

The background is a light blue gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

DISASTER SANITATION

*DON'T LET YOUR COMMUNITY
SURVIVE THE EARTHQUAKE,
BUT DIE OF DYSENTERY*

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OAFP LUNCH AND LEARN

DEC. 19, 2023

Is Disaster Sanitation – A Consumer Product? Or Community Empowerment?

Consumer Product Buy this stuff!

- Camping equipment
- Camp toilet \$60 - \$160
 - Porta-potties \$700 - \$1300
- Portable sink - \$80 - \$1200
- \$\$\$\$

Empowerment* You can do this!

- Make a handwashing sink from a bucket, for \$5
- Use buckets as toilets
- Learn how infection spreads

**(Family Physician's Superpower)*

LEARNING OBJECTIVES

- Part 1. **Prevent** infection and death, after a sanitary disaster
 - Know: WHY failed sanitation makes people sick
 - Know: HOW to stop the **5 ways** failed sanitation makes people sick
- Part 2. **Manage:** Sanitation BEFORE and DURING a disaster
 - Equipment & supplies can save lives – long before FEMA arrives
- Part 3. **Know:** The big picture
 - Storing infectious material: Poop
 - Mobility-impaired people, and different genders, need different equipment
 - Leadership, staffing, and the disgust reflex

YOUR ROLE IN DISASTER IS NOT FEMA'S

Different Abilities, Different Goals

- FEMA response is **massive** & **relatively well-funded**.
 - But too slow to arrest infection spread
 - Top down, cookie cutter
 - Requires transport infrastructure:
Roads, airports, trucks, fuel – will be crippled after a big disaster
 - Like the massive earthquake expected in the Northwest any year now, or the 1962 Columbus Day Windstorm
- You and your neighbors will be on the scene immediately – because you live here!
 - You're not massive, not well-funded
 - But you will know who needs what
 - If you can quickly deploy practical sanitation, you will save many lives & prevent misery

COMMUNITY-BASED DISASTER SANITATION

- **Simple!**
 - Everyone must be able to set it up and use it
- **Cheap!**
 - If \$\$\$, perpetuates inequity
- **Hyper-local!**
 - Pre-made & pre-distributed.
 - Amazon will be down!
- **Effective!**
 - Test every model before recommending
- **Sturdy!**
 - Water supply & sewage collection will be out for many months

WHY IS THERE SANITATION?

- Sanitation systems protect people from their poop
 - Millenniums before germ theory, people knew poop was dangerous
 - Makes cities livable; without it, volume of excrement overwhelming
- When sanitation systems fail, people get sick. Many die.
- Community leaders, like yourselves, can arrange for and deploy substitute infrastructure that does the same job.

WHAT HAPPENS WHEN SANITATION FAILS?

- Sanitation failure allows intestinal microbes, like E. Coli, to run free
- They reach the mouth via hands & drinking water – the **fecal-oral route**
- The stomach, wisely, doesn't want them in there!
- The digestive system expels the bad bugs with a rush of fluid called **dysentery**, or severe diarrhea
 - The gut is trying to be helpful
 - Thanks a lot
- Fecal-oral perpetrators: E coli. Norovirus. Salmonella. Campylobacter. Shigella. Polio. Cholera. Typhoid. Hepatitis A & E. And their many accomplices.

CONSEQUENCE: DYSENTERY

- **For the patient:** dehydration, electrolyte loss, misery, death
- **For community:** germs in uncontained diarrhea reach other people, causing diarrhea, which reaches exponentially more people, etc.
 - Fecal-oral transmission
 - Sadly common in disasters, wars, refugee camps, migrant workers, the homeless, and the developing world
 - Many victims are **children** and the **elderly**
 - Dysentery often kills more people than the original catastrophe



HOW do we replace sanitation systems,
WITHOUT

Clean running water,
Sewers, or
Flushable toilets?

WE STOP THE FIVE Fs!



5 PATHS TO INFECTION – BLOCK THEM ALL!

- **5 ways** germs get from one person's bottom to another's mouth.
 - **Fingers** – wash those hands!
 - **Flies** – cover & alkalinize (lime) poop in bucket toilets and latrines!
 - **Fields** – bury it deep!
 - **Fluids** – no poop in, or near, water!
 - **Food** – wash hands, wash dishes! Keep flies off your food!

