Dialysis Devices: A Photographic History of Progress

Vern Taaffe – © 2011 Delivered at NANT 2011 National Symposium
Dialysis Devices Reviewed

• Dialyzers
• Delivery Systems and Dialysis Machines
• Devices Used with Delivery Systems
• Concentrate Mixing Systems
• Reprocessing Systems & Germicides
• Primary Water Treatment Devices
Dr. Willem Kolff

Inventor of the Artificial Kidney

Dr. Kolff and George Rovegno

ca. 1991
Original (First) Dialyzers

Kolff Rotating