“More Than Just Dirty”
Pathogen Exposures to Workers in the On-Site Industry
Purpose of the Grant and Outcomes

To study pathogen exposures to workers in the On-Site Industry

An extensive literature review was completed in the first phase

Numerous studies have been done on wastewater workers in “Treatment Plant” situations but never in the field work that we do.

Field observations and workplace sampling were conducted in the next phase
Purpose of the Grant and Outcomes

QUANTIFY THE ACTUAL EXPOSURES TO WORKERS ON THE OSS INDUSTRY.

IDENTIFY CURRENT RISK MITIGATION WITH COMMONLY USED TOOLS AND PPE (PERSONAL PROTECTIVE EQUIPMENT).

RAISE AWARENESS TO THE EXPOSURES THROUGH EDUCATION AND TRAINING.

PROVIDE USEFUL TOOLS AND RECOMMENDATIONS TO IDENTIFY AND MANAGE PATHOGEN EXPOSURES IN THE WORKPLACE.
Sampling was done on:

- Offices, Shops, Storage areas, Equipment, Clothing, Cell phones, Smokers, Chew, Truck Cabs and more.
- Pumping, jetting, system repairs
- Wastewater in tanks
- Sewer lines
- Drainfield components
Laboratory Testing

- Fluid testing.
- Contact surface / swab testing.
- Aerosol / vapor testing
- Controls

Testing laboratories:
- Laboratories NW (MultiCare)
- Water Management Lab
- WSU Food Safety Lab
Fluid Testing
Contact Surface Testing
Aerosol Testing
What we found...

ALMOST EVERYTHING IS CONTAMINATED!
We also know that ...

You are NOT SURPRISED!

Up until now ... You know that it’s DIRTY!

Today, you will learn how it’s UNHEALTHY!
• Mixed Bacterial flora
• Bacillus
• Gram negative Rods
• Gram positive Cocci
• Aeronmonas Hydrophila
• Aeromona Caviae
• Streptococcus
• Fungus
• Yeasts
• Enteric type gram negative rods

• Staphylococcus, Coagulase Negative
• Gram positive Coryneform rods
• Aeromonas Sobria
• Escherichia Coli O157:H7
• Fecal Flora
• Spore forming gram positive rods
• Propionibacterium gram positive rods
• MRSA
• Diptheroides
• Molds and Rare Molds
How Do We Compare to Other Work Settings
Where we Work.....

- Residential systems
- Commercial/Schools
- Community systems
- Sewer jobs
- Digesters
What are you working in?

You JUST Don’t KNOW!!! BUT........

Public beaches are closed when E.Coli levels hit

> 126 /100 ml

Raw Sewage in our field sample studies were commonly

> 160,000 /100 ml
What should you do First?

If you’re the owner of the business...

• Create a simple outline of your Accident Prevention Plan (APP)

• Use the KISS method when approaching this task...

• Involve your workers in workplace safety and health awareness and identification.

• Give new employees job safety orientation and provide the personal protective equipment they need.
If you’re the employee of the business....

**Willingness ...**
To take personal responsibility for your safety, your family and the homeowner!

**Awareness ...**
To pay attention to the tasks at hand!

**Common Sense ...**
If you figure it out ahead of time, it's usually pretty easy to do it without increasing your exposure or getting sick!
Workplace Accidents and Illness’

- Your APP plan identifies them to the workplace
- Include them in your safety orientation with new employees
- Use them in your safety meetings:
  - Tailgate, Weeklies, Managers
Why Do Accidents/Illness’ Happen?

1. Rushing
   Not replacing compromised PPE
   Eating on the go...

2. Eyes not on Path
   Slips, trips and falls
   Doing too many things at once

3. Eyes not on Task
   Impact injuries in a contaminated environment
   Pay attention to the task at hand

4. Line of Fire
   Exposure to sewage by “splash back”
   Less obvious is line of fire by “aerosols”
Why Do Accidents/Illness’ Happen?
How Does Illness OTJ Happen?