– World Health Organization

1. FINGERS!

- Make it **easy** for everyone to clean their hands
 - If it isn't easy and available, too often it won't happen
 - Don't blame people who don't wash
 - They're busy surviving. Make it easy
- Set up handwashing at toilets, food prep, eating areas, medical areas

2. FLIES!

- Flies carry germs from poop to food
- So, keep their tiny feet *off the poop*
 - Cover contributions to poop buckets & latrines with dry materials
 - **Don't use air-tight poop-bucket lids.**
Oxygen is good, it kills anaerobic bacteria
- *And off your food*
 - Be vigilant with food, plates, utensils
 - Dishwashing set ups must be easy to find and use

3. FIELDS!



- Dig & maintain latrines safely
- Cover deposits to latrines **COMPLETELY**, with dry materials and occasional garden lime

4. FLUIDS!



- **Store** water
 - For handwashing and dishwashing
 - Treating dysentery uses up a lot of precious water
- **Protect** water
 - **Dig** latrines where they won't contaminate water
 - **Know** how far down your water table is
 - In most of Portland, 100-600 ft. below surface. No problem
 - More on the water table, later

5. FOOD!

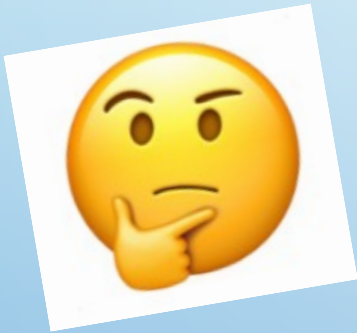
- Isolate food from fly-carried germs
 - Prevent the second disaster: food contaminated by flies
 - Easy access to dishwashing set-ups
- Protect food from other critters, too – rats, raccoons, etc.

SUMMARY

PART I

- A disaster that disables sanitation can sicken & kill
 - Dysentery, infectious diarrhea
 - Caused by poop germs reaching mouths, via hands or drinking water
 - **In your power to prevent!**
- Block all 5 F routes
 - Fingers!
 - Flies!
 - Fields!
 - Fluids!
 - Food!

PART 2. **MANAGING SANITATION** BEFORE, & AFTER, A PIPE-BREAKING DISASTER



- Equipment
- Supplies
- What to buy, what to pre-build

POOP VS PEE

DIFFERENT MANAGEMENT CHALLENGES

POOP

- Poop is dangerous
- Even in small amounts, packed with really bad pathogens
- We don't produce much
 - < 8 fl. oz./Day. Compact. Lightweight
 - Stinks less if not mixed with pee

PEE

- Pee is not dangerous.
- It's even useful as fertilizer, diluted
- Large volumes bad for bodies of water, high nitrogen & phosphorus
- People make a large volume
 - ~ 2 quarts/day, weight 4 lbs. Heavy

BOTTOM LINE: KEEPING PEE & POO SEPARATE IS EASIER & SAFER

THE TWIN-BUCKET TOILET

- Developed in New Zealand after the 2011 Christchurch earthquake
- Still found in country cabins there
- Portland-area preparedness agency RDPO (Regional Disaster Preparedness Organization) adopted it



THE TWIN-BUCKET TOILET

- One bucket for pee, one for poo
 - Separation reduces odor
 - Manages both pee & poo easier & safer
- Promoted by RDPO, Regional Disaster Preparedness Organization
- More on this later



TWIN-BUCKET TOILETS ADOPTED IN TURKEY AFTER FEB. 2023 EARTHQUAKES

- RDPO – distributor of the pee & poo bucket stickers – received this email:

“I Am Ilker Kayı from Koç University School of Medicine, Istanbul Turkey, and I am writing to you about your emergency toilet guidelines. As a group of medical students, we have translated your guide into Turkish to be distributed among the people affected by the two consecutive earthquakes that happened on Feb 6th, which affected 14 million people living in 10 different cities.

“There is a huge need for sanitation at the moment and we found your guide very useful. We are grateful to those who prepared it and immediately translated it into Turkish and will be distributing it with your logo and information in the document.”

EQUIPMENT NEEDED *BEFORE THE DISASTER*

- Handwashing stations
 - 1-bucket model
 - DIY-on-the-spot model, Tippy-Tap
- Toilets
 - Bucket toilets
 - Urinals
 - Latrines
 - Toilet seats

SUPPLIES NEEDED *BEFORE THE DISASTER*

- For handwashing

- Clean stored water, lots of it
- Soap
- Hand sanitizer

- For toilets

- Liner bags, in poo bucket only
- Dry material for covering poop, including lime
- Toilet paper
 - Or leaves, newspaper, etc.

THE NUMBERS

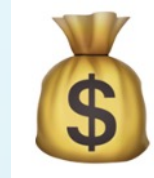
HOW MANY, OF WHAT, WILL YOU NEED?

