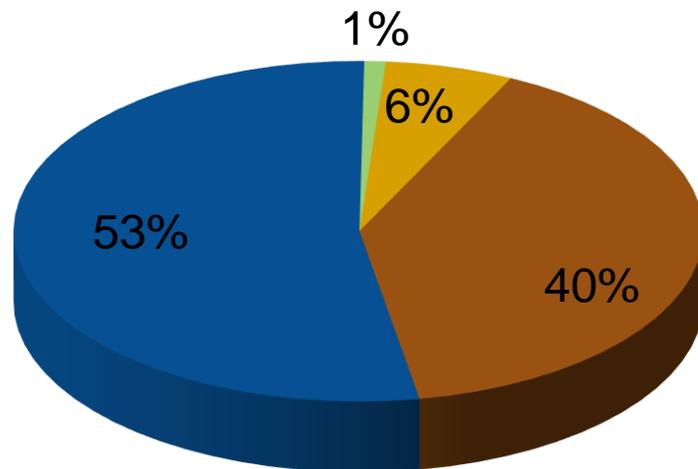


- Scientific reasons for understanding size and concentration of the aerosols produced by electronic cigarettes
 - The **chemical composition** of the particles varies with size and concentration
 - Size and concentration determine the **toxicity** of the particles.
 - User and secondhand exposure is determined by the size, concentration, and composition of the particles

What Remains in the User's Lungs and What is Exhaled?

- Model results predicted 47% of inhaled emissions were deposited in the lung, mostly in the deep lung (RTI unpublished data)
- Are the potential exhaled electronic cigarette emissions a potential second-hand exposure?

Respiratory Deposition of E-Cigarette Emissions

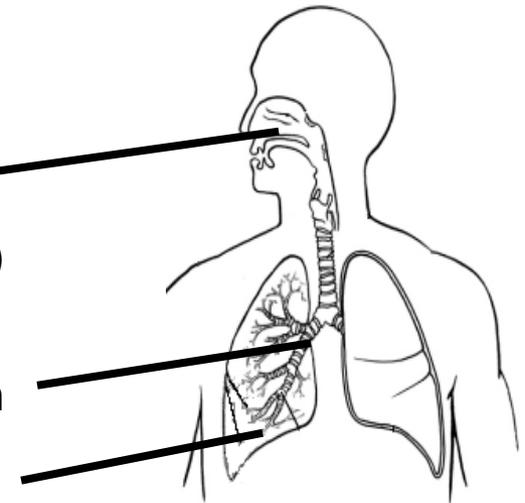


■ Exhaled

■ Head
(nose and throat)

