

Continuing Education for Water Operators



Mariana Islands
Water Operator Association

May 11, 2011
Pacific Islands Club, Saipan

5/11/2011

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Today's Agenda

- About Continuing Education
- Current Events
 - Haiti cholera update
 - Japan Earthquake & Tsunami
 - DEQ's Radiation Monitoring
- Main Events
 - Understanding Radiation
 - Radionuclide Rule
 - Radon
- Association Announcements

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Continuing Education for Water Operators



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Is THIS training required?

➤ NO

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Why have continuing education?

- DEQ Drinking Water Regulations require certified operators to have 10 contact hours of continuing education per year (30 contact hours in 3 years) to maintain certification.
- DEQ is not required to offer training (and no longer offers training – no \$\$\$)
- Where would operators get training?

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Other training options

- Professional training provided by your employer (safety, pump maintenance, lab procedures, etc.)
- College classes
- Conferences or workshops by professional organizations or agencies
- Correspondence courses
- On-line opportunities

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NOT continuing education

- Meetings with DEQ or EPA
- Surveys or inspections by DEQ or EPA
- Reading journal articles or textbooks by yourself
- Googling water operator stuff on the internet

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When should training be offered?

- DEQ surveyed all certified operators
- Results
 - One 3 hour session every 3 months
 - In morning
 - On a Wednesday
- First session September 6, 2006

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2006 – 2008 (DEQ)

- September 6, 2006: Chlorination
- November 8, 2006: Using a Pump Curve
- February 7, 2007: Cross Connection
- May 9, 2007: Regulations - CCR, PNR
- August 8, 2007: Sizing Pressure Tanks
- November 26, 2007: PWS workshop
- February 20, 2008: Fluoridation
- May 2008: Process Controls (Robert Brokate)
- August 2008: Slow Sand Filters
- November 12, 2008: TCR and Control Valves

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2009 MIWOA

- March 25, 2009: Security and Filters
- May 13, 2009: Alt. Energy, CCR, Compliance
- August 5, 2009: Geology of Saipan, GWR
- October 9, 2009: GWR Workshop
- December 2, 2009: Valves, Spills, Walkerton

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2010 MIWOA

- February 3, 2010: Safety, Haz Materials
- May 5, 2010: BEH & DEQ, Cross Connections
- August 11, 2010: Waste Water Collection/Trtmt
- November 3, 2010: Response to disease outbreak

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2011

- February 2011: Chemical Injection Pumps
- May 2011: Radiation, Radionuclide Rule

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THIS TRAINING IS FOR YOU!

We'll do what we can to make it
what YOU want it to be!

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Water Operator Association

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Suggestions for training

➤ Possible topics for upcoming sessions:

- Backflow prevention device testing
- Rainwater
- Local Water System
- How Reverse Osmosis Works
- ~~Energy efficiency~~
- Storm water and erosion control
- ~~Introduction to waste water treatment~~
- ~~Field trip~~

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Announcements

- 2011 Membership Dues \$10
 - Check your member info
 - Pick up your membership card
- Pick up certificates from February
- Ballot form for Board elections (return today)

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Current Events

May 2011

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Haiti Cholera Update

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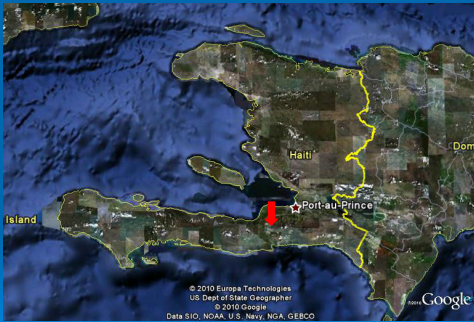
Earthquake Rocks Haiti

- Tuesday January 12, 2010
- 7.0 magnitude, 8.1 miles deep
- 15 miles WSW of capital



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Earthquake Effects

- Estimated 230,000 dead
- 1,600,000 homeless
- 3,000,000 need assistance
- Did the earthquake cause the cholera epidemic?

