

BioE 100: Lecture 3

Society Affects Science & Technology:
The FDA

What does the FDA do?

Mum, what does the FDA do?

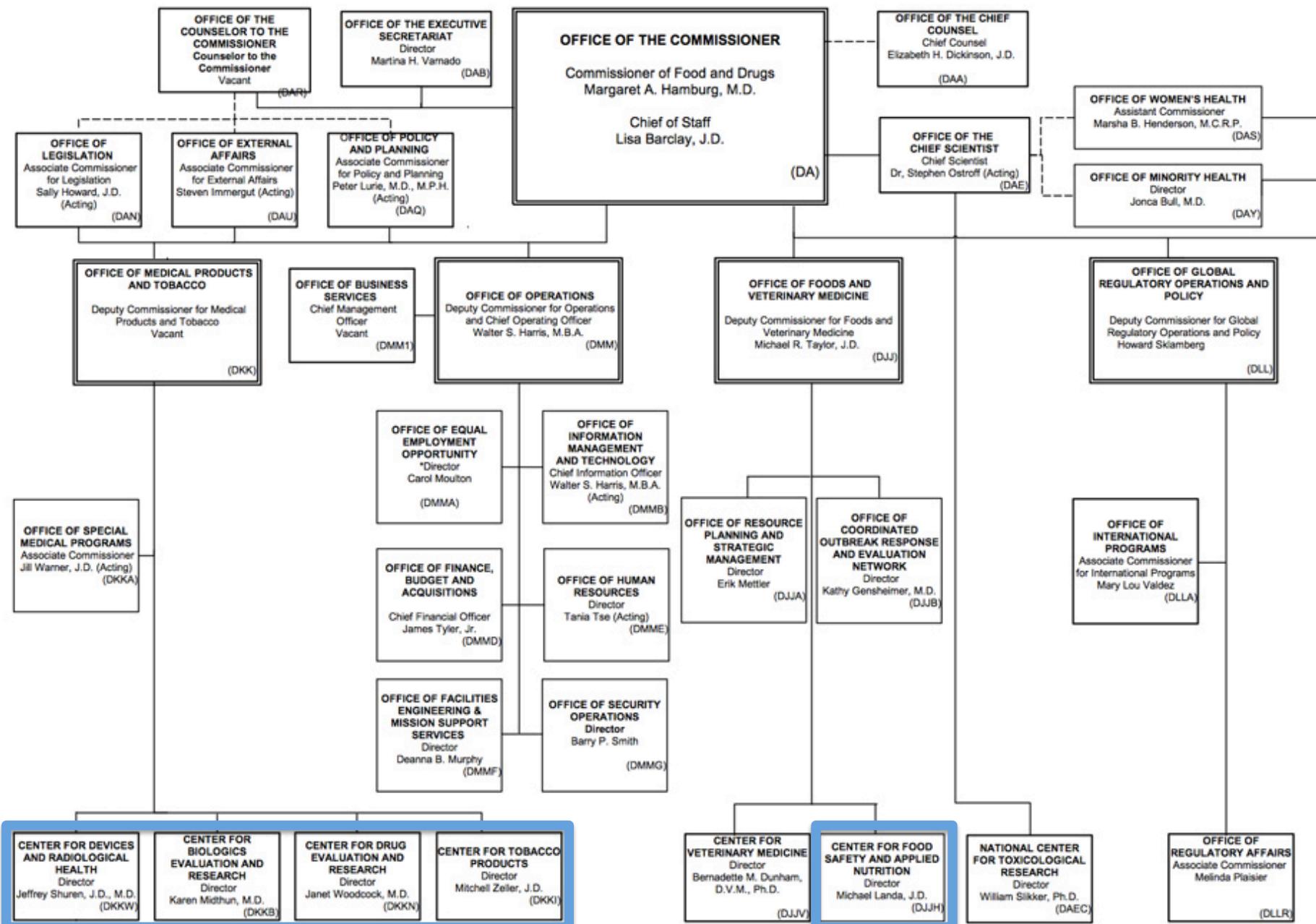
Well, let me see now, darling . . . I suppose it's there to protect the doctors and drug companies against scary, angry parents giving them a hard time for having killed their children.



