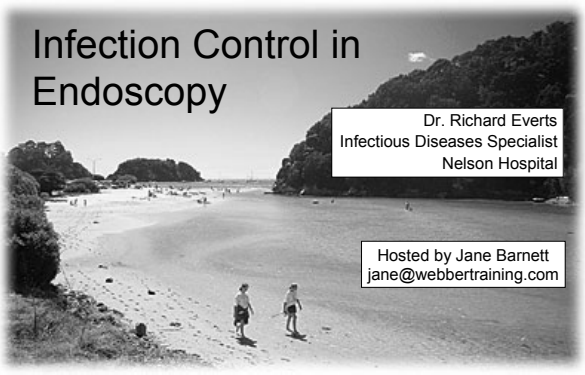
Infection Control in Endoscopy
Dr. Richard Everts
A Webber Training Teleclass



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Plan

1. Protecting staff from the patients' bugs
2. Protecting patients from each other's bugs
3. Protecting patients from environmental bugs
4. Hot topics for 2006-7

Patient to staff transmission

Standard precautions

Wash or cleanse your hands often

Wear gloves if you are going to put your hands somewhere dirty

Standard precautions

Wear gowns and face shields if you may be splashed with bodily fluids.

What is the risk?

- Est. 13.2% risk of exposure to a patient's body fluids during a GI endoscopy
  - 4.1% splash rate to eyes

Indian J Gastroentrol 1999;18:109-11

- 5 of 7 studies show GI endoscopists have higher rates of *H. pylori* exposure
- Less than 10% of endoscopy staff routinely wear gowns, masks and eyewear

Inf Cont Hosp Epid 1991; 12:289-96

Recommendations - endoscopists

- GI endoscopy
  - I can't find any specific guideline but several authors imply that protection against splashing into mucous membranes is indicated
- Bronchoscopy (ACCP and AAB 2005)
  - Every procedure – gown, gloves, mask and eye shield
  - (See slides below if suspected mycobacterial infection)

Recommendations – cleaning and disinfection staff

Common sense

If there is an insect in the Tegaderm packet, discard it.

How do you isolate an infectious patient in the endoscopy suite?

First – identify infectious patients

- Often you can't
- Good staff communication
- Infectious labels?

To prevent spread by contact…

- Direct contact or via fomites
- Examples:
  - MRSA and other multi-resistant organisms
  - Gastroenteritis.

…use contact isolation precautions

To prevent spread by droplet…

- Large droplets from mouth and nose, which travel about 1 metre then settle
- Examples:
  - Meningococcus
  - Whooping cough
  - Influenza

…use droplet isolation precautions

Surgical mask

To prevent spread by air…

- Infectious particles remain airborne for long periods – fill the room
- Examples:
  - TB
  - Chickenpox
  - Measles
  - SARS

…use airborne isolation precautions

N95 mask

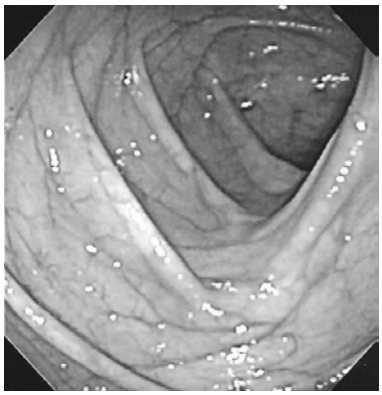
Summary – transmission-based precautions in Endoscopy

- Contact isolation:
  - Patient last on list?
  - Physical separation from other patients?
  - All staff handling patient wear gloves and gown
  - Surfaces and equipment touched by patient must be cleaned afterwards.
- Droplet isolation:
  - Patient wears surgical mask
  - Staff wear surgical mask within 1 metre.
- Airborne isolation:
  - Airborne isolation room (if available)
  - Patient wears surgical mask
  - Staff wear N95 mask (fit-tested) in same room
  - Room unused for approx. 20 minutes after.

