Sanitizers and Pests

Sanitation and Environmental Monitoring Basics Workshop

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Objectives:

- Understand what sanitizers can and cannot do
- Review the strengths and weaknesses of sanitizers
- Protecting workers and label comprehension
- Pest control and integrated pest management

Sanitation is the Beginning of Food Safety, Not the End.

Definitions

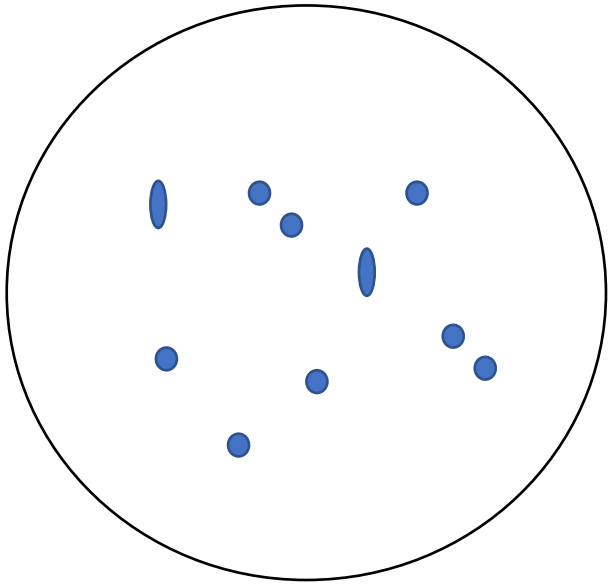
How a product is classified is VERY important to understand. It is essential when determining WHEN, HOW, and WHERE to use a product.

Sanitizers: reduce bacteria to levels considered safe by many public health agencies. Commonly used in food processing environments.

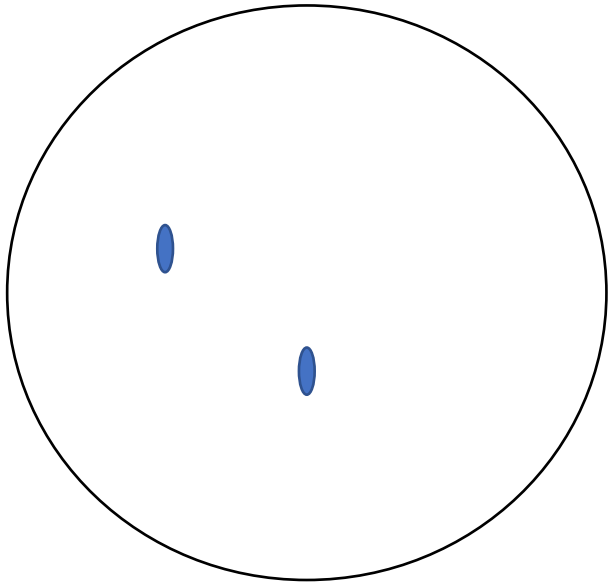
Disinfectants: these products kill all bacteria/molds/most viruses. However, they do not kill bacterial endospores. They are often used in hospitals.

Sterilants: these products kill all microorganisms, including endospores. They would be used in aseptic processing and sterilizing surgical devices.

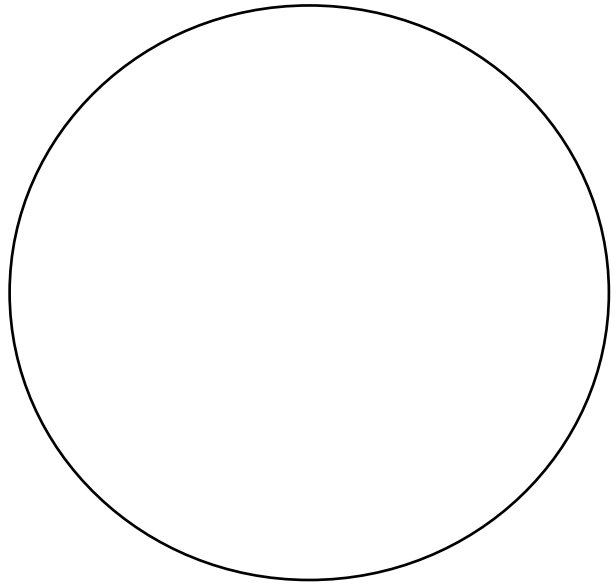
Sanitization



Disinfection



Sterilization



Hard Surface Sanitizers

Sanitizers approved for use for hard services can be divided into two major categories: food contact sanitizers and non-food contact sanitizers.

- For food contact sanitizers, these products are specifically registered for use on hard surfaces where food products make any type of contact.

- Food contact sanitizers are required to reduce pathogens (E. coli and S. aureus) by 99.999% (5-log) within 30 seconds.

    - Note: a potable water rinse is typically not allowed following the application of a sanitizer of a food contact surface.

Non-food Contact Sanitizers

These products are used for applications on hard services in which food products have no contact. Sometimes these surfaces are referred to as “environmental surfaces.”