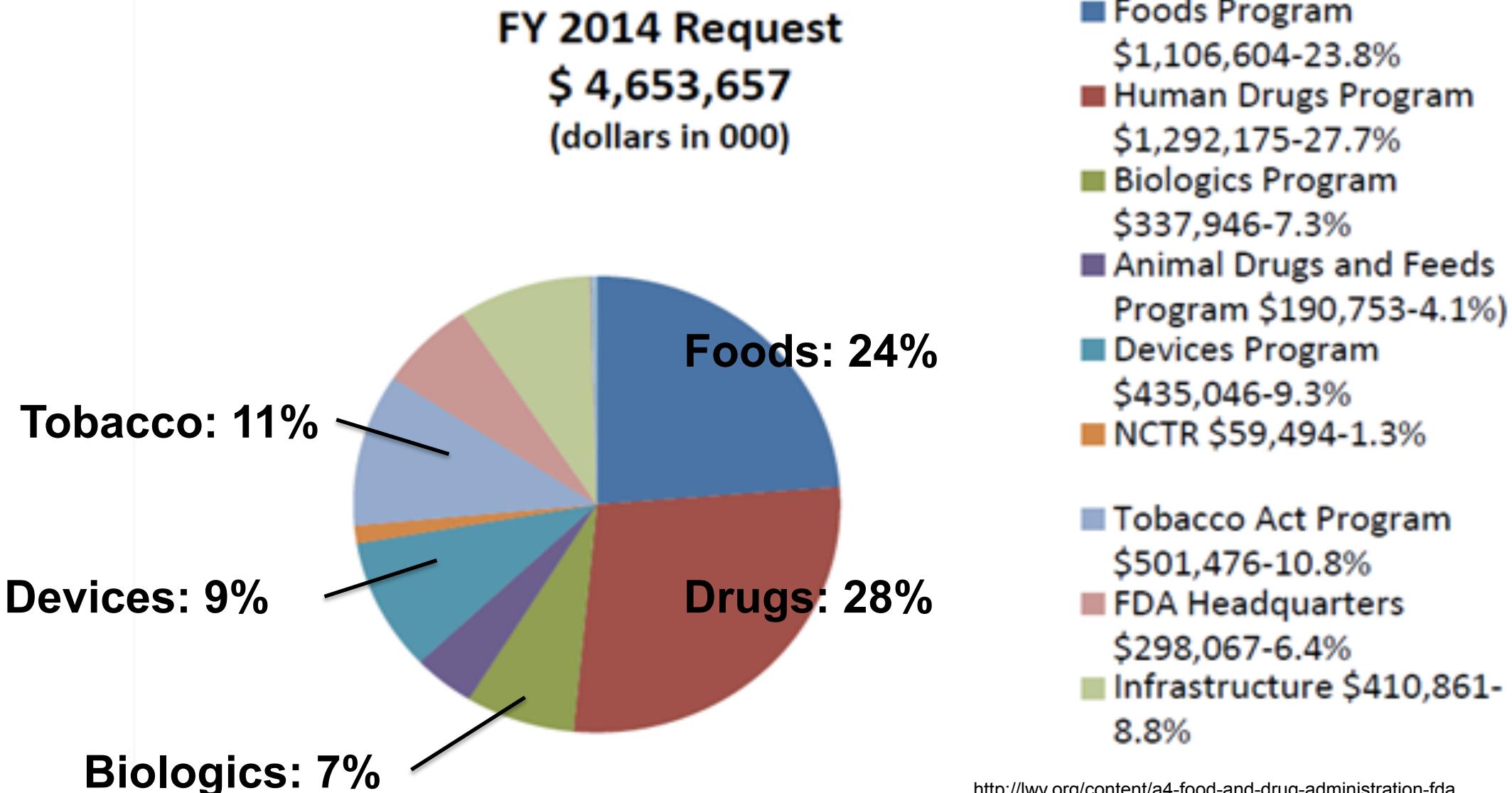
Lecture 3 Agenda

- FDA History and Structure
- Drugs vs. Medical Devices
- Tobacco

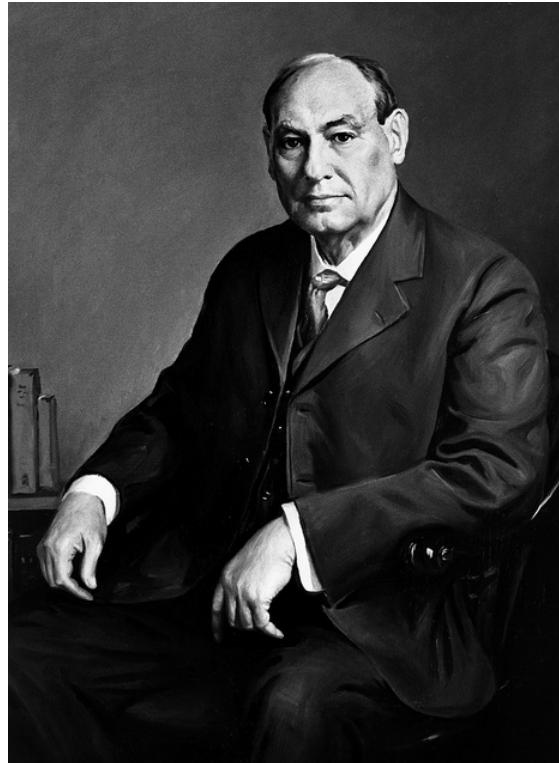
FOOD AND DRUG ADMINISTRATION



How much is spent by the FDA?



Harvey Wiley: “Father of the Pure Food and Drug Act”



- Chief Chemist at the Department of Agriculture Bureau of Chemistry (the FDA before it was called the FDA)
- Conducted early studies on toxicity of preservatives with the “poison squad”

HAMLIN'S

WIZARD OIL



gettyimages®

Library of Congress

640475011
BEST PAIN REMEDY ON EARTH

THE
CALVERT LITHO CO.
DETROIT & CHICAGO

William Carter with Wiley and the Poison Squad



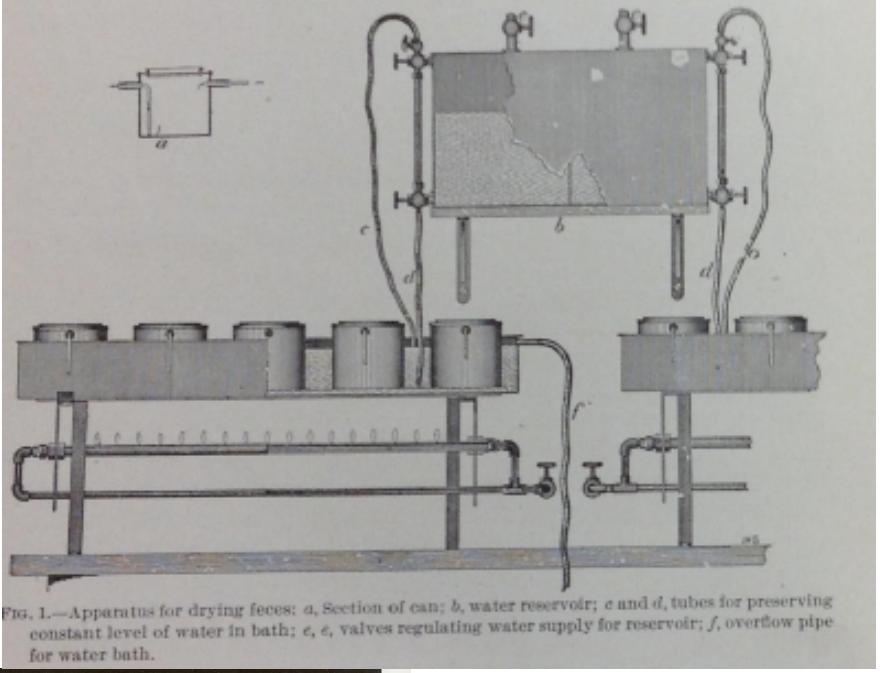


FIG. 1.—Apparatus for drying feces: *a*, Section of can; *b*, water reservoir; *c* and *d*, tubes for preserving constant level of water in bath; *e*, *f*, valves regulating water supply for reservoir; *f*, overflow pipe for water bath.