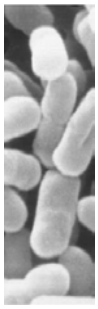
Needlestick injuries

- First aid
  - Squeeze
  - Rinse under cold water
- Apply or wash with antiseptic (e.g., chlorhexidine, alcohol or iodine)
- Notify Occupational Health or Infection Control.

Patient to patient transmission



How many bacteria in the colon?



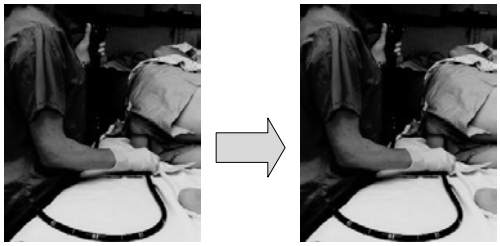
- 10^{11} - 10^{12} (100,000,000,000) per ml of stool
  - 1/3 of faecal dry weight
- 99.9% anaerobes (*Bacteroides* etc.)
  - 0.1% aerobes (e.g., coliforms, *Enterococcus*)
- At removal, a colonoscope has between 1,000,000 and 1,000,000,000 organisms on it

Gastrointest. Endosc. 1998;48:137-42

- AND: colonoscopy patient has increased risk of:
  - Enteric pathogens
  - Blood.

Blood-borne virus prevalence in NZ

- Hepatitis B
  - 4.4% of Maori
  - 3.2% of Pacific Islanders
  - 0.4% European
  - **1.2% overall**
- Hepatitis C
  - **0.8% overall**
- HIV
  - **0.05% overall**



Risk of transmission by rectal "inoculation"

- Suppositories work!
- *Clostridium difficile* enemas work!
- Gonococcal proctitis happens!
- Hepatitis C
  - Sexual transmission is rare but increased in MSM
- Hepatitis B
  - Sexual transmission is common and increased risk if receptive anal intercourse
- HIV
  - Receptive anal intercourse 0.8-3.2% per act
  - (Receptive vaginal intercourse 0.08-0.2% per act
  - Needlestick 0.3%)

Risk of transmission of any organism

- New Zealand audit 2002-2004
- 37 endoscopy units
- Good compliance with GENCA guidelines
- More than 7000 endoscope surveillance cultures in 3 years
- 43 cultures yielded faecal flora or *Pseudomonas* spp.

= 1 in 163 endoscopes tested.

Risk of infection with <u>any</u> organism transmitted by endoscopy

- = 1 in 1,800,000 procedures

<u>versus</u>

- 1 in 100,000 risk of dying per skydive
- 1 in 10,000 risk of dying of influenza each winter in New Zealand
- 1 in 6,000 risk dying in a car crash per year (if you drive 16,000 km/year)

Clinically significant infections transmitted by endoscopy

<u>Gastroenterology</u>
- *Pseudomonas aeruginosa*
- *Salmonella* spp.

<u>Cystoscopy</u>
- nil

<u>ENT scopes</u>
- nil

<u>Bronchoscopes</u>:
- TB (7)
- *Pseudomonas* spp. (8)
- Coliforms (3)

- More pseudo-outbreaks than true outbreaks
  - most pseudo-outbreaks caused by rapid-growing mycobacteria, TB, other mycobacteria, *Pseudomonas* spp., molds

How many endoscopies?!

- 10 m/yr worldwide

- **No** proven HIV transmission
- **2** cases of Hepatitis B transmission
- **4** cases of Hepatitis C transmission

- **Wipe down and rinse channels immediately**

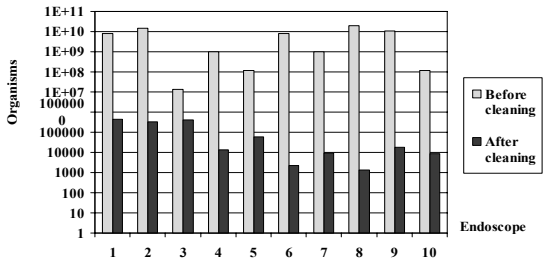
Reprocessing an endoscope

- Wipe down and rinse channels immediately
- **Soak if unable to clean within short time**