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Cholera outbreak in Haiti

- Outbreak first confirmed on October 21, 2010
- First cholera outbreak in Haiti in 100 years
- Latest News
 - Final Report of the Independent Panel of Experts on the Cholera Outbreak issued on source of cholera May 6, 2011

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Final Report

- Source of cholera (*Vibrio cholera*) controversial:
 - Arrived into Haiti from Gulf of Mexico due to tectonic shifts from earthquake;
 - Evolved into disease-causing strains from non-pathogenic strains naturally present in Haiti;
 - Introduced from a human host (non-Haitian)

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Cholera origins hypothesis

- Common belief in Haiti:
 - Soldiers deployed from a cholera-endemic country to the Mirebalais MINUSTAH camp were the source of the cholera

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What is the source?

- Independent Panel of four international experts formed by Secretary-General of the United Nations
- Mandate: "investigate and seek to determine the source of the 2010 cholera outbreak in Haiti"

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Panel

- Dr. Alejandro Cravioto – Bangladesh
- Dr. Claudio F. Lanata – Peru
- Engr. Daniele S. Lantagne – U.S.
- Dr. G. Balakrish Nair - India

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To fulfill mandate

- Concurrent
 - epidemiological
 - water and sanitation, and
 - molecular analysis
- Investigations carried out

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Epidemiology

- October 22: first cholera case confirmed at Haiti National Public Health Lab.
- Hospital admission records reviewed along Artibonite River from mountains to coast
 - First hospitalized case upstream on Oct 17
 - First hospitalized case on coast on Oct 20
 - Outbreak widespread on coast by Oct 22
- Timeline suggests spread via river

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Water and Sanitation

- Potential sources investigated upriver
- MINUSTAH had contractor handle human fecal waste.
- Sanitation no sufficient to prevent fecal contamination of river tributary.
- Water in tributary -> 8 hrs to river
- 1-2 days downstream to dam and irrigation system in Delta

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Molecular Analysis

- Genetic material of the bacteria studied
 - Outbreak strains in Haiti are genetically identical = single source of outbreak
 - Bacteria similar (not identical) to South Asian strains currently in Asia (did not originate in Haiti)

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Conclusions

- Hydrological data + epidemiological timeline + molecular analysis = contaminated river water likely route from mountains to coast
- Cholera introduced as a result of human activity
- Contamination of tributary with South Asia strain of cholera

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Epidemic

- Explosive spread of disease due to:
 - Widespread use of river water for washing, bathing, drinking, and recreation;
 - Regular exposure of agricultural workers to irrigation water from river;
 - Salinity gradient at Delta (favorable for cholera)
 - Lack of immunity in local population

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Epidemic cont..

- Poor water and sanitation conditions in Haiti
- Migration of infected people to home communities and treatment centers;
- South Asian strain has more toxin;
- Conditions in treatment centers did not prevent spread to patients and health workers.

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Multiple Factors

- Simultaneous water and sanitation and health care system deficiencies allowed the environmental contamination by feces to cause an outbreak.

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Conclusion

- Caused by “confluence of circumstances”
- Not the fault of, or deliberate action of, a group or individual

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Recommendations

1. U.N. workers/emergency responders should be screened for cholera
2. U.N. personal/emergency responders should be immunized
3. U.N. installations (worldwide) should treat fecal waste using on-site systems that inactivate pathogens

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Recommendations...

4. Improve case management: train health workers; make oral rehydration salts available in community; use cholera cots
5. Prevent spread: invest in piped treated drinking water supplies & improved sanitation
6. Use vaccines to reduce caseload
7. Promote molecular analysis for tracking

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Final Report

- [Link to pdf](#)

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Cholera outbreak in Haiti

- Since beginning of outbreak
 - 287,742 cumulative cases
 - 155,077 hospitalizations
 - 4,888 deaths

- [Link to Map](#)