1. Unaware of exposures
   - Not replacing compromised PPE
   - Eating on the go...

2. Positive reinforcement for negative behaviors

3. Line of Fire
   - Exposure to sewage by “splash back”
   - Less obvious is line of fire by “aerosols”
Describe in your company “Culture” in two words......

- Needs improvement
- Pretty good
- Totally Comprehensive
If Safety “Management” is the Warehouse, Then “Safety Programs” are the Delivery Trucks.

• Programs are used to focus workers attention on specific issues...
  • Establishing the company “safety culture”
  • Team building / Training
  • Focus safety issue
How Does Safety Happen?

• **Administrative Controls**: Policy, Management Programs, Training, Vaccines
  • PS:.......Make sure you put these in writing!

• **Elimination/Substitution**: How can I do the work differently and still get it done?

• **Engineering Controls**: Equipment design, Operational Procedures
Making it part of your Culture

Compliance to use of appropriate PPE by task (pumping, jetting, cleaning, repairs) was an issue from field observations in this study.

- PPE used appropriately 100% the time – Never
- Compliance varied by job task...generally the more complicated or longer the job became, appropriate use of PPE declined and exposure increased.
Personal Protective Equipment (PPE)

- What do I need?
- Is it Available?
- Is it user Friendly? (all work tasks)
- Is it “Fit for Use”?

When needed, will I use it 100% of the time?
PPE for sewage exposure refers to a variety of different types of barriers used alone or in combination depending on the task.

- Barrier protection
- Working “Clean to Dirty” techniques
- Clean up steps afterwards
What is the appropriate level of PPE?
What are the Pathogen Exposures?
What are the Pathogen exposures?

Are they really different from what you are exposed to everyday at home, with kids, pets…?

Short answer: Yes.........No.........Maybe

You just don’t know what pathogens will present from one job to the next.
It Won’t Happen to Me!

- TAMPA (CBSMiami) -

- Two Tampa Bay Buccaneers players are being treated for methicillin-resistant staphylococcus aureus (MRSA) infections and neither the team nor the players know where they contracted the disease.
It Won’t Happen to Me!

• MRSA

• Methicillin resistant *Staphylococcus aureus* (MRSA) is a bacterium responsible for several difficult-to-treat infections in people
LABORATORIES Northwest
Tacoma, WA 98415

REPRINTED REPORT

NAME: BUCKLEY SER, ADVANCED
MR#: WOSSA-8221302
AGE: 60
SEX: U
PHONE#: 802/22/2013
LOC: WOSSA

FLUIDS, WOUNDS, MISC SPECIMENS

08/22/13
Coll Time: 1145
ACC. NO.: H70791
MRSA Culture Screen
Specimen Description: Fluid
Special Requests: sewage study
Culture Results:
1. MRSA isolated
2. MultiCare Infection Control notified

08/22/13
Coll Time: 1145
ACC. NO.: H70792
Enterovirus Culture
Specimen Description: Fluid
Special Requests: sewage study
Culture Results:
1. No Enterovirus including: Coxsackie A & B,
Echovirus, Poliovirus or Enterovirus isolated in
cell culture.

08/22/13
Coll Time: 1145
ACC. NO.: H70793
Giardia/Cryptospor
Specimen Description: Fluid
Special Requests: sewage study
Direct Ag Test:
1. Negative for Cryptosporidium and Giardia
lambia antigens by EIA
MRSA Infection in the Eye
It Won’t Happen to Me!

- MRSA

- Methicillin resistant *Staphylococcus aureus* (MRSA) is a bacterium responsible for several difficult-to-treat infections in people
It Won’t Happen to Me!

Exposure Vectors?
• Direct (examples?)
• Indirect (examples?)

