

Biological Process Engineering

Supplement 1

Table 2.5.4 p. 195

<u>Food Materials</u>	<u>Density</u>
Sugar beets (74% moisture)	1170
Maple syrup	1330

Table 2.4.1 p. 130

	<u>Temperature</u>	<u>Density</u>	<u>Viscosity</u>
Maple syrup	25	1330	1.635×10^{-1}
Corn syrup			
(72.5% solids)	26.6		1.600×10^{-1}
(77.4° Brix)	20		5.46
Honey			
(18.2% solids)	25		4.80
Sucrose solution	25		4.40×10^{-2}
(60% solids)			

Table 3.6.1 p. 392

<u>Food Materials</u>	<u>Specific heat</u>
Sugar beets	3546

Table 3.2.2 p. 628

<u>Fruits and Vegetables</u>	<u>Thermal Conductivity</u>
Sugar beets	
(-1°C)	0.54
(4 °C)	0.55
(9.4 °C)	0.52
(24 °C)	0.62
Food Materials, frozen	
Sugar beets (-13 °C)	1.16

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Table 2.5.4 Density

Natural Materials

Corneal tissue	1000 kg/m ³
Aqueous humor	1000 kg/m ³

Table 3.2.2 Thermal Conductivity

Human and animal materials

Corneal tissue	0.556 N/(°C · sec)
Aqueous humor	0.578 N/(°C · sec)

Table 3.6.1 Specific Heat

Biological Materials

Corneal tissue	3830 N·m/(kg °C)
Aqueous humor	4180 N·m/(kg °C)

Reference:

Berjano, E. J., J. Saiz, and J. M. Ferrero, 2002, Radio-Frequency Heating of the Cornea: Theoretical Model and In Vitro Experiments. IEEE Trans Biomed Engr 49:196-205.

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2.5.10 Laminar Flow Hoods

Working with tiny particles, such as virulent bacteria, can be dangerous if the particles become aerosolized and distributed through small gusts of air. Even when working within fume hoods, where fans are used to draw air from the room in which they are located, can have local regions of flow reversal where air from the hoods flows back into the room.

Common laboratory events can produce dangerous cross drafts. Opening or closing laboratory windows or doors can send air currents traveling in excess of 1 m/sec. Heating and air-conditioning vents can create exit velocities of 1.3-2.5 m/sec. Even a laboratory worker walking past at a moderate 1.3 m/sec can push a column of air ahead of herself at almost the same speed. Crossdraft velocities greater than 0.5 m/sec can suck clouds of particles out of a cabinet or hood and into the operator's face.

The solution is a laminar flow hood, where fans inside the hood blow parallel currents of filtered air in a unidirectional circulating pattern at a velocity of about 0.5 m/sec. The flow is from top to bottom at the opening, and then to the opposite side along the bottom. All the aerosols liberated inside the cabinet are plunged into grills along the workspace and sucked through a HEPA (High Efficiency Particulate Air) filter for removal. HEPA filters remove 99.97% of particles as small as 0.3 microns (0.3×10^{-6} m).

This kind of open-front workspace with laminar flow is called a Class II cabinet. For very stringent biosecurity, a Class III cabinet is required with no openings and with relatively cumbersome rubber gloves intruding into the cabinet space. Figure 2.5.15 shows the air circulation pattern for a Class III cabinet (Berlinger, 2003).

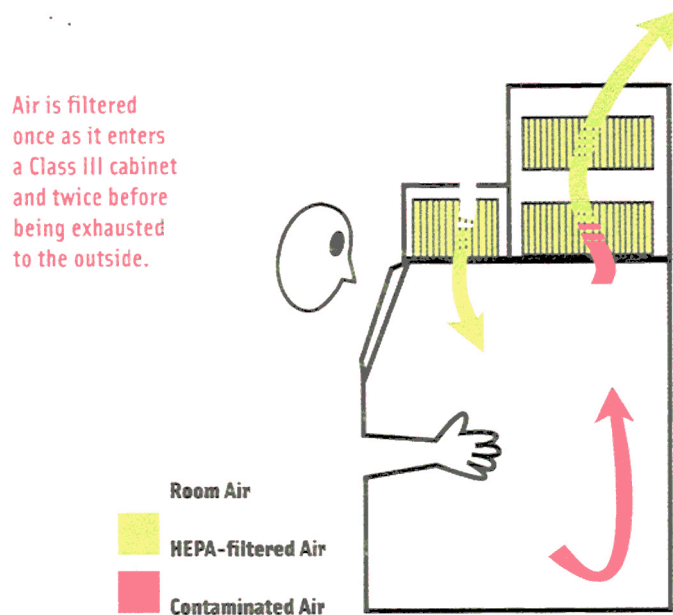


Figure 2.5.15. Air circulation inside a Class III cabinet.

Reference:

Berlinger, N. T., 2003, Why There Hasn't Been an Anthrax Outbreak, Invention & Technology 18(3): 40-45.