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Japan Earthquake & Tsunami

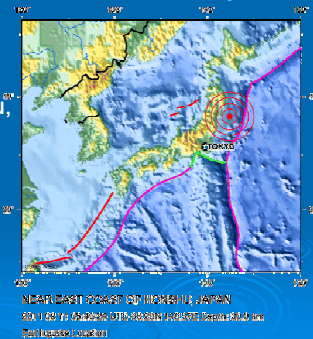
March 2011

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Friday March 11, 2011 2:46 pm

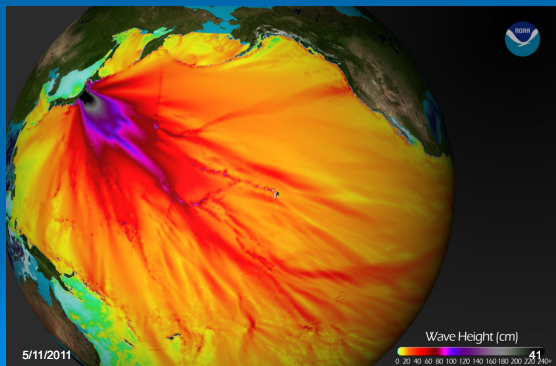
- 9.0 magnitude earthquake
- East coast of Honshu, Japan
- 80 mi E of Sendai
- 231 mi NE of Tokyo



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Tsunami



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Tsunami Propagation

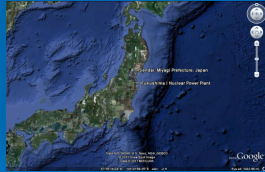
- [Link to tsunami propagation video](#)

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Tsunami

- East coast of Japan – Sendai, Miyagi Prefecture devastated
- Fukushima Daiichi Nuclear Power Plant suffers damage



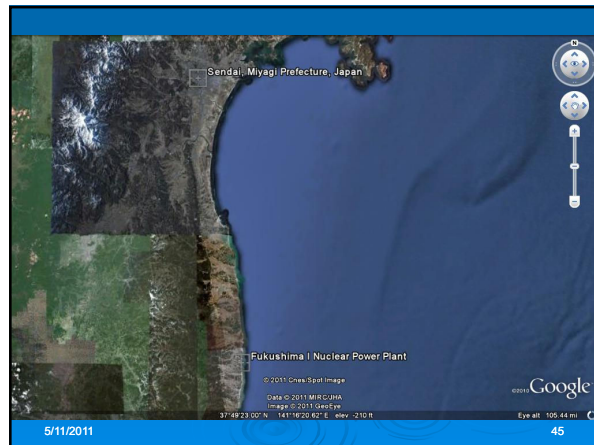
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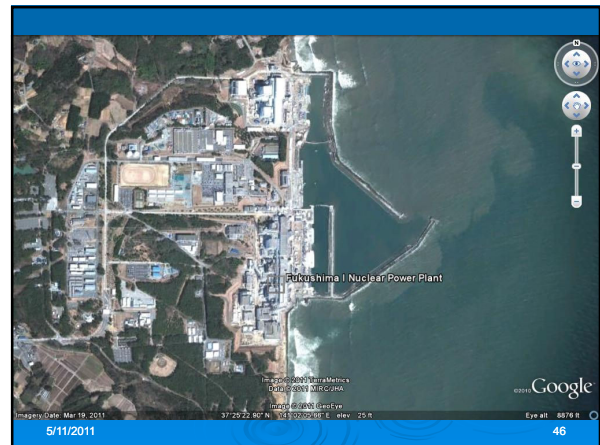
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Fukushimi Daiichi

- [Link to Washington Post graphics](#)

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US Dept of Energy

- March 14 National Nuclear Security Administration deployed 33 people and 17,200 lbs of equipment to Japan.
- Includes Aerial Measuring Systems

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US EPA -> RadNet

- <http://www.epa.gov/japan2011>
- “EPA Monitoring Continues to Confirm That No Radiation Levels of Concern Have Reached the United States”

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CNMI Rad Monitoring Station



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CNMI Rad Monitor

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A man wearing a red t-shirt and blue jeans is kneeling outdoors, working on a white electronic device. The device has a small screen and various cables connected to it. He is holding a small object in his hands, possibly a component or a tool.

