



# *Currency – Health and Safety Concerns*

*2011 Cash Customer Forum  
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Federal Reserve Bank of N.Y.  
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# **PERILS THAT TRAVEL IN PAPER CURRENCY**

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**Prof. Hilditch of Yale Finds That  
Disease Lurks in Money  
to Dangerous Extent.**

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**BACTERIA BY THE THOUSAND**

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**Every Solled Bill Found to Contain an  
Average of 142,000, Although Some  
Had Lost Their Virulence.**

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**The New York Times**

Published: May 23, 1910

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# Outline

- 🌱 Currency is Everywhere!!!
- 🌱 Types of International Currency in Circulation
- 🌱 What is Contaminated?
- 🌱 Types of Contamination and Hazards



# Currency is Everywhere!!!

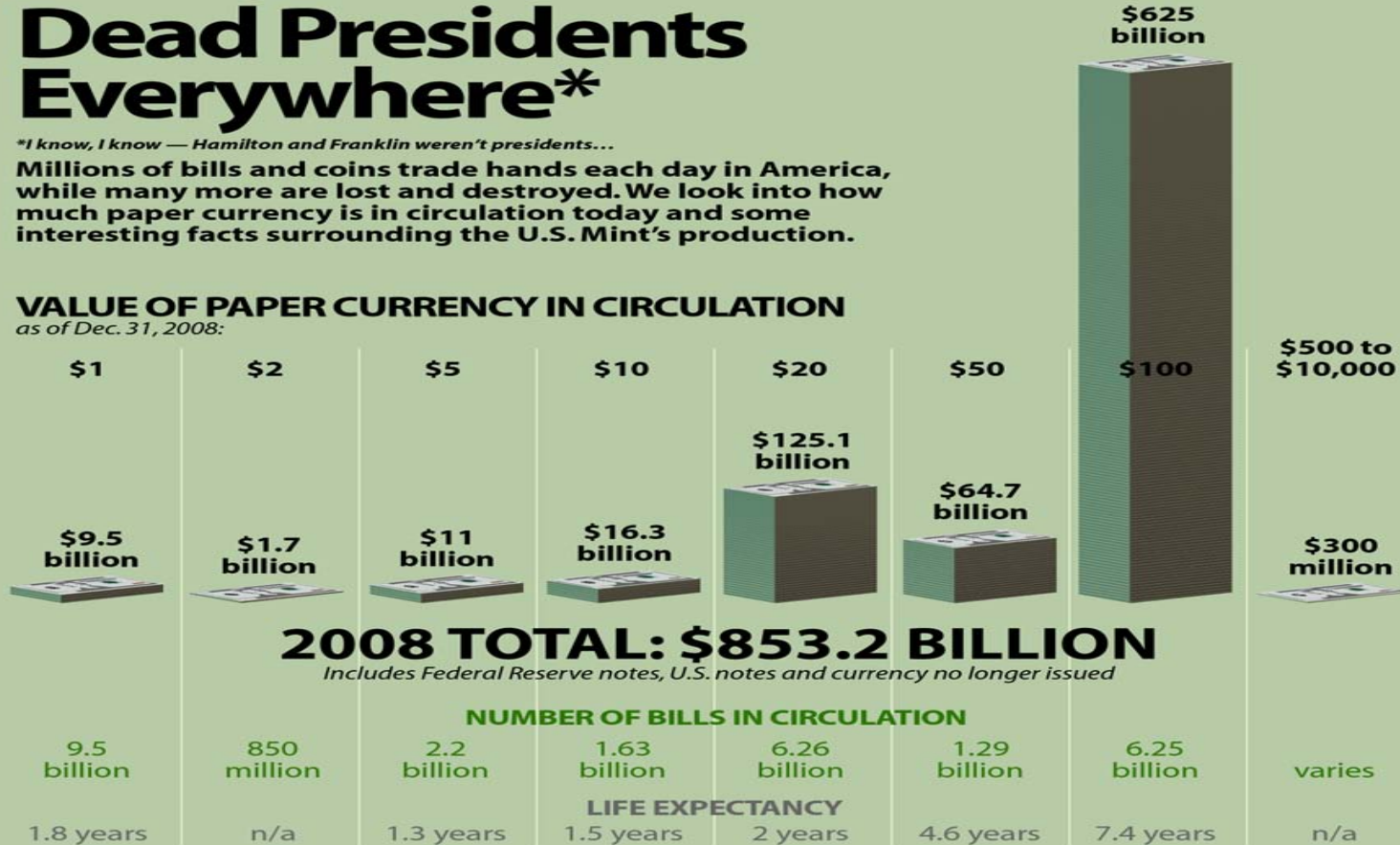
## Dead Presidents Everywhere\*

*\*I know, I know — Hamilton and Franklin weren't presidents...*






Millions of bills and coins trade hands each day in America, while many more are lost and destroyed. We look into how much paper currency is in circulation today and some interesting facts surrounding the U.S. Mint's production.

