# PANDEMICS…EPIDEMICS…ENDEMICS

## AND THE WILD RIDE OF LABORATORY SAFETY!

LINDA GYLLAND, MLS(ASCP)$^{cm}$,QLS$^{cm}$

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# OBJECTIVES

Upon completion of this presentation, the participant will be able to:

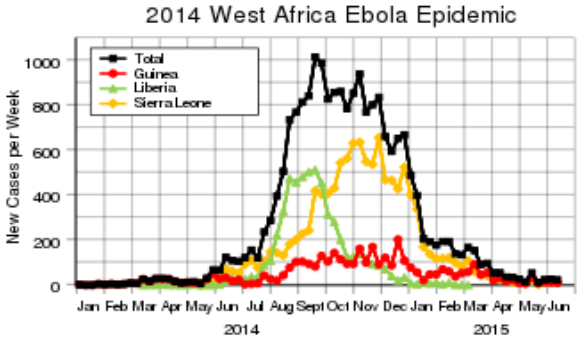
- 1) Review significance of prior and current pandemics with laboratory involvement.
- 2) Correlate the Hierarchy of Controls with a successful safety culture.
- 3) Summarize safety measures we have learned from the COVID-19 Pandemic and action plans for all emergencies.
- 4) Describe how the timeline for safety organizations has made the 100th anniversary of ASCP reason to celebrate laboratorians and pathologists working together.

# DEFINITIONS

**When disease spreads uncontrollably into multiple countries**

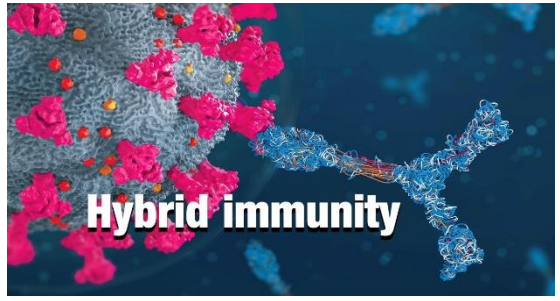


**When disease spikes suddenly in a certain area**



**When disease will be part of our normal life in some form in a controlled, predictable level (like the Spanish Flu of 1918 morphed over time into the common flu of today……)**




**When emerging sub-variants are less risky with vaccine and natural immunity**

# 1918 "SPANISH FLU" PANDEMIC

- The "grippe"
- 50 million global deaths, 675,000 in the U.S.
- 1st identified March 1918,Kansas
- Avian flu →pigs in nearby pen →soldiers in military camp
- Pig epidemic closely resembled the influenza in men
- 51% of WWI casualties were from this…..
- Life expectancy dropped 10 years
- "Mother" of all pandemics
- Worst natural disaster of all times
- Caused a cytokine storm (↑immune response to battle infection→multiorgan failure, ARDS)
- Economic loss: 3-4 Trillion
- Why was it called the "Spanish Flu?"

# Other pandemics

- 1957 H2N2 pandemic → ~ 1 million global deaths
- 1968 H3N2 pandemic → ~ 1 million global deaths
- 2009 H1N1 pandemic → <0.3 million deaths the first year
- COVID-19 pandemic (March 2020) (SARS-CoV-2/ 2019-nCoV=2019 Novel Coronavirus)→as of 2/22/22: 424,822,073 confirmed cases;

  5,890,312 deaths (globally) -

  10,407,358,583 vaccine doses (2/21/22).

  18.2 million people died during the first 2 years of the pandemic,

  3-11-22 ASIA > 1 million COVID-linked deaths making up 16% global deaths

The biggest mortality shock since the Spanish Flu.

