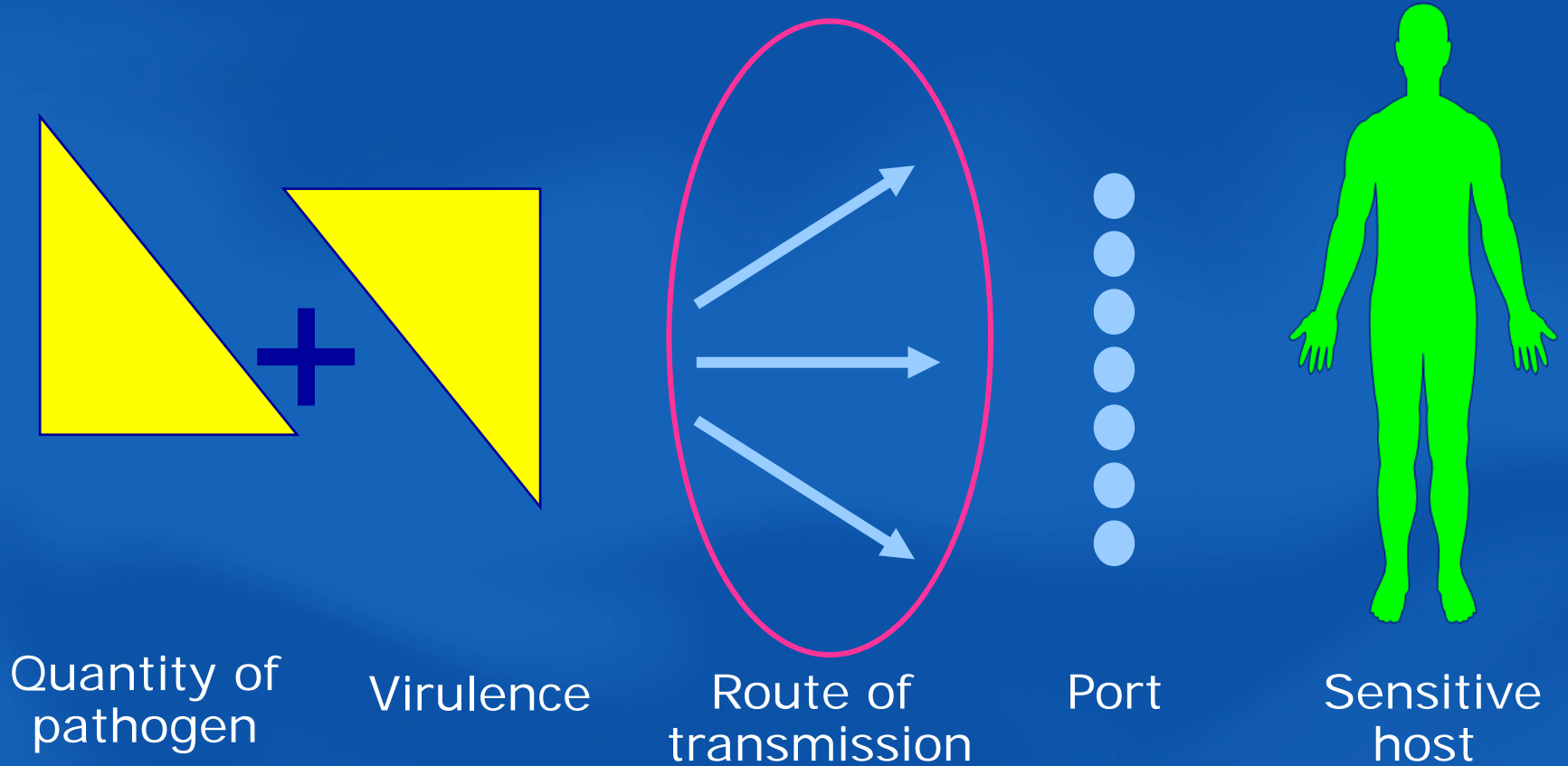


**Infection Control Practices -
Principles of Infection Control
and Personal Protective
Equipment**

Chain of Infection



Routes of Transmission Contact

Direct Contact

- ❑ Host comes into contact with reservoir
- ❑ Kissing, skin-to-skin contact
- ❑ Contact with soil or vegetation

Indirect Contact

- ❑ Disease is carried from reservoir to host
- ❑ Contaminated surfaces (fomites)