Philadelphia, Pa.

Dear Sir:

I read in the paper of your experiments on diet. I have a stomach can stand anything. I have a stomach that will surprise you. I am afflicted with 7 seven diseases. Never went to a doctor for 15 years. They told me 15 years ago that I could not live 8 months. What do you think of it? My stomach can hold anything,

Yours truly,

1906 “Pure Food and Drug Act”



- President Theodore Roosevelt signed the federal law prohibiting adulterated and mis-labeled foods and drugs
- Allowed examination of foods and drugs
- Allowed seizure of mislabeled foods and drugs

1938 Food, Drug and Cosmetic Act



- After 107 people died from 'Elixir Sulfanilamide' (antibiotic) medication using diethylene glycol as the solvent...
- Changed the FDA from a 'policing' agency to a 'regulatory' agency
- Must prove SAFETY BEFORE marketing

Video link: http://www.nytimes.com/2013/09/23/booming/the-death-and-afterlife-of-thalidomide.html?_r=3

Thalidomide



Frances Oldham Kelsey blocked the FDA approval of thalidomide in the US.



1962: Drug Amendments



- Unanimously passed by Congress
- Must prove **EFFICACY** of drug as well as **SAFETY**... **BEFORE** marketing
- Required:
 - Informed consent of patients in drug studies
 - Reporting of adverse events to FDA
 - Complete information provided to doctors (risks and benefits)

Micro-dynameter Type A 1936

“The ELLIS MICRO-DYNAMETER provides the physician with a new and penetrating insight into the pathological condition of the patient. . . . provides a new measure of disease and disease intensity . . . calibrates intensity, calibrates progress. . . and registers these findings visibly-readings as definite as those of a clinical thermometer.” – from Ellis Research Laboratories ad



“The copper dishes on the lower part of the cabinet were rubbed by the patient and the operator manipulated the dials above to provide a roving beam of light from the string galvanometer to the top curved gauge. When this device was restored, it was discovered that there was no connection from the copper plates to the machine.” - Museum of Quackery

Micro-dynameter 1963

Commissioner Lerrick of the Food and Drug Administration called the machine "a peril to public health because it cannot correctly diagnose any disease...thousands of patients are being hoodwinked by its use into believing they have diseases which they do not have, or failing to get proper treatment for diseases they do have."



"Over 1,200 of the devices were seized by the FDA or voluntarily destroyed by the practitioners.

The Micro-Dynameter is a string galvanometer - a rather simple device for measuring electric currents installed in this impressive cabinet. The machines sold for as much as \$875 each. During a court trial, evidence was introduced that readings given by the Micro-Dynameter showed no significant differences between a cadaver and a living body." - Museum of Quackery

Medical Device Amendments of 1976

- Introduced the device classification system.
- Enabled regulation of market entry.
 - Prove safety/effectiveness

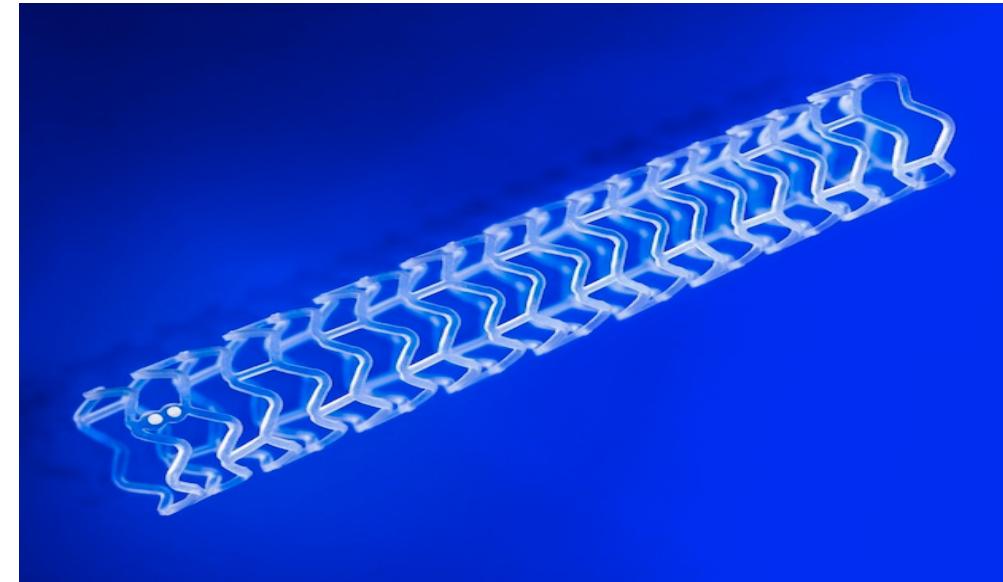


Photos courtesy of US FDA 'Orgone Accumulator' sold by psychiatrist Wilhelm Reich

Lecture 3 Agenda

- FDA History and Structure
- Drugs vs. Medical Devices
- Tobacco

Treatments



What is it?

What is a drug?

What is a medical device?

How do drugs and devices do their job?

What is a drug?

A drug is defined as:

- A substance recognized by an official pharmacopoeia or formulary.
- A substance intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease.
- A substance (other than food) intended to affect the structure or any function of the body.
- A substance intended for use as a component of a medicine but not a device or a component, part or accessory of a device.
- Biological products are included within this definition and are generally covered by the same laws and regulations, but differences exist regarding their manufacturing processes (chemical process versus biological process.)
-

Biological Product

- Biological products include a wide range of products such as vaccines, blood and blood components, allergenics, somatic cells, gene therapy, tissues, and recombinant therapeutic proteins. Biologics can be composed of sugars, proteins, or nucleic acids or complex combinations of these substances, or may be living entities such as cells and tissues. Biologics are isolated from a variety of natural sources — human, animal, or microorganism — and may be produced by biotechnology methods and other cutting-edge technologies. Gene-based and cellular biologics, for example, often are at the forefront of biomedical research, and may be used to treat a variety of medical conditions for which no other treatments are available.
- In general, the term "drugs" includes therapeutic biological products.