- After an earthquake, hurricane, etc, your town will look like a refugee camp.
 - Dazed people. Broken buildings. No running water. No sewers. No electric lines.
- So, let's ask the refugee camp experts: the UN High Commission for Refugees.
- **UNHCR minimum: one toilet unit for every 20 people.**
 - “Toilet unit” = Containers or latrines for poop & pee, handwashing station, privacy shelter
- Data: if toilets scarcer than that, more people get sick & die

DO THE MATH

- **ONE TOILET PER 20 PEOPLE.**
- My Portland neighborhood, South Burlingame: Population **1750 / 20 = 87**
 - We will need **87** toilet units, each with a handwashing unit.
 - 87 twin-bucket toilets = 174 buckets, fewer if we dig latrines
 - 87 one-bucket handwashing stations = 87 more buckets
 - One small neighborhood needs 261 buckets to prevent dysentery
 - Big numbers. We will do the best we can

WHAT YOU CAN GET FOR NOT MUCH!



Sinks: Both hold 5 gallons

\$80 - \$130



\$850 - \$1200



Camp toilet

\$60 - \$150



Porta-potties

\$700 - \$1300

Hard to transport

KNOWING HOW MANY YOU NEED, WHAT DO YOU WANT?

- Well, gold toilets are out
- Sanitation does more good – prevents more infections – if ready Day 1
 - Build and distribute **before** disaster. Work parties build stuff, and they build resilience
- Portable toilets & sinks can be bought, but prohibitively expensive
 - Yes, FEMA will bring porta-potties. Not fast enough to contain E. Coli etc
 - Purchasing commercial is NOT a plan



SANITATION JUSTICE IN DISASTERS



- Economic status always affects disaster survival
- Richer, whiter neighborhoods have more camping equipment
- What about everyone else? Sanitation is life and death
- ***Affordable sanitation equipment, in bulk, is a moral imperative***
- Benefit of community involvement is long-term resilience



THE NITTY GRITTY: *MAKING SANITATION EQUIPMENT*

Handwashing



Stations

DIY HANDWASHING EQUIPMENT

HANDS-FREE OPERATION PREVENTS INFECTION

- 2 types, that are affordable, sturdy, and easy to make & use
 - **Spigot** on container – *hands-free* with foot pedal
 - **Tippy tap** – easy to make without tools, hard to aim
- Many other designs, I've built and tested them, not worth it

BUCKETS CAN BE *FREE*

- Food businesses receive bulk foods in 5-gallon buckets
- Most go to landfills
- So, when you go grocery shopping, ask for used buckets at the deli, the bakery, caterer, even the olive bar. Ask restaurants, too. You want lids, if possible.
- Metro paint used to give away free empty buckets. *No longer.*
- It's getting harder to find free buckets. More groceries & delis send buckets back to vendors. Anyone have sources?

TURN-SPIGOT ON CONTAINER NOT HANDS-FREE – **GERM MAGNET**

- Intuitive, easy to use
- Handle **easily contaminated**
- Wastes water if left open
- Many people have these for camping, outdoor markets, etc.






TYPE 1. HANDS-FREE FLIP-SPIGOT ON BUCKET

- Emergency Volunteer Corps Of Nehalem Bay (EVCNB) gives these to residents
- Sanitary, because hands-free
- Water-efficient, because spigot closes when foot-stick is released
- Running twine up, sideways, & down keeps water off the twine.
 - Also, off your foot
- (Ignore the bottom bucket, it's empty, just holding up the handwasher for use)

IMPROVED FLIP-SPIGOT ON BUCKET

- I adapted EVCNB's design, with drapery hooks to carry the twine
- < \$5, takes 15 minutes to make
- DIY level easy
- Stackable
- Need plan for falling water
 - Ground? Catch bucket?
- Video instructions on [instructables.Com](https://www.instructables.com)





This is the kind of
spigot you want
for your
Handwashing Station.

NOT this.

TYPE 2. THE TIPPY TAP

<https://tinyurl.com/Tippy-TapWaterAid>

- Easy build with materials on hand
- Hands-free
- Widely used in developing world
- Requires catchment for used water
- Best for outdoors



SUMMARY

HANDWASHING STATIONS

2 Types

- One-bucket, flip-spigot, opened with foot-stick
- Tippy Tap



THE NITTY GRITTY: *MAKING SANITATION EQUIPMENT*



Toilets, Latrines,
Urinals, Toilet Seats

THE TWIN-BUCKET TOILET

- One bucket for pee, one for poo
 - Separation reduces odor
 - Manages both pee & poo easier & safer
- Promoted by RDPO, Regional Disaster Preparedness Organization
- Developed in New Zealand



WAIT ... “MANAGING POOP”? WHAT?