Routes of Transmission: Droplets

Large droplets within 1 meter transmit infections

Infection via:

- ❑ Coughing, sneezing, talking
- ❑ Medical procedures

Examples:

- ❑ Diphtheria
- ❑ Severe Acute Respiratory Syndrome virus
- ❑ Avian influenza in humans

Routes of Transmission Airborne (Droplet Nuclei)

Very small particles of evaporated droplets or dust with infectious agent May

- ❑ Remain in air for a long time
- ❑ Travel farther than droplets
- ❑ Become aerosolised during procedures

Examples:

- ❑ Tuberculosis
- ❑ Measles

Contact Transmission Potential

- ❑ Influenza virus survival on surfaces at room temperature and moderate humidity

On steel and plastic: 24-48 hours

On cloth and tissues: 8-12 hours
(absorbent surfaces)

- ❑ Transfer to hands possible after inoculations from:

- Contaminated steel: up to 24 hours
- Contaminated tissue: up to 15 minutes

- ❑ Influenza virus – an enveloped virus – inactivated by detergents, alcohol, bleach, household disinfectants

Transmission of Influenza Viruses

	Seasonal Influenza in Humans	Avian Influenza in Humans
Droplet	Yes	Probable (human-to-human)
Airborne	Likely	Unknown
Contact	Yes	Yes (bird-to-human)

**Infection Control Methods
&
Personal Protective Equipment**

Hand Washing

Method

- ❑ Wet hands with clean (not hot) water
- ❑ Apply soap
- ❑ Rub hands together for at least 20 seconds
- ❑ Rinse with clean water
- ❑ Dry with disposable towel or air dry
- ❑ Use towel to turn off faucet



Alcohol-based Hand Rubs

- ❑ Effective if hands not visibly soiled
- ❑ More costly than soap & water

Method

- ❑ Apply appropriate (3ml) amount to palms
- ❑ Rub hands together, covering all surfaces until dry

Personal Protective Equipment (PPE)

- ❑ When used properly can protect you from exposure to infectious agents
- ❑ Know what type of PPE is necessary for the duties you perform and use it correctly



Personal Protective Equipment

- ❑ Gloves
- ❑ Gowns
- ❑ Masks
- ❑ Boots
- ❑ Eye protection

Personal Protective Equipment

Gloves

- ❑ Different kinds of gloves
 - Housekeeper gloves
 - Clean gloves
 - Sterile glove

- ❑ Work from clean to dirty

- ❑ Avoid “touch contamination”
 - Eyes, mouth, nose, surfaces

- ❑ Change gloves between patients

Personal Protective Equipment

Gowns

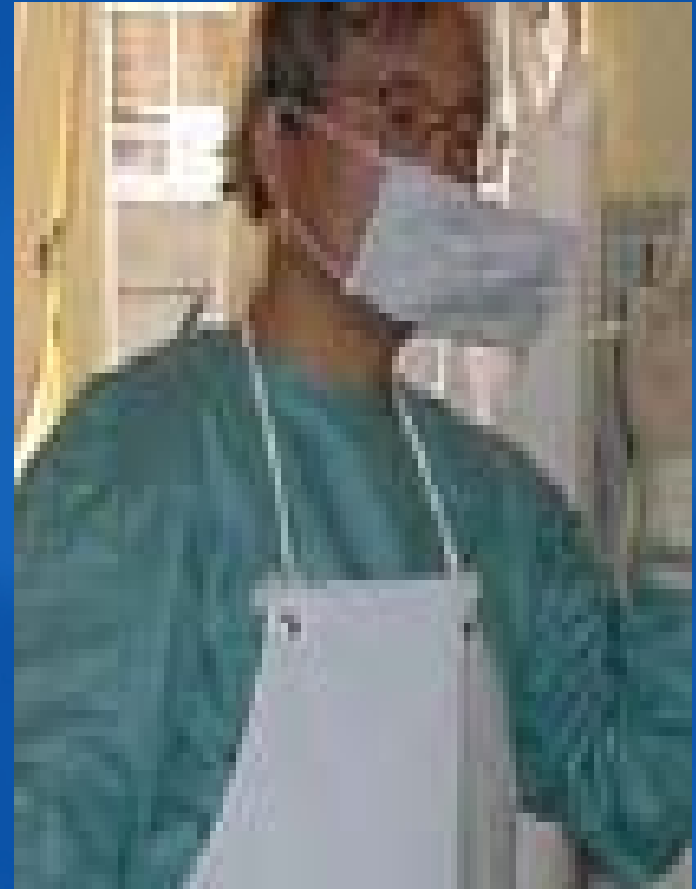
- ❑ Fully cover torso
- ❑ Have long sleeves
- ❑ Fit snugly at the wrist