What is a medical device?

A medical device is an **instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent**, or other similar or related article, including any component, part, or accessory, which is—

- recognized in the official National Formulary, or the United States Pharmacopeia, or any supplement to them,
- intended for use in the **diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease, in man** or other animals, or
- intended to affect the structure or any function of the body of man or other animals, and which **does not achieve its primary intended purposes through chemical action** within or on the body of man or other animals and which is **not dependent upon being metabolized** for the achievement of its primary intended purposes (21 U.S.C. 321(h)).

Arterx Sealant



Malaria Test



Dermal Template



Heart Valve



Insulin Pump



Stent



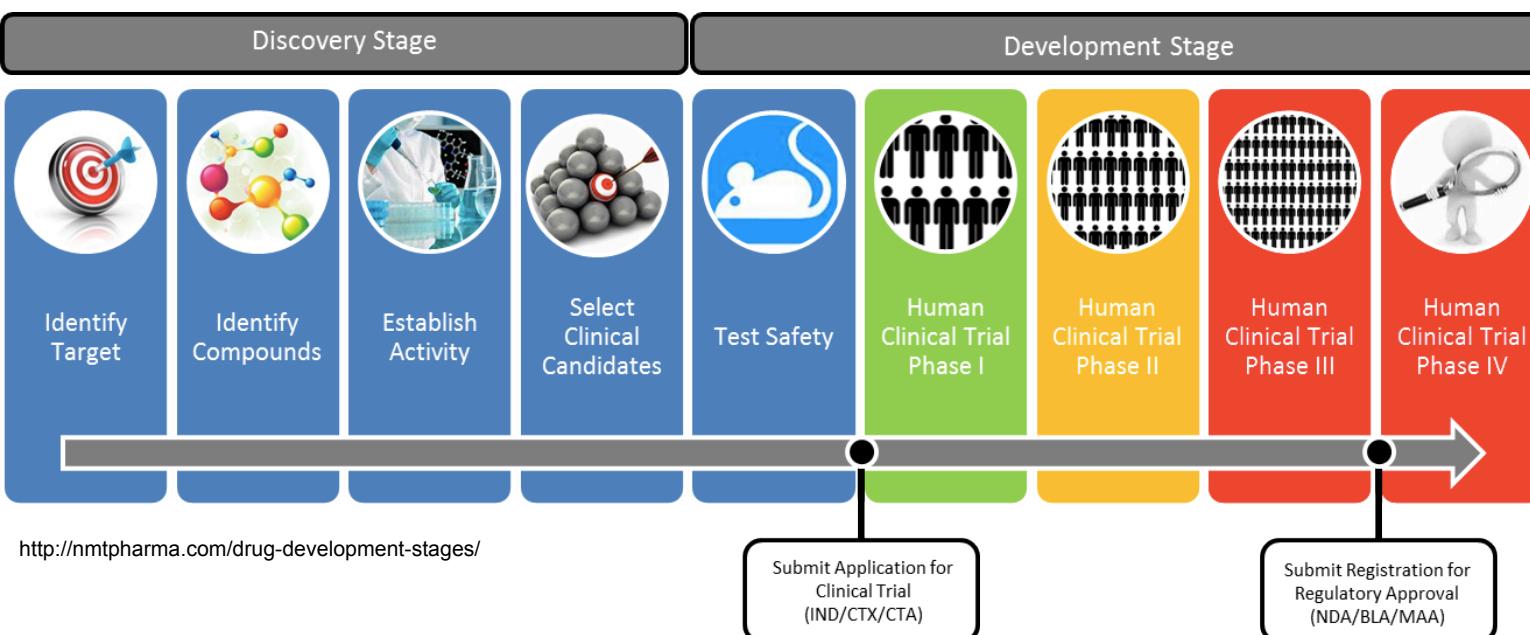
Mandible System



TB Test

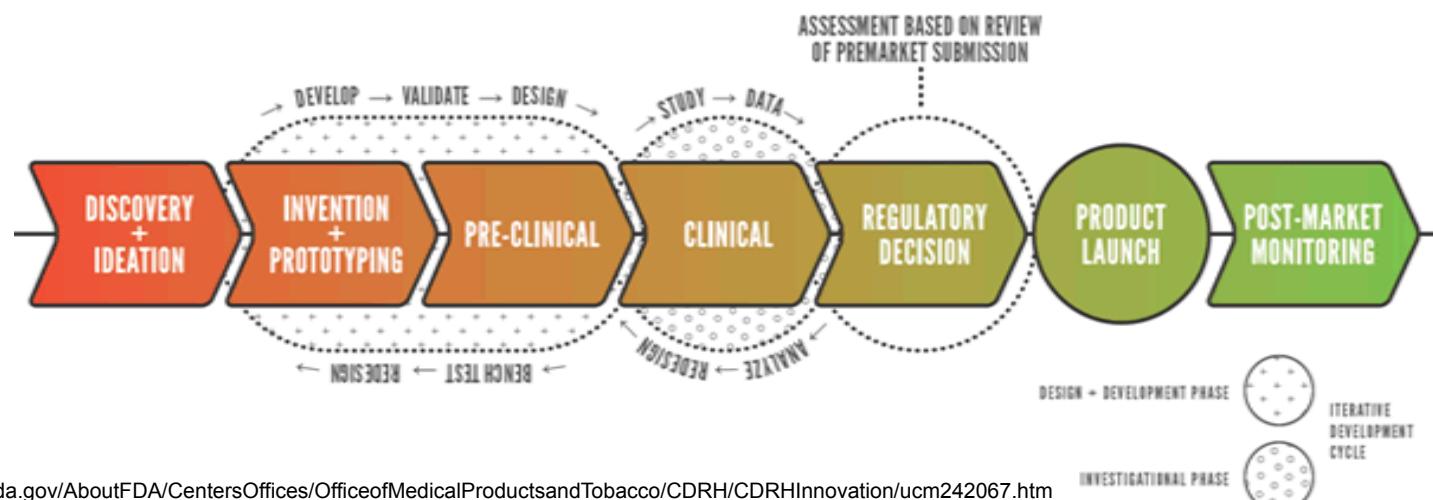


DRUG DEVELOPMENT PATHWAY



How are the two pathways similar?
different?