- After a pipe-breaking disaster, no pipes will whisk our waste away to a sewage treatment facility
- That’s right – WE’LL BE STUCK WITH IT!
- We will have to store poo, safely, in sturdy bags in critter-proof containers.
 - Roll carts (used pre-disaster for yard debris, recycling, garbage) hold many weeks of poo
 - Dumpsters (make sure bottom drain is capped, and no overhanging branches to give critters access) hold many months of poo
- Must keep it isolated from people, and from rats, raccoons, and insects that can spread its germs
- Advantage of latrines. Store our waste in the earth, which takes care of it

TWIN-BUCKET TOILET

PRO & CON

PRO

- Materials cheap, available
- Minimal set up
- Poo lighter weight, smaller volume, without pee
- User separates pee & poo by moving between buckets
 - Easy for people w male anatomy

CON

- User separates pee & poo by moving between buckets
 - Tricky for people w female anatomy
- If mistakes:
 - Pee in poo bucket just makes it heavier, not a huge problem
 - But if poop in the pee bucket, have to manage like it's all poop – more work

LATRINES

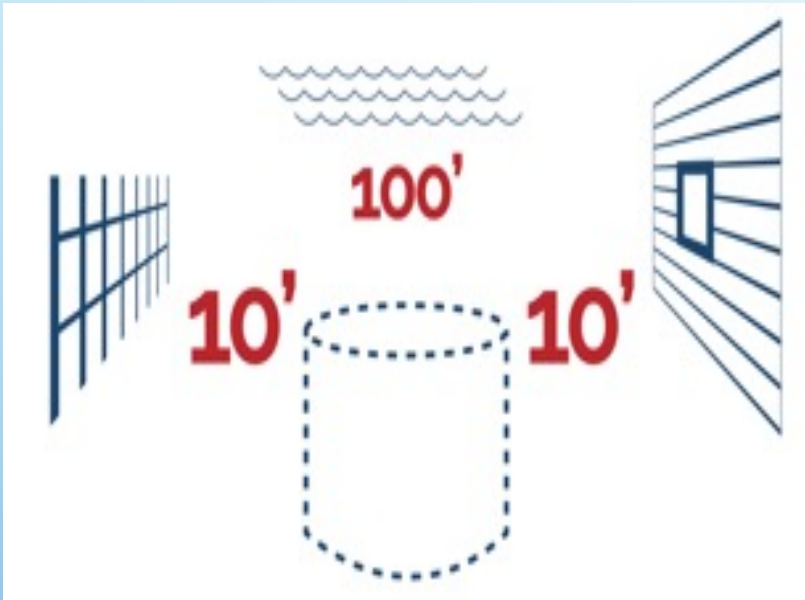


WHERE, HOW, WHAT

LATRINES 101

- Dig hole, save dirt
- Poop & pee into the hole, including toilet paper
- Cover poop with saved dirt so flies can't reach the poop
- Good idea: add garden lime occasionally. More on this later
- When almost full, cover it well, mark site (!), dig a new hole

CHOOSING A SITE



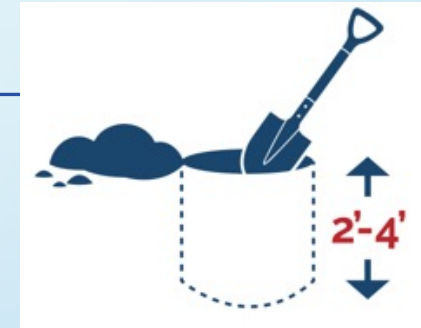
- ✓ At least 100 feet from any body of water
- ✓ FAR above the water table
- ✓ 10 feet from dwellings
- ✓ Choose site pre-disaster, if possible, to avoid utility lines

HOW DO YOU KNOW HOW FAR DOWN YOUR WATER TABLE IS?

- On the beach it's right below your feet. So never dig a latrine on the beach. Please!
- Land next to water (rivers, lakes) may have a water table within reach of a shovel. Don't dig there.
- The higher the hill one lives on, the farther down the water table.
 - Most of metro Portland is 20 feet or more above the water table, too far to reach with a latrine.

DIGGING & USING A LATRINE

- Dig a hole at least 2 feet in diameter, 2-4 feet deep.
- Save the dirt.
- (If you hit water, stop, dig at another location.
That's the water table.)