Personal Protective Equipment

Masks and Respirators: Barriers and Filtration

- Surgical masks
 - Cotton, paper
- Particulate respirators (N95)
 - Fit testing essential
- Alternative materials (barrier)
 - Tissues, cloth



Personal Protective Equipment



Boots



Eye Protection

- Face shields
- Goggles

Personal Protective Equipment Supplies

- Maintain adequate, accessible supplies
- Use locally produced PPE when possible
- Creative alternatives
 - **Mask:** tissue, scarf
 - **Boots:** plastic bags
 - **Gown:** laboratory coat, scrub gowns

Working with Limited Resources

- ❑ Avoid reuse of disposable PPE items
 - Consider reuse of some disposable items only as an urgent, temporary solution
 - Reuse only if no obvious soiling or damage

- ❑ When prioritising PPE, purchase:
 - Masks
 - Gloves
 - Eye protection

Infection Control Precautions

Precaution Levels

All levels require hand hygiene

- Standard Precautions

Transmission based precautions:

- Contact Precautions
- Droplet Precautions
- Airborne Precautions

Standard Precautions

- ❑ Prevent the transmission of common infectious agents
- ❑ Hand washing is key
- ❑ Assume infectious agent could be present in the patient's
 - Blood
 - Body fluids, secretions, excretions
 - Non-intact skin
 - Mucous membranes

PPE for Standard Precautions

1. Gloves
2. Gowns
3. Eye Protection

When touching:

- ❑ Blood & body fluids
- ❑ Secretions, excretions
- ❑ Contaminated items
- ❑ Mucous membranes
- ❑ Non-intact skin



Contact Precautions

(Prevent infection through direct or indirect contact with patients or patient care environment)

Taken in addition *to* standard precautions

- ❑ Limit patient movement
- ❑ Isolate or cohort patients
- ❑ Gown + gloves for patient/room contact
 - Remove immediately after contact
- ❑ Do not touch eyes, nose, mouth with hands
- ❑ Avoid contaminating environmental surfaces

Contact Precautions

- ❑ Wash hands immediately after patient contact
- ❑ Use dedicated equipment if possible
 - If not, clean and disinfect between uses
- ❑ Clean, then disinfect patient room daily
 - Bed rails
 - Bedside tables
 - Lavatory surfaces
 - Blood pressure cuff, equipment surfaces

Cleaning and Disinfection for Contact Precautions

□ Detergents

- Remove dirt, soiling
- Mechanical force essential
- Flush with clean water

□ Disinfectants

- Kill viruses, bacteria
- Decontaminate surfaces
- Type depends on infectious agent
- Use after detergent

Droplet Precautions

(Prevent infection by large droplets from sneezing, coughing & talking)