- **Leak test**

- Clean with warm water and a detergent (or Matrix)

Colonoscope bioburden before and after manual cleaning



Gastrointest. Endosc. 1998;48:137-42

Reprocessing an endoscope

- Wipe down and rinse channels immediately
- Soak if unable to clean immediately
- (Leakage testing)
- Meticulous manual cleaning with detergent
- High-level disinfection (e.g., OPA, peracetic acid)
- **Rinse with sterile water**

Reprocessing an endoscope

- Wipe down and rinse channels immediately
- Soak if unable to clean immediately
- (Leakage testing)
- Meticulous manual cleaning with enzymatic detergent
- High-level disinfection (e.g., OPA, peracetic acid)
- Rinse with sterile water
- **Dry with 70% alcohol and forced air (at end of list)**

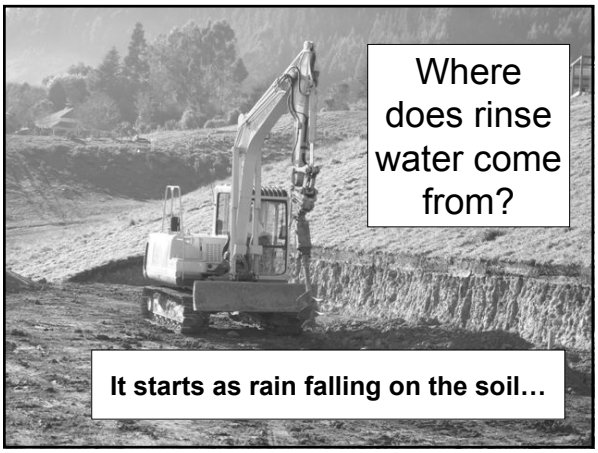
Accessories

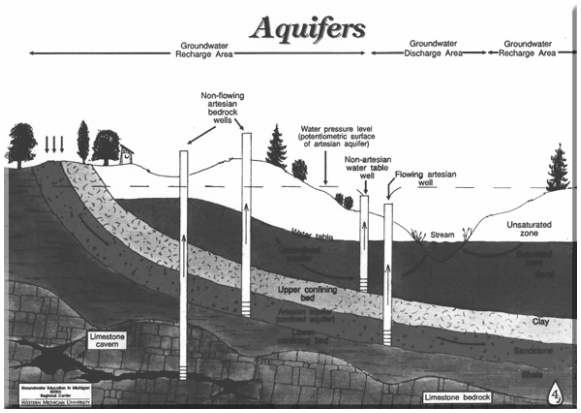
- Follow manufacturer's instructions
- Discard single-use items
- If reusable, in general:
  - Soak in detergent
  - Dismantle as far as possible
  - Clean
  - Ultrasonic treatment
  - Rinse
  - Dry
  - Sterilise biopsy forceps, ERCP equipment; otherwise high-level disinfect according to manufacturer's instructions