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A man wearing a red t-shirt and blue jeans is kneeling outdoors, working on a white electronic device. The device has a small screen and various cables connected to it. He is holding a small object in his hands, possibly a component or a tool.

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A man wearing a red t-shirt and blue jeans is kneeling outdoors, working on a white electronic device. The device has a small screen and various cables connected to it. He is holding a small object in his hands, possibly a component or a tool.

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A man wearing a red t-shirt and blue jeans is kneeling outdoors, working on a white electronic device. The device has a small screen and various cables connected to it. He is holding a small object in his hands, possibly a component or a tool.

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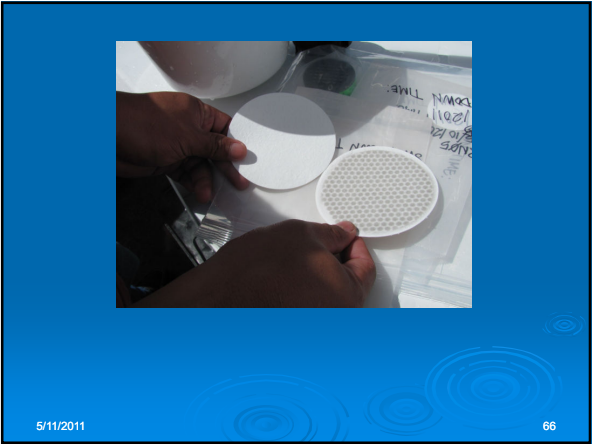
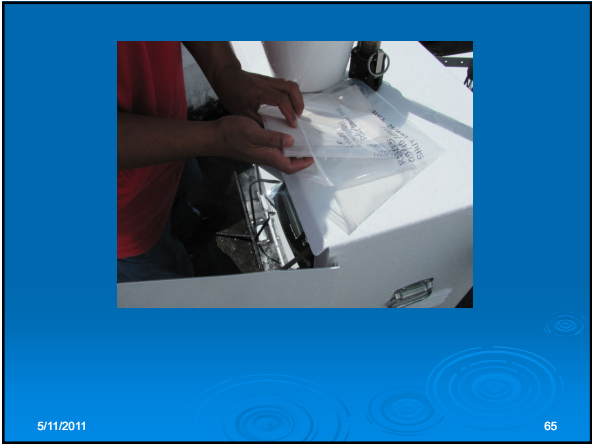
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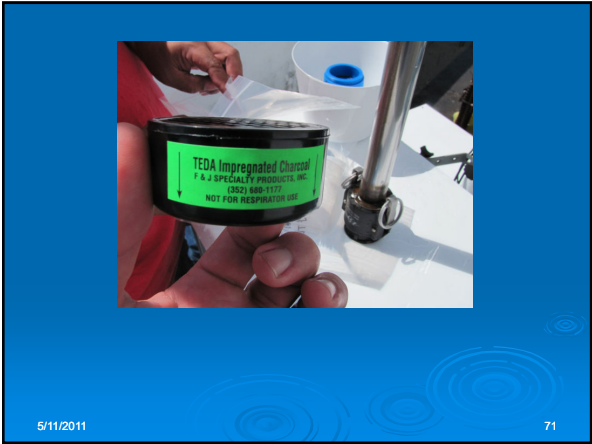
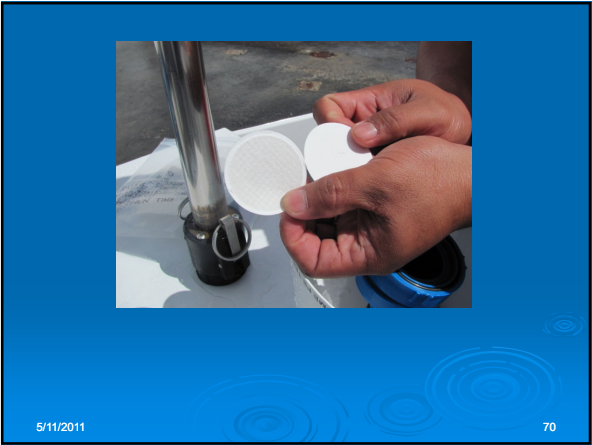
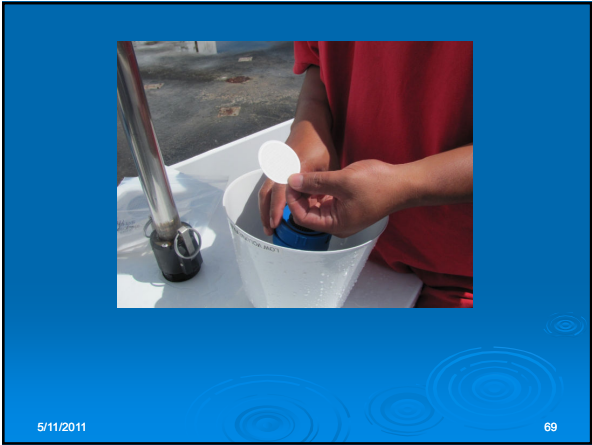
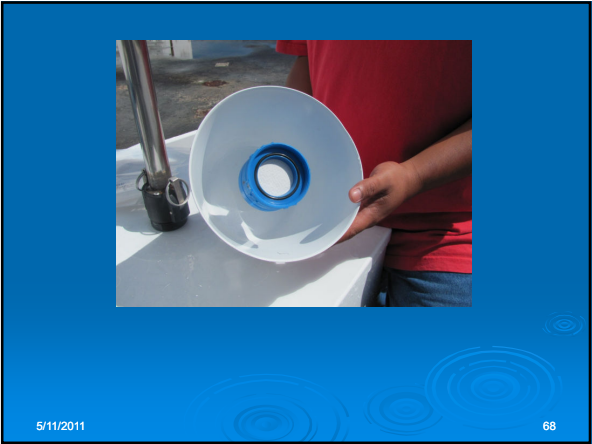
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A close-up view of a weather station mounted on a pole. The station includes a black cylindrical sensor housing, a white anemometer cup, and a small white electronic box. The background shows a clear blue sky with some clouds.