PPE Choices
• Sunglasses?
• Splash shield?
• Goggles?
• N-95 mask?
• Exam Grade Nitrile Gloves
• Double gloves?
• Anti-Bacterial lotion
What do you think is the most common vector route?

- Pink Eye

- Common bacteria responsible for non-acute bacterial conjunctivitis are staph and strep and are common in wastewater.
Most likely cause....

- Splash back
- Aerosols
- Hand to face
- Sweating into eyes
Sty — also called a hordeolum appears as a red, sore lump near the edge of the eyelid.

- It is usually caused by a bacterial infection.

- A sty will develop at the base of an eyelash if the eyelash follicle (root) is infected.
Exposure Vectors?
Direct (examples?)
Indirect (examples?)

PPE Choices
• Sunglasses?
• Safety glasses with side shields?
• Splash shield?
• Goggles?
Microbiology of Sewage

Bacteria

- Extremely common in sewage
- Found naturally in human intestinal tract, sewage, soil, lakes, streams & ponds
- Three groups: aerobic, anaerobic, facultative
- Responsible for much of treatment of sewage
- Some are pathogenic – indicator organisms
Microbiology of Sewage

Virus

- Extremely small infective agents – electron microscope is needed to see them.
- Depend on living host cell to supply needs
- More than 100 types found in sewage
- Must be removed or may cause illness
Protozoans

- About 50 times bigger than a bacterium, single cell
- Organisms should not survive passage through system, problem with cysts and eggs.
- More than 100 types found in sewage
- Must be removed or may cause illness
Protozoans
Other Organisms

- Worms
- Rotifers & other micro-organisms
- Other macro-organisms
Not so “Invisible Hazards”

Exposure risks you recognize in the field?

Objective Hazards: What are they?

- Pumping
- Dumping
- Jetting
- OSS Component Repair/ Maintenance
- Personal Actions (smoking, chew, eating)
- Others? (External conditions – weather: heat/cold)
Not so “Invisible Hazards”

Most Common Exposures - In the Field

Objective Hazards (Hazard)

- Direct Contact
- Aerosols
- Splash back
- Inhalation
- Immersion
- Secondary (smoking, chew, sweating, clothing)
How Do I Protect Myself?

Determining what Personal Protective Equipment is “Fit for Use”
Consideration of PPE includes understanding why we use it in the first place.....

- PPE Means:

- “Specialized clothing or equipment worn by an employee for protection against infectious materials” (OSHA)
Consideration of PPE includes understanding why we use it in the first place.....and is it “Fit for Use”

• Uniforms – protect skin and/or clothing
• Gloves – protect hands
• Masks– protect mouth/nose
• Respirators – protect respiratory tract from airborne infectious agents
• Goggles – protect your eye
Exposure: Contact/Immersion/Barrier Protection

Glove Grades

**Surgical Gloves:** Good
As the name suggests, surgical gloves are designed primarily for use in healthcare procedures posing the highest risk for the spread of blood borne pathogens.
Exposure: Contact/Immersion/Barrier Protection

Glove Grades

Examination / Medical Gloves (min. 4-6ml):

Better

Examination grade gloves, also sometimes referred to as medical gloves, were originally designed for non-surgical medical procedures, but are also used in a variety of other applications. Exam gloves are sold both sterile and non-sterile.
Exposure: Contact/Immersion/Barrier Protection

Glove Grades

**Food Service Gloves:** *Minimal to Poor*
Food Service gloves, often referred to as multipurpose gloves, are designed for short-term use and frequent glove changes. No government regulations or inspection program exists for food service gloves.