# Spanish Flu

- Unusual
- Course of disease
- Why
- Mild form (Headache, body ache, coughing, fever)
- Severe form (same plus eye pain, eye muscle paralysis, fatigue, bilateral pneumonia, cyanosis: indigo blue coloration in cheek bones & ears, face & trunk brilliant red, hemorrhaging everywhere (ears, eyes, mouth, nose)
- Side effects: brain damage, personality changes, delirium, dementia, hysteria, restlessness, irritability, fear, psychosis schizophrenia
- 3-4 waves - attached those nonimmune from previous infection

# Lab involvement

- Med students
- Doctors: urine, blood, sputum cultures
- Chemistries, blood counts, Hgb, blood transfusions
- Microbiology: normal flora (Stpn, Staph, Strep)
  - Secondary infections – (probable Stpn)
  - Primary agent unknown
  - Earlier pandemics (Bacillus influenza) but was found in healthy pts too

Gram stains – 2 stories

Ziehl-Neelsen stain -  story

# Pandemic plans in 1918

- None
- Everything closed
- Terrible strain on nurses and Drs (30% of Drs deployed)
- Federal government - no role in planning interventions
- Sorted patients in 3 categories (I, II, III): treat I and II first

  I = best chance of survival: aspirin, hydration, Whiskey?,  good diet, O2 therapy

  II = might survive: same as above, IV epinephrine

  III = not much hope

Workplace shortage

Stockpiled supplies

Worked on vaccines - no success

# Safety Measures/ Cures?

- Gloves (rubber in surgery)
- Gauze mask ordinances
- Stiff fines for handshaking
- Fines for sneezing or coughing in public without covering mouth
- What worked:  isolation (quarantine), handwashing, gauze masks
- Desperate cures: inhale chloroform, 1 pint whiskey for 10 days, remove tonsils and teeth?????
- Misinformation in newspapers, people giving up
- Many tried to warn the nation, but few were listening…….
- Many did not believe influenza was a disease, just environmental factor

# Common statements

- True mission of a Dr: “to cure occasionally, to relieve often, to comfort always”
- “Death is the commanding officer”
- “The demon only stops when it has killed everyone that cannot resist it”
- “Obey the law and wear your gauze, protect your jaws from septic paws”
- “You can’t do everything, but you can do what you can do”
- Poem sung by many:

  “I had a little bird, It’s name was Enza

  I opened the window, And In-flu-enza”

**Medicine had 3 puzzles: patient history, physical exam, laboratory data**

# Research: 1951 and 1997
# Johan Hultin -Swedish Microbiologist & Ph.d Student

**1951: 25 yrs old - Went to Alaska, excavated graves for lung tissue, trying to get virus to grow, (notice the pipetting)**
→Failed attempt


1997: 72 years old – back to the same village, removed perfectly preserved lungs, put in preservative

# Successes!

Next step-recreate live version of virus, CDC-summer 2005
Dr Terrance Tumpey - BSL3 lab: Spliced 8 genes into plasmids, re-created the virus! Powered Air Purifying Respirator (PAPR), double gloves, suit, scrubs, shoe covers, Class II BSC)

Dr Jeffery Taubenberger and Dr. Ann Reid
at the Armed Forces Institute of Pathology.

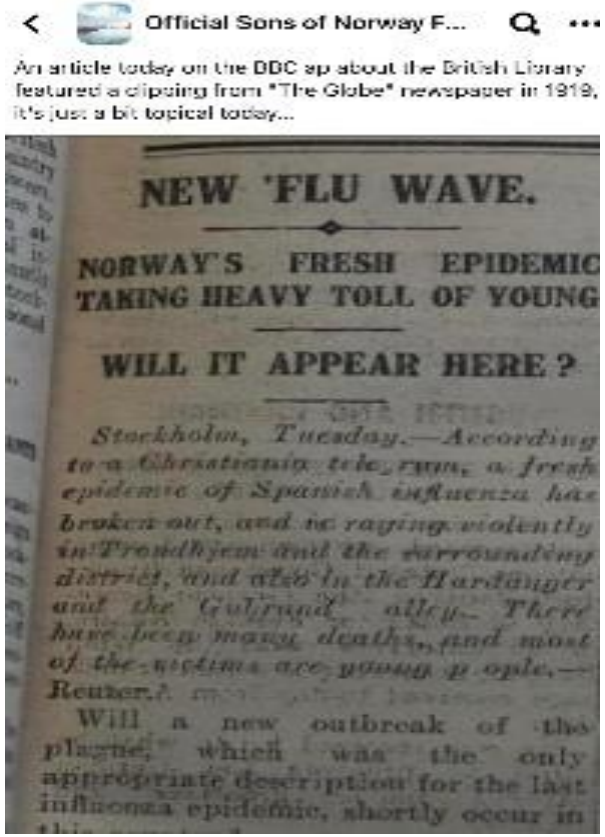
10 days later after Johan brought lung tissue back, they confirmed that positive 1918 virus genetic material had been obtained from this tissue. They sequenced its genome, (showed avian origin). All 8 1918 influenza genes were sequenced.