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CNMI Data

➤ <http://www.epa.gov/japan2011>

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Break -10 minutes



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Main Event

Understanding Radiation

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Topics

- Atom refresher
- Difference between ionizing & non-ionizing radiation
 - Health effects
- Radiation protection basics
- Radiation doses in perspective

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Atom Refresher

- BrainPop : Atoms

(link to BrainPop website w/video and animation about atoms)

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Radioactivity

- A property of some atoms that causes them to spontaneously give off energy as particles or rays.
- Radioactive atoms emit ionizing radiation when they decay.

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Radiation

Non-ionizing

- Enough energy to move atoms in a molecule or cause them to vibrate (but not enough to remove electrons)
 - Sound waves
 - Visible light
 - microwaves

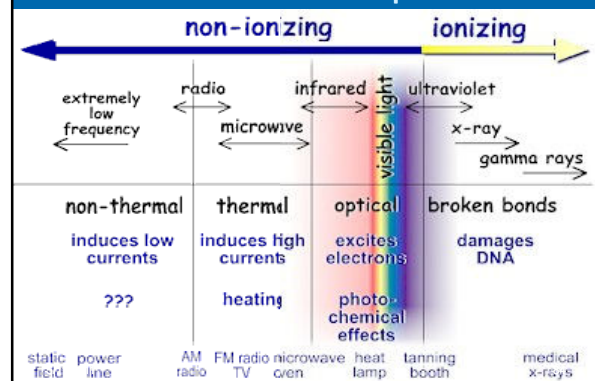
Ionizing

- Enough energy to remove tightly bound electrons from atoms, creating ions.
 - Usually think of as "radiation"
 - Use to generate electric power
 - Kill cancer cells
 - Manufacturing