Instead, the USDA requires that all glove components comply with the provisions of the FDA and Cosmetic Act.
Exposure: Contact/Immersion/Barrier Protection

Glove Grades

Mechanics/Industrial Gloves: Poor
Offering greater protection than nothing, nitrile gloves provide resistance to most finishes, solvents, and chemicals. Nitrile material is also resistant to punctures, cuts, and snags. Gloves are pre-powdered and contain no natural rubber latex. Common in our industry but unsuitable for the exposures that we face in Sewage.
Mechanics/Industrial Gloves: Poor
Mechanics/Industrial Gloves: Poor

CAUTION: These gloves are intended for Industrial Use Only. They may NOT be worn for barrier protection in medical or healthcare applications. Please select other gloves for these applications. Components used in making nitrile gloves may cause allergic reactions in some people. Do not expose this product to any person known or suspected to be sensitive to nitrile manufacturing components before consultation with a physician. Follow your institution's policies for use. For single use only.
Exposure: Contact/Immersion/Barrier Protection

Glove Grades

**Double Exam / Medical Gloves: Best**
Offering greatest protection used along with, over gloves to provide barrier protection. Nitril material is also *resistant* to punctures, cuts, and snags more so than latex and provides better durability for many tasks.
Eye Protection

Exposure: Splash, Suspended Aerosol's

- Eye protection chosen for specific works depends on the task, potential exposure and personal vision needs.

- Personal eyeglasses and/or contact lenses are not considered adequate eye protection.
Exposure: Splash, Suspended Aerosol’s

**Good** - but task specific

**Better** - all around choice
Inhalation Protection

Exposure: Splash, Suspended Aerosol’s

Surgical Mask:
• known as a procedure mask, is intended to be worn by health care professionals during surgery and at other times to catch the bacteria shed in liquid droplets and aerosols from the wearer's mouth and nose...
Inhalation Protection

Exposure: Splash, Suspended Aerosol’s

N-95 Mask: **Best**

- It provides the greatest protection from airborne particles to the face for our work tasks.
Working in the Field

“Best Practice” minimizing potential pathogen exposures in the field
Best Practice - Personal Behaviors

**Personal Behaviors:**
- Wash hands immediately after handling wastewater
- Avoid touching face, mouth, eyes, nose, or open sores and cuts
- Wash your hands before eating or using the toilet
- Do not smoke or chew tobacco or gum
Best Practice - Personal Behaviors
Best Practice - Personal Behaviors

Why does accident / illnesses Happen:

1. Rushing
2. Eyes Not On Path
3. Eyes Not On Task
4. Line Of Fire
Best Practice - Personal Behaviors

The “Compliance” Barrier:

1. Cost
2. Peer pressure
3. Time
4. Nothing really bad has happened...
Best Practice

Exposure:
Splash Aerosol’s Line of Fire

PPE Used:
Waterproof Boots

Additional PPE:
Double Gloves
Safety Glasses
N-95 Mask
Coveralls
Exposure:
- Splash
- Aerosol’s
- Line of Fire

PPE Used:
- Double Gloves
- Waterproof Boots

Additional PPE:
- Safety Glasses
- N-95 Mask
- Coveralls
Exposure:
Splash Aerosol’s Line of Fire

PPE Used:
Double Gloves
Waterproof Boots
Glasses*
Coveralls

Additional PPE:
N-95 Mask

Best Practice
Best Practice – Aerosol
Best Practice – Aerosol
H56631 COLL: 06/08/2013 15:00 REC: 08/08/2013 13:28 PHYS: Miscellaneous BD

Cultures/Gram Stain
SETUP: 08/08/2013 2056

Specimen Description: Fluid

Special Requests: Nasogastric study, fx 283-770.0896. r/o WSSA.

Culture Results: Many mixed organisms including few mixed types of coliforms, mixed coagulase negative staph, diptheroids, Bacillus species, and rare mold.