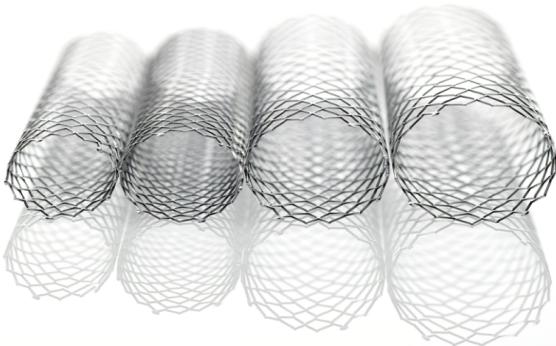
DEVICE DEVELOPMENT PATHWAY



Medical Devices vs. Drugs

MEDICAL DEVICES

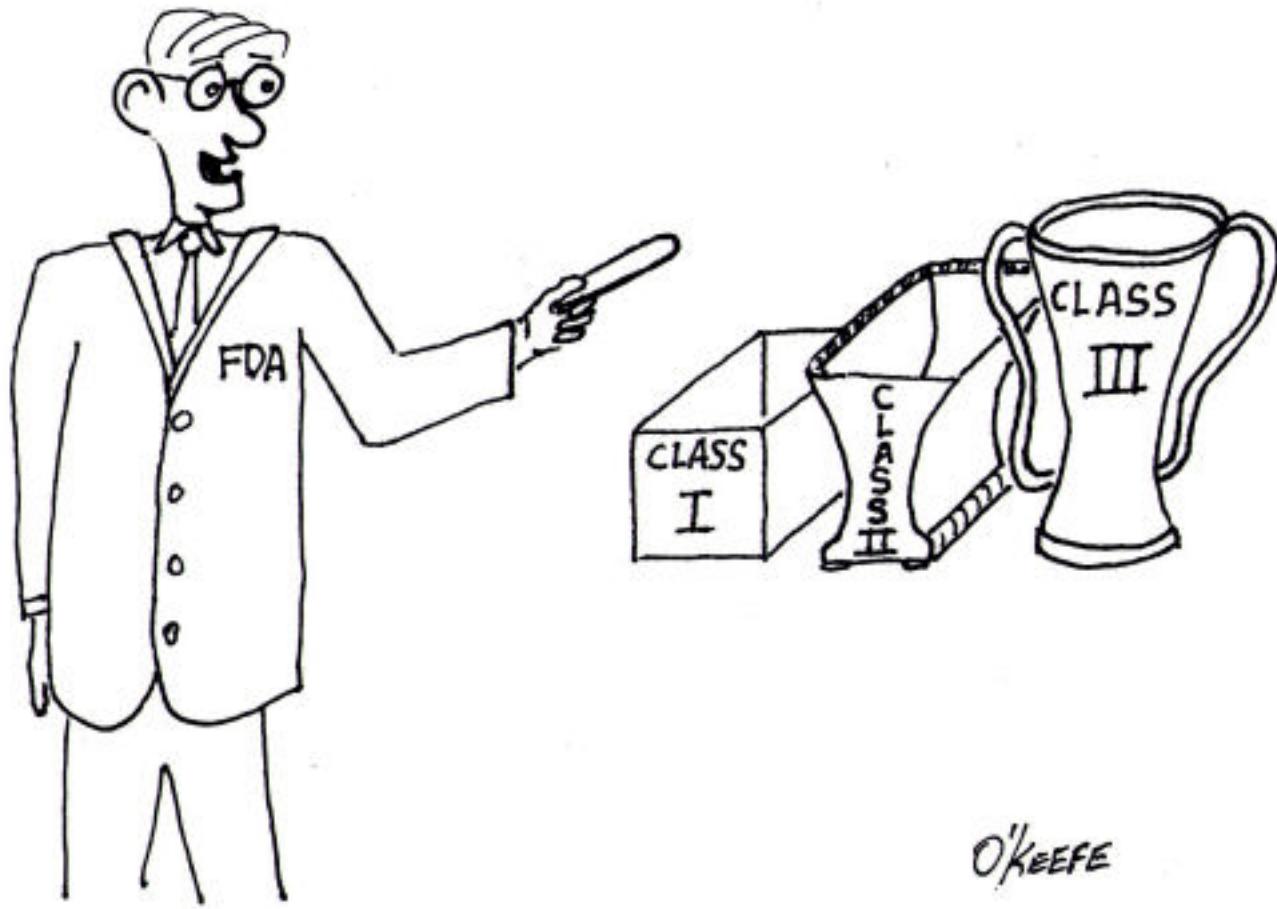
- Tongue depressors to pace makers
- Market Size: \$300B+
- Annual Revenues: \$M (rarely \$B)
 - AlloDerm - \$170M+/year
 - Xience V - \$1.5B+/year
- Time to Market: 2-5 years
 - Cost: \$5M - \$100M



DRUGS

- Pharma/Biotech
- Drug Market Size: \$700B+
- Annual Revenues: \$B
 - Lipitor - \$12B+/year
 - Plavix - \$9B+/year
- Time to Market: 11-14 years
 - Cost: \$1-\$4B