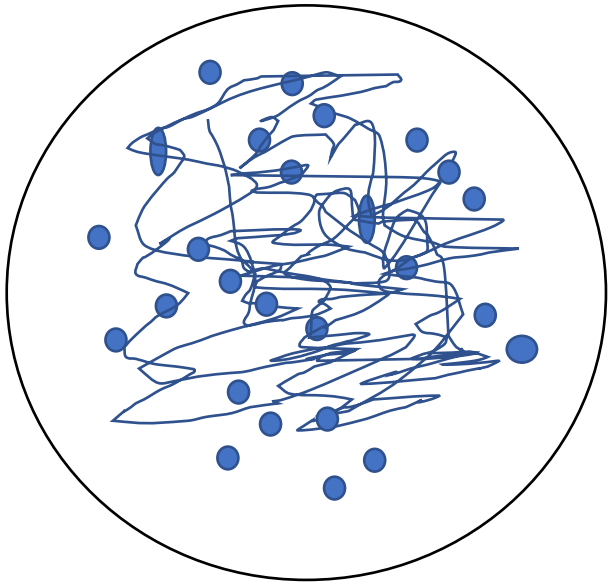
The minimum requirement for these products is a 3-log reduction (99.9%) of pathogens (*S. aureus*) within 5 minutes contact time.

The main purpose is to prevent cross-contamination of food contact surfaces through the application of sanitizers to non-food contact areas.

The Power of Log Reduction

If you begin with 1,000,000 organisms, this the effect of exponential log reduction on bacteria from different sanitizers.

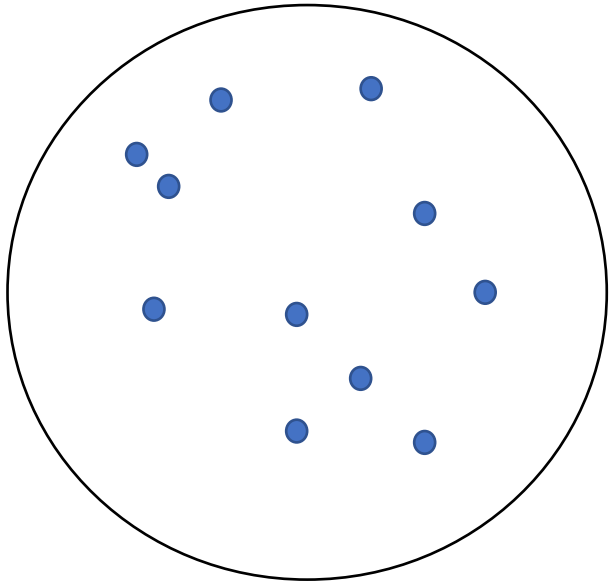
Non-food Contact



1,000 organisms remain

Three log reduction
99.9%

Food Contact



10 organisms remain

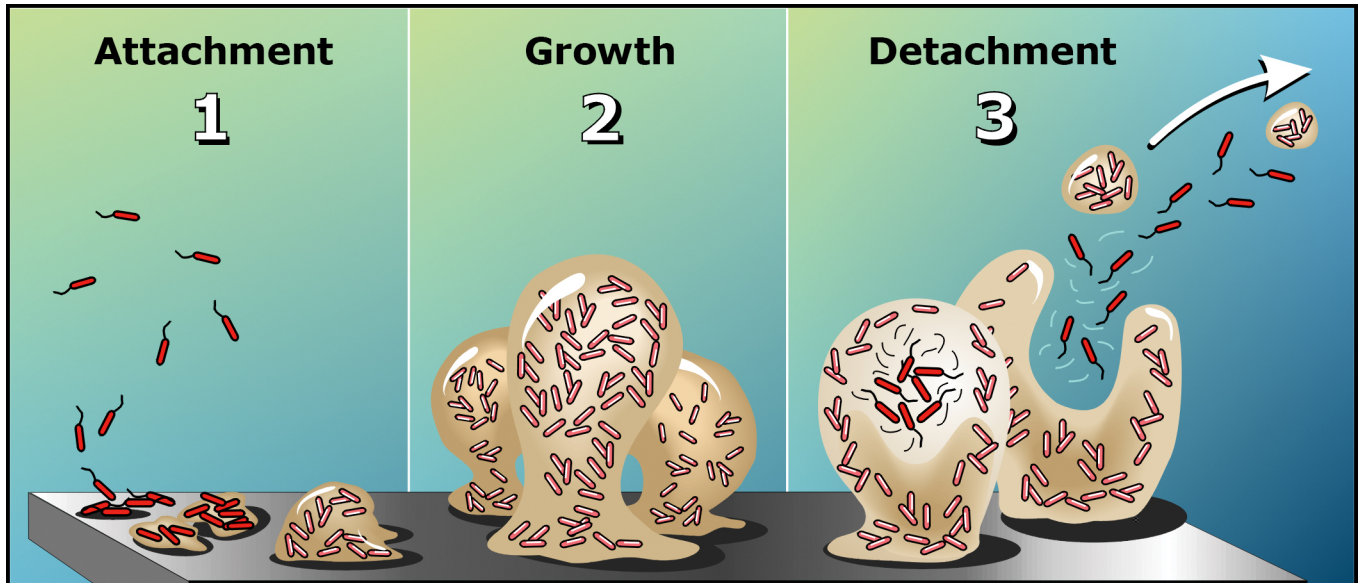
Five log reduction
99.999%

Biofilms

Biofilms are “slime” layers that adhere to surfaces, including pipes, processing equipment, filters and cooling devices. Biofilms are a complex matrix of sugars and residues secreted by bacteria.