- Cover waste with dirt after each use.

- Good idea: add garden lime occasionally. More on why later.
- Toilet paper goes in the latrine. Plastic bags do not!



WHEN IT'S FULL

- When almost full –
- Cover well
- Mark the site!
- Dig a new latrine



LATRINES

HOW TO MAKE THEM MORE PLEASANT

- Add a commode, squatting board, or bench over the latrine
- Buckets of dirt, wood pellets, lime, etc., And a scoop, to cover contributions
- Privacy structures, such as curtains, lightweight walls, rain protection
- Clear, non-hazardous pathway
- Extras
 - ‘Occupied’ indicators to prevent embarrassment
 - 2 sharp sticks, stuck in ground. VACANT = 2 sticks parallel. OCCUPIED = 2 sticks crossed in X
 - Path indicators for finding it in the dark

SUMMARY

LATRINES

- Choose site pre-disaster to avoid utility lines; far from people; very far from water; far above water table
- Dig. Save dirt
- Top with a commode or seat
- Cover deposits with dirt or other dry materials
- When almost full, cover well, mark site

Urinals – Many design options

Ping-pong ball in funnel keeps smell contained



People w female anatomy can use urinals, too

- With pee funnels, aka female urination devices
- Many commercial models
- DIY from a plastic bottle
- Takes practice using it



PEE BUCKETS & URINALS – WHY?

- Mixed pee & poo is **heavier**, and ***stinkier***, than either by itself
- Poop is easier to manage if not mixed with pee
 - Smaller amount, lighter weight
- Collected pee is easy to manage
 - Lug it away from people, away from bodies of water, pour on ground or post-quake cracks in pavement, rotate sites



TOILET SEATS
JUST BECAUSE!

DON'T MAKE TOILET SEATS AIRTIGHT

COUNTERINTUITIVE, RIGHT?

- YOU'D THINK PEE & POO SHOULD BE SEALED AWAY. BUT NO.
- OXYGEN *KILLS* THE MOST DANGEROUS (AND STINKIEST) BACTERIA
 - THEY'RE CALLED "ANAEROBES" MEANING 'WITHOUT AIR'
 - SUPPRESSED BY AIR CIRCULATION – GOOD FOR US

REMEMBER, WE'LL NEED A LOT OF THESE



- Option: Plastic toilet seat, made to snap onto a 5-gallon bucket
- Cost: \$10 - \$25



Option: Pool Noodle

Non-porous foam

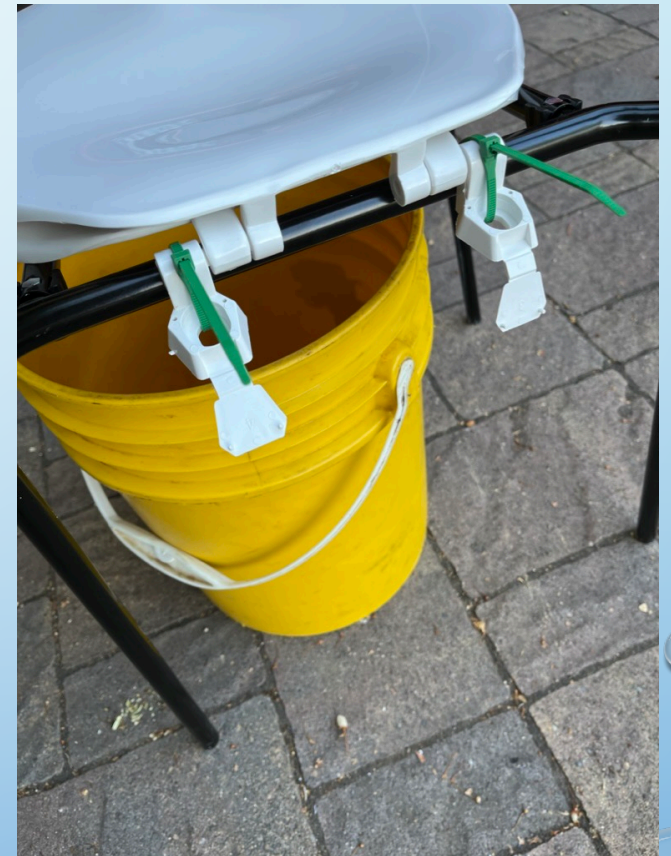
Rough surface, so clean often

Another Commode & Toilet Seat Option

IKEA's ADDE chair **\$14.25**
(\$15, - 15% on free loyalty plan)



Don't snap on the plastic seat.
Zip-tie on a \$5 toilet seat.