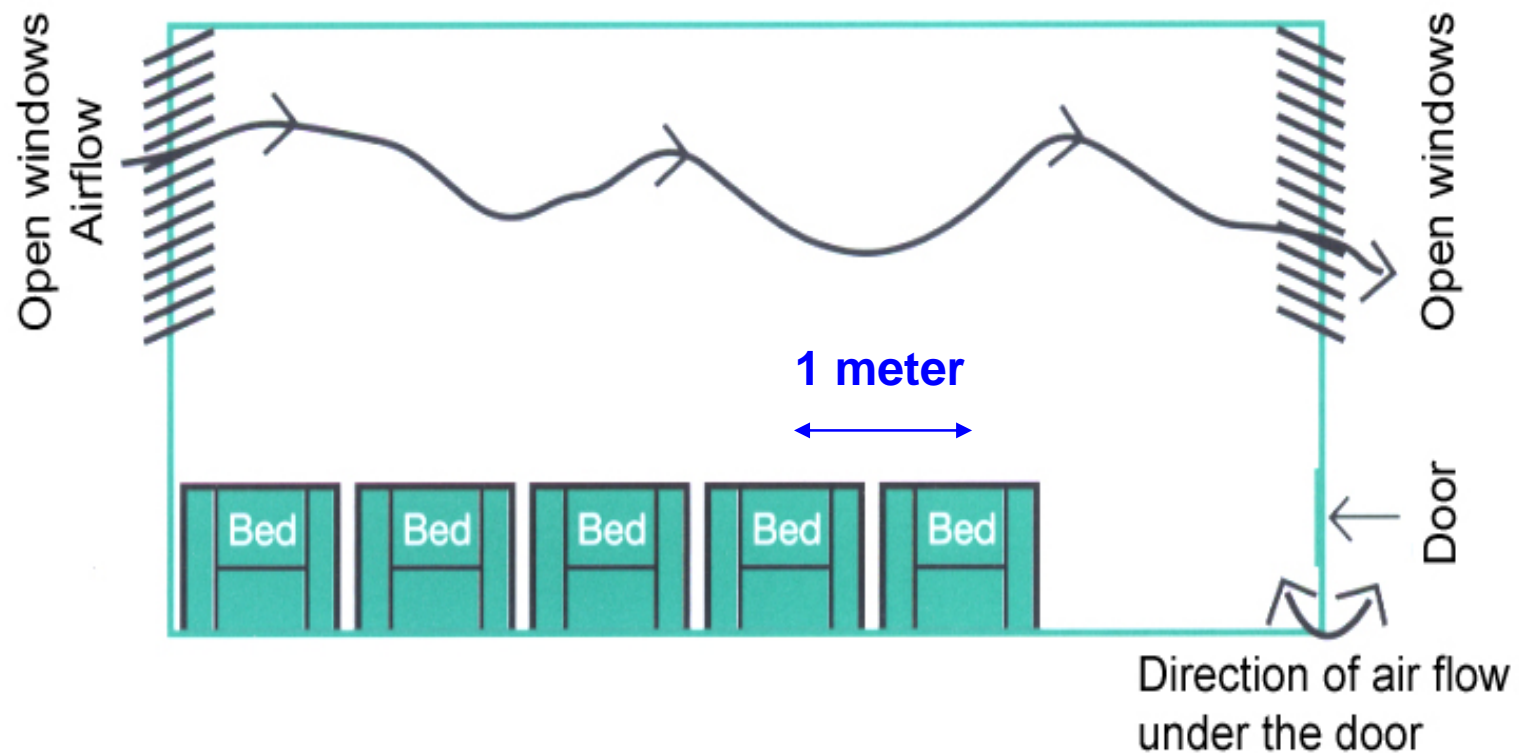
Taken in addition to Standard Precautions

- ❑ Wear three layered surgical mask within 1 metre of patient
- ❑ Wear face shield or goggles within 1 meter of patient
- ❑ Place patients in single rooms or cohort (groups together in a large room) 1 metre apart
- ❑ Limit patient movement within facility
- ❑ Patient wears mask when outside of room



Natural Ventilation Cohorting Room

Figure 2. Natural ventilation; free flow of ambient air in and out through open windows.



Aerosol-Generating Procedures

(Example: Endotracheal Intubation)

- ❑ N95 particulate respirator
 - If not available, wear tight fitting surgical mask and face shield
- ❑ Eye protection
- ❑ Gloves and hand washing
- ❑ Gown and waterproof apron
- ❑ Isolation room with negative pressure
- ❑ Hair cover optional

Duration of PPE Use

Surgical Masks (if N95 not available)

- ❑ Wear once and discard
- ❑ Discard if moist

N95 Particulate Respirators

- ❑ May use just one with cohorted patients

Eye Protection

- ❑ May wash, disinfect, reuse

If You Must Reuse PPE

- ❑ Use during one shift and for one patient
- ❑ Discard at the end of each shift

Gown

- ❑ Hang gown with outside facing in

Mask or Respirators

- ❑ Put the mask into the sealable bag
- ❑ May touch the front of the mask, but wash hands immediately after removing

Hand Washing

- ❑ Between PPE item removal if hands become visibly contaminated
- ❑ Immediately after removing all PPE
- ❑ Use soap and water or an alcohol-based hand rub

Assessing Infection Control Needs During an Investigation

	High risk patient areas	Outpatient areas	Non patient areas
No direct patient contact	Standard precautions Surgical Mask, Linen/Disposable gown +/- Eye shield/Full-face Shield +/- Disposable cap	Standard precautions Surgical mask	Not Applicable
Direct patient contact or activities with risk of exposure to blood and body fluids, secretions, excreta and contaminated items	Standard precautions N95 Mask, Linen/disposable gown Latex gloves, Eye Shield/full face shield, +/- Goggles +/- Disposable cap	Standard precautions Surgical/N95 mask Transmission based precautions	Not Applicable
Procedures with high risk of generating aerosols and requiring prolonged very close contact with affected	Standard precautions N95 mask ,Disposable Gown, Latex gloves, Full faced shield, Goggles +/- Disposable Cap	Standard precautions N95 mask, Disposable gown Latex gloves Full-face shield +/- Goggles +/- disposable cap	Not Applicable