**Eenie, meenie, mynie, moe, in which bin should
the tongue depressor go?**

FDA Medical Device Classification

Class I



Class II



Class III



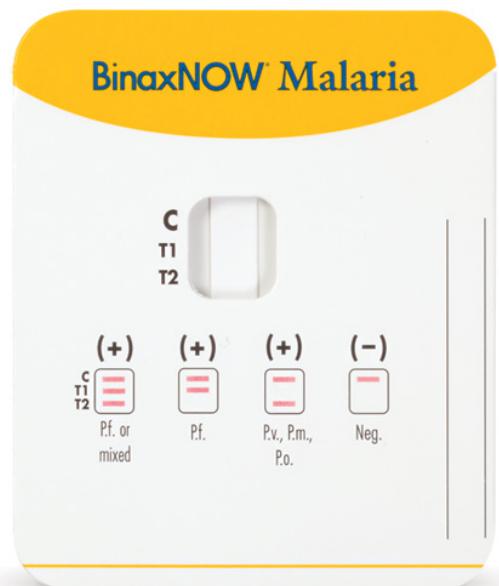
Device Classification: Examples

Device	Tongue Depressor	Suture	Coronary Stent
Intended Use	Depress tongue	Approximate tissues	Maintain lumen of blood vessel
Indications For Use	Depress tongue to allow visual access for diagnosis of throat organs	PDS II Sutures are indicated for use in soft tissue approximation, including use in pediatric cardiovascular tissue where growth is expected to occur and ophthalmic surgery. PDS II Suture is not indicated in adult cardiovascular tissue, microsurgery and neural tissue.	The Integrity Coronary Stent Systems are indicated for improving coronary luminal diameter in patients with symptomatic ischemic heart disease due to discrete de novo or restenotic lesions with reference vessel diameters of 2.25–4.0 mm and ≤30 mm in length using direct stenting or predilatation.
Risk upon failure	Tongue injury	Local organ injury, organ failure	Heart failure, multiple organ failure, death.

Arterx Sealant



Malaria Test



Dermal Template



Heart Valve



Insulin Pump



Stent



Mandible System



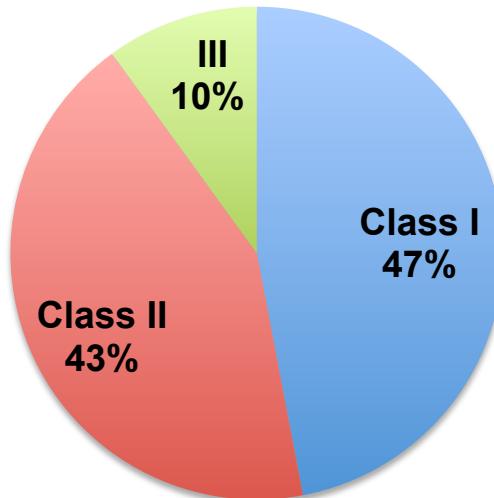
TB Test



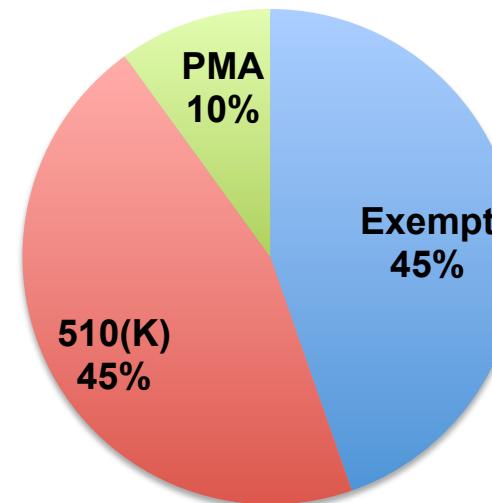
FDA Pre-Market Device Controls

Device Class	I	II	III
Risk Level	Low to moderate	Moderate to high	High
Regulatory Controls	General	General & Special	General & PMA
Pre-Market Process	Exempt / File 510(K)	File 510(K)	File 510(K) or PMA

Marketed Medical Devices



Pre-Market Regulatory Control



PMA, 510(K) What?

To legally market a new medical device, Manufacturer must demonstrate safety and effectiveness of device for clinical use.

2 major regulatory processes

510(K) –

Pre-Market Notification

Your new device has same intended use and technology as:

- Device marketed prior to May 28, 1976.
(grandfathered devices)
- Class I, II, III 510(K) cleared device.

PMA –

Pre-Market Approval

Your new device is/has:

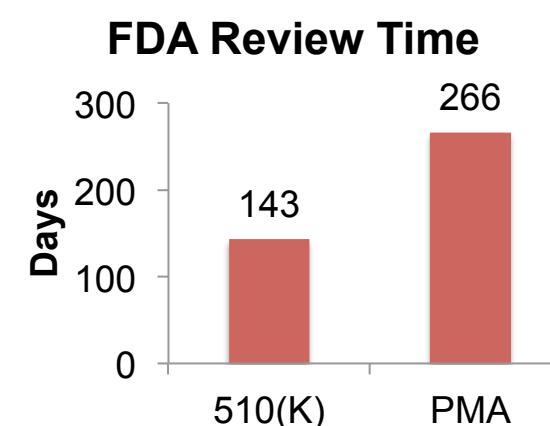
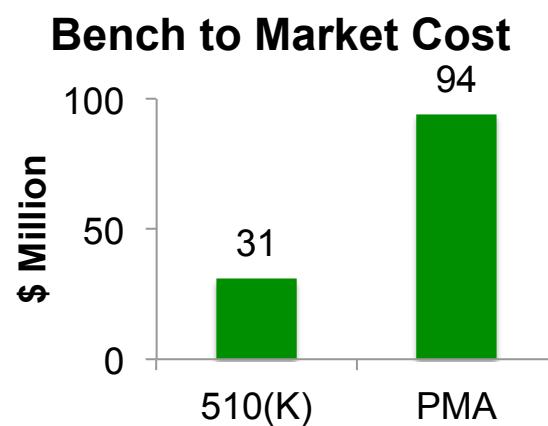
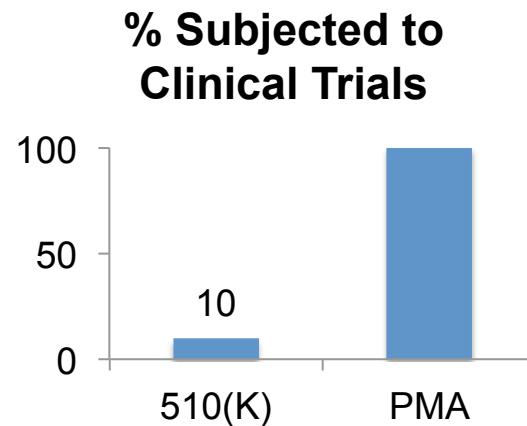
- Class III and not 510(K) eligible.
- New indications for use.
- New technology.

