

Center for Occupational and Environmental Medicine
@ Erie County Medical Center
Gordon Steinagle, DO, MPH, Medical Director

Occupational Exposure to Cytomegalovirus (CMV)

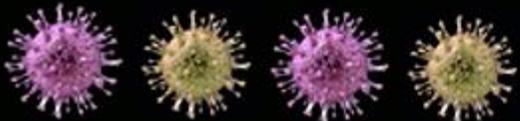
Preventing exposure in child care and educational settings,
including OSHA advisories



Worker Institute @
Cornell University
ILR School

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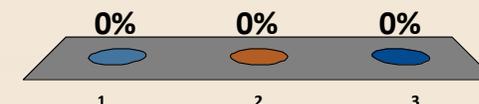


January 2020
With Turning Point
Interactive Slides



Before today's workshop topic was announced, had you ever heard about cytomegalovirus (CMV)?

1. Yes
2. No
3. Unsure





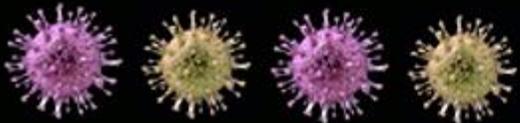
Topics

- ❖ Why should we talk about cytomegalovirus, CMV?
- ❖ What is cytomegalovirus?
- ❖ How could CMV be acquired or spread at work?
- ❖ How could workplace exposure to CMV be prevented?

Why should we talk about cytomegalovirus?



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CMV can seriously affect an unborn child

- ❖ Each year ~1/200 babies are born with congenital cytomegalovirus (CMV) infection (according to the CDC).
- ❖ They acquired CMV *in utero*.
- ❖ ~20% of them will suffer long term: such as hearing loss, vision loss, and intellectual disability.
- ❖ Congenital CMV infection is one of the most common viral causes of birth defects and developmental disabilities.
- ❖ There is no vaccine.

What is a virus?
What is CMV - cytomegalovirus?



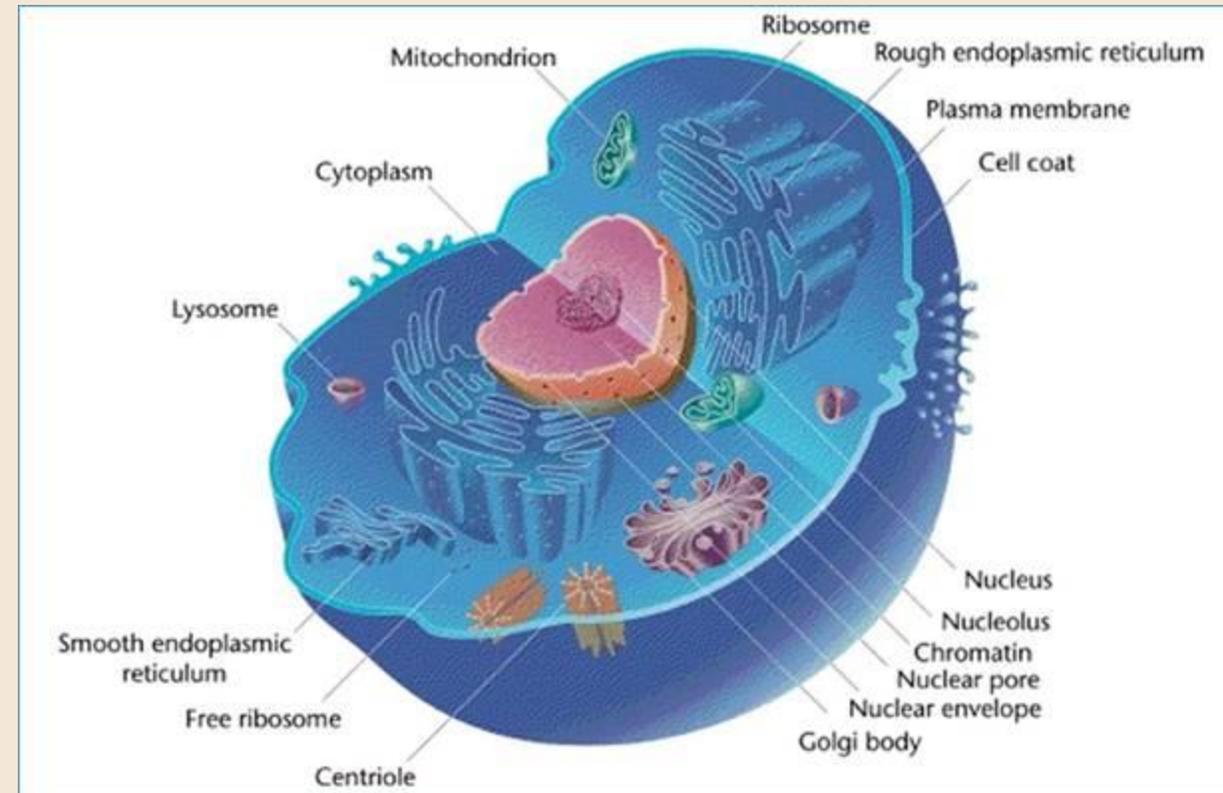
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A virus is not a living cell...