Personal Protective Equipment for Care of Patients With Avian/Pandemic Influenza

	Entry to Cohorted Area but No Patient Contact	Close Patient Contact (<3 Feet)	Aerosol Generating Procedures
Hand hygiene	Yes	Yes	Yes
Gloves	×	Yes	Yes
Plastic apron	×	Yes	Yes
Gown	×	Yes	Yes
Surgical mask	Yes	Yes	×
N95 mask	×	×	Yes
Eye protection	×	Risk Assessment	Yes

Precautions for Suspected or Confirmed Cases of Avian & H1N1 Influenza

- ❑ Place patient in a negative air pressure room
- ❑ To create a negative air pressure room:
 - Install exhaust fan and direct air from inside to an outside area with no person movement
- ❑ If no air conditioning, open windows in isolation areas but keep doors closed
- ❑ Place patients in rooms alone
 - Alternative: cohort patients away from other patient care areas with beds > 1 metre apart

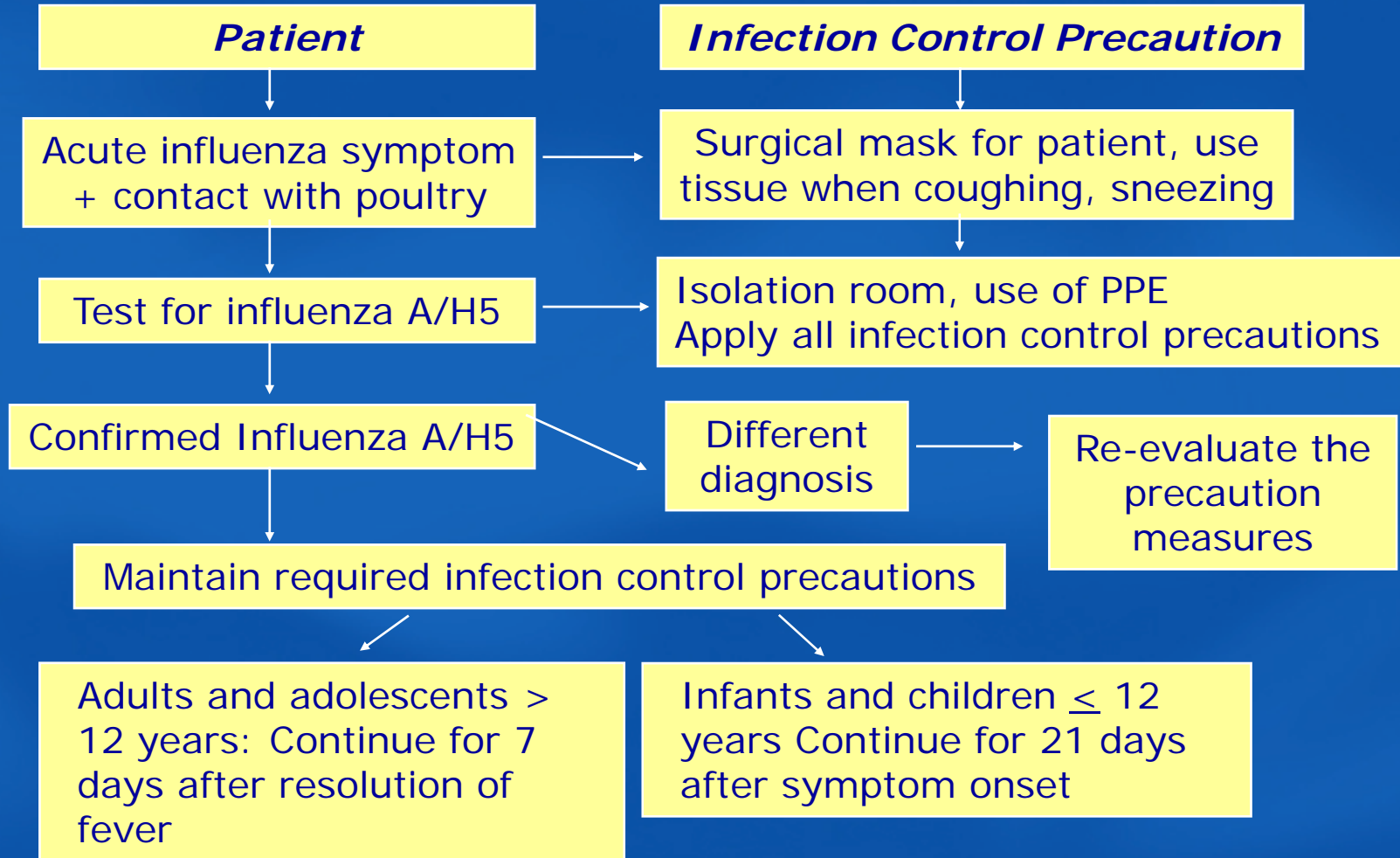
Precautions for Suspected or Confirmed Cases