510(K) vs PMA: Does it matter?

510(K) – Demonstrate that your device is as safe and as effective as predicate device (SE).

PMA – Prove your device is safe and effective in clinical use.

Pre-Market Approval process is significantly more stringent, and costs more time and money.



Lecture 3 Agenda

- FDA History and Structure
- Drugs vs. Medical Devices
- Tobacco

Tobacco should be regulated like a drug.

Agree? Disagree?

Have you used a e-cig product in the last 30 days?

Have you used a tobacco product in the last 30 days? (cigarettes, e-cig, hookahs, cigars, smokeless tobacco)

responses anonymous

Bro, the Government Is Coming After Your Vape Pen

According to a new rule, e-cigarettes will be regulated like regular cigarettes.

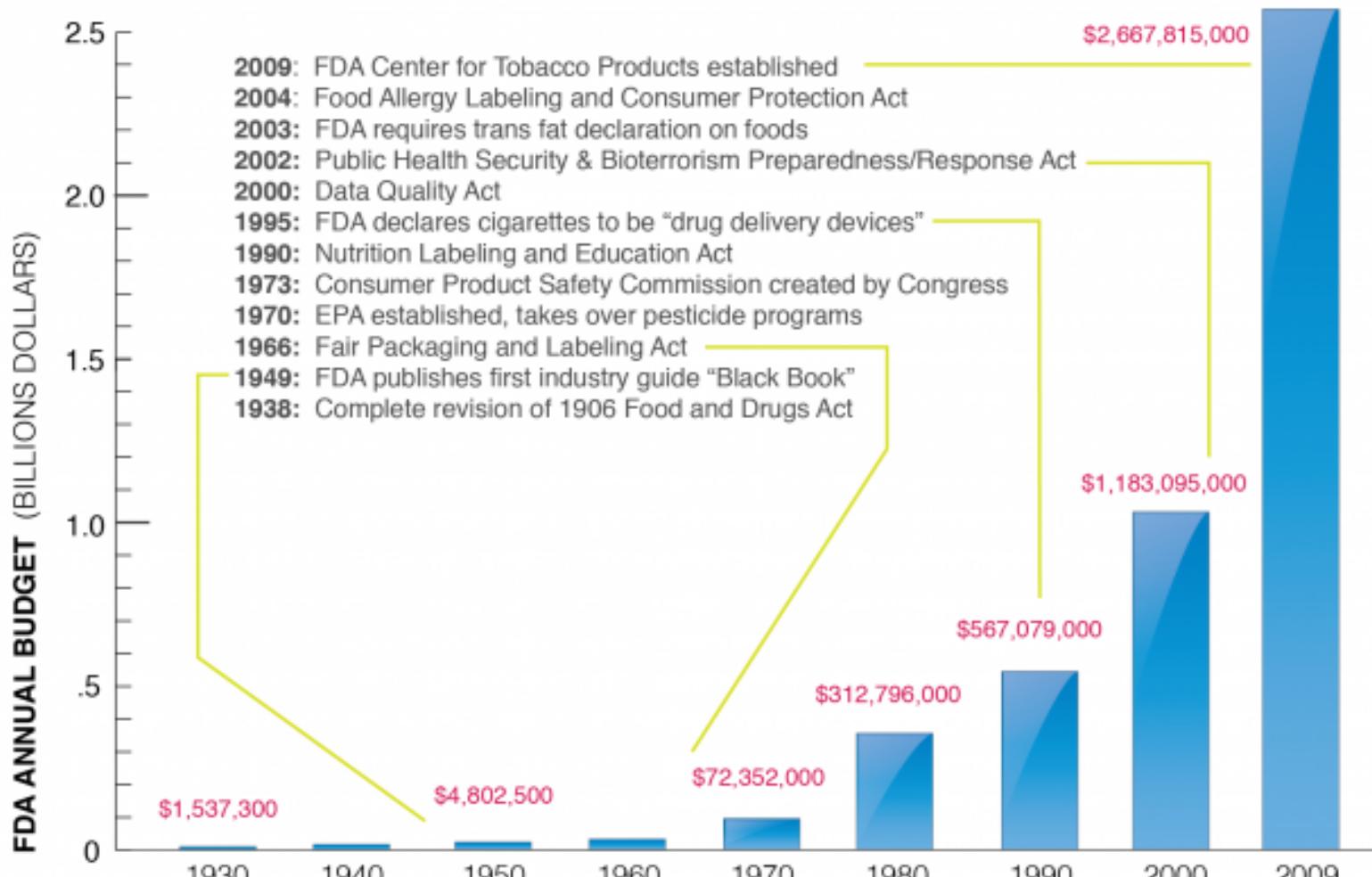


BY SARAH RENSE MAY 5, 2016

217



FDA Budget & Significant Legislation 1930 - 2009



SOURCES:

Peter Barton Hutt, et al., Food and Drug Law: Cases and Materials, Third Edition, 26-27 (2007).
FDA, FY 2010 Congressional Justification, Executive Summary, www.fda.gov/downloads/FDA, <http://www.fda.gov/AboutFDA/WhatWeDo/History/Milestones/ucm128305.htm>

Since June 2009, CTP has regulated:



Cigarettes

The basic components of most cigarettes are tobacco, a filter, and paper wrapping.



Roll-Your-Own Tobacco

Roll-your-own tobacco products are cigarettes made from loose tobacco and rolling paper.



Smokeless Tobacco

There are several forms of smokeless tobacco, including chewing tobacco, snuff, and snus. **Chewing tobacco** is cured tobacco in the form of loose leaf, plug, or twist. **Dry snuff** is loose finely cut or powdered dry tobacco that is typically placed in the nostrils. **Moist snuff** and **snus** are finely cut tobacco that can be loose or pouched and placed in the mouth.

For the full text of the final rule, visit FDA.gov and search for "extending authorities to all tobacco products."