A living cell, like this one, has machinery to repair and reproduce itself and to produce energy.

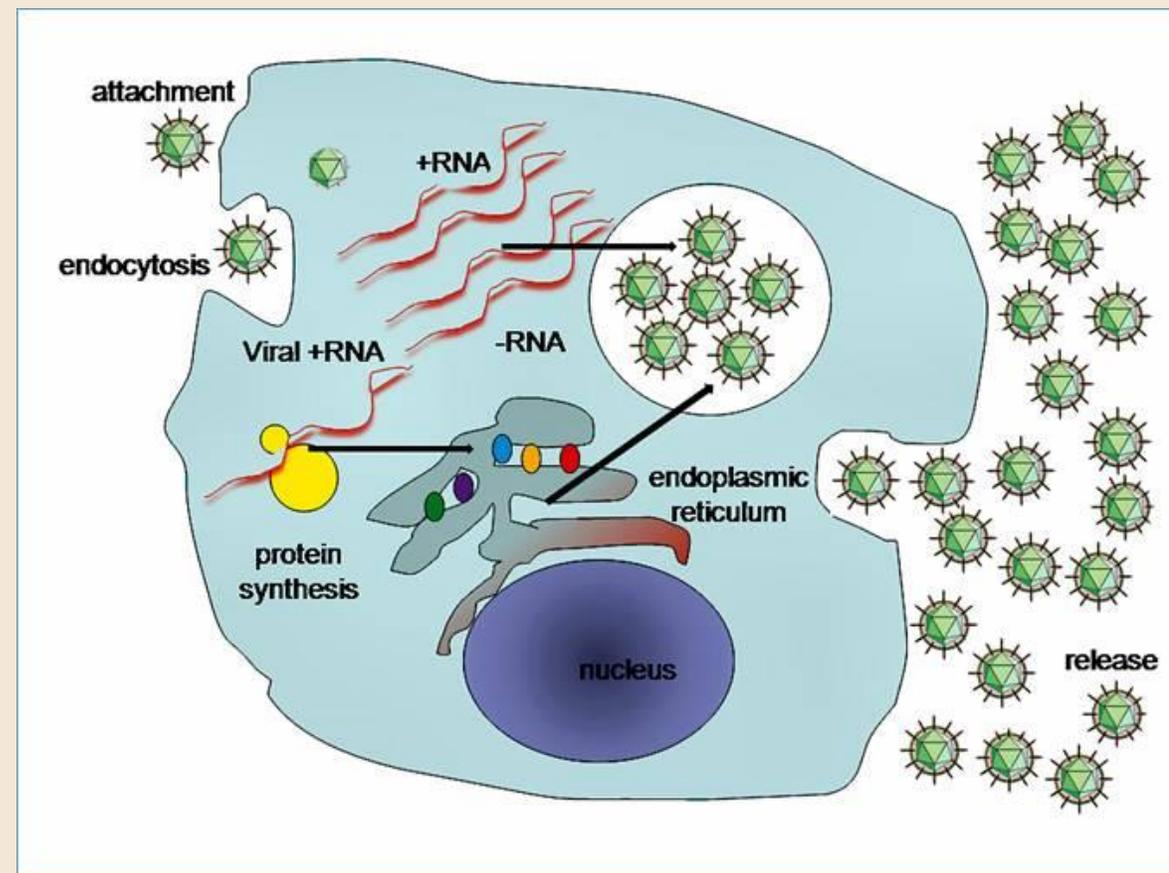


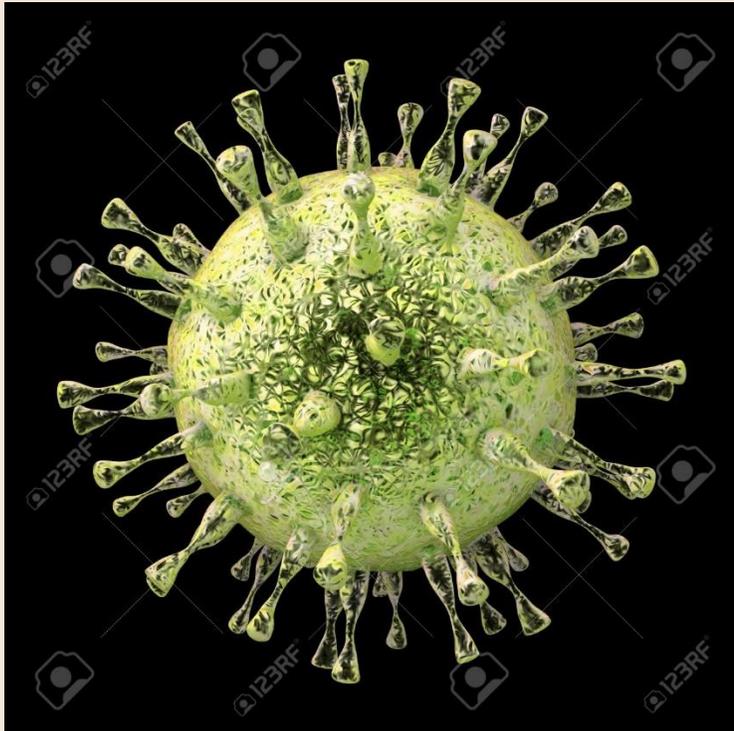
Source: [https://commons.wikimedia.org/wiki/File:Eukaryotic_Cell_\(animal\).jpg](https://commons.wikimedia.org/wiki/File:Eukaryotic_Cell_(animal).jpg)

**A virus carries information,
but lacks machinery to reproduce itself.**

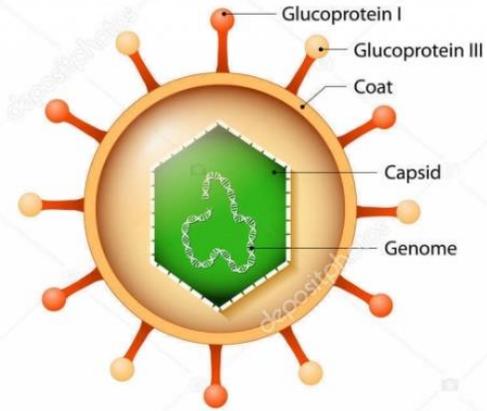


A virus must take over a cell and hijack its machinery to reproduce new viruses.





CYTOMEGALOVIRUS





Who is at risk from CMV?

Childcare workers, early interventionists, early childhood providers (including daycare providers, pre-school teachers)

Healthcare workers (including nurses, therapists)

- ❖ Nearly 1 in 3 children are infected by age 5.
- ❖ 8% - 20% of childcare staff are infected with CMV each year.
- ❖ 40% - 70% of childcare staff have evidence of a prior infection.



Licensed child care providers learn infection control methods, but surveys show that...

...most do not know about their occupational risk for CMV

...many acknowledge using diaper wipes to clean hands or surfaces

Stowell, J. D. 2014. Cytomegalovirus survival and transferability and the effectiveness of Common hand-washing agents against cytomegalovirus on live Human hands. *Applied and Environmental Microbiology* 80(2): 455–461

[Child & Youth Care Forum](#) April 2016, Volume 45, [Issue 2](#), pp 301–314. Child care provider awareness and prevention of cytomegalovirus and other infectious diseases.



Protection and prevention extends beyond the workplace

Workers can bring CMV home...

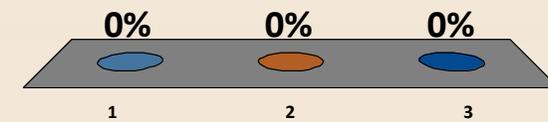
...as can children

...and their parents



What symptoms are typical for a CMV infection?