Biofilms can be problematic due to:

1. They are difficult to detect.
2. They slough off cell layers regularly causing spikes.
3. They can harbor pathogens, such as *Listeria* or *Salmonella.*



Major Sanitizer Classes

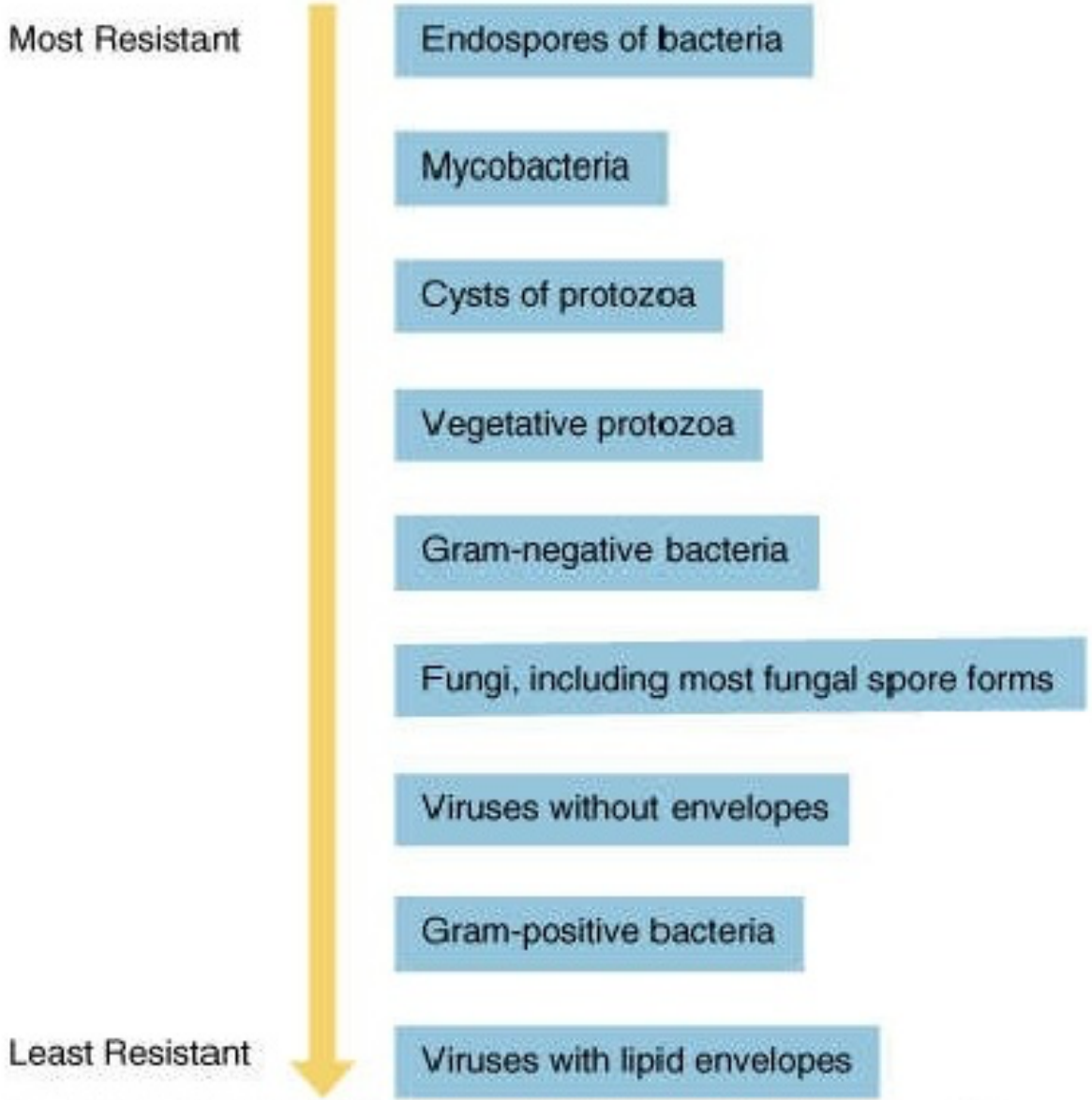
Quaternary Ammonia Compounds (QACs or Quats)

Oxidizers

- -Peroxyacetic Acid
- -Chlorine Dioxide
- -Sodium hypochlorite
- -Ozone

Acid Anionics

Iodophors



Microbial Sensitivity to Chemical Biocides

Hypochlorite (Bleach):

Hypochlorite: often referred to as “bleach.” Bleach is available in liquid and granular forms. Make sure the product is food grade and not household bleach with fragrances and other additives.

