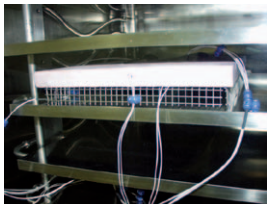
Collagen, tissue samples, thymus

Procedure (Overview)

Freezing	Solidification range, Solidification point	Container for FD	Process A / B / C *	Vacuum primary drying
pre-cooled in LN_2 or on the shelf Collagen: -45 °C	Collagen: about -35 °C, Tissue samples: -56 °C (contain $CaCl_2$)	special dishes, Special formats (L x W, indentation)	A and C	$T_{ICE} = T_{EP}$ -10 °C $p_{HT} = f(T_{ICE})$ → ice pressure curve = 0.070 mbar to 0.0047 mbar

Temp. of the shelves during primary drying (T_{SF}/t)	Duration of primary drying	Vacuum for secondary drying
-30 °C / 5 h, increasing first by 5 °C every 5 h (5–6 x), then reduce the time interval to 2 h	36 h	necessary to remove capillary water, lowest pressure of pump (10^{-3} mbar)



Collagen plate during test drying

Special features

- Rate of refrigeration ≥ 1 °C / min
- Avoid damage to cell walls with non-freezing mixture (cryo protectants, displace water in the cell wall and prevent denaturation)
- Only heat moderately so that cells do not defrost and burst

Short description of market

Uses of the freeze-dried products

- Collagen for skin cosmetics (moisturiser, cell rejuvenation)
- Cell tissue, bone, arteries, scalp tissue, or aorta valves for transplantation can be lyophilised

Typical users

- Doctors, clinics, increasingly also beauty farms