Report Status: Final 08/12/2013
Best Practice – Aerosol
Best Practice – Aerosol
Best Practice – Aerosol

Truck Vent
Aerosol:
- Mixed Bacterial Flora
  - Gram Negative / Positive Rods
  - Bacillus Species
  - Streptococcus Species
  - Diphtheroids

20’ - Similar growth to truck venting
30’ - Half the growth at truck venting
60’ - Little no colony growth in 4 days
Best Practice – Aerosol

Exposure:
Splash
Aerosol’s
Line of Fire

Lab Results:
Enteric Gram Negative Rods
Gram Positive Cocobacillus
Fungus
Gram Positive Rods
Bacillus
Best Practice – Aerosol

Exposure:
Splash
Aerosol’s
Line of Fire

Lab Results:
> 100 Colony Forming Units
Mixed Bacterial Flora
Bacillus
Streptococcus
Gram Negative Rods
Best Practice
– Direct Contact
Best Practice — Direct Contact
Best Practice  
– Direct Contact
08/16/13 Culture/Gram Stain
Coll Time ACC. NO.: F35544
Specimen Description: Fluid
Special Requests: SEWAGE STUDY FX 253 297 0896 OR 253 770 0896

Culture Results: 1. Bacillus species, 3 colony types.
2. Gram negative rods, 2 colony types.
Best Practice
– Direct Contact
Best Practice – Direct Contact
FLDS, WOUNDS, MISC SPECIMENS

08/16/13 Culture/Gram Stain
Coll Time ACT. NO.: P36525
H1800 Specimen Description: Fluid
Special Requests: SEWAGE STUDY FX 253 770 0896
Culture Results: 1. Bacillus species
2. 3 colony types.
Lab Test Results:

At Tank - 100 Colony Forming Units Mixed Flora, Bacillus, Gram Negative Rods

At Truck Vent – 10 Colony Forming Units

At 60’ - No Growth In 4 days

Best Practice
Best Practice

Exposure:
- Splash
- Aerosol’s Line of Fire

PPE Used:
- Double Gloves
- Waterproof Boots
- Glasses
- N-95 Mask

Additional PPE:
- Coveralls
Best Practice – Protecting the Public
Best Practice – Protecting the Public
Best Practice – Protecting the Public
Summary
Pathogen Exposures to Workers in The OSS Industry
Basic Hygiene Practices for On-Site Workers

Best Practice – Protecting Yourself
Basic Hygiene Practices for On-Site Workers

- Wash hands with soap and water immediately after handling human waste or sewage.
- Avoid touching face, mouth, eyes, nose, or open sores and cuts while handling human waste or sewage.
- After handling human waste or sewage, wash your hands with soap and water before eating or drinking.
- Before eating, remove soiled work clothes and eat away from human waste and sewage-handling activities.
- Do not smoke or chew tobacco or gum while handling human waste or sewage.
- Carry at least a gallon of fresh water in the truck for emergency eye wash.
Basic Hygiene Practices for On-Site Workers

- Keep open sores, cuts, and wounds covered with clean, dry bandages.
- Gently flush eyes with safe water if human waste or sewage contacts eyes.
- Use Exam/Medical gloves to prevent cuts and contact with human waste or sewage.
- Wear rubber boots at the worksite and during transport of human waste or sewage.
- Remove rubber boots and work clothes before leaving worksite.
- Clean contaminated work clothing daily with 0.05% chlorine solution (1 part household bleach to 100 parts water).
How to Immediately Reduce Your Exposure

<table>
<thead>
<tr>
<th>Step</th>
<th>Instructions</th>
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</thead>
<tbody>
<tr>
<td>Stop</td>
<td>1.) Stop touching your face!</td>
</tr>
<tr>
<td>Double up</td>
<td>2.) Double up on your gloves = Exam grade Nitril w/ Outer Glove</td>
</tr>
<tr>
<td>Wear</td>
<td>3.) Wear proper eye protection to protect from Splashback and Aerosols</td>
</tr>
<tr>
<td>Use</td>
<td>4.) Use N-95 rated mask for tasks that create Aerosols</td>
</tr>
<tr>
<td>Wash</td>
<td>5.) Wash with disinfectant % of alcohol is at least 67% or higher</td>
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This concludes the education portion of this session.

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