- Bleach should be used in water with pH range of 6-7.5. Below this pH can start to generate dangerous chlorine gas.

- A common misperception is that chlorine content can be inferred from smell. Don’t confuse the smell of chlorine with free chlorine available for killing microbes.

- Test kits should be used to determine the amount of free chlorine. Follow all guidelines to make sure the bleach concentration is in the appropriate range.

Hypochlorite (Bleach):

Advantages:

-Bleach is effective a low temperatures and in hard water.
-Bleach has a very broad killing spectrum.
-Efficacious against bacteriophages.
-Inexpensive

Disadvantages:

-Corrosive. Don’t apply to soft metals.
-Solutions have very short shelf-life.
-Some safety/handling issues – strong irritant.
-Efficacy is limited by organic matter.

Chlorine Dioxide (ClO_2):

ClO_2 possesses strong oxidizing properties, and is significantly more effective compared with just chlorine. ClO_2 works by disrupting cell members, oxidizing chemical bonds and denaturing proteins.

Advantages:

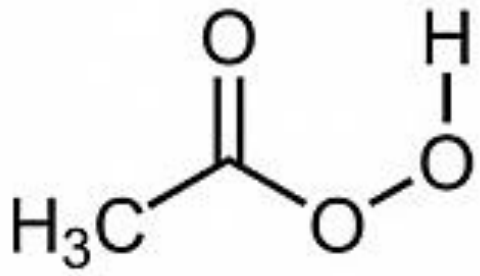
-ClO_2 can be effective on addressing biofilms.
-Non-corrosive to stainless steel at label uses.
-Broad spectrum efficacy against pathogens.

Disadvantages:

-It must be generated onsite.
-Short shelf-life of active solution.
-Potential to generate chlorine gas.

Peroxyacetic/Peracetic Acid (PAA):

PAA is widely used and has many diverse applications given it's broad spectrum killing capabilities. First registered in 1985, PAA is used in medical, agricultural and processing facilities.



Advantages:

-Approved for organic use.
-Excellent cold water killing capabilities.
-One step acid rinse + sanitation.
-Efficacious against bacteriophages.

Disadvantages:

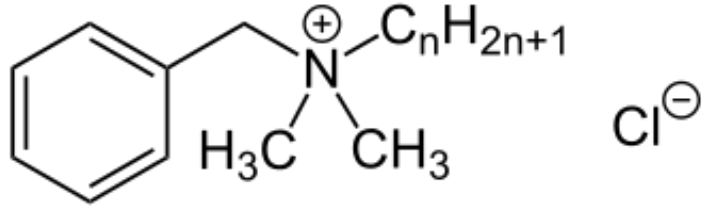
-Corrosive. Don't apply to soft metals.
-Some safety/handling issues – strong irritant.

Quats (Quaternary Ammonia Compounds):

Many quats are available for food processing facilities. These include ADBAC and DDACs. They are positively charged compounds that disrupt cell membranes and have many uses in society.

<u>Advantages:</u>

-Quats are non-corrosive and appropriate to use on soft metals.
-They have excellent foaming properties
-Quats leave a bacteriostatic film.



<u>Disadvantages:</u>

-Quats are not compatible with negatively-charged surfactants
-Less efficacious against biofilms.
-Quats cannot be used on food-contact surfaces in organic production.

Iodophors:

Iodophors are neutrally charged surfactants that have iodine and phosphoric acid. These water-soluble mixtures release iodine to attack microbes. Solution should be left on equipment for at least 2 minutes.

Advantages:

-Broad spectrum killing (but not bacteriophages and endospores).
-Efficacy is robust in high organic loads and hard water.
-Suitable for sanitizing utensils and for hand dips.

Disadvantages:

-Iodophors are inactivated by proteins at pH > 4 and temperature > 50^0C-
-Iodine causes staining on some materials.

How to Chose your Sanitizer:

There are no perfect antimicrobials for every situation. Understanding the limitations and strengths of different products is critical. Chemical sales representatives can be very helpful.

When making a product decision, consider:

- efficacy claims
-worker safety issues
-organic vs. conventional production
-material composition
-environmental factors (temp, humidity, water)
-application methods

Word of Caution

Be careful if you turn your sanitation program over to people other than your supervisors. Many people don't read the container label or have a hard time comprehending the instructions for dilution and use.

The manufacturer recommends dilutions for precise reasons. However, there are always a few "chemists" who think more is always better or "mixologists" who want their own concoction. These can lead to trips to the ER or courtroom.

With any chemical, be judicious and attentive!

