

Prion Inactivation Methods

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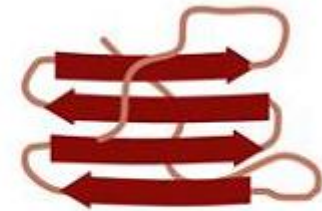


Prion diseases

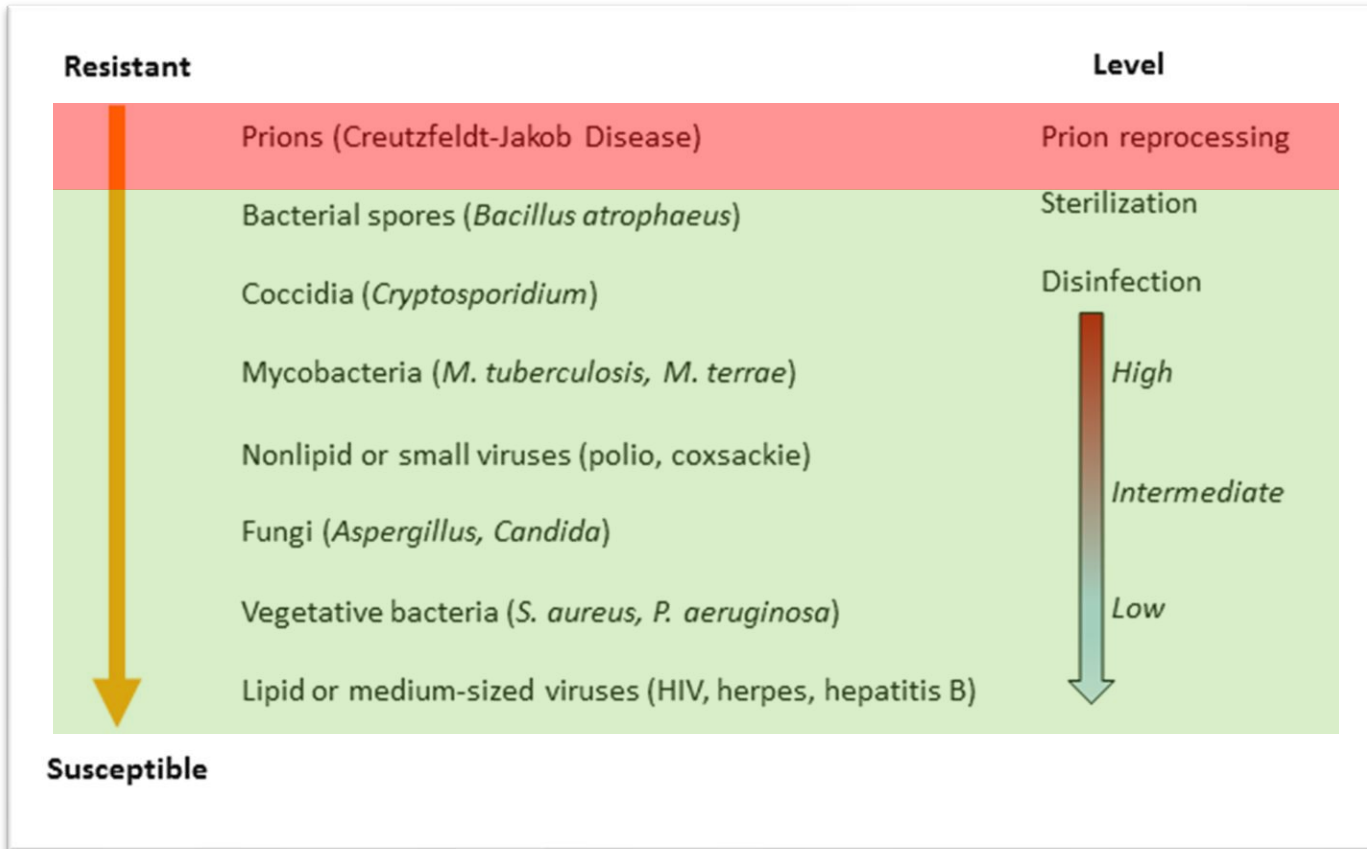
- “Proteinaceous infectious particle” (Prusiner, 1982)
- Conformational change that can be induced in other prion protein molecules
- Not a living organism
- Cannot be killed
- Unique mode of infectivity



PrP-sen
Normal



PrP-res
Disease-causing



Source: <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/tables/figure1.html>

Creutzfeldt-Jakob Disease

- Notifiable disease
- Invariably fatal
- Long incubation time
- Lack of diagnostic tests i.e. autopsy
- Sporadic, familial, acquired types
- RMDs – potential source of iatrogenic CJD



Prion inactivation studies

- Methodology
 - Reduction in recoverable prion load vs infectivity
 - Choice of prion strain
 - In vivo vs in vitro e.g. RT-QuIC
 - Steel coupons/wires vs surgical instruments
 - Sample size
- Medical device/laboratory apparatus
 - Provides evidence for label claims
 - Need for market-ready or comparable methods



Steam sterilisers

- WHO Guidelines (1999)
- No singularly effective process
- Includes impracticable methods
 - Concentrated NaOH or NaClO
 - Gravity displacement steriliser
- Thomas et al. (2013)
 - Mathematical modelling, not experimental
 - Determine “contactable group” according to risk
 - Based on potential level of prion contamination



Prion Inactivating Detergents

- ARTG - Class IIb medical devices
- Disinfection claims \neq prion inactivation claims
- Alkaline or enzymatic action
- Lawson et. al (2007)
 - Novapharm Epizyme Ultra ®
 - Getinge Clean Prion Detergent ®
 - Ecolab Asepti Autozyme PR®
 - Recommends second process per WHO



Low temperature sterilisers

- LTSF is unsuitable vs prions
- Hydrogen peroxide
 - Liquid vs VHP
 - \pm gas plasma
- Plasma's role as a sterilant/prionicide
 - Investigated using various source gases
 - Used in some VHP sterilisation processes
- Prion inactivation is an additional claim



VHP studies

- Fichet et al. (2007)
 - V-Pro® steriliser vs liquid H₂O₂
 - Success vs liquid form
- Rogez-Kreuz et al. (2009)
 - STERRAD® ± various pre-treatments
 - Detergent a significant contributor
- McDonnell et al. (2013)
 - V-Pro® steriliser half/full cycle ± pre-detergent
 - Detergent + full VHP cycle effective



VHP manufacturer claims - examples

- ASP Sterrad®
 - Rogez-Kreuz et al. (2009) effectivity of STERRAD®
 - French *Protocole Standard Prion v2011*
- STERIS V-Pro®
 - Fichet (2004) efficacy of dry H₂O₂ gas
 - Fichet et al. (2007) efficacy of VHP
 - McDonnell et al. (2013) effectivity of V-Pro®



Lookback process

- Medical In Confidence letter to “contactable group”
- RMD and process traceability is essential
 - Electronic > paper-based
 - Full serialisation
- Prospective vs retrospective risk
- Destruction of implicated RMDs



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