Health Risk with Cleaning Chemicals

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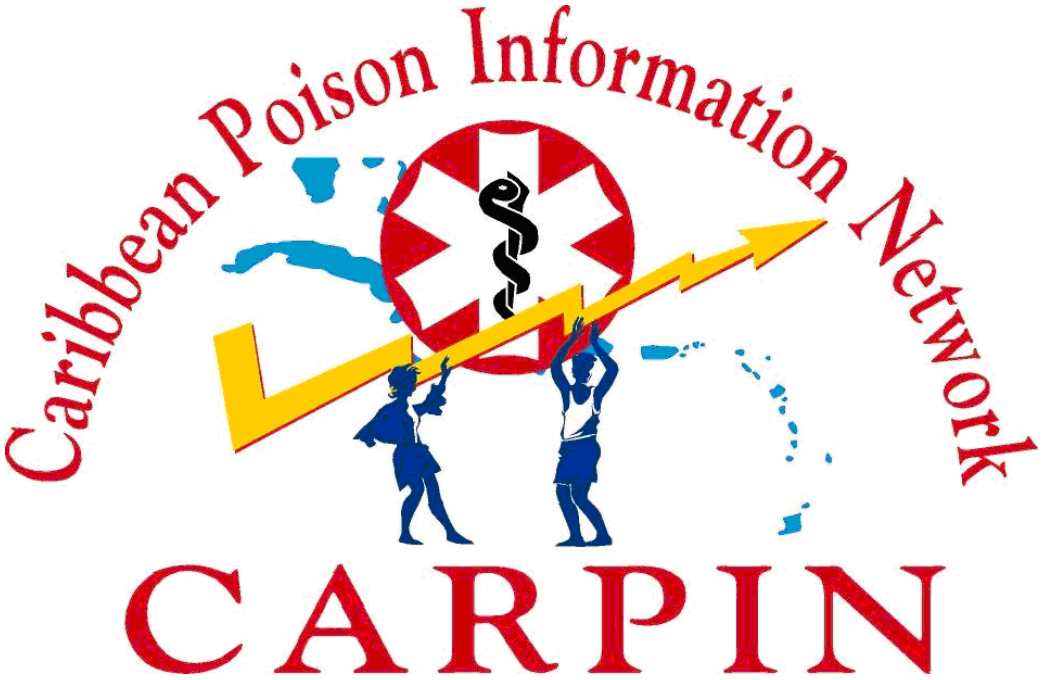

Tens of thousands of workers have job duties that include the use of chemical cleaning materials in work settings. Both workers and bystanders are exposed through spills, inappropriate mixing and this may involve a variety of allergens and irritants (Massachusetts Nurses Association, 2003)

Outline

- Frequently used chemicals
- Implication of mixing two chemicals
- Proportion for mixing
- Health implication through exposure
- Recommendation

Frequently used chemicals

Detergent

Bath maid: alkaline Cleaner

Ingredients: Ammonia, Carbonates, Non-ionic and ionic surfactants

Exposure reaction

Respiratory irritation if fumes are concentrated

Frequently used chemicals

Disinfectants

Deodorant & Disinfectant

Ingredient: Quaternary Ammonium Chloride

Over exposure: irritation and burning of lips, mouth and throat. Gastro-intestinal irritation, stomach cramps, nausea, vomiting

Frequently used chemicals

All Purpose Cleaner

Wonder –O SPC-500: Heavy Duty Alkaline Cleaner

Ingredients: Meta silicate, sodium tri-polyphosphate, sodium hydroxide, anion surfactants, alkyl ethers

Caution: Avoid contact with mineral acids and cationic surfactants

Health data: will aggravate pre-existing eye or skin disorder

Frequently used chemicals

Toilet Bowl Cleaner: Acid Cleaner

Ingredients: Mineral Acids, Quaternary Ammonium Compound

Over Exposure: May cause coughing or choking, skin burn. Extremely irritating to the eye.

Acid Products

- Products containing acids include vinegar and some glass and window cleaners, automatic dishwasher detergents and rinses, toilet bowl cleaners, drain cleaners, rust removal products, and brick and concrete cleaners.

Implication of mixing two chemicals

Mixing Bleach and Ammonia

bleach + ammonia =chloramines

Exposure to chloramine gases can cause the following symptoms:

- Coughing.
- Nausea.
- Shortness of breath.
- Watery eyes.
- Chest pain.
- Irritation to the throat, nose, and eyes.
- Wheezing.
- Pneumonia and fluid in the lungs.