- One person after hours
- Shower before entering
- Biometric fingerprint scan to enter
- No other work done
- Daily prophylactic antiviral drug
- Inserted plasmids from gene segments into human kidney cells
- Waited many weeks = SUCCESS!

# What they learned

- Virus could replicate VERY fast
- 100X more lethal than other recombinant viruses tested
- Did not spread to other vital organs (brain, heart, liver, spleen)
- Did not cause systemic infection
- Unique combination of genes made it contagious and dangerous
- Severity was from overcrowded conditions of war, limited health services, no medical technology, no diagnostic lab tests
- Most thought pandemic caused by Pfeifer's Bacillus (H. influenza)
- Most deaths from bacterial pneumonia following influenza infection

# Warnings then and warnings now

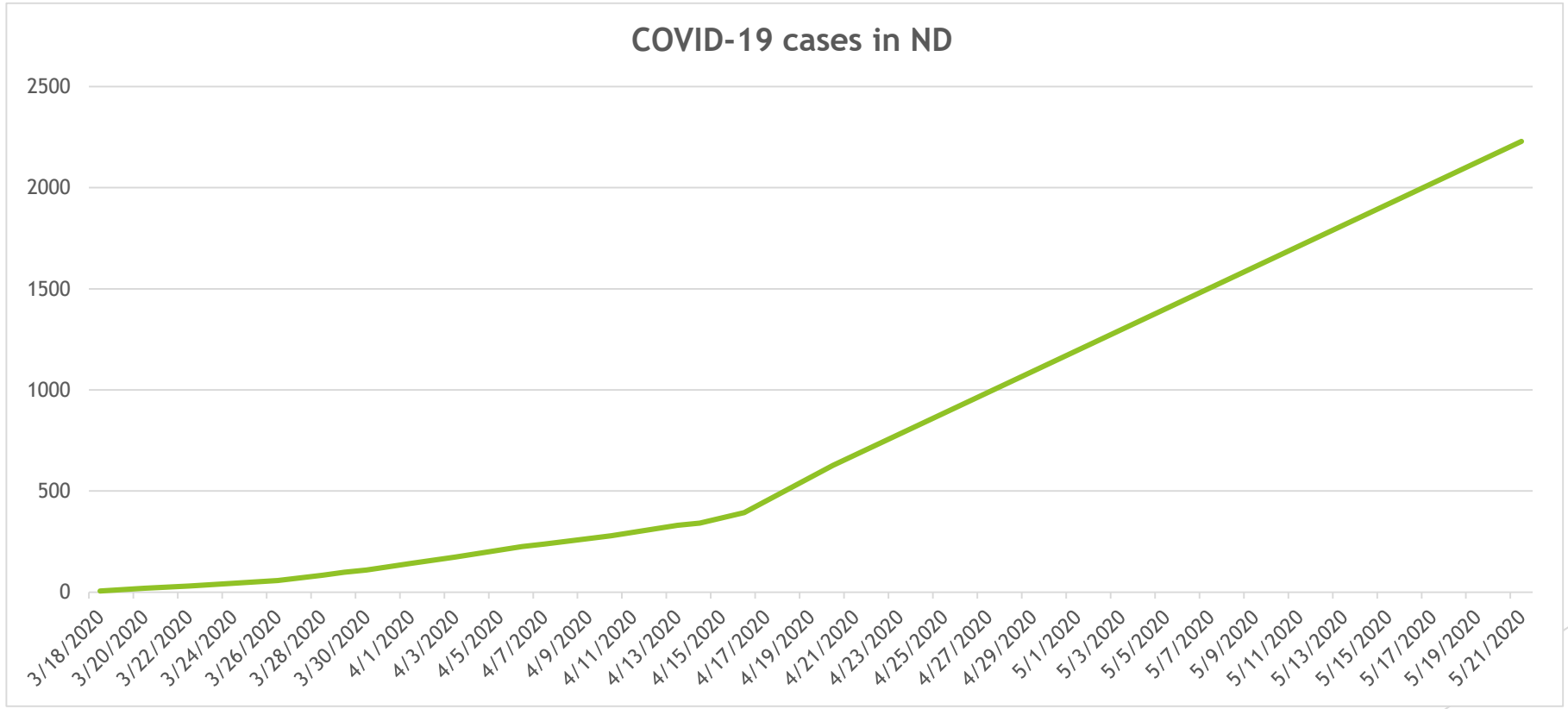



1918 – Norway's warning to Sweden

**3-3-2020: CDC warns community COVID-19 spread could take place in US**

**Officials from the Centers for Disease Control and Prevention warned that although the agency is taking historic measures to slow the introduction of COVID-19 into the United States, the country should prepare for the possibility of community spread, as seen in China and neighboring Asian countries. "The day may come when we may need to implement such measures as seen in Asia," Dr. Nancy Messonnier, director of the CDC's National Center for Immunization and Respiratory Diseases, said in a press conference, referencing the closing of businesses, schools and churches in multiple countries where transmission is now occurring within the community 3/3/2020 ASCLS eNewsBytes <ascls@multibriefs.com>**

# MN & IOWA 3/9/20 confirmed cases → ND 3/11/20



# Lab Testing sites

- PCR → PHL, Quest, Mayo
- 3/23/20 Sanford launched COVID lab testing
- 4/3/20 In-patient & ER → SU lab PCR
- Healthcare employees & nursing home pts → Sioux Falls PCR
- Special Care Unit - Persons Under Investigation

# Impact on Labs

- CDC changing information almost daily (who masks, quarantine/isolation rules changing, rules for testing
- Incident command - daily updates, clarifications, changes
- FACTS OVER FEAR
- Daily temp checks for staff, masking, cleaning…..
- Phone calls: “Coronavirus Script for Lab Staff”