- ❑ Limit number of health care workers, family members and visitors
- ❑ Designate experienced staff to provide care
- ❑ Limit designated staff to avian influenza patient care
- ❑ Teach family and visitors to use PPE

Precautions for Collecting Specimens

- ❑ Notify laboratory in advance
- ❑ Health care worker collecting specimen should wear full barrier PPE
- ❑ Place specimen in leak-proof triple packaging
- ❑ Hand deliver, if possible
- ❑ Label specimen clearly as “suspected avian influenza”

Precautions for Suspected or Confirmed Cases



Environmental Decontamination

- ❑ Cleaning must precede decontamination
- ❑ Disinfectant ineffective if organic matter is present
- ❑ Use mechanical force to remove organic matter
 - Scrubbing
 - Brushing
 - Flush with water

Environmental Decontamination

Disinfecting

- ❑ Household bleach (diluted)
- ❑ Quaternary ammonia compounds
- ❑ Chlorine compounds (Chloramin B, Presept)
- ❑ Alcohol
 - Isopropyl 70% or ethyl alcohol 60%
- ❑ Peroxygen compounds
- ❑ Phenolic disinfectants
- ❑ Germicides with a tuberculocidal claim on label
- ❑ Others

Preparing Bleach Solutions

- ❑ With bleach containing 5% sodium hypochlorite:
10 ml bleach + 990 ml cold tap water
- ❑ With bleach containing 2.5% sodium hypochlorite:
20 ml bleach + 980 ml cold tap water

Household Bleach Safety

- ❑ Use mask, goggles, rubber gloves, waterproof apron
- ❑ Mix in well-ventilated area
- ❑ Do not use or mix with other detergents
- ❑ Use cold or room temperature water to mix



Using Bleach Solutions

- ❑ First clean organic material from surfaces or items
- ❑ Wipe nonporous surfaces with sponge or wet cloth
 - Allow to dry
- ❑ Immerse items for 30 minutes
- ❑ Make fresh diluted bleach daily

Waste Disposal

- ❑ Use Standard Precautions
 - Gloves and hand washing
 - Gown + Eye protection
- ❑ Avoid aerosolisation
- ❑ Prevent spills and leaks
 - Double bag if outside of bag is contaminated
- ❑ Incineration is usually the preferred method

Managing Linens and Laundry

- ❑ Use Standard Precautions
 - Gloves and hand hygiene
 - Gown
 - Mask

- ❑ Avoid aerosolisation – do not shake

- ❑ Fold or roll heavily soiled laundry
 - Remove large amounts of solid waste first

- ❑ Place soiled laundry into bag in patient room

Avian Influenza Infection Control in the Community

Preventing Transmission

Stop the spread of germs that make you and others sick!

Cover your Cough



You may be asked to put on a surgical mask to protect others.

Clean your Hands

after coughing or sneezing.