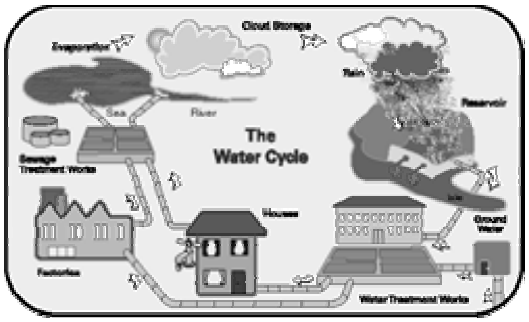
Water bottles

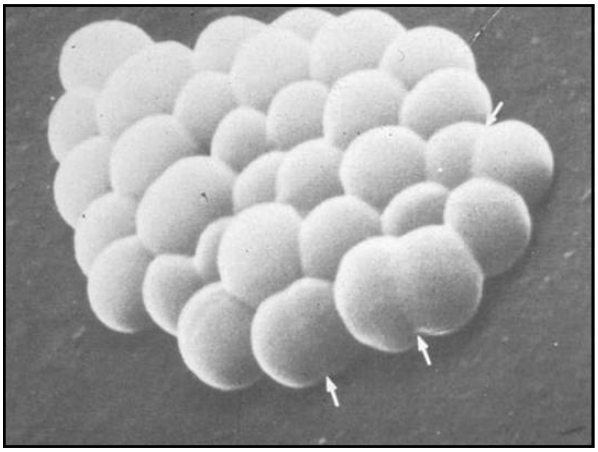
- SGNA 2006:
  - Manually clean and high-level disinfect or sterilise daily (according to manufacturer's instructions)
  - Store dry
  - Use sterile water only
  - (For ERCP use a fresh reprocessed water bottle for each procedure)

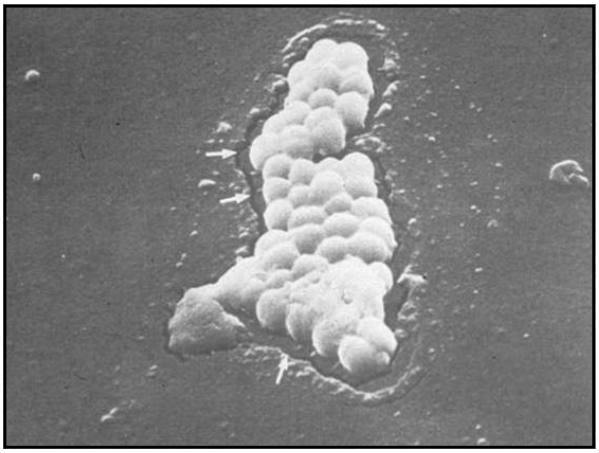
Environment to patient transmission

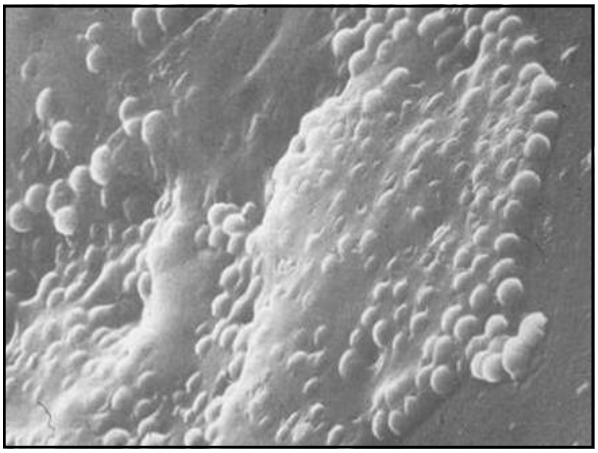


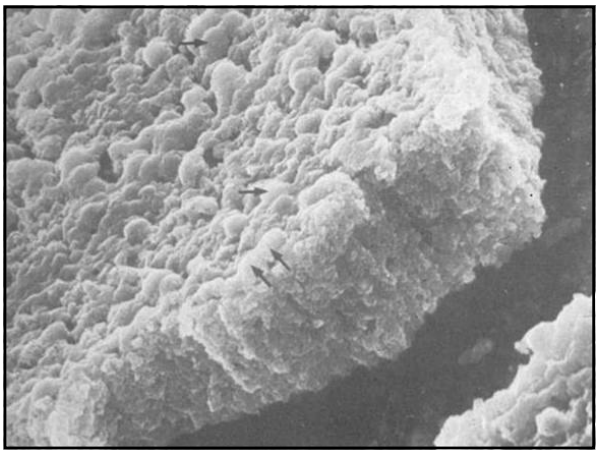












Contamination of rinse water

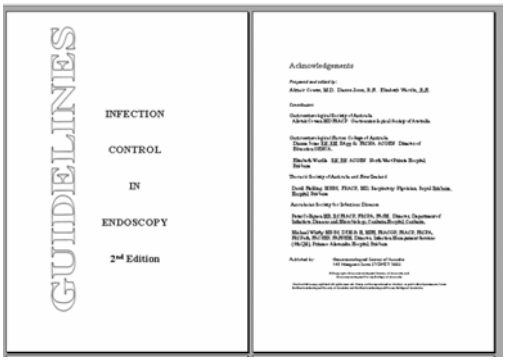
Organisms
- *Pseudomonas* spp. and other non-fermentative gram-negative bacilli
- Mycobacteria (non-tuberculous)
- Molds