Worker Safety

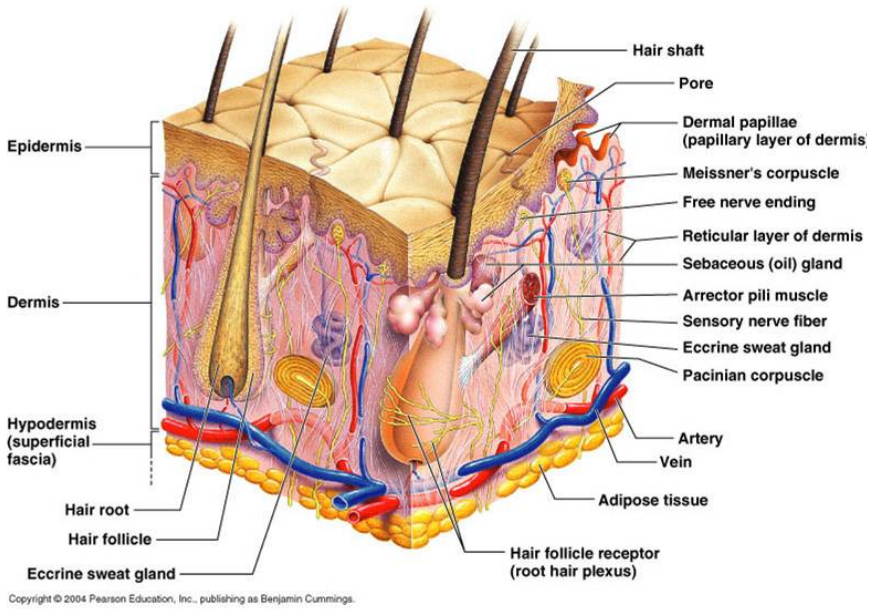
Starts with Training:

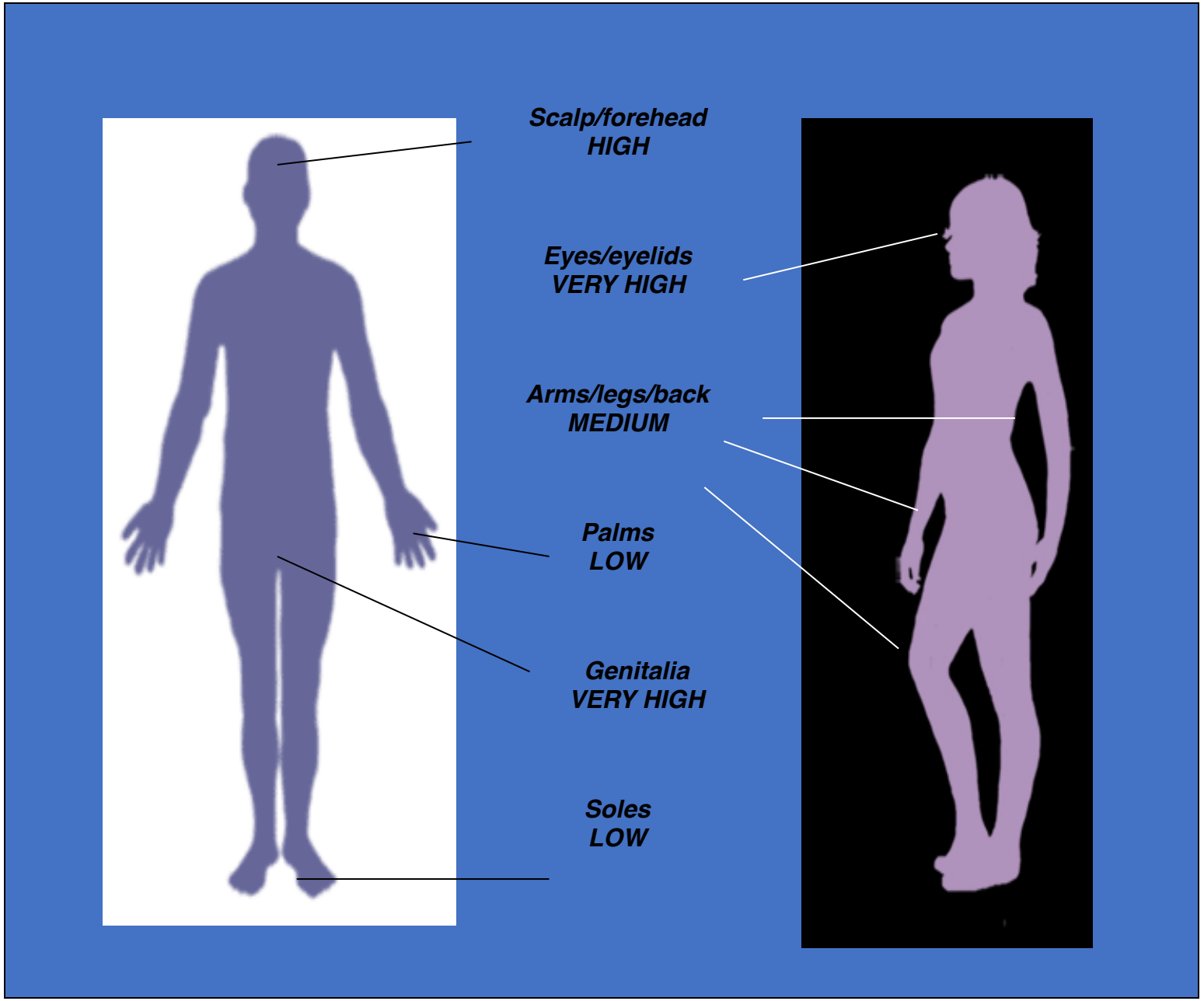
-right-to-know laws
-basic first aid
-label comprehension
-how to use and clean PPE
-blood-borne hazards
-SSOPs

