

TUTORIAL: KILLING MICROORGANISMS (GERMS) WITH FOAMSTREAM

Terminology

- There are many different kinds of microorganism: viruses, bacteria, fungi, algae and protozoa.
- Most microorganisms are harmless or beneficial. The small number that are harmful are called pathogens by scientists and doctors but the general public call them GERMS.
- The germs of most importance to your customers are bacteria and viruses.

How do you kill germs?

There are three ways of killing germs:

- Chemicals
- Radiation
- Heat

There are many different chemicals that are used to kill germs on surfaces, i.e. to disinfect the surface. The best known one is bleach. Key points to note about chemical disinfectants are:

- Concentrated disinfectants are dangerous to handle (think about handling household bleach in bulk).
- The efficiency of disinfection can be severely compromised if not diluted correctly (too little or too much dilution).
- They are damaging to the environment and certain kinds of surfaces.
- Killing takes longer if there is a lot of dirt present
- They are not effective against biofilms.

There are two types of radiation used to kill microorganisms. Gamma irradiation is used to sterilize hospital supplies. This can only be done in specialist facilities with very thick concrete walls to protect operatives and cannot be used in the general environment. Ultra-violet (UV) light will kill microorganisms but is very slow and it is not effective over distances more than 12 inches or in the presence of dirt.

Heat is the most effective way of killing microorganisms. There are two types of heat: dry heat (i.e. an oven) and wet heat (hot water or steam). Wet heat is much more effective than dry heat. As an example, the most heat-resistant living things are bacterial spores and to kill 100 million of them takes 15 minutes at 115°C (wet heat) or 2 hours at 160°C (dry heat). Note that there are very, very few situations where you would be required to kill bacterial spores. Key point: Foamstream uses wet heat.

Killing bacteria and viruses with heat

We use D values to describe the rate of killing of microorganisms. The D value is the time in seconds to kill 90% of the microorganisms, i.e. to reduce their number by

tenfold. Of the bacteria that your customers might encounter, the most heat resistant is one called *Enterococcus faecium*. The D values for it with wet heat are:

Temperature (°C)	D value (seconds)
55	3800
60	1150
65	347
72	65
82	6.5
92	0.65

For most bacteria and viruses, the D value is less than 1 second at 72°C and will be about 10 milliseconds at 92°C. *Key point: Foamstream operates at 98.5°C and the foam will retain this temperature for several seconds.*

Some potential applications of Foamstream

- Public places often get contaminated with animal droppings, i.e. pigeons, dogs, rats. Rats are major carriers of a vast range of disease organisms that they excrete in their urine and faeces. Foamstream can disinfect these areas, even in the presence of dirt with minimum risk to operatives.
- Public toilets could be quickly and effectively disinfected, including walls, as well as sanitary fittings.
- Street furniture (seats, waste bins, etc.) can be disinfected
- Algae and moss often disfigure brickwork and paths and make them very slippery. Chemicals and/or high-pressure washing will remove them, but may cause damage. Also, moss spores will not be killed by these treatments and will cause rapid re-growth.
- 'Deep cleaning' (whatever that means) of stations, trains, museums, etc.
- Any facilities used to house animals could be disinfected and cleaned as well as vehicles used for animal transport.