SUMMARY EQUIPMENT

HANDWASHING

- Hands-free to prevent contamination
 - Build pre-disaster
 - Flip-spigot on bucket, foot stick
 - Build post-disaster
 - Tippy-tap

TOILETS

- Latrines
- Twin bucket, easy, available
 - Less functional for female anatomy
- Urinals, easy to make & manage
- Toilet seats
 - Build or buy ahead
 - Pool noodles



THE NITTY GRITTY: SUPPLIES



THE DISPOSABLES

SUPPLIES FOR SANITATION

FOR HANDWASHING

- Clean stored water, lots of it
- Soap
- Hand sanitizer

FOR TOILETS

- Liner bags, in poo bucket only – trash compactor bags
- Dry materials for covering poop – wood chips, sawdust...
- Toilet paper
 - Leaves, moss, newspaper, etc.

POO BAG LINERS

- At least 2 mil thick
- 7-20 gallon, to fit buckets
- Not useful:
 - Too **big**: contractor bags 3 mil, 42 gallon
 - Too **thin**: kitchen trash bags, 0.34 mil, bags will leak
- Just right: **trash compactor bags** size & thickness fit the bill. Stock up!



DRY COVERING MATERIAL TO COVER POOP

- Many choices, best is what's available. Container & scoop by bucket toilet
- Wood chips, shavings, or pellets, sawdust, ashes, dirt, wood shavings, straw, coffee grounds, mulch, shredded paper, etc.
- Lime (see next slide) can be combined with any of the above
- ***DON'T use:***
 - Clumping clay cat litter, turns to cement
 - Cedar shavings, wood is oily so doesn't absorb moisture

MATERIALS TO COVER POOP LIME

- Doesn't just cover, changes chemistry, makes it alkaline (“sweet”)
 - Flies less interested, & stinks less
- Several products called lime
 - You want “garden lime” or “lawn lime”
 - Pelletized, aka “prilled”
 - NOT powdered, it will fly up in your face and burn



SUPPLY LIST

TWIN-BUCKET TOILET

- 2 buckets, ~5 gallon, labelled PEE & POO
- 2 seats
- Strong plastic bags for the poo bucket
 - Look for **TRASH COMPACTOR BAGS**. Right size & thickness
 - No need for a bag in the pee bucket
- Covering materials: dirt, dry leaves, wood pellets, wood chips, garden lime
- Container & scoop for covering materials
- Shelter

PRIVACY SHELTERS

- Commercial shelters cost \$20 - \$200



STORING WATER



STORING WATER

- MOST IMPORTANT ASK IN EMERGENCY PREPAREDNESS
 - STORE EMERGENCY WATER. 1 GALLON PER DAY, PER PERSON, FOR 2 WEEKS = 14 GALLONS
 - ELSEWHERE, STORE 3 DAYS OF WATER, BUT WE EXPECT BIGGER DISASTERS HERE
 - STORE IN FOOD-GRADE PLASTIC, GLASS IS FRAGILE
- ONE OPTION: PURCHASED BOTTLED WATER –
 - BOTTLED WATER HAS FRESHNESS DATES, 6 MONTHS - 2 YEARS, PROBABLY SAFE MUCH LONGER
- ANOTHER OPTION: SANITIZE CONTAINERS, FILL, ADD BLEACH, CAP & STORE
 - SAFE FOR YEARS
 - DEPENDING ON HOW CLEAN THE CONTAINER WAS WHEN FILLED, AND WHERE IT'S STORED

STORING WATER

2 WAYS TO CLEAN CONTAINERS

- 1. When canning fruit & veggies
 - Glass jars must be *sterile*
 - Boiling water bath for jars & lids
 - Pull from water bath, fill & seal immediately
- Boiling water good for glass, **not** for plastics
- 2. When storing water, **CDC says**
 - a. Wash container & lid with soap, rinse well
 - b. Mix 1 teaspoon liquid chlorine bleach in a quart of water, pour into container
 - c. Cap container, shake to cover all inner surfaces, then pour out bleach water
 - d. **Air-dry your empty sanitized container**
 - e. Fill the container

Anyone see a problem?

AIR-DRYING?