Food Safety Culture Starts at the Top and is Shared Throughout the Organization!

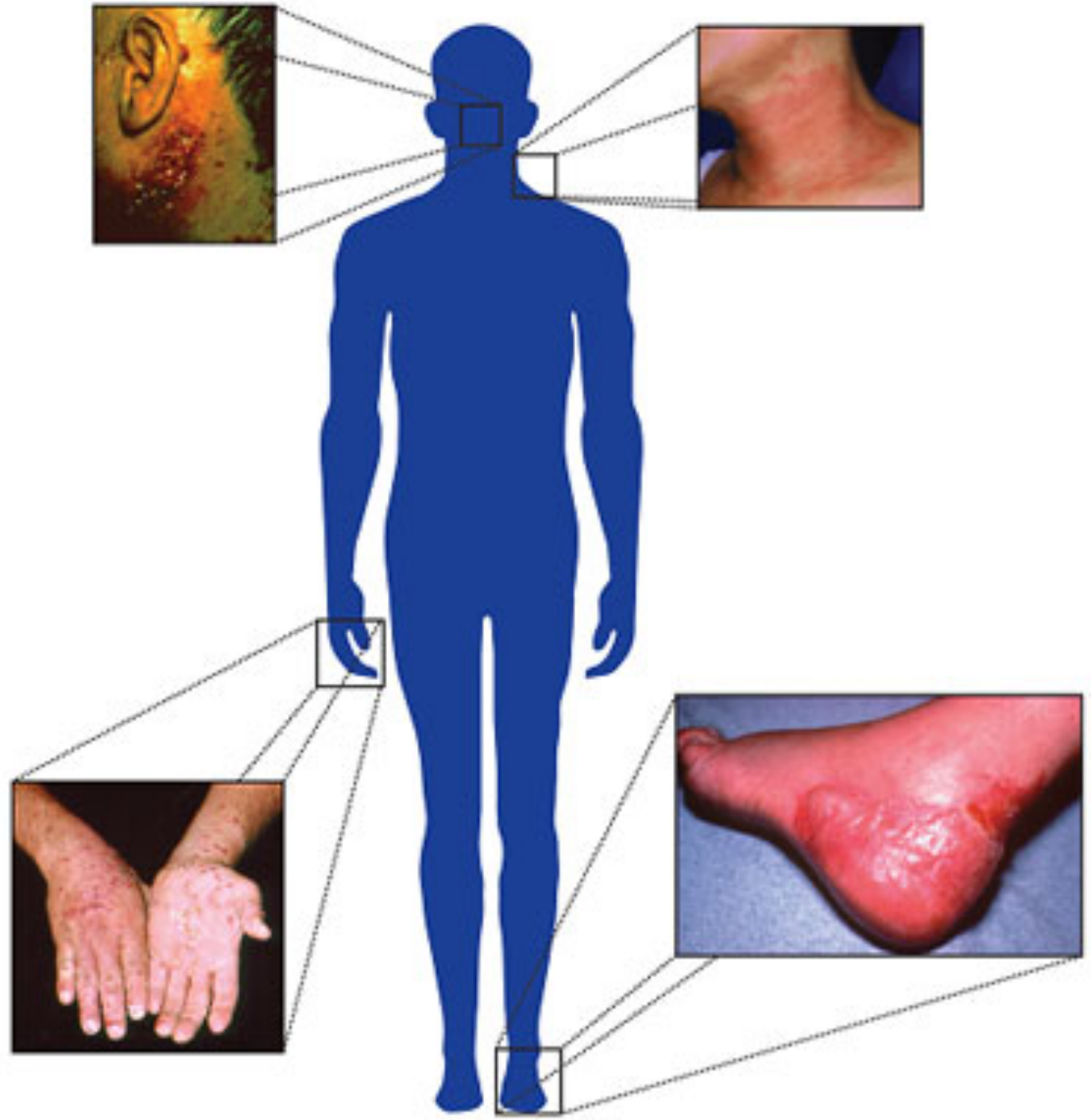
Skin

Most chemical exposures and adverse effects occur on the skin. Appropriate sleeves, goggles, aprons and gloves can help mitigate exposures. This is particularly important during mixing and loading of sanitizers and pesticides.