- Workloads ↓ (surgeries & routine appts cancelled) - take PTO, reduce hours
- No potlucks!!!


# More problems….

- Delay in TAT - 1600 tests/day in 26 Enterprise labs
- Staff burnout - expected to work more with less…..
- Changes in testing:
  4 common coronaviruses →cold-like respiratory infections in people:
  (HCoV-229E, HCoV-HKU1, HCoV-OC43 & HCoV-NL63)
  Our Resp panel did not detect SARS-CoV-2 at the beginning so had to be sent out.
  Eventually got molecular testing here...
- Supple Chain Shortage (pipets, cartridges, instruments, NP swabs, sharps containers, sharps replacements did not fit on phleb draw carts, hand sanitizer
- Glove conservation- mainly for chemotherapy dept.……urging depts to use vinyl
  Do not re-use or wash!  (our lab was not affected)

- Pneumatic tube system: no respiratory specimens due to aerosol/droplet exposure

# Problems continue….

- Cleaning alternatives- if sanicloth & bleach wipes shortage…. (we did not experience this)

  10% Bleach made fresh daily (most is 8.25% now, so dilution is 1:15 for 10%)
  Followed by 70% alcohol to remove bleach residue

  (BLEACH EXPIRES ONE YEAR FROM MANUFACTURED DATE, OPEN OR UNOPEN):

  E622128 = manufactured date 2022, May 8. Exp 5/8/23 for lab usage, not home….

- Hepacide Quat II Spray: ready to use, 1 yr outdate open or unopened (does not need to follow with 70% alcohol)
- TB-Cide Quat Spray: ready to use spray bottle, 1 yr outdate open or unopened (does not need to follow with 70% alcohol)
- Quaternary Disinfectant 25 in spray bottles (from ES) for break room tables, etc….
- Workloads ↑ (pandemic rate ↑) staff stress, working extra hours, incentive pay, hired travelers (received ? from them -
- Mental anguish - heightened fear changing behaviors
- Students training in the labs/less applicants for internship

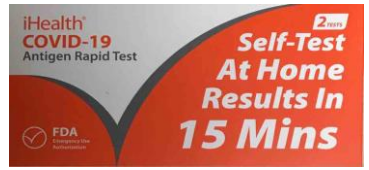
# Problems continue…

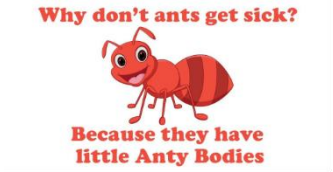
- Lab questions nationwide
- COVID struggle: no masks, PPE fatigue, more injuries, new staff
- COVID weary: volume of work (supervisors/managers doing phlebotomy/COVID testing)
- Postponing CAP inspections (or virtually….)
- More needle stick injuries for ALL staff (overfilled sharps)
  Enterprise said to conserve : fill to the “until full line”(factory fire → shortage)

- Locked on the walls - who has the key??????