### VALUE OF PAPER CURRENCY IN CIRCULATION

*as of Dec. 31, 2008:*



# Currency is Everywhere!

-  In fiscal 2008, the U.S. Bureau of Engraving and Printing produced almost 8 billion banknotes (on average 38 million notes per day), for a face value of \$629 million
-  Approximately \$829 billion in U.S. currency in circulation today, the majority outside of the U.S.
-  Estimated 2.2 million ATM's worldwide with \$6,000 to \$10,000 in each machine
-  Estimated 500,000 ATM's in the U.S. with 1 billion transactions per month
-  A new ATM is installed every 7 minutes

# Types of International Currency

## 🌿 Two Broad Categories of Notes

### 🌿 Porous

🌿 Paper and/or Cloth Notes (U.S., Argentina, Euro, UK)

### 🌿 Non-Porous

🌿 Polymer Notes (Australia, Mexico, Singapore, Israel, soon to be Canada)

🌿 Durable Paper Notes/Resin or Varnish Coated (Switzerland)

## 🌿 Type of Note is a Major Factor in Contamination








# What is Contaminated?

 Federal Reserve Defines Contaminated Currency as:

“Currency that has been damaged by or exposed to contaminants, poses a health hazard or safety risk and cannot be processed under normal operating procedures”

In general, contamination may be caused by the following:

-  Floodwater or prolonged exposure to water or other liquids;
-  Exposure to blood, urine, feces or any other bodily fluids, including removal from any body cavity, corpse or animal;
-  Exposure to sewerage;
-  Exposure to any foreign substance or chemical, including dye packs, which may pose a health hazard or safety risk;
-  Mold or mildew.

# Types of Contamination on Notes

 Biological

 Viruses

 Bacteria

 Fungi

 Chemical

 Drugs












 Dye Packs

 Other Chemicals





# Biological Contamination -- Viruses

-  Recent Focus on Influenza (H5N1 and H1N1)
-  Transmission Routes
  -  Droplet or Airborne Transmission (coughing/sneezing)
  -  Contact Transmission (hand to hand, object to hand)
-  Many Contributing Factors
  -  Droplet Size
  -  Temperature and Humidity
  -  UV Radiation (sunlight)
  -  Open Air
  -  Viral Inactivation Rate (Survival Time)
  -  Presence of Mucus or Other Secretions (increases survival)

Weber and Stilianakis, Journal of Infection, 2008

Thomas et al, Applied and Environmental Microbiology, May 2008

Tiwari et al, Avian Diseases, 2006

# Biological Contamination – Viruses (continued)

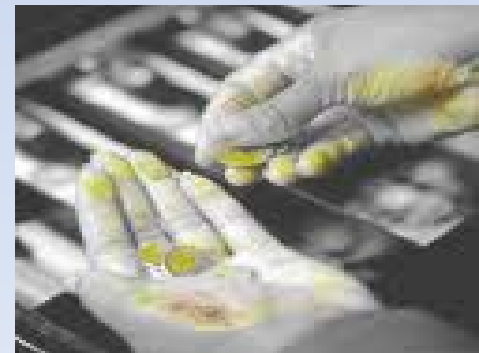
🦠 Key Transmission Route with Currency is Contact

🦠 Primary Variable is Survival Time

🦠 Non-Porous (metal, plastic) – up to 72 hours

🦠 Porous (cloth, paper, tissue) – up to 24 hours

🦠 Survival on Hands After Transfer – 5 minutes








Weber and Stilianakis, *Journal of Infection*, 2008

Thomas et al, *Applied and Environmental Microbiology*, May 2008

Tiwari et al, *Avian Diseases*, 2006






# Biological Contamination – Viruses (continued)

-  Study of Swiss Banknotes found survival of influenza viruses up to 3 days
-  Presence of mucus extended survival to 17 days
-  Swiss Banknotes have resin coating, so equate to that of non-porous surface
-  No comparable studies of U.S. Banknotes, but would equate to that of porous surfaces
-  FYI, flu virus survival on coin would equate to non-porous surfaces, ie, 72 hours

# Biological Contamination-- Bacteria



# Biological Contamination – Bacteria (continued)

-  Studies of bacterial contamination on currency vary and are very limited
-  Two studies of currency from randomly selected individuals found that 7% of notes contained bacteria considered pathogenic to healthy individuals.
-  Of these, one study found that 87% of notes contained bacteria pathogenic to hospitalized or immune compromised individuals
-  A third study by Abrams and Waterman found pathogenic bacteria on 42% of paper currency collected from hospital workers
-  Most common pathogens include Staph Aureus and Enterococcal organisms, including E. Coli



# Biological Contamination -- Fungi







- 🌱 Wide range of fungal organisms on currency
- 🌱 Typically found on currency that has been kept in wet or damp environments for long periods of time
- 🌱 Generally cause exacerbations of respiratory illnesses, eg allergies and asthma, and also skin irritation



# Chemical Contamination -- Drugs



# Chemical Contamination – Drugs (continued)


-  Although many drugs found on banknotes, most prevalent is Cocaine
-  Money from drug busts contribute to some degree
-  More importantly by snorting through notes – positive tests most common in \$1, \$5, \$10 and \$20 bills
-  In U.S. and Canada, approximately 90% of notes test positive for Cocaine – 95% in Washington D.C., but also high in many urban centers, Boston, Baltimore, Detroit
-  Outside of U.S., 80% of notes in Brazil, 20% in China and 16% in Japan tested positive for Cocaine
-  Amounts of Cocaine varied widely, but in most instances, very unlikely to impact health or drug test results

# Chemical Contamination – Red Dye

- 🌿 Only health affects are to those allergic to the **specific** red dye (there are multiple red dyes)
- 🌿 Some dye packs contain tear gas, which can cause temporary medical symptoms



# Chemical Contamination -- Other

 Any number of other chemicals potentially able to contaminate currency – mostly irritant effects to skin, mucus membranes and respiratory tract

 Pesticides

 Fertilizers

 Sewage

 Gasoline and Petroleum Based Products





# Questions?