Scalp/forehead
HIGH
Eyes/eyelids
VERY HIGH
Arms/legs/back
MEDIUM
Palms
LOW
Genitalia
VERY HIGH
Soles
LOW

Examples of Localized Skin Effects:



Source: Centers for Disease Control

Factors in Severe Health Outcomes

Fatalities from skin exposure to pesticides are very rare. However, severe outcomes are possible. They typically involved a combination of factors, such as:

-significant misuse against label instructions
-wrong dilution and improper mixing/loading
-pre-existing extensive skin disease
-faulty equipment
-prolonged & extensive skin contact,
-lack of decontamination

Source: Kregier, Handbook of Pesticide Toxicology

Ocular Exposure

All chemicals should be treated as potentially harmful to your eyes. Effects can range from mild irritation to permanent damage, depending on the active ingredient and formulation. Personal protection equipment should be on and first aid materials should be nearby.

A common exposure pathway is rubbing eyes with a contaminated glove or sleeve.

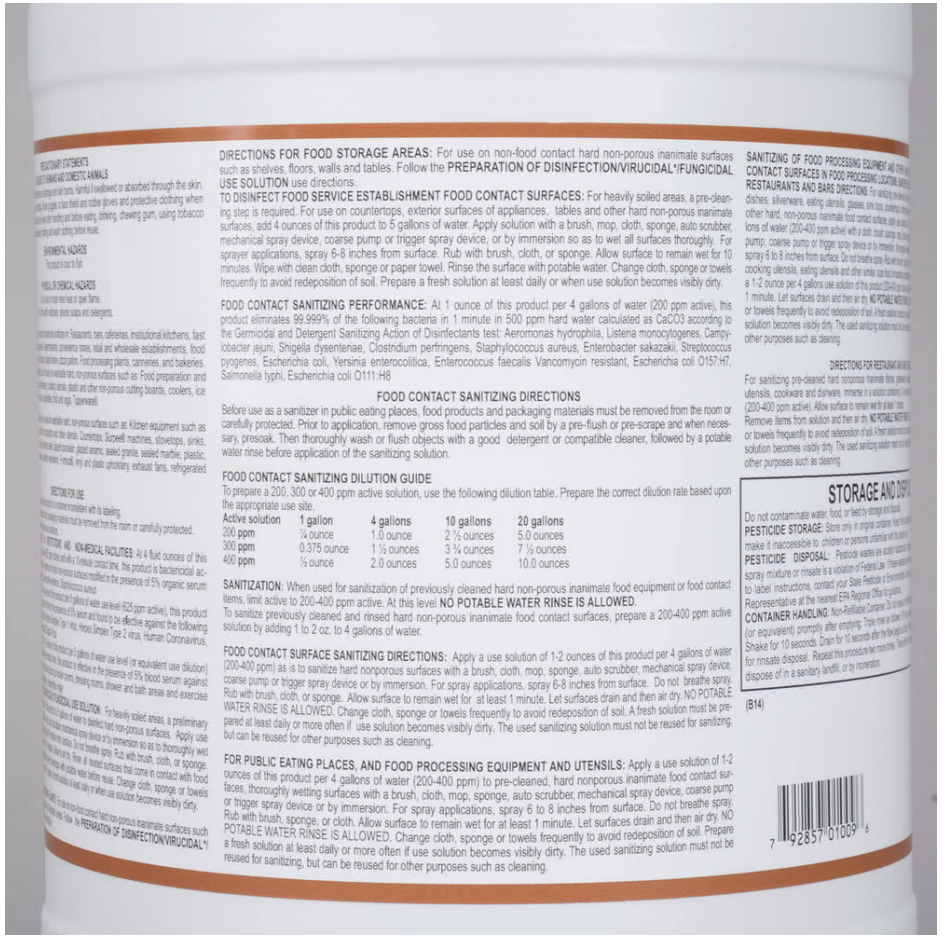
Read and Follow the Label

Dilute to the exact concentration on the label or purchase RTU products.

Verify minimum contact/exposure time for product.

Verify optimum temperature.

Ensure personal protective equipment is available.



Pesticides

A pesticide is any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest & registered by the U.S. EPA.

There are over 1100 different active ingredients comprising over 80,000 products (including sanitizers and disinfectants).

Pesticide vary widely from highly toxic to virtually non-toxic to humans. The way in which a pesticide is used will also influence its risk level.