# Publics view of the lab: ??????

- "Lab people are contagious" (myth).....
- "Why do you need the lab tests  if people can test at home?"
- "Just what are antibodies???




- TV ads show lab staff - no lab coats or gloves, cute outfit
- Lab magazine showing staff with capris, etc.....




- Video from Enterprise leadership 7/23/20 showed staff with open lab coat, cute outfit

# What Have We Learned?

- Incident Command, daily emails, daily meetings, stages of the pandemic surge plan, hand washing, cover your cough, face masks, don't touch door knobs, notice the "anti-hand washers" in restrooms, stockpiling while shopping, confusion with changes in CDC and politics……
- ***Change is ever-changing*** – BE READY for the unexpected!
- Changes in the "variants":

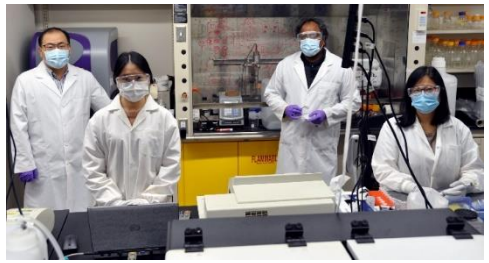
  Alpha, Beta, Gamma

  Delta (B.1.617.2) spread easily, more severe cases

  Omicron (B.1.1.529) more infectious- faster spread, less severe

  BA.2 Covid-19 variant of concern ("Stealth Omicron") - more contagious, hard to contain…..

  Deltacron (AY.4/BA.1 recombinant) hybrid of delta & omicron- rare, not a major concern??
- Don't throw away masks yet!



# Changes in Definitions

- Quarantine, Isolation, Exposure definitions have changed since 9/22/20:
- Quarantine: if exposed to COVID-19, stay at home 14 days, check temp X2 daily, watch for symptoms, and minimize contact with others
- Isolation: isolate if you test positive, whether or not you have symptoms. No contact with others for 10 days, including your home, stay in one area of your home and use a separate bathroom to avoid close contact with others.
- Exposure: close contact or within 6 feet for > 15 minutes with a confirmed COVID-19 case.
- Testing effectiveness has changed- better kits, molecular methods
- Has COVID-19 changed lab safety practices????
- Have labs with a *solid safety culture* following the hierarchy of controls been affected?

# What is a “Culture of Safety?”

- Being aware at all times, avoid complacency & non-compliance to prevent injuries and exposures
- PANDEMICS WILL COME AND GO; THE IMPORTANCE OF LAB SAFETY WILL ALWAYS BE #1!!!
- Specimen transport
- Hoods and Environmental issues
- PPE:

  Approved lab coats, snapped shut

  Gloves, masks, goggles, appropriate shoes (impermeable)
- Blood Borne Pathogens
- Chemical Hygiene Plan
- Compressed Gases
- Electrical Safety
- Ergonomics
- Fire Safety
- Signage, Spill kits, BSC, Sharps containers, Eyewash & showers
- Waste management – waste disposal policies
- Visual Checks

# A Culture of Safety

- General Safety - safe work practices:

  No gum chewing, mints, vaping, smoking, no lip gloss

- Some examples of non-safe work practices


Cell phones:

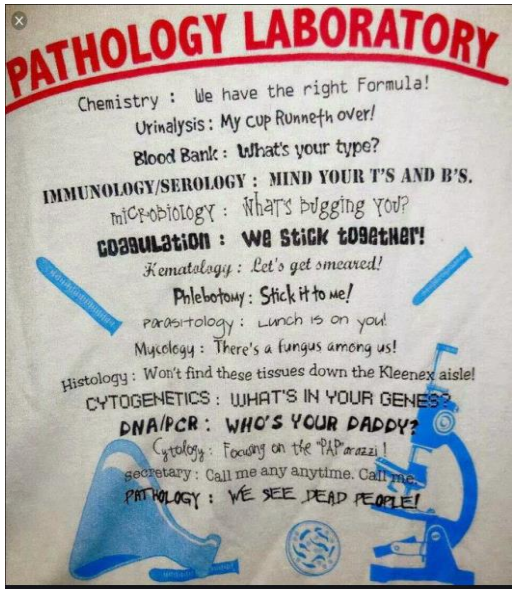
- Inside pocket, NOT in lab coat
- On vibrate only
- Remove gloves & lab coat/wash hands
- Leave lab to call or text
- Not for personal use/FB/texting
- Clean phone if accidentally using in lab

Student Binders: remember to clean with Sani wipes before taking them home!

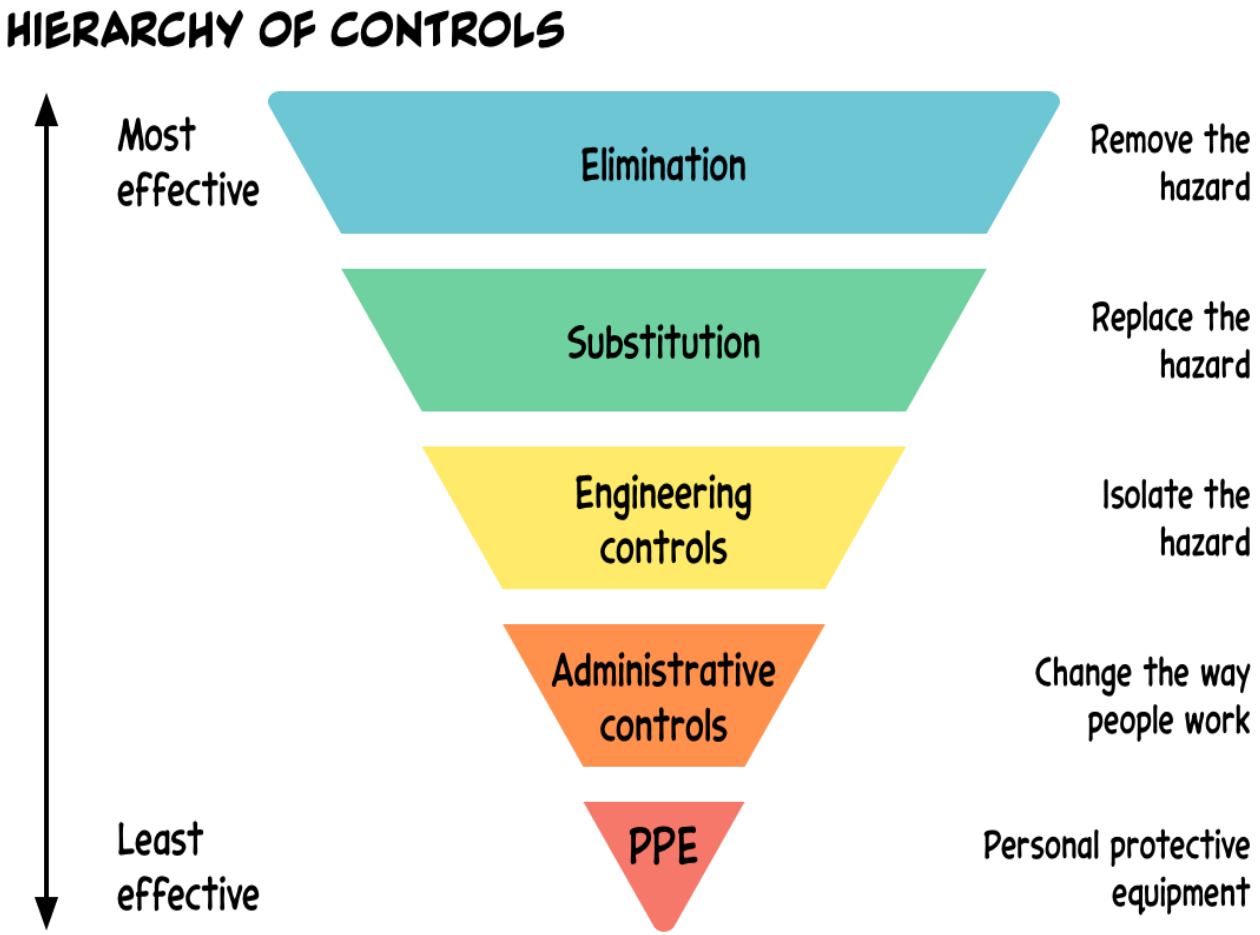
- Examples of good safety practices

# FUN TIMES

- Productivity ↑ with ↑ fun and happiness: lab staff can still have plenty of fun ☺