1. Skin rash
2. Aching, swollen joints
3. There may be no obvious symptoms.





Background on CMV

One of the herpesviruses. Only infects humans.

- ❖ Usually no medical treatment needed. Typical infection has minor flu-like symptoms such as
 - ❖ Mild fever
 - ❖ Fatigue
 - ❖ Sore throat
 - ❖ Swollen glands
- ❖ Can cause more severe infections in people with compromised immune systems.
- ❖ However, 90% of adults and many children show no symptoms at all.



Background on CMV

Less commonly, CMV can cause mononucleosis (“mono”)

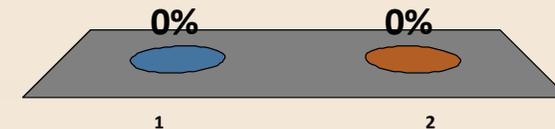
- ❖ enlarged spleen
- ❖ enlarged liver

Usually, “mono” is caused by a related herpes virus, Epstein Barr virus.



Once you have had CMV infection, you are immune to becoming infected again.

1. True
2. False





Background on CMV

CMV exists in several strains.

After infection with one strain, a person develops immunity, but this does not protect against other CMV strains.

**CMV stays in a person's body for life, becoming dormant.
It may reactivate later, including during pregnancy.**

A reactivated infection can be passed to the fetus, although this is more likely during a new CMV infection than a reactivated one.



Background on CMV

This virus can pass through the placenta and cause serious birth defects, especially in the first trimester.

- ❖ cerebral palsy
- ❖ seizures
- ❖ impaired hearing
- ❖ impaired vision

This is especially hazardous for workers who...

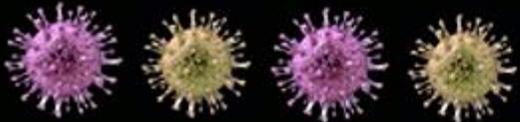
...are or may become pregnant

**...could spread CMV to a sexual partner who is or may become pregnant
(sexual transmission)**

How could CMV be acquired or spread at work?



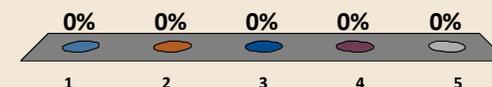
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Workplace exposure to a child infected with CMV could involve contact with...

1. Urine
2. Saliva
3. Nasal mucus
4. Tears
5. All of the above





CMV is spread through exposure to infected body fluids...

- ❖ blood
- ❖ breastmilk
- ❖ saliva
- ❖ tears
- ❖ mucus; nasal secretions
- ❖ urine

Viral loads of CMV are higher in saliva than in urine.

...so, how might that happen when caring for young children?



Exposure could occur when...

- ❖ kissing a child on the lips
- ❖ sharing food, drinks, toothbrushes, or utensils with children, including putting the child's pacifier in your mouth
- ❖ handling toys that may have been in children's mouths
- ❖ feeding a child
- ❖ wiping a child's nose or mouth
- ❖ changing a diaper
- ❖ providing first aid
- ❖ hand-to-mouth transfer if your hands are not washed before eating, smoking, nail-biting



How does the virus enter the body to produce infection?

- ❖ Contact with the mucous membranes of the eyes, nose, or mouth
- ❖ Through non-intact skin: cuts, abrasions, badly-chapped skin, bites, puncture wounds

How could workplace exposure
to CMV be prevented?



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OSHA regulations for protection and prevention

General duty clause of the OSHAct of 1970

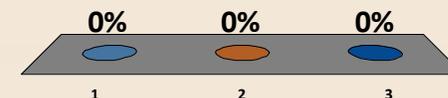
Bloodborne Pathogens Standard (1991, 2001)
(29 CFR 1910.1030)

Personal Protective Equipment standards – gloves, eye and face protection;
employer must provide it and pay for it



The Occupational Safety and Health Act (OSHA) of 1970 protects workers from workplace injury and illness. Under this law, who is responsible for providing a safe and healthy workplace?