Toxicity Classes and Signal Words

	Danger I	Warning II	Caution III	Caution IV
Eating (oral)				
Breathing (inhalent)				
Skin Contact (dermal)				
Eye irritation				
Skin irritation				

DANGER WARNING CAUTION

Pests:

- Trigger/cause asthma and allergies
- Bites
- Contaminate food
- Stress and embarrassment
- Transmit disease
- Hitchhike in belongings
- Structural damage
- Barrier to Trade

Every Pest Needs:

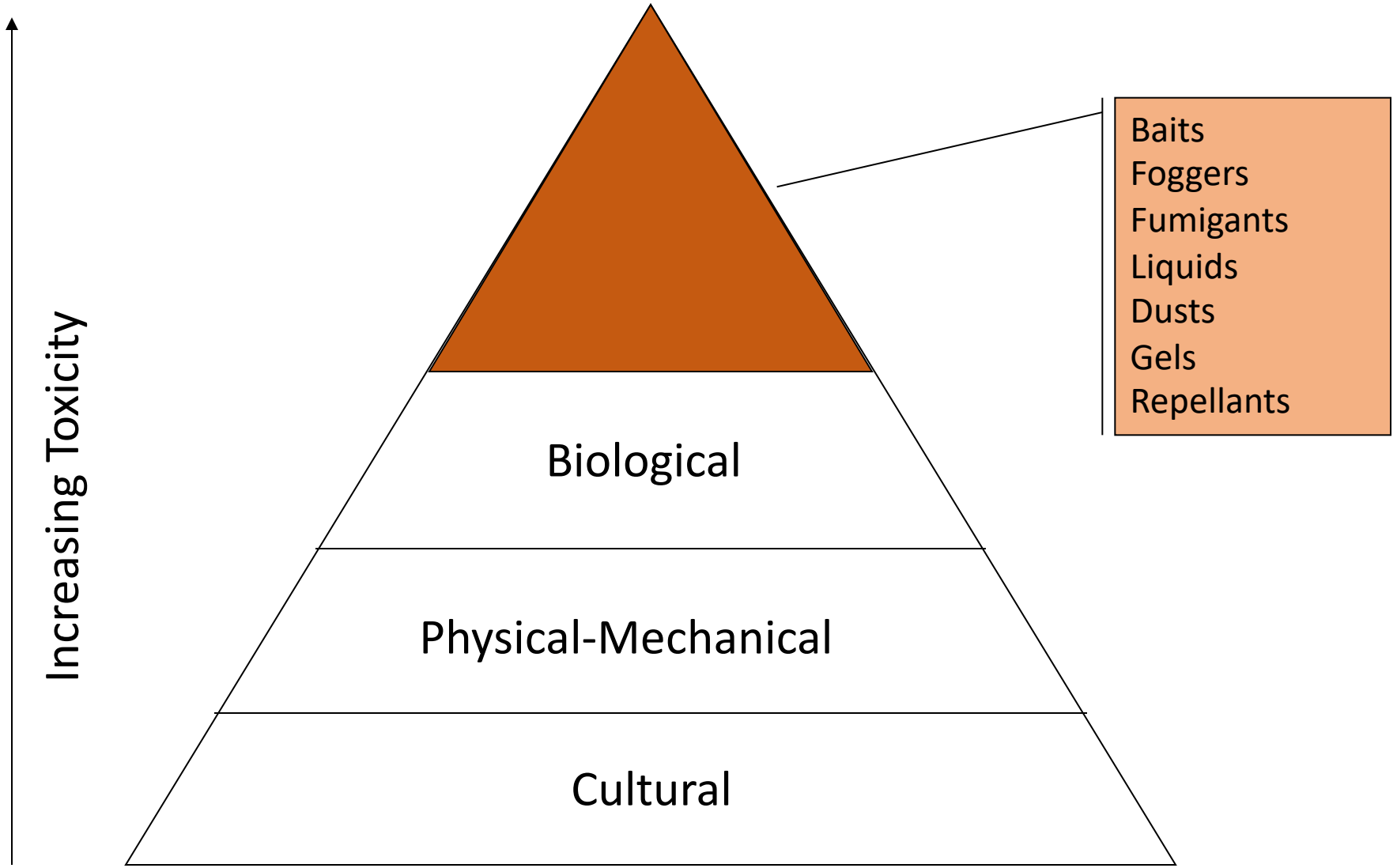
- Water
- Food
- Shelter

Integrated Pest Management

- **Integrated:** Uses multiple approaches that work together.
- **Pest:** What the multiple approaches work to fight. Set Action Thresholds.
- **Management:** Use of the most economical means with the least possible risk to people, property, and the environment.

IPM involves identifying pests, preventing infestations through sanitary, cultural, mechanical controls and then chemical control if needed.

IPM Paradigm



Food Safety and IPM Paradigms

General Approach to IPM:

1. Identify Pest
2. Understand Pest Biology/Hazard
3. Implement IPM tactics
4. Monitor Effectiveness
5. Evaluate and revise if needed

Summary:

- Sanitation is not the last defense – it is the beginning of food safety.
- No sanitizer is perfect for the job.
- Consider the materials, pH, temperature, efficacy and application method for that sanitizer.
- Trained employees and a food safety culture is key to preventing food safety issues and protecting workers.
- Integrated Pest Management is an important paradigm for controlling pests in food production facilities.

Thank You!


"Ooooo, honey. A Pinot Noir! ...
That could be a game changer."
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