**Follow the hierarchy of controls and standard precautions to keep employees safe from hazards. Focus on those & continue making smart decisions to keep a culture of safety in all situations, pandemics & epidemics…….**

# Hierarchy of Controls

- INTRODUCED IN 1950
- Recognized that design, elimination, and engineering controls reduce risk better than lower controls like warnings, procedures, and PPE.
- Elimination: most difficult to achieve. We cannot eliminate biohazards, hazardous chemicals or specimens that may harbor pathogens. So on to another level for safety.
- Substitution: not feasible in the laboratory. We can substitute some chemicals for less hazardous but we cannot substitute patient samples.
- Engineering controls: using a physical barrier to protect employees from hazards (BSC, Plexiglas face shields on countertop, safety engineered devices, needleless devices, blunt needles, sharps disposal).
- Administrative controls: using safety policies and practices to ensure employee safety. (Using transport bags for specimens, hand sanitizer in appropriate locations, proper hand washing. Difficult to enforce since human behavior cannot be controlled.
- Work Practice controls: an off-shoot of administration controls, alter the manner is which a task is performed.
- Personal Protective Equipment (PPE) - last level of hierarchy, least effective of the controls. PPE usage is vital in the laboratory and the final barrier that protects the worker from the hazard.

# Safety Climate


**What you "SAY YOU DO" should equal "WHAT YOU REALLY DO!!!"**

# Action Plan for Emergency Preparedness

- Tornados (Know your place of “shelter”)
- Blizzards (Come prepared to sleep overnight)
- Floods (If you can drive to work, can you get home)
- Fires (Do you know how to use the fire extinguisher?)
- Train Derailments, Explosions (Do you have a plan for this?)
- Hazardous spills in the lab (Know how to handle spills, when to call for help)
- BSL3 organisms in the lab (You may not have a Micro lab, but you could encounter an unusual referral to send to them)

# Action Plan for Emergency Preparedness

- Suspicious packages  (Who do you contact? Know emergency phone numbers)
- Bomb threats (How do you respond to bomb threat phone call)
- Armed Intruder  (Ensure routes of egress free of obstacles)
- Loss of power  (Know where your flashlights are / and that they WORK)
- Cyber Security (Always be on the lookout for suspicious emails and report them)
- Workplace violence (What's your plan)
- What do you do?  Know YOUR action plan

# “EBOLA was EASIER?”

- COVID more complicated! ”Lab with Ebola experience – Dallas, Texas:
- EBOLA-Intense, widespread fear like COVID-19
  EBOLA- you get it and die; COVID= misinformation
  Dallas Ebola lab: communicated to minimize confusion & gossip, COVID- not so
  EBOLA lab Testing was done under a biosafety hood or on the robotic line (semi-protected from open tube exposure)

  Buddy system was implemented in donning/doffing PPE and in testing.

  Ebola Supply Chain not affected like with COVID.

- Ebola was easier because it was contained to just their hospital and less variables between many labs, training, instrumentation.

- Ebola – Sanford preparation – Special Cares Unit – 10 lab staff volunteered to train and be on call, ongoing training was scheduled, also to check instruments and stains, every 5 months – competency training, Was in “Stand-by” mode, could be activated at any time, but was never needed!

# 1918 Pandemic: COVID-19 similarities

- Staff shortages
- Supply shortages
- Hospitals full, added beds
- Virus mutated
- Warnings given
- Misinformation
- Masks sometimes → false sense of security
- Funerals limited to small gatherings
- Most public gatherings closed (schools, churches…)
- What worked: isolation (distancing), handwashing, masks
- One difference: vaccine now was easier to make based on the work done years ago.  1918 vaccine- no clear evidence that it worked, but they tried!