1. employer
2. employee
3. both





OSHA regulations for protection and prevention

General duty clause of the OSHAct of 1970

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(29 CFR 1910.1030)

Personal Protective Equipment standards – gloves, eye and face protection; employer must provide it and pay for it



Occupational Safety and Health Act of 1970

DUTIES

SEC. 5. (a) Each employer --- shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause, death or serious physical harm to his employees;



OSHA Bloodborne Pathogens Standard (29 CFR 1910.1030)

Occupational exposure definition:

“any reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee’s duties”



Diaper wipes are effective for cleaning hands and surfaces in a child care facility.

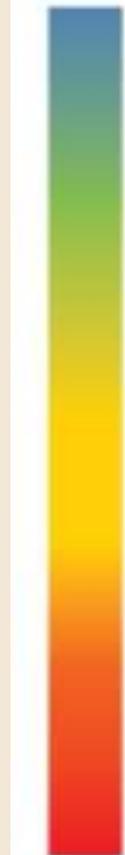
1. True
2. False



To address a workplace hazard, use the...

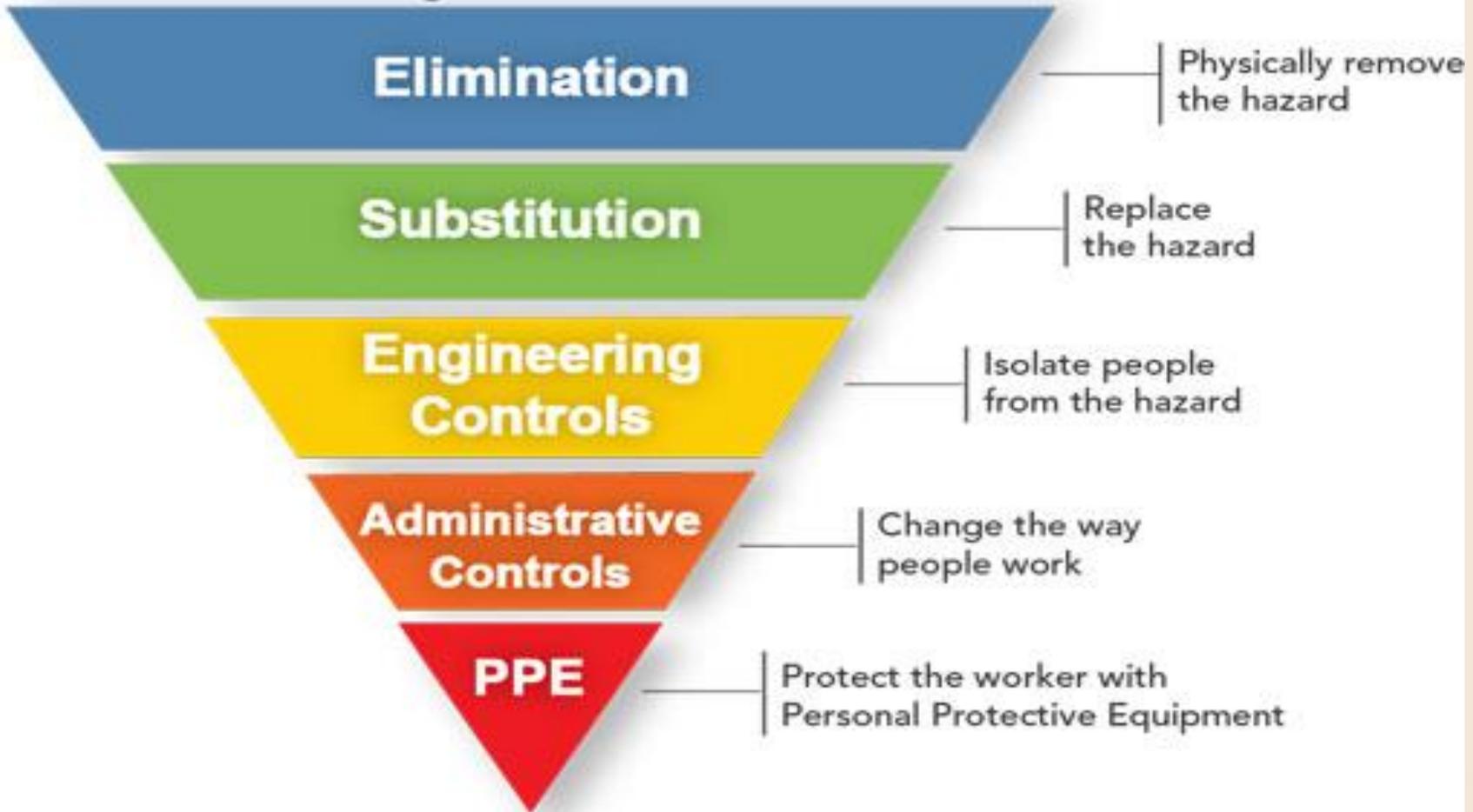


Most effective



Least effective

Hierarchy of Controls





No vaccine is currently available.