- Respiratory etiquette
 - Cover nose/mouth when coughing or sneezing
- Hand washing



State Department of Health
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Avian Influenza and Food

- ❑ Heat to $>70^{\circ}\text{C}$ to kill the avian influenza virus
- ❑ Consumption of any raw/undercooked poultry ingredients is risky
 - Runny eggs
 - Meat with red juice
- ❑ Separate raw meat from cooked or ready-to-eat foods to avoid cross-contamination
- ❑ Wash hands before and after preparing food

Patients Cared for at Home

- ❑ Potential for transmission
- ❑ Must educate family caregivers
- ❑ Fever/symptom monitoring
- ❑ Infection control measures
 - Hand washing
 - Use of available material as PPE

Patients Cared for at Home

- ❑ Handle laundry with gloves; do not shake to prevent aerosolisation
- ❑ Use disposable or dedicated dishes, utensils
- ❑ Decontaminate the home environment
 - Frequent cleaning before disinfection

Decontamination of Dishes and Eating Utensils

- Use disposable items when available
- Wash with detergent and hot water
 - Wear rubber gloves

Precautions for Handling Corpses

- ❑ Mortuary staff should use Full Barrier PPE
- ❑ Anyone handling a corpse infected with avian influenza should be informed

Application of Infection Control Activities during an Investigation

Location Influences Actions

- ❑ Medical facilities
- ❑ Homes
- ❑ Farms
- ❑ Markets
- ❑ Rural versus Urban areas

Anticipate Exposures

Contact with:

- ❑ Infected individuals
- ❑ Individuals suspected to be infected
- ❑ Potentially contaminated substances
- ❑ Potentially contaminated surfaces/items
- ❑ High-risk procedures
- ❑ Corpses
- ❑ Animals

Assess Existing Infection Control Infrastructure

- ❑ Policies and procedures
- ❑ Authority
- ❑ Human resources
- ❑ Financial resources
- ❑ Engineering resources

Assess Existing Infection Control Infrastructure

Example:

- ❑ Do policies describe PPE for healthcare workers?
- ❑ Are procedures in place for patient room cleaning?
- ❑ Are there negative air pressure rooms?
- ❑ Will you need to promote respiratory and hand hygiene in the community?

Waste Disposal

2 Types of Waste→

- ❑ Infected Liquid Waste →To be decontaminated (chemical treatment with 1% sodium hypochlorite)→ discharge into drains
- ❑ Infected Solid Waste → To be decontaminated before disposal as given below

Decontamination

- 1) SHARPS (Needles, blades, instruments) to be put in puncture proof containers containing fresh 1% hypochlorite→ final disposal
- 2) NON SHARPS (Gloves, swabs, plugs, cultures, plastic wares) to be disinfected either by 5-10%bleach/1%hypochlorite/ Autoclaving→ final disposal

Waste Disposal

Final Disposal after Decontamination

- ❑ **Disposable Sharps** → Destroyed in needle destroyer followed by deep burial
- ❑ **Disp Plasticware** → Either by shredding or mutilated by heating at 160°C for 20 mts followed by deep burial
- ❑ **Human/Animal Tissues, cotton Swabs/Cultures** to be incinerated
- ❑ Reusable instruments/glassware etc. to be either chemically disinfected/autoclaved, washed sterilised
- ❑ Linens/gowns/footwear etc. to be boiled/disinfected with 5% bleach → final washing

Remember

- ❑ No chemical pretreatment of waste before incineration
- ❑ Waste collection bags needing incineration not to be made of chlorinated plastics
- ❑ Colour coding of waste categories with multiple treatment options to be selected

Standards for Deep Burial

- ❑ Pit/trench, about 2 metres deep to be dug
- ❑ Half filled with waste, covered with 50cm of lime, rest with soil
- ❑ Burial site to be impermeable and not close to any shallow well, or habitation
- ❑ Entry of animals to the site banned
- ❑ Burial to be performed under close supervision
- ❑ Institution to keep record of all pits for burial

Waste Disposal in the Field

What are the wastes

- ❑ Infectious blood, body fluids, leftover biological samples
- ❑ Disposable needles and syringes
- ❑ Disposable or nonreusable Protective clothing
- ❑ Disposable or nonreusable gloves
- ❑ Used laboratory supplies
- ❑ Used disinfectants

How to Burn Waste in an Incinerator

1. Place waste on platform inside of the drum
2. Soak waste in one liter of fuel
3. Light the fire carefully
4. Watch the fire and frequently mix the waste with the metal bars to be sure all of the waste is burned
5. When the fire has gone out, empty the ashes into a pit

Summary

- ❑ Influenza transmission occurs mainly through respiratory droplets
 - Contact can be prevented using PPE
 - Virus can be inactivated with infection control procedures
 - Hand washing is key
- ❑ PPE must be donned and removed appropriately to prevent contamination of wearers and environments
- ❑ Guidelines for using PPE and infection control measures for avian/H1N1 influenza in humans should be practiced until they are routine

Thank You