Causes
- Contaminated municipal water supply
- Blind loop pipes
- Lead fragments damaging filters
- Ineffective self-disinfection.

Sterile rinse water

- Multiple reports of contamination from rinse water
- Sterilise by filtration, UV light, sterile water, distilled water, reverse osmosis, heated water, addition of biocide (e.g., sterilox, chlorine), ozonisation
- Filtration most common
  - regularly change the filters
  - internal water rinse pathways and internal water filter should be disinfected daily
  - regular monitoring of rinse water

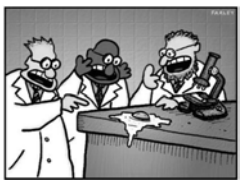
Joint Working Group of Hospital Infection Society and PHLS June 2001



AS4187 and GESA/GENCA Guidelines are co-ordinated.

Hot topics for 2006-7

- "Detergents"
  - Matrix
- Brushes
  - Dispoclean & others
- Disinfectants
  - Which one?
  - How long?
  - OPA for cystoscopes?
  - Tristel Wipes
- Connectors
- Sheaths
- Steris System 1 fault
- Prions



Dispo'Clean

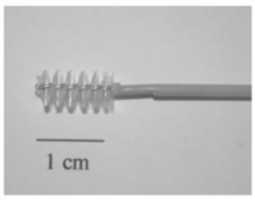


Photo no.1: "Brush" cleaner

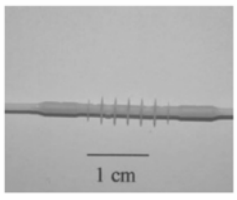
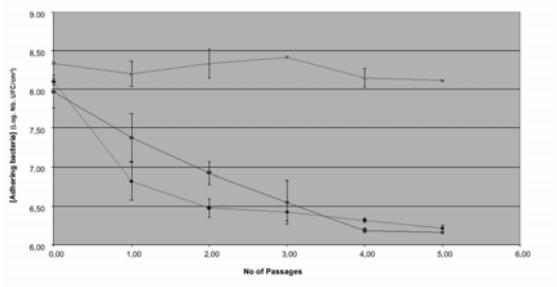


Photo no. 2: "Dispo'Clean" cleaner



1: Activity of 2 cleaning procedures ("brush" cleaner vs. Dispo'Clean cleaner) vis-à-vis Teflon tube contaminated by a biofilm with *Pseudomonas* ıosa CIP A22. Development of the number of adhering viable bacteria on the inner surface of the Teflon tube plotted against the number of passages of aner for each procedure tested ["brush" cleaner (■) "Dispo'Clean" cleaner (●)] in relation to the control procedure (▲).

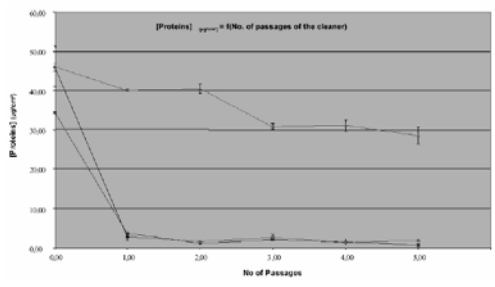


Figure 2: Activity of 2 cleaning procedures ("brush" cleaner vs. Dispo'Clean cleaner) vis-à-vis PTFE tube contaminated by a biofilm with *Pseudomonas aeruginosa* CIP A22. Development of the residual concentrations of proteins on the inner surface of the PTFE tube plotted against the number of passages of the cleaner for each procedure tested ["brush" cleaner (■) "Dispo'Clean" cleaner (●)] in relation to the control procedure (▲).