FDA.gov/tobacco



@FDATobacco



facebook.com/FDA

Last Updated May 2016

CTP-55

All Tobacco Products Are Now Regulated by FDA

CENTER FOR
TOBACCO
PRODUCTS

Tobacco use is the single largest preventable cause of disease and death in the United States. As part of its goal to improve public health and protect future generations from the risks of tobacco use, the FDA has extended its authority to cover all tobacco products. The fact that FDA regulates tobacco products does not mean they are safe to use.

In 2016, FDA's Center for Tobacco Products (CTP) finalized a rule to regulate:



E-Cigarettes and All Other Electronic Nicotine Delivery Systems (ENDS)

This includes all kinds of electronic cigarettes, e-hookahs, e-cigars, vape pens, advanced refillable personal vaporizers, and electronic pipes that are not marketed for therapeutic purposes. These battery-operated products typically heat nicotine, flavor, and other chemicals into an aerosol that the user inhales.



Pipe Tobacco

Any product that consists of loose tobacco that is intended for use by consumers in a pipe.



Dissolvables

These tobacco products dissolve completely in the mouth. CTP now regulates all dissolvables that are not already regulated as smokeless tobacco products.



Hookah Tobacco

Hookah tobacco, also referred to as waterpipe tobacco, shisha, narghile, and argileh, is generally smoked using a waterpipe.



Cigars

Cigars are tobacco wrapped in leaf tobacco or a substance containing tobacco. Cigars vary in size, from small cigars (such as little cigars or cigarillos) to larger ones (such as large premium cigars).



Novel and Future Tobacco Products

One example of a novel tobacco product is nicotine gel (a tobacco product that contains nicotine and can be absorbed through the skin). CTP now regulates this and all future products made or derived from tobacco, except those marketed for therapeutic purposes.

Youth Tobacco Use

RESULTS FROM THE 2014
NATIONAL YOUTH TOBACCO SURVEY

CENTER FOR
TOBACCO
PRODUCTS

The National Youth Tobacco Survey is the only nationally representative survey of **middle** and **high school students** focusing exclusively on patterns of tobacco use.

More than
4.6 million
students reported being
current tobacco users.

(use of tobacco product(s)
within the past 30 days.)

1 in 4
high school
students



1 in 13
middle school
students



Of the current tobacco users,

2.2 million
students



reported being current users of **two or more types** of tobacco products.

Of the current tobacco users,

2.4 million
students reported using e-cigarettes.



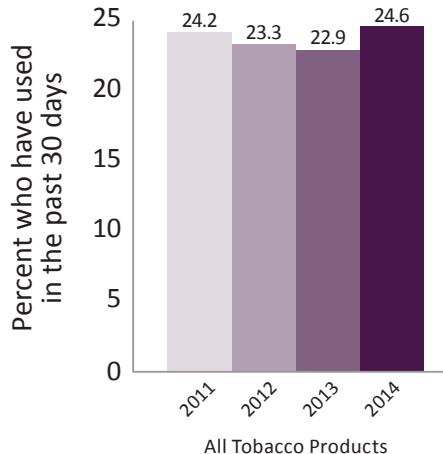
For the first time in NYTS, **e-cigarettes** were the most commonly used tobacco product among students, followed by hookah (1.6 million), cigarettes (1.6 million), and cigars (1.4 million).

TOBACCO USE TRENDS—HIGH SCHOOL STUDENTS

From 2011 to 2014, **e-cigarette** use increased nearly **800%** and hookah use more than **doubled**.



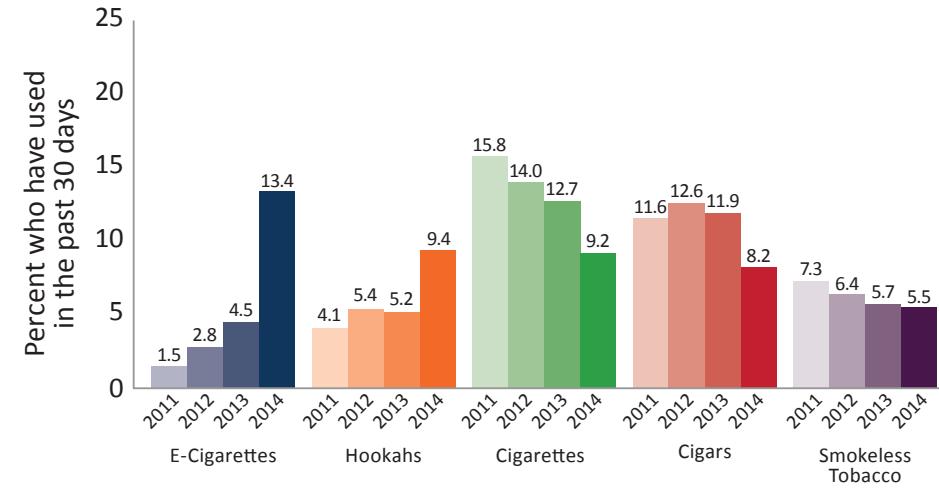
Between **2011** and **2014**,
there was **no decline**
in overall tobacco use
by students.



Between 2011
and 2014, the percentage
of students
reporting current
use of cigarettes
decreased from

15.8%
to
9.2%.

Student use of **e-cigarettes** and **hookah**
offset the decrease in use of
traditional products such as cigarettes and cigars.



Currently, FDA regulates cigarettes, cigarette tobacco, roll-your-own tobacco, and smokeless tobacco. FDA has also published a proposed rule to bring other products that meet the definition of tobacco products under its regulatory authority, such as e-cigarettes, some or all cigars, hookah and pipe tobacco.

The data above were published online on April 17, 2015, as part of an issue of *Morbidity and Mortality Weekly Report* (MMWR), highlighting the findings from the 2014 National Youth Tobacco Survey. Since 2012, FDA and the Centers for Disease Control and Prevention (CDC) have collaborated to conduct the annual survey.

Source: Arrazola RA, Singh T, Corey CG, et al., Centers for Disease Control and Prevention. Tobacco use among middle and high school students--United States, 2011-2014. *MMWR Morb Mortal Wkly Rep.* 2015; volume 64, no. 14: 381-385.



FDA.gov/tobacco



@FDATobacco



facebook.com/FDA

Tobacco cannot be regulated like a drug
because it is not safe.