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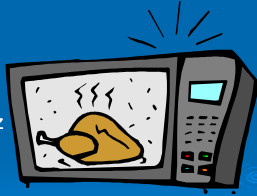
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Radiation in E-M Spectrum



Non-ionizing Radiation

- ELF -> ultraviolet
- ELF:
 - Long waves lengths (> 1,000,000 m); 100 Hertz
- Radio:
 - 1 – 100 m; 1M – 100M Hz
- Microwaves:
 - 0.01m; 2.5B Hz



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Ionizing Radiation

- Higher frequency
- Can break chemical bonds
- X-ray & gamma
 - 100 BB Hz
 - 0.0000001m
- Can strip electrons
- Break nucleus of an atom


X-Ray

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Ionization

- Electron breaks away from atom
- Forms two charged particles (ions)
 - Molecule +
 - Electron -



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Kinds of Ionizing Radiation

- Alpha particles
- Beta particles
- Gamma rays

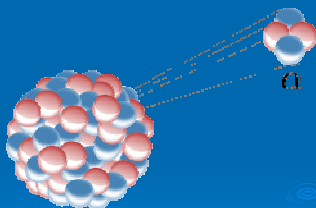


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Alpha Particles

- Identical to a helium nucleus
 - 2 protons
 - 2 neutrons
- Relatively heavy
- High energy
- Positive charge
- Not penetrating

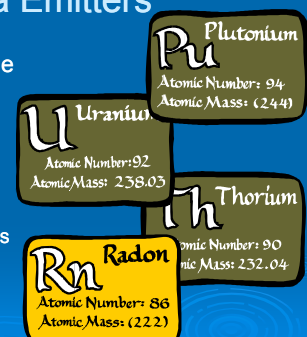


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Alpha Emitters

- Occur naturally in the environment
- Given off by:
 - Uranium-238
 - Radium-226
 - Other members of uranium decay series



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Alpha Health Effects

- Externally
 - Lower risk
 - Lack energy to penetrate outer dead layer of skin
- Internally: ingested, inhaled, absorbed in blood
 - Damages sensitive living tissue
 - Increased risk of cancer
 - Lung cancer
 - Radon

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Beta Particles

- Electrical charge of -1
- 1/2000 mass of a proton/neutron
- Speedy
- Excess energy in the form of speed that causes damage to living cells
- Energy can break chemical bonds and form ions

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Beta emitters

- Tritium (H-3)
- Strontium-90
- Iodine-129 and -131
- Cesium-137

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Beta Particles

- Travel several feet in the open air and easily stopped by solid materials
- When loses its energy, it is like an other loose electron

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Beta Particle Health Effects

- | | |
|--|--|
| Acute | Chronic |
| ➤ Uncommon | ➤ More common |
| ➤ Contact with abandoned industrial instrument | ➤ Low-level over long time |
| ➤ Can redden or burn skin | ➤ Cancer <ul style="list-style-type: none">• Thyroid from Iodine-131 |

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Gamma Rays

- High energy
- 10,000 times the energy as photons in visible range of electromagnetic spectrum
- Travel at speed of light
- Travel far before using their energy
- Pass through all kinds of materials (including human tissue)
- When energy is gone, they cease to exist

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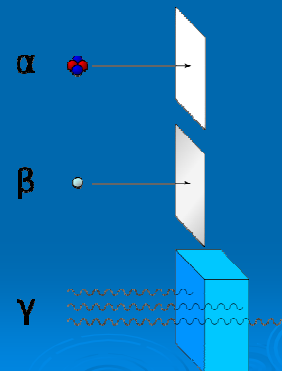
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Gamma Rays Health Effects

- Because of penetrating power, considered the primary hazard during most radiological emergencies.
- "Radiation sickness" usually results from gamma radiation

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Radiation Refresher

- BrainPop: Radioactivity

(Link to BrainPop website w/video and animations about Radioactivity)

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Units Used to Measure Radioactivity

- Curie = 37 billion disintegrations / second
- picocuries (pCi) = 1×10^{-12} Ci
 - Used in measuring small amounts of radioactivity in air and water
- Megacuries (MCi) = 1×10^6 Ci
 - Used in measuring large amounts of radioactivity released from nuclear weapons

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Units Used to Measure Dose

Japan

- Sieverts (Sv)
- Press reports dose in milliSieverts (mSv)

➤ 1 Sv = 100 rem

U.S.