- Air-drying, like in your dish drainer?
- Exposed to all the bacteria, viruses, dust, & schmutz in the air?
- So i called a food scientist.
 - Sarah masoni, senior faculty research associate, of the osu food innovation center
- Answer: no, NOT like drying a dish in the kitchen
- Air-dry for 15 MINUTES OR LESS. Then, dry or not, fill with water
- That's how sanitizers, such as bleach, work – by drying

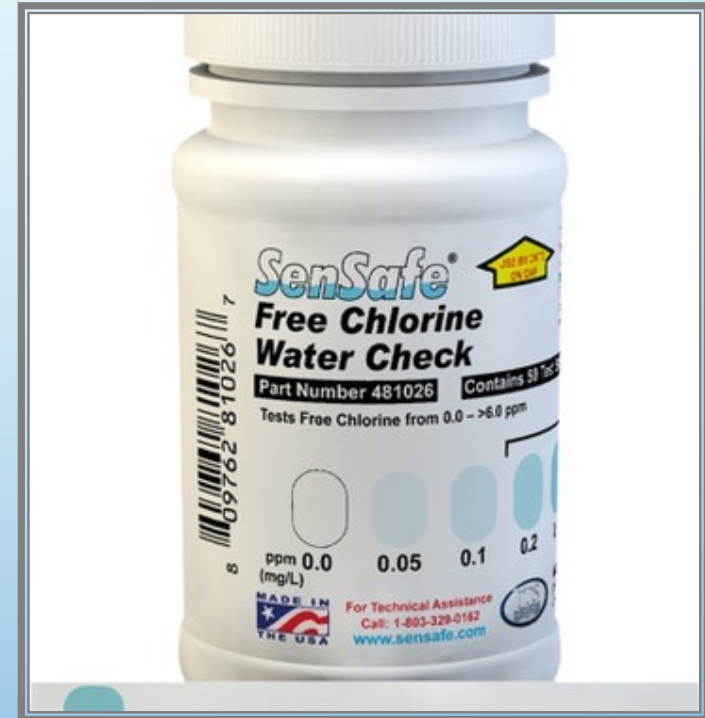
BLEACH KEEPS STORED WATER GERM-FREE

1. Clean the container well – soap & hot water, rinse well
Optional: shake some bleach water in the container, drain
2. Fill with tap water
3. **5 drops** of bleach per quart or liter
Unscented chlorine bleach. 5.25%. Check freshness date, bleach expires
4. Add bleach and cap
5. Label with date, keep in **cool, dark** place
Because heat makes bacteria happy, and UV light degrades plastic
Safe for YEARS, depending on container cleaning, and how cool & dark its storage place

HOW LONG IS STORED WATER SAFE? YOU CAN TEST IT

SOURCE: EVCNB.ORG – THANKS!

- Bleach = chlorine = dead microbes
- So, you want a smidge of circulating chlorine, to zap any bug that manages to get into your stored water
- Scientific term for “circulating chlorine” is “**free chlorine**”
- Use a test strip to measure free chlorine
 - \$19 for 50 strips



HOW MUCH FREE CHLORINE IS ENOUGH?

TARGET CHLORINE LEVELS FOR DIFFERENT PURPOSES

1. Storing Tap Water: 0.5 – 1.0 ppm
2. Treating **Clear** Raw Water: 3 – 5 ppm
3. Treating Cloudy Raw Water: 5 – 8 ppm
4. Handwashing & Cleaning Eating Utensils: 100 ppm
5. Cleaning toilets/diarrhea: 1000 ppm

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I tested my Portland tap water.
The strip turned a very faint blue, matching ~0.10 ppm.
So, if I'm storing this water, I need to add bleach.



CONTAINERS FOR EMERGENCY WATER STORAGE “FOOD-GRADE” PLASTIC

- Best choice: #2, HDPE, high density polyethylene.
 - Jugs, jerry cans, barrels, buckets, any size.
 - **No milk jugs**, can't clean out milk fat or sugars
- Best source: Green Concepts Container, Gresham. On Facebook
 - Example: 55-gallon drum for water. \$30 Green Concepts, \$150 Amazon.
 - Joe Dodd started GCC because he saw the food industry sending millions of plastic containers to landfills. He collects & cleans them to as-new. Sells at **huge** discount.

GREEN CONCEPTS CONTAINER



SUMMARY SUPPLIES

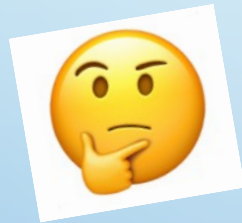
HANDWASHING

- Stored water
- Soap
- Hand sanitizer

TOILETS

- Liner bags: **trash compactor bags**
- Covering materials
 - Dry materials
 - Lime: pelletized garden lime
- Toilet paper
 - Can substitute leaves, paper, etc.