# Timeline for Safety

- FDA (Silver Springs, MD) 6-30-1906
- ANSI (New York, NY) 5-14-1918
- American Society of Clinical Pathologists – founded in May 1922
- Board of Registry for laboratory personnel 1928
- American Board of Pathology – 1934
- College of American Pathologists – 1946 (election of first female president Dr Emma Moss, for a national medical organization
- CDC (Atlanta, GA) 7-1-1946
- Hierarchy of Controls introduced in 1950
- Joint Commission (Oakbrook Terrance, IL) 1951
- US Dept of Health & Human Services (Washington D.C.) 4-11-1953
- EPA (Washington D.C.) 12-2-1970

# Timeline for Safety

- OSHA (Washington, D.C.) 4-28-1971
- National Accrediting Agency for Clinical Laboratory Sciences (NACCLS) 1973 (formerly ASCP Board of Schools)
- Hearing Conservation Standard 1981
- Resident-In-Service Exam (RISE) 1983
- Haz Com Standard 1910.1200 1983
- Universal Precautions (introduced to CDC in 1985, but used term in 1986-88, mostly in response to HIV & Aids Epidemic)
  (not for sputum, feces, sweat, vomit, tears, urine, nasal secretions unless visibly contaminated with blood, because their transmission of Hep B or HIV is low or non-existent)
- Body Substance Isolation - introduced by CDC in 1987 - avoid direct physical contact with all moist and potentially infectious body substances, even if blood is not visible- emphasized handwashing after removing gloves *only if hands visibly soiled*!?
- Ergonomic Standard 1988
- Hazardous Waste Standard 1989

# Timeline for Safety

- Laboratory Safety Standard - Haz Chemicals 29 CFR 1910.1450 1990
- Bloodborne Pathogen Standard 29 CFR 1910.1030 12-6-1991
- PPE Standard 1910.132 revised 7-5-1994
- Standard Precautions 1996 - (replaced Universal & Body Sub isolation) apply when risk of potential exposure to blood, all body fluids, secretions, excretions, (except sweat) regardless of visible blood, non-intact skin, mucous membranes

  Included hand hygiene (preventing transmission of disease) and PPE

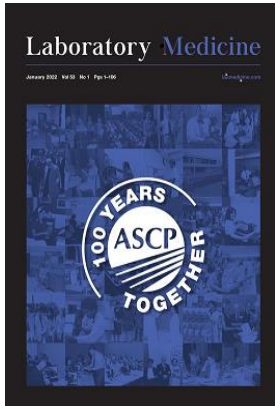
- Needlestick Safety & Prevention Act - Nov 11, 2000 and updated 4-18-2001 (no recapping, safer needles)
- American Society for Clinical Pathology (name change in 2001) - to include non-pathologist laboratory professionals.
- Accreditation of the Board of Registry by the American National Standards Institute (ANSI) in 2007
- Global Harmonization System (GHS), changing MSDS to SDS 2009

# ASCP - 100th Anniversary May 2022

- ASCP= the premier professional organization for pathology and laboratory medicine;
- goal_= to achieve greater scientific proficiency in clinical pathology AND to maintain the status of clinical pathologists on an equal plane with other specialties.

# ASCP

- The American Society of Clinical Pathologists was founded in May, 1922, by Dr. Ward Burdick and 39 other physicians at the 1922 meeting of the American Medical Society in St. Louis, Missouri.
- Dr. Philip Hillkowitz was elected the first ASCP President, and the society was based in Dr. Burdick's Denver laboratory. The ASCP offices eventually moved to Chicago, where they remain today.
- In 2001, the name of the organization was changed to the American Society for Clinical Pathology, to recognize the inclusion of non-pathologist laboratory professionals.
- On the cover of this first issue of Laboratory Medicine in 2022, we display the official logo to commemorate the 100th anniversary of the ASCP, and we congratulate the society for its rich history of service and education in the interest of quality patient care.



# So what have we really learned?

- If you have a good, solid culture of safety, you should be prepared……
- Every new “situation” is a learning experience for growth and change
- We should be grateful for science, especially those in the past who started this amazing journey – 104 years ago the Spanish Flu and 100 years of ASCP.
- The timeline of all safety organizations, policies, accreditation has made us what we are today!
- Will we be ready for the next pandemic?……

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