

# HISTORICAL REVIEW OF EXTRACORPOREAL ORGAN SUPPORT TECHNOLOGIES.

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**1)Objective:** To provide a concise review on the historical development of extracorporeal organ support.

**2)Method.** Electronic literature reviews on the historical development of of extracorporeal organ support

**3) Results:** Extracorporeal organ support was developed in order to support of a failing organ until recovery or transplantation: Dialysis was initially developed to keep patients with AKI alive until the kidneys could recover. Extracorporeal Membrane Oxygenation (ECMO) to keep a patient alive during times of profound cardiopulmonary collapse, and extracorporeal liver support to support patients with liver failure. (1)

- 1860; Animal model injecting oxygen to the blood stream through a syringe directly to right heart. (2-4)
1861. The term "dialysis" to describe the separation of crystalloid/colloid according its diffusion mobility through a septum of gelatinous matter'. (3,4)
- 1920 . Animal model Total body perfusion using excised donor lungs with isolation of the heart. (5)
- 1912, 'vidivdiffusion' apparatus, conformed a by semi-permeable colloidon (cellulose nitrate) tubes contained within a glass jacket filled with saline dialysate and hirudinated blood. (6)
- 1930s, Freestanding roller pump device for extracorporeal support.
1953. First successful extracorporeally assisted repair of an atrial septal defect . (3, 4)
1956. Use of haemodialysis to treat hepatic encephalopathy . (8)
- 1960s. Charcoal haemoperfusion ;effective in removing large molecules in the 500–5000 kDa.(9).
1972. First successful cannulation and prolonged extracorporeal circuit use.
1976. Use of polyacrylonitrile allowed the removal of higher molecular weight (up to 15 000 Da.)
- 1990's. High-flux polysulfone dialyzer impregnated with albumin for the removal of albumin-bound molecules.,(10) Single-Pass Albumin Dialysis
- 1999, Fractionated plasma separation and adsorption (FPSA). (11, 12)
- 2000's, Prometheus system; removal of both albumin-bound and water-soluble toxins (7) (9) (13-15)

This historical goals are a part of a complex multidisciplinary approach that has been needed to achieve functional vascular access, biocompatible circuit lines, long term patent, controlled and measurable blood flow and biocompatible and specific hemofilters.

**4)Conclusion:** Having a historical perspective on the physiological and technological challenges that needed to be overcome in order to achieve successful extracorporeal life support provides an initial step on understanding the actual technologies used for ECOS and the future perspectives in technological development.

## TIMELINE

	1850-1880	1900	1920	1940	1960	1980	2000	2020
Vascular access (16).	Direct oxygen injection (syringe). IV fluids administration.		Glass cannulae Artery-to-vein surgical cutdowns.	Metal trocars. Artery to-vein Vessel puncture.	Subclavian vein cannulation.	External and internal jugular vein cannulation.		
Blood flow	Hand operated roller pump. (19)	Double roller pump. Hirudinated blood.	Roller pump device. Total body perfusion. Electrically powered roller pump.		Centrifugal blood pumps.	Axial flow pumps	Regional citrate/ heparin protocols to avoid circuit coagulation. (18)	
Hemofilters.	Term "Dialysis" first used.		Collodion membrane	Rotating Drum kidney. Cellophane and Dyalysate use	Bubble oxygenator (1954). Charcoal hemoperfusion	Polyacrylonitrile	High-flux polysulfone. Endotoxin removal: (17) Polymyxin-B. Prometheus system	

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