PART 3. THE BIG PICTURE



- Containment of infectious material
- Vulnerable populations
- Vive la difference
- Leadership, staff, and disgust

THE DISPOSAL CONTROVERSY



What do we do with all that sh*t?

DISPOSING OF PEE

- Pour on ground, or post-quake cracked pavement
 - Far from bodies of water
 - Rotate sites.
 - NOT down storm drains!
- Buckets vs jugs for transport
 - Need tight lid or cap to prevent sloshing
 - Heavy. 8 lbs./Gallon. Large amounts, 1-2 quarts per day per person

DISPOSING OF POO

STOP!

It's infectious. It's dangerous.

We have to *store* it –

In those trash-compactor sturdy plastic bags

Latrines have the advantage of a built-in disposal mechanism






WHERE DO WE STORE IT?

PRIORITY: PROTECT PEOPLE

- Flies must be kept away from fresh poop
- Rats must be kept away from bagged poop
- Plastic roll carts hold 64 gallons
 - **~500 person-days** of bagged poo
 - Store plastic roll carts within rat-resistant enclosures
 - Inside ¼-inch hardware cloth, or similarly secure building

DUMPSTERS

- Dumpsters hold 2 – 40 cubic yards
- 1 cubic yard = **1600 person-days** of poop
 - = 50 people's poop for a month
- Dumpsters have drains in the floor. Close the drain, or rats get in
- Avoid overhanging branches or structures that critters can use to jump onto the dumpster

| | | |
|--|---|---|
|  <p>MOST POPULAR</p> |  |  <p>WM PICK</p> |
| <p>2 Yard Dumpster Holds: 400 pounds Frequency: Up to 5x a week Best Use: The perfect size for small restaurants and companies with up to 25 employees See 2 Yard Dumpster Details</p> | <p>3 Yard Dumpster Holds: 600 pounds Frequency: Up to 5x a week Best Use: Ideal for businesses with up to 50 employees See 3 Yard Dumpster Details</p> | <p>4 Yard Dumpster Holds: 800 pounds Frequency: Up to 5x a week Best Use: Best for midsize restaurants and companies with up to 100 employees See 4 Yard Dumpster Details</p> |
|  |  | |
| <p>6 Yard Dumpster Holds: 1,200 pounds Frequency: Up to 5x a week Best Use: Ideal for mid to large businesses with up to 250 employees See 6 Yard Dumpster Details</p> | <p>8 Yard Dumpster Holds: 1,800 pounds Frequency: Up to 5x a week Best Use: Our largest recurring size — best for large businesses with up to 500 employees See 8 Yard Dumpster Details</p> | |

The background is a light blue gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

VIVE LA DIFFÉRENCE

Different anatomy:

Different disaster sanitation needs

PEOPLE WITH DIFFERENT ANATOMY

FEMALE

- Poop & pee AT THE SAME TIME!
- Don't need to know for sure which
- If in doubt, use the poo bucket
 - Pee bucket when you're sure
- Solution: Latrines, Urine-diverting toilets
- Peeing into a funnel, standing, seems to suppress defecation

MALE

- Used to peeing & pooping into different containers
- Twin-bucket toilets work well for male anatomy

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MOBILITY-IMPAIRED SURVIVORS

Most at risk of dysentery, etc. already

Let's take care of them

MOBILITY-IMPAIRED SURVIVORS

- Need grab bars in privacy shelter, to transfer from walker or wheelchair to bucket
- Commodes fit over buckets or latrines, and have built-in side support bars.
- Need unobstructed path to toilet station

WAG BAGS

“WASTE-ALLEVIATING GEL”

- Plastic bag containing a NASA-developed gelling powder that deodorizes & breaks down waste
- Poop and/or pee
- Can be used multiple times
- Unaffordable for the general population, ~\$3 each

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TEAM SANITATION

WHO? *ME?*

LEADERSHIP, STAFFING, & THE DISGUST REFLEX

- The people who mind the poo & pee
 - Among the most important, essential, lifesaving people in the survivor community
 - **They will probably save more lives than the medical team.** For real.
- We have an instinctive disgust for poop. Good thinking, evolution!
 - But big mistake, evolution: Our disgust reflex extends to the people who protect us from it
- Leadership, in a disaster, will need to openly value sanitation volunteers
 - If this is a thankless job, it won't be done well. Or, maybe, at all
 - And people will die

QUESTIONS?



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I would be happy to give this talk to other groups:
PTAs, schools, churches, mosques, & synagogues, City Hall, comedy clubs