U.S. Institute of Medicine has rated CMV as a top priority for vaccine development but...

...no CMV vaccine has been tested beyond
a stage II clinical trial

...no stage III trials have been registered

One promising means for the prevention of congenital CMV is the promotion of behaviors that reduce exposures to CMV during pregnancy.



Workers with pregnancy concerns should discuss CMV risks with their healthcare providers. Could request re-assignment to a...

- ❖ Job where not exposed to young children's body fluids
- ❖ Job working with older children

NOTE: Pregnancy Discrimination Act protects employees from adverse consequences in response to an employee notifying their employer of pregnancy plans or requesting reassignment due to pregnancy concerns.



Testing for CMV

While workers at risk of exposure can be tested before becoming pregnant, there is no consensus on these tests' utility.

USCDC does not recommend routine testing because tests cannot predict which developing babies will become infected or have long-term health problems.



Testing for CMV

Antibody tests:

- ❖ Positive test indicates current/past infection
- ❖ Cannot decide if person is infectious

Viral culture; polymerase chain reaction:

- ❖ Positive test indicates current infection
- ❖ Used for saliva, urine, or blood
- ❖ If needed, can test a mother's cervical secretions or breastmilk



Administrative controls – work practices

- ❖ Training on CMV, on protection and prevention
- ❖ Treat all body fluids as potentially infectious – “universal precautions”
- ❖ Regular and thorough handwashing



Regular and thorough handwashing because...

...CMV remains viable on the hands.

...it can persist on hands for at least 15 minutes, long enough for transfer to mucous membranes, other children, objects, or surfaces.



Cytomegalovirus survival on common environmental surfaces

- ❖ on metal and wood to 1 hour
- ❖ glass and plastic to 3 hours
- ❖ rubber, cloth, and cracker to 6 hours

Apparently-dry surfaces can harbor viable virus in the 1–2-hour time period between when they are visibly dry and when completely dry.



Administrative controls – work practices

- ❖ Disinfect toys or small objects that may have been exposed to a child's saliva or other body fluids
- ❖ Disinfect workplace surfaces that may be contaminated with body fluids

- ❖ **Countertops**

- ❖ **Tables**

- ❖ **Cabinets**

- ❖ **Chairs**

- ❖ **Door knobs**

- ❖ **Telephones/cellphones**

- ❖ **Faucet handles**

- ❖ **Equipment**



The length of time that a disinfectant needs to be on a surface to kill infectious organisms is called the...

1. dwell time
2. life-cycle
3. half-life





Disinfectants for CMV – label states...

- ❖ it is an EPA-registered disinfectant
- ❖ that it kills CMV (herpesviruses)
- ❖ active ingredient(s)
- ❖ “dwell time” – how long disinfectant needs to stay on a surface to obtain the stated kill



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Demonstration

A volunteer will show us how to clean up blood/body fluids and doff contaminated gloves.



Personal protective equipment

Wear gloves for all contact with children's body fluids. (For potential splashes, add eye and face protection (goggles, faceshield, mask or disposable respirator).)

Disposable latex-free gloves...

- ❖ Such as nitrile or vinyl, to avoid allergic reactions to latex
- ❖ Discard gloves immediately after use
- ❖ Then wash hands: soap and water is preferred (rather than alcohol-based hand sanitizer). Diaper wipes do not effectively remove CMV from hands.



Written exposure control plan

- ❖ Housekeeping procedures: clean and disinfect workplace
- ❖ Describe how workers will be protected
 - ❖ Employer must provide and pay for personal protective equipment
- ❖ Describe how workers will be trained in precautions
- ❖ How workers with pregnancy concerns can request re-assignment



In review

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