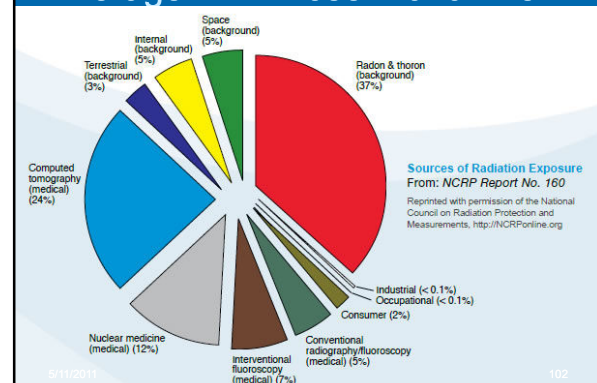
- rem (Roentgen Equivalent Man).
- Usually reported in millirem (mrem)

➤ 1 mSv = 100 mrem

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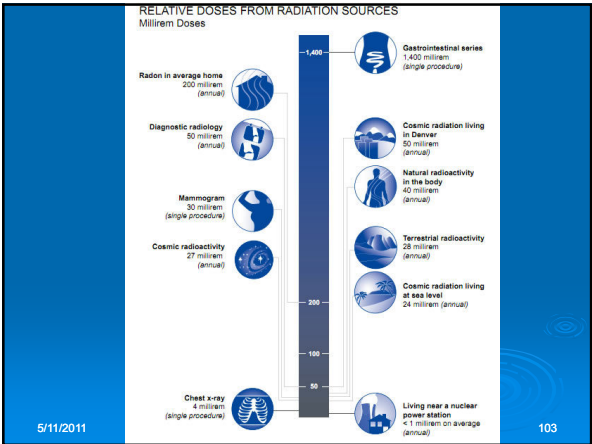
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Average Ann. Dose = 620 mrem



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End of Radiation

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PERIODIC TABLE OF THE ELEMENTS

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The Element Song

➤ By Tom Lehrer

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Main Event

Radionuclide Rule

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Monitoring

➤ Safe Drinking Water Act requires monitoring for over 90

- Chemical,
- Microbiological,
- Radiological, and
- Physical contaminants

➤ Implemented under various “rules”

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Chemical Contaminant Rules

- Covers 65 chemicals:
 - Inorganic Chemicals (IOC)
 - Volatile Organics Chemicals (VOC)
 - Synthetic Organic Chemicals
- Implemented in phases
 - Phase I (1989) covered 8 VOCs
 - Phase II (1991) 11 VOCs, 14 SOC, 8 IOCs
 - Phase IIB (1993) 1 SOC, 1 IOC
 - Phase V (1994) 3 VOCs, 14 SOC, 5 IOCs

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Chemical Contaminant Rules

- Maximum Contaminant Level Goals (MCLGs) -> non-enforceable
- Maximum Contaminant Levels (MCLs) -> enforceable

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Other Rules

- Lead and Copper
- Total Coliform
- Disinfection By-Product
- Surface Water Treatment
- Arsenic
- Groundwater
- And → Radionuclides

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Radionuclide Rule

- Published in December 2000
- Set MCLs for:
 - Combined radium 226/228
 - Gross alpha particle radioactivity
 - Beta particle and photon activity
 - Uranium
- Applies to all Community Water Systems

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Radionuclide Rule

- Out of all PWS nationwide, only 795 were expected to have to install treatment to comply with the rule



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Radionuclide Rule

Regulated Radionuclide	MCL	MCLG
Beta/photon emitters*	4mrem/yr	0
Gross alpha particle	15 pCi/L	0
Combined radium 226/228	5 pCi/L	0
Uranium	30 ug/L	0