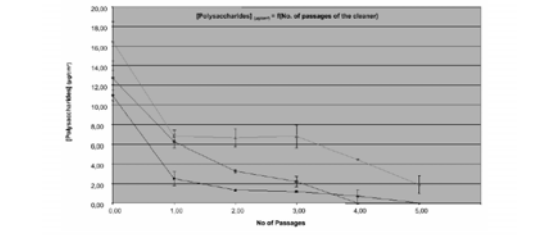
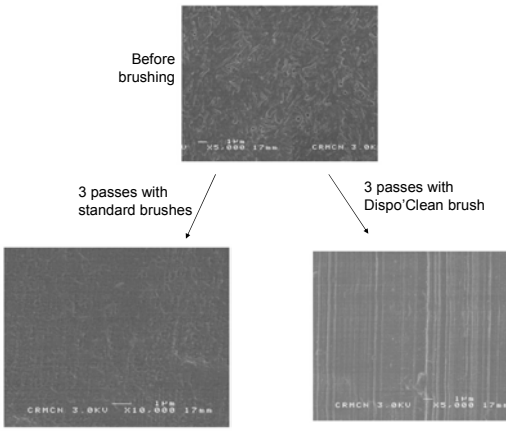


Figure 4: Activity of 2 cleaning procedures ("brush" cleaner vs. Dispo'Clean cleaner) vis-à-vis Teflon tube contaminated by a biofilm with *Pseudomonas aeruginosa* CIP A22. Development of the residual concentrations of polysaccharides on the inner surface of the Teflon tube plotted against the number of passages of the cleaner for each procedure tested ["brush" cleaner (■) "Dispo'Clean" cleaner (●)] in relation to the control procedure (▲).



Dispo'Clean

- "Lumen cleaners" endorsed by the BSG (according to the Dispo'Clean rep)
- Used in many UK endoscopy units
- Novapharm in Australia is developing a "better product"
- "Sponge on a string" product being developed – "the best"
- Stick with guidelines.

High-level disinfection

- Effective agents:
  - 2% glutaraldehyde
  - 0.55% *ortho*-phthalaldehyde (OPA)
  - peracetic acid
  - high concentrations of hydrogen peroxide
  - some chlorine releasing agents
- Peracetic acid and high concentrations of hydrogen peroxide can only be used in automated processors that prevent staff exposure
- Ethylene oxide gas achieves sterilisation with prolonged contact time, but has same limitations as liquid chemical disinfectants.

Adaspor®

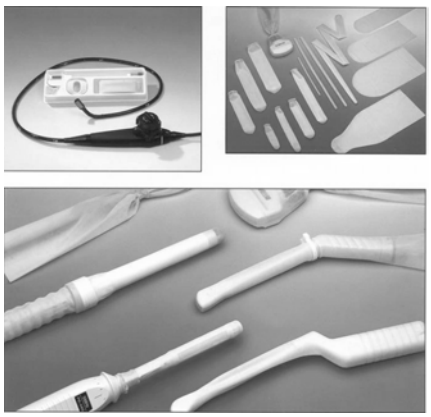
- Peracetic acid 5% plus Adazone®
- Adazone® is a "new molecule that gradually releases the peracetic acid"
- Effective killing of bacteria, mycobacteria, spores – no comparative data seen
- Compatible with endoscopes

Tristel Sporicidal Wipes

- Claim:
  - "Kills all bacteria, viruses, fungi, mycobacteria and spores on a pre-cleaned surface in less than 30 seconds
  - Far superior to a wipe that uses alcohol, a quaternary ammonium compound, a biguanide, chlorhexidine or any other chemical
  - No toxicity"
- For:
  - Endoscopes and ultrasound transducers that cannot be immersed in liquid or sterilised by heat or for hard surfaces.
- Active ingredient:
  - Chlorine dioxide, acidified.