Mixing Bleach and Acids

Chlorine bleach + an acid = chlorine gas

Chlorine gas + water = hydrochloric and hypochlorous acids.

- Chlorine gas exposure: low levels and short periods of time, almost always irritates the mucous membranes (eyes, throat, and nose), and causes coughing and breathing problems, burning and watery eyes, and a runny nose.
- Higher levels of exposure: cause chest pain, more severe breathing difficulties, vomiting, pneumonia, and fluid in the lungs. Very high levels can cause death.

Mixing Bleach with Other Cleaning Products

- Bleach also reacts with some oven cleaners, hydrogen peroxide, and some insecticides. Pool chemicals frequently contain calcium hypochlorite or sodium hypochlorite and should not be mixed with other cleaning products.

Proportion for mixing

3M Internal study April 2011

Bleach Solution

5.25-6.15% sodium hypochlorite

Dilution	Chlorine (ppm)
None	52,500-61,500
1:10 or 1 ½ cup:1 gallon	5,250-6,150
1:20 or ¾ cup:1 gallon	2,625-3,075
1:100 or ¼ cup:1 gallon	525-615

Intermediate - High level disinfection (approximately 1000 ppm)

Preparing a 1: 50 Household Bleach Solution:

- 20 ml (4 teaspoons) household bleach + 1000 ml (4 cups) water
- 100ml (7 tablespoons) household bleach + 5000 ml (20 cups) water

Recommended Uses:

- for use in washrooms, change tables in childcare, during outbreaks of respiratory diseases or vomiting and diarrhea

Intermediate level disinfection (approximately 500 ppm)

Preparing a 1: 100 Household Bleach Solution:

- 5 ml (1 teaspoons) household bleach + 500 ml (2 cups) water
- 62 ml (1/4 cup) household bleach + 6138 ml (24 3/4 cups) water

Recommended Uses:

- for use on non-critical medical or personal service instruments

High level disinfection (approximately 5000 ppm)

Preparing a 1: 10 Household Bleach Solution:

- 62 ml (1/4 cup) household bleach + 562 ml (2 1/4 cups) water
- 250 ml (1 cup) household bleach + 2250 ml (9 cups) water

Recommended Uses:

- cleaning up a blood or body fluid spill
- when directed by public health
- for use on semi-critical medical and personal service instruments

Low level disinfection (approximately 100 ppm)

Preparing a 1: 500 Household Bleach Solution:

- 1ml (1/4 teaspoons) household bleach to 500ml (2 cups) water
- 20 ml (4 teaspoons) household bleach to 10 L (40 cups or approx. 2 gallons)

Recommended Uses:

- safe level for toys, dishes and utensils and food contact surfaces

Household bleach (5.25% sodium hypochlorite) mixed with water, is an inexpensive and effective disinfectant. By mixing different amounts of bleach with water you can make a high, intermediate-high, intermediate, or low level disinfectant.

HEALTH IMPLICATIONS

Ammonium Compound

Long term studies reveal a pattern of tolerance to irritation symptoms below 25ppm.

Study of intermediate exposure with 50 or 100 ppm for six week (6H per day, 5 days per week) reported transient eye, nose, and throat irritation at 100ppm but not at 20 or 50ppm.

PPM:- ppm is an abbreviation of parts per million. A ratio of 2 quantities of the same unit. For example: mg/kg. 1ppm = 0.0001%, 1/1000000 = 0.000001 = 1×10^{-6}

Ammonium Compound

Persons with pre-existing respiratory condition such as asthma or other obstructive lung disease are generally considered to be at increase risk of adverse health consequences from exposure to atmospheric irritants like ammonia. (Fedoruk etal 2005)

Quaternary Ammonium Compounds

- The highest risks of asthma are associated with disinfection product dilution tasks by manually mixing. This suggest dilution errors. (Wiley & Son, 2013)

Cleaning Product and Work related Asthma

- In 4 states in America (193-1997) surveillance data showed 195 confirmed cases of work related asthma as a result of cleaning chemical exposure.
- 80% were new onset
- 20% were aggravated asthma
- From the new onset 22% were consistent with reactive airways dysfunction syndrome. (Scheil etal, 2013)

Recommendation

- Follow the instructions on the label.
- Use chemicals in a well ventilated environment
- If you have existing health problems remove yourself from the cleaning environment until well ventilated.

THANK YOU

References

- Washington State Health Department

https://www.doh.wa.gov/YouandYourFamily/HealthyHome/Contaminants/BleachMixingDangers

www.healthunit.com

3M Internal Study 2011