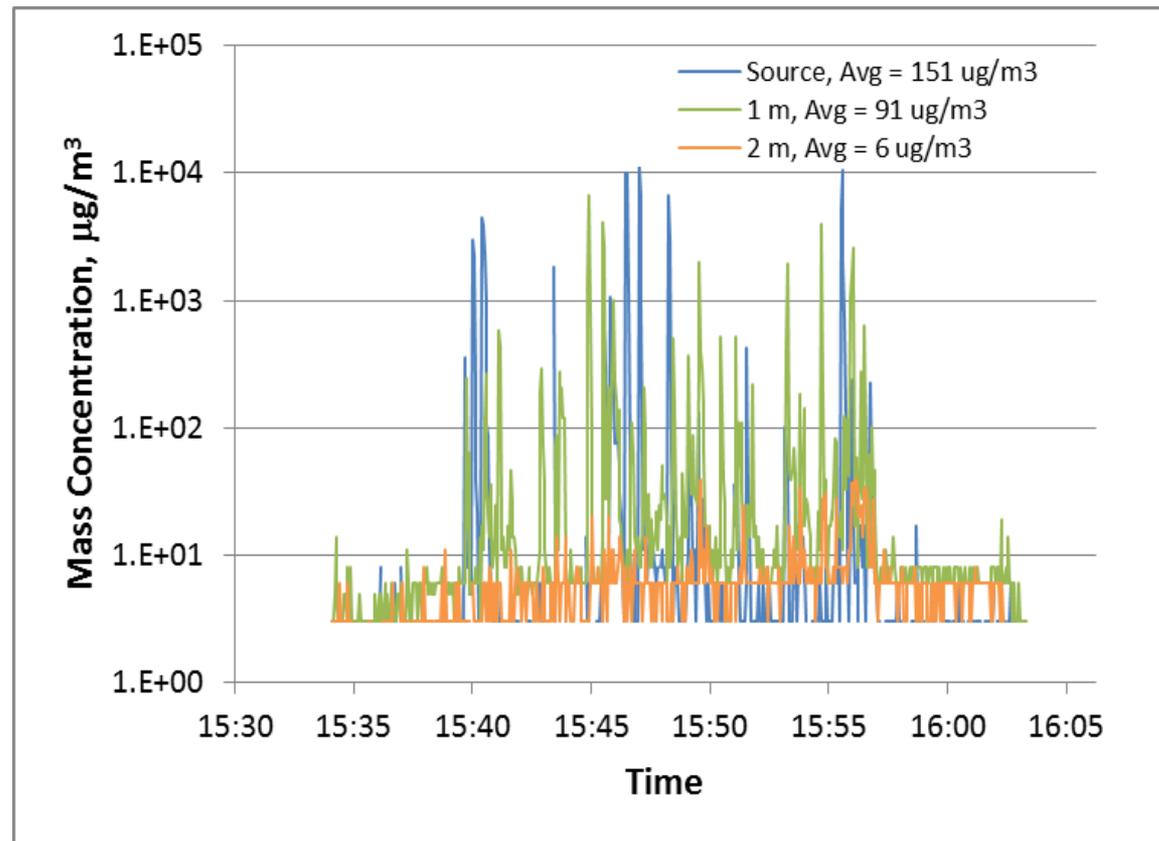
■ Tracheo-
Bronchial Region

■ Alveolar Region
(deep lung)



Are Secondhand Exposures Possible?

- RTI unpublished data suggests e-cigarette use within a room could cause secondhand exposures
- Exhaled e-cigarette vapors from a single user were detected 6 feet away; concentrations were 25 times lower than adjacent to the user



Health Implications of E-Cigarettes Emissions

Toxicity and Health Effects

- Health effects and toxicity of nicotine are well known
- Toxicity of some ingredients in e-cigarettes are also known
 - Ingredients can include known toxicants such as diacetyls (butter flavor), cinnaldehyde (cinnamon flavor), etc.
 - Industrial hygiene inhalation toxicology provides scientific basis
- Toxicity of other ingredients are unknown
 - Many ingredients classified by FDA as “generally regarded as safe” for ingestion
 - Inhalation toxicity has not been studied
 - Propylene glycol, glycerin, many flavorings, and artificial colors fall into this “unknown” category
- Toxicity of by-products from e-cigarette use
 - Improper use, user modifications, or poor quality construction can cause other toxics to be produced from the e-liquid or device
 - Formaldehyde: thermal decomposition of carrier liquid
 - Heavy metals: leaching from heating element

Health Risks to Users and Public

Users

- Health risks from inhalation of nicotine, certain ingredients, and some by-products of use have been established by scientific literature
- Acute and chronic impacts that result from inhalation of high concentrations of many common e-liquid ingredients with unknown toxicity are unknown

Secondhand exposure

- Research on the potential for secondhand exposure and associated health risks has been limited

Tertiary exposure

- Potential exposure to nicotine or other components of e-cigarette emissions that deposit on surfaces has not been investigated

Summary



Where are we?

- Science has not kept pace with e-cigarette development and use growth to inform policy at the national, state, county, or municipal level
- Areas of most knowledge
 - Usage rates in adult and youth populations
 - Toxicity of e-cigarette emissions (generically)
- Areas of least knowledge
 - Potential for secondary or tertiary exposure
 - Acute and chronic health impacts on user or others