

Module 08 Lecture 03

Cleaning and disinfection

a summary

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General principles

- **The purpose of cleaning is to remove food residues and dirt**
- **The purpose of disinfection is to reduce the numbers of living microorganisms**
- **Disinfection does not usually kill bacterial spores**
- **To be effective, disinfection must be preceded by thorough cleaning**

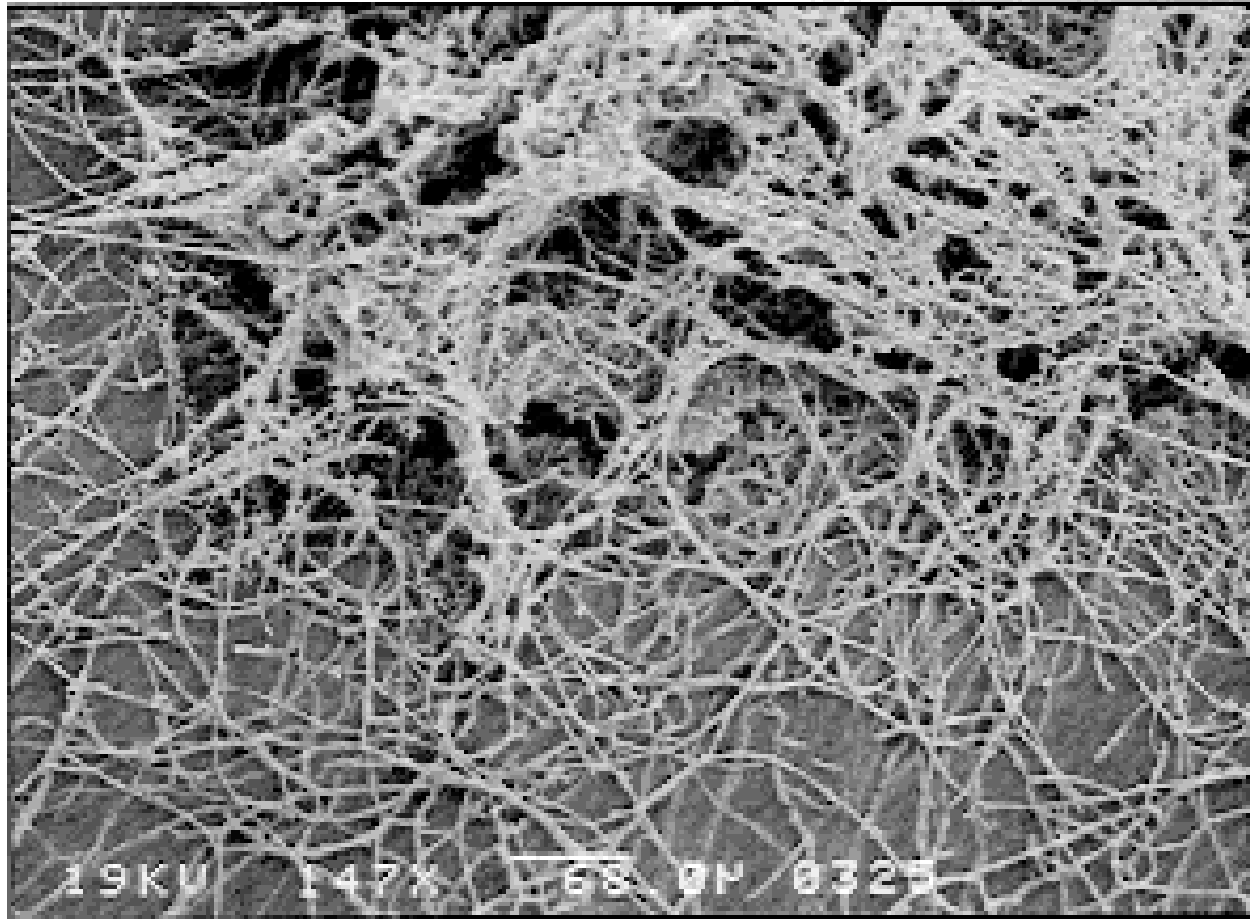
Steps in cleaning / disinfection

- **storing exposed foods to avoid chemical contamination**
- **removing gross debris**
- **rinse**
- **cleaning, usually with a detergent**
- **rinse**
- **disinfection**
- **rinsing with clean water**
- **drying**