* A total of 168 beta particle and photon emitters may be used to calculate compliance with the MCL



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Monitoring Requirements

Gross Alpha; Combined Radium 226/228, Uranium

- Initial Monitoring
 - 4 consecutive quarters



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Beta Particle and Photon Radioactivity

- Initial Monitoring
 - No monitoring for most CWSs
 - Vulnerable CWSs
 - Gross Beta quarterly samples
 - Tritium, Strontium-90 annual samples

Monitoring Requirements

Gross Alpha; Combined Radium 226/228, Uranium

- Reduced Monitoring
 - Average < DL
 - Once in 9 years
 - DL < Average < 1/2 MCL
 - Once in 6 years
 - 1/2 MCL < Average < MCL
 - Once in 3 years

Beta Particle and Photon Radioactivity

- Reduced Monitoring
 - RAA of gross beta – naturally occurring potassium 40 < 50 pCi/L
 - Once in 3 years

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Monitoring Requirements

Gross Alpha; Combined Radium 226/228, Uranium

- Increased Monitoring
 - MCL < one EP Sample
 - Quarterly, until 4 consecutive quarterly samples < MCL.



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Beta Particle and Photon Radioactivity

- Increased Monitoring
 - If gross beta – naturally occurring potassium 40 > 50 pCi/L
 - Sample like initial monitoring

Monitoring Results in CNMI

Gross Alpha

- Excludes radon & U
- MCL = 15 pCi/L
- 31 detects of 82 samples
- High 13 pCi/L
- 19 samples < 2 pCi/L
- 9 samples 2 – 10
- 3 samples above 10
- Taken in 2000-2002

Combined Radium

- MCL = 5 pCi/L
- 16 detects of 27 samples
- High = 4.08 pCi/L
- Taken in 2001

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Compliance Options

Non-Treatment

- Blending water sources
- Finding a new or alternative source
- Purchasing water or consolidation



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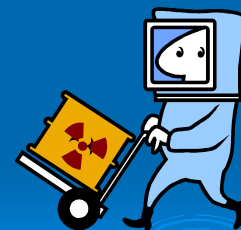
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Treatment

- Ion exchange
- Reverse osmosis (RO)
- Point-of-use (POU) RO
- Lime softening
- Electrodialysis
- Pre-formed MnO3 filtration
- Activated alumina
- Coagulation/filtration

If Treatment -> Then

- Worker safety issues
- Residual disposal issues, including:
 - Waste characterization
 - Transportation



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Conclusion

- Community Water Systems required to monitor
 - Quarterly initially, then at least 1 in 9 years
- Some detects in CNMI
 - None over MCL
 - Naturally occurring
 - No man-made radionuclides detected

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Break -10 minutes



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Main Event

Radon

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Video

- [Link to Radon Video](#)

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CNMI Radon Testing

- Limited sampling 10? years ago
- Radon issues on Guam

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Tsunami Education

- [Link to Video](#)

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Association Business

HRWA news
Lending Library
Treasurer's Report (2010)
Board Elections

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HRWA news

- EPA budget cuts hurt HRWA
- Will not be able to travel to CNMI as often as previously envisioned
- Looking for additional funding



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Association Lending Library

- List is on the website
- 4 new books last month (\$200)
 - Operator Certification Study Guide
 - Wastewater Operator Certification Study Guide
- Ordered 10 new books this month (\$600)
 - Mostly math books
 - Expect them here in May

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Treasurer's Report 2010

- See spreadsheet

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Board Member Terms

- Chair: Derek Chambers – May 2013
- Vice chair: Bernard Keremius – May 2013
- Secretary: Mariano Iglecias – May 2011
- Treas: Cecilio Raiukiulipiy – May 2012

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Elections

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Contact Information

Mariana Islands Water Operator Association
P.O. Box 502512
Saipan, MP 96950

www.MarianasOperators.org

e-mail

info@MarianasOperators.org

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