Tristel Sporicidal Wipes - data

- All data presented in the product brochure was produced by the company itself
- Independent research on chlorine dioxide:
  - *Am J Inf Control 2005; 33: 320-5* – chlorine dioxide 600mg/L free chlorine took 30 minutes to inactivate all spores of *C. difficile, C. sporogenes* and *B. subtilis* (compared with 10 minutes for domestic bleach or acidified bleach and 13 minutes for hydrogen peroxide)
  - *J Food Protection 2004; 67: 1702-8* – more than 5.6-log kill of *B. cereus* and *B. thuringiensis* as an alkaline or acidified 85 mg/L solution.



Over 200 ENT units in the UK use sheaths (with alcohol wipe-down between) as their primary method of decontamination of nasendoscopes…

Use of TOE scope sheaths is widespread…

J Hosp Infect 2002;52:153-4

Urology sheaths used in Aus?

Lawrentschuk N. Chamberlain M.
Division of Urology, University of Melbourne, Austin Hospital, Heidelberg, Victoria.

Sterile disposable sheath system for flexible cystoscopes

…this study is the first to document experience using a flexible cystoscope with a disposable sheath in a urologic setting.

Urology Dec 2005; 66(6):1310-3

Endoscope sheaths - advantages

- Fast turnaround time (simple wipe down in-between cases)
- Reduce damage to endoscope from disinfection process
- No need to worry about prions
- No reported cases of transmission of infection by nasendoscopes or TOE probes
- Nasendoscopes are used and processed out-of-hours by untrained junior ENT medical staff
- TOE probes can't be submerged → difficult to disinfect
- Image quality equal.

Clin Otolaryngol Allied Sci 2002;27:81
Chest 2000;118:183

Endoscope sheaths ?safety

Laser holes drilled or small tears made in sheath
Sheathed ENT endoscope soaked in virus suspension (10^8 viruses/ml)
Endoscope removed, rinsed and replaced in new sheath with holes in similar places
→ endoscope lightly contaminated but no virus passed outward through second sheath
Conclusion: Sheath + intermediate-level disinfection between uses should be safe.

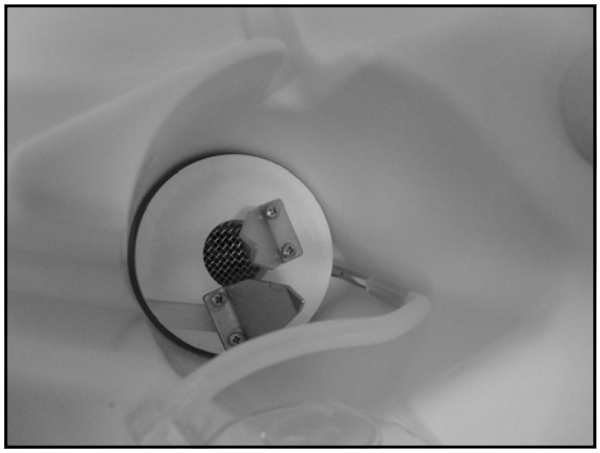
Laryngoscope 1999;109:636-9

Endoscope sheaths - disadvantages

- Limited use – TOE probes, ENT nasendoscopes, transvaginal/trans-rectal ultrasound probes
- Bronchoscopy sheaths made scopes unwieldy and gave poor image quality

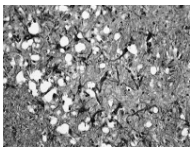
Respiration 2004;71: 174-7

- $30 each
- Up until 2003 no US or European recommendations accept sheaths as a replacement for high-level disinfection.



Scrapie

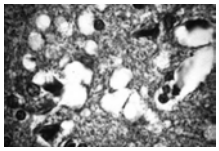
- Described in 18th Century
- Sheep and goats
- Afflicted animals inco-ordinate, tremorous and wasted and eventually cannot stand.



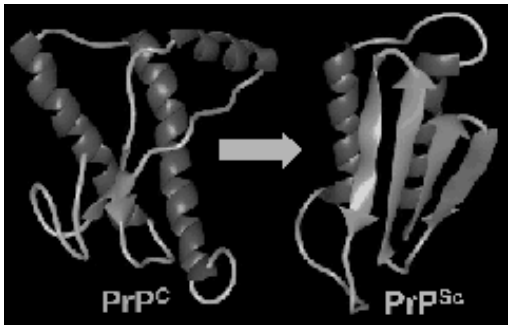
- Intense itch
- Prevented by elimination of flock and avoiding use of contaminated animal feed.

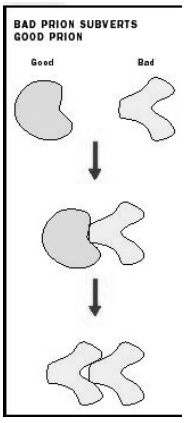
Kuru

- Fore people in New Guinea highlands
- Loss of co-ordination, tremor then mood changes and mild dementia



- Associated with ritualistic cannibalism – eating of brains.





Where is abnormal prion protein found?

- Most infective:
  - Human and animal brain
  - Dura mater
  - Spinal cord
  - Eye
- Occasionally contain infective material:
  - CSF
  - Lympho-reticular organs
  - Kidney
  - Spleen
  - Lung
- Almost never:
  - Blood
- No evidence
  - Human faeces, saliva, tears, vaginal secretions, semen or milk.

How do humans get CJD?

Disease	Proportion of cases	Details
Sporadic CJD	85-95%	1.1 case/million population/year
Familial CJD	5-15%	Geographic clusters, > 100 families
Iatrogenic	< 1%	Dural grafts, pituitary hormone; rarely corneal tx, neurosurgical instruments, EEG electrodes
Variant	> 150 cases	UK – related to eating beef affected by BSE

The risk via endoscopy

- Variant CJD more likely to transmit than sporadic CJD
  - Found in lympho-reticular tissues of GI tract
  - Proven transmission through ingestion
- No routine endoscope disinfection process inactivates prion; aldehydes fix protein to surfaces
- Autoclaving for 1 hour at 132 ^{0}C or disinfection with chlorine at > 10,000ppm or sodium hydroxide 1 N for 1 hour at RT will damage the endoscope.

The risk via endoscopy

- GENCA 2003
  - Avoid endoscopy in known cases
  - If unavoidable:
    - refer to large centre where specific endoscopes are reserved for patients with prion disease
    - Dispose of all accessories.
- BSG 2005
  - Risk extremely low provided adequate cleaning
  - Patients at risk of or with suspected vCJD who have invasive GI endoscopy (e.g., biopsies) require:
    - Dispose of cleaning brushes, rubber ring on biopsy channel, biopsy forceps, cytology brushes, guidewires and all other accessories
    - Avoid aldehydes and multi-use disinfectants
    - Quarantine the scope for same patient or known future CJD patients – dedicated CJD scopes available at limited UK centres.

The risk via endoscopy

- France 2004
  - double cleaning prior to disinfection
  - some stipulations regarding timing and duration of cleaning and subsequent rinsing
  - banning of aldehydes
  - banning of recycled detergents or disinfectants.

Journal of Hospital Infection. 56 Suppl 2:S40-3, 2004

2007 South Pacific Teleclasses

February 21	***Infection Control in the Endoscopy Clinic*** … with Dr. Richard Everts, Nelson Marlborough Health Service
April 25	***Making Infection Control Really Work – Managing the Human Factor*** … with Dr. Seto Wing Hong, China
June 20	***Central Venous Lines and Prevention of Infection*** … Dr. Steve Chambers, New Zealand
August 22	***ESBLs – Where are We Now*** … with Dr. Fong Chiew, New Zealand
October 10	***Infection Prevention Among Refugees*** … with Dr. Mark Birch, Australia

For the full teleclass schedule – www.webbertraining.com
For registration information www.webbertraining.com/howtoc8.php