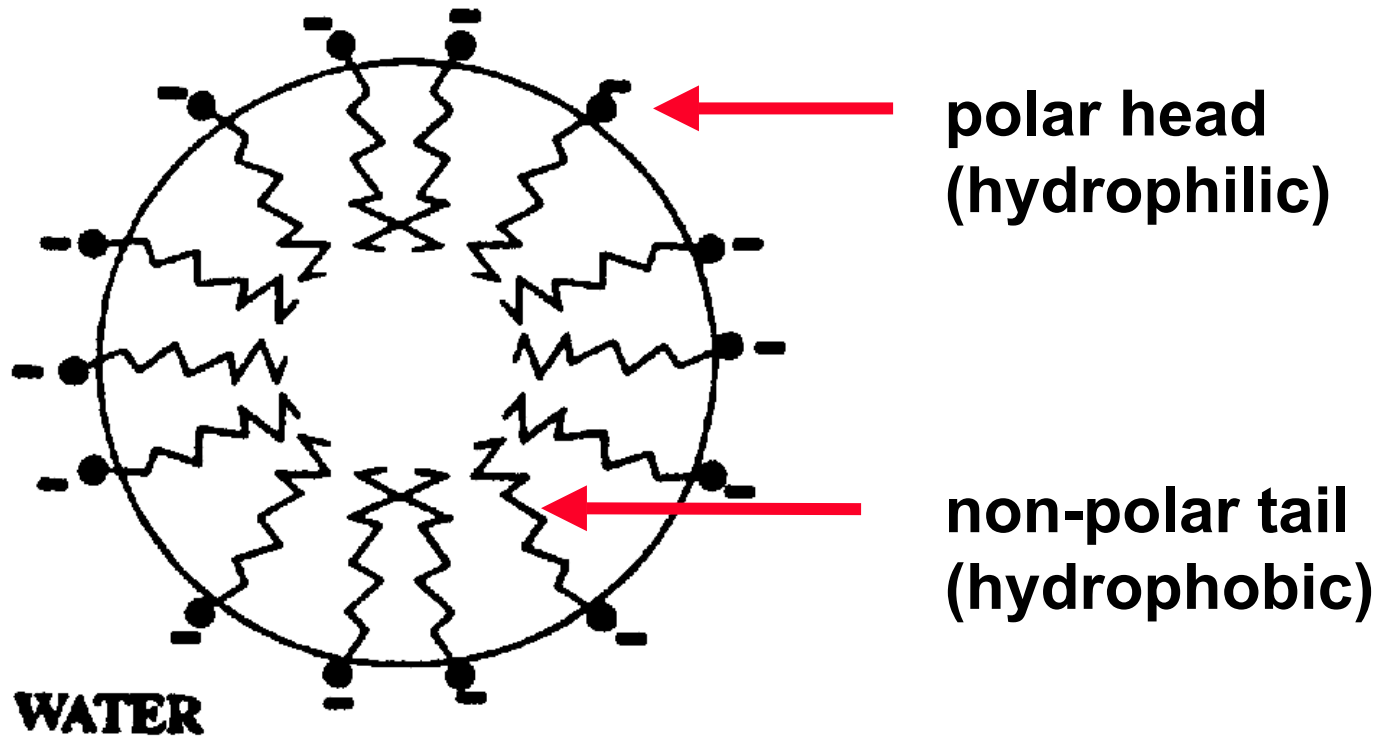
Biofilms

- **Some microorganisms produce polysaccharides**
- **Polysaccharides combine with hard water salts to create biofilms on surfaces**
- **Biofilms are tenacious and difficult to remove**
- **This problem is important for the food manufacturing industry**

Biofilms



Detergents



Detergents for use with foods

- **Alkaline (anionic) detergents are used for organic materials (soils):**
 - fats / oils
 - proteins
 - carbohydrates
- **Acidic (cationic) detergents are used for inorganic materials (soils):**
 - scale from hard water (calcium, magnesium, salts)
 - other mineral films (iron, sulphates)
 - mineral-rich food debris (milkstone)

Choice of detergent

<i>Soil</i>	<i>solubility</i>	<i>ease of removal</i>	<i>change on heating</i>	<i>best detergent</i>
protein	water insoluble	difficult	denatures, more tenacious	chlorinated alkaline
fats / oils	water insoluble	difficult	polymerisation more difficult to clean	alkaline
carbo-hydrates	water soluble	easy	caramelisation, more difficult to clean	alkaline
mineral salts	variable water insolubility	variable	generally easy	acid

Factors affecting cleaning

Time

Temperature

Detergent concentration

Mechanical action

Importance of cleaning before disinfection

Food residues

- ◆ **protect microorganisms**
- ◆ **provide nutrients for microbes**
- ◆ **reduce effectiveness of disinfectants**
- ◆ **reduce equipment efficiency (e.g. heat exchangers)**

Methods of disinfection

High Temperature

- ◆ hot water
- ◆ steam

Chemical

- ◆ halogen or oxidising (e.g. chlorine, iodine)
- ◆ surfactant or non-oxidising

Hot water

- **kills all vegetative microorganisms (and some spores)**
- **no chemical residues**
- **not corrosive**
- **gets to hard-to-reach areas**

Principles of chemical disinfection

Surfaces must be clean

A disinfectant should

- ◆ **be non-toxic to man**
- ◆ **have wide antimicrobial activity
(pathogens and spoilage organisms)**
- ◆ **kill rather than inhibit
microorganisms**
- ◆ **not taint the food or drink**

Oxidising disinfectants

- **Chlorine compounds**
 - ◆ inorganic (bleach, sodium hypochlorite)
 - ◆ salts of organic carrier (formulated to control corrosion)
 - ◆ chlorine dioxide

- **Iodine compounds**
 - ◆ iodophors

- **Ozone**
- **Peracetic acid**

Non-oxidising disinfectants

**Quarternary
ammonium compounds**

Factors affecting efficacy

- **Contact time**
- **Temperature**
- **Concentration**
- **pH**
- **Nature of “soil”**
- **Compatibility with detergents**

Rinsing and drying after cleaning / disinfection

- **Equipment and surfaces should be rinsed with potable water**
- **Air-drying is essential because microbial growth may occur in the water film**

Disinfectant selection

	Bact. phages	Small virus	Large virus	Gr. + bact.	Gr. - bact.	Spores	Yeasts	Moulds
Hot water	+	+	+	+	+	+	+	+
Active chlorine	++	++	++	++	++	+	++	+
Iodophors	+	+	++	++	++	+	++	++
Hydrogen peroxide	+	+	+	++	++	+	+	+
Peracetic acid	++	++	++	++	++	++	++	+
Quarternary ammonium compounds	-	-	++	++	+	-	++	+
Aldehydes	+	+	+	+	+	+	+	+

Cleaning protocols for the food and catering industries

Cleaning protocols are needed for

- ◆ **surfaces in contact with food**
- ◆ **utensils used with food**
- ◆ **cleaning equipment (mops, brushes, buckets)**
- ◆ **all other areas in the kitchen and canteen**

Safe use of chemicals

- **Always follow the supplier's instructions**
- **Never mix chemicals unless the supplier states that it is safe**
- **Acids and alkalis must never be mixed (exothermic reaction)**
- **Hypochlorite must never be mixed with**
 - ◆ **acids (chlorine gas released)**
 - ◆ **nitrogenous materials (may form explosive compounds)**

Pest control

Pathogens can be spread by

- ◆ **flies**
- ◆ **cockroaches**
- ◆ **rats**
- ◆ **mice**

procedures must be in place to keep them out of the food processing and handling areas

Key messages for the home

- **Surfaces / utensils must be clean to achieve satisfactory disinfection**
- **Cleaning is improved with a simple detergent**
- **Disinfection is achieved with hot water or with hypochlorite solution**
- **Cleaned surfaces and utensils must be kept dry**
- **Chemicals must be stored safely**

Key messages for the catering and food industries

- **Clean surfaces are necessary to ensure satisfactory disinfection**
- **Facilities/equipment must be adequate to do the job**
- **Efficacy of disinfectants depends on chemical composition, time and temperature**
- **Each disinfectant has unique properties**
- **Protocols must be followed for all cleaning/ disinfection activities**
- **Chemicals must be used and stored safely**
- **Cleaning should be monitored**