CLEANING AND VERIFICATION TO AVOID CROSS-CONTAMINATION

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Cleaning and disinfection - definitions

- **Cleaning**
  - The removal of materials to a level where the surface appears visibly clean
  - Cleaning removes the majority of debris from a surface

- **Disinfection**
  - The application of chemicals or heat to destroy micro-organisms
  - Thermal and chemical disinfection may change the structure of any remaining organic matter to the extent where it cannot be detected via sample analysis. Important with regard to allergens, species etc..
  - Sanitisers are substances that simultaneously clean and disinfect.

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Why Clean?

- Prevent product cross-contamination by
  - Microbes
  - Other product residues (including allergens and species)
  - Chemicals
  - Non-product related foreign matter
- Legal requirements
- Brand/business protection
- Discourage Pests
- Health & Safety
- Production Efficiencies
Cleaning 101 - all cleaning involves...

The importance of each varies dependant on the type and method of clean undertaken.
Types of cleans

Risk of cross-contamination following

- Interim cleans
- Product changeover
- Daily cleans
- Periodic or deep cleans
Cleaning Methodology

Developed over time by a site and influenced by:

- Product type
- Equipment to be cleaned
- Risk assessment
- 3rd party advice
  - Species verification at 1% - currently set by FSA
- Historical issues – horse meat incident
- Customer demands – increased
Cleaning Methodology

Designed to ensure required results are achieved

- Manual cleans
- Chemical cleans
  - Foaming
  - CiP
- Mechanical cleans
  - Tray/rackwash
Manual Cleaning

Requires

- Appropriate cleaning equipment
- Appropriate cleaning chemicals
- Trained staff
- PPE
- Time
- Effort (gross debris removal, scraping, scrubbing, wiping, rinsing etc..)
Manual cleaning - equipment
Manual cleaning – Chemicals

Choose to suit

- Soil to be removed
- Equipment to be cleaned
- Occupational exposure risk to the staff using them
- Compatibility with the cleaning equipment used
- Desired level of clean
  - Detergent
  - Sanitiser
Manual cleaning – Staff

- People are a vital part of manual cleaning
- Staff should be trained in the use of the chemical and cleaning equipment to be used
- PPE – gloves, goggles, apron, as appropriate
- Conscientious - time and effort required
Manual cleaning – spread of contamination

The action of cleaning can spread contamination

Microbial counts in air after different cleaning activities (Camdpen BRI)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total viable count/m$^3$</th>
<th>Yeast and mould/m$^3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor cleaning</td>
<td>1383</td>
<td>307</td>
</tr>
<tr>
<td>Equipment cleaning</td>
<td>1192</td>
<td>318</td>
</tr>
<tr>
<td>Waste disposal</td>
<td>488</td>
<td>95</td>
</tr>
<tr>
<td>Tray washers</td>
<td>383</td>
<td>58</td>
</tr>
<tr>
<td>Non-production</td>
<td>107</td>
<td>25</td>
</tr>
</tbody>
</table>
Manual cleaning – spread of contamination

Wet cleaning

3D Water Spread For A High Pressure/Low Volume Spray
Impact At (0,0). Angle = 30 Degrees. Pressure = 90 bar.

7.0 Metres

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Vacuum cleaner

Broom

Compressed air

Flour & Compressed air

Courtesy of Campden BRI
Manual cleaning – spread of contamination

If not properly cleaned between uses, cleaning equipment can become a source and vector of contamination

Survey of cooked product areas for *Listeria monocytogenes* (Campden BRI)

- 10,000 samples
- Equipment - very low
- Floors - 17% positive
- Drains - 25%
- **Cleaning equipment - 47%**
Manual cleaning – spread of contamination

- Hygiene staff can be a source and vector of contamination
  - Microbes
  - Allergens
  - Foreign bodies
  - Species?!
# Hygiene process control - Definitions

<table>
<thead>
<tr>
<th>Validation</th>
<th>The process of checking that something satisfies a certain set of criterion</th>
<th>Will a cleaning regime “work”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verification</td>
<td>The act of reviewing, inspecting, testing, etc. to establish and document that a regime meets the requirements</td>
<td>Has a cleaning regime “worked”</td>
</tr>
<tr>
<td>Monitoring</td>
<td>Visual inspection, hand-over sheets</td>
<td>Did it happen</td>
</tr>
</tbody>
</table>
Reasons for validation and verification

- Food safety
  - Microbiological
  - Chemical
  - Physical
  - Allergenic
- Species control
- Requirement of all 3rd party food safety standards
- Cost-effective execution of the hygiene operations
- Monitoring key performance indicators (KPI’s).
Validation methods

- **Microbiological**
  - TVC
  - Species specific
  - DNA
  - ATP

- **Physical**
  - Visual
  - Colourimetric

- **Species**
  - DNA
  - ELISA

- **Chemical**
  - pH paper
  - Test kits

- **Allergen**
  - ELISA
  - Lateral flow
  - DNA (PCR)
Validation of Detergents and Disinfectants

- There are defined standards for disinfectants
  - EN1276 and EN 13697
  - Define efficacy under set criteria

- No such regime exists for detergents
  - Efficacy is dependant on many variables

- Validation is about the cleaning regime not a component part of that regime.
Validation Methods – Microbiological

- Specialist lab facilities needed
- Relies on growing the living organisms
- Several days to get results – more if you’re looking for species identification
- Generally recognised as the “Gold Standard” for this type of contamination
- Quantification method.
Validation Methods – Physical

- Relies on visual assessment of the equipment and plant
- Benefits from being a real-time assessment
- Can be undertaken readily by trained staff.
Validation Methods - Species

- DNA methods:
  - Highly sensitive – 0.1%
  - Several days to get result
  - Expensive to undertake
  - Restricted number of laboratories that can undertake the testing

- ELISA methods:
  - Sensitive to the 1% in product level
  - Lab facilities needed
  - Only viable for un-processed meats
Validation Methods - Allergen

- **ELISA (Enzyme Linked Immunosorbant Assay)**
  - Sensitive
  - Highly specific
  - Generally done in laboratories
  - Quantification method

- **DNA (PCR)**
  - Highly sensitive
  - Not looking for reactive particle
  - Susceptible to cross-contamination
  - Not recommended by UK retailers
Stages of cleaning – when to validate

- Remove Gross Debris
- Clean
- Rinse
- Inspection
- Disinfect
- Rinse

Key stages:
- Microbiological
- Allergen
- Chemical
- Visual
- Physical
- Chemical
- Allergen Species
Verification methods

- Microbiological
  - ATP

- Physical
  - Visual
  - Colourimetric

- Chemical
  - pH paper
  - Test kits

- Allergen
  - Lateral flow

- Species
  - ELISA
Verification Methods - Chemical

- Test strips can be used to test from presence of: -
  - Alkaline chemicals
  - Acidic chemicals
  - QAC based disinfectants
  - Peracetic Acid based disinfectants
  - Hypochlorite

- Gives real-time results

- Quickly and easily undertaken.
Verification Methods - Microbiological

- Micro methods cannot be utilised for verification due to the timescales involved

- Closest we’ve got is ATP technology
Verification Methods - Physical

- Relies on visual assessment of the equipment and plant
- Benefits from being a real-time assessment
- Can be undertaken readily by trained staff
Verification Methods - Species

- Factory based ELISA methods:
  - Sensitive to the 1% level in product
  - Can be used in the factory
  - Only viable for un-processed meats at the moment
  - Validated for detection of product not surface swabs
Verification Methods - Allergen

- Factory based ELISA
  - Requires lab facilities
  - Quantification method

- Lateral Flow Devices
  - Rapid, accessible & specific
  - Results in minutes
  - Cost effective
  - Easy to use
Stages of cleaning – when to verify

Remove Gross Debris

Clean

Rinse

Inspection

Disinfect

Rinse

Visual
Physical
Chemical
Allergen
Species

ATP

Chemical
Case study – species testing

- Produce a pork containing product.
- Undertake a validated clean-down.
- Produce a beef product and take first-off-the-line sample.
- Undertake on-site ELISA testing for presence of Pork.
- Provides verification that clean-down has been effective.
Case Study - Inter-product Clean Involving Allergens

- The company manufactures sandwiches for multiple retailers
- Production operatives undertake change-over cleans so a neutral detergent / disinfectant (sanitiser) is chosen:
  - Reduced operative H&S risk
  - Emulsification retains allergenic component in fat matrix
  - Additional biocidal activity
- Efficacy assessed by:
  - Visual
  - ATP
  - Rapid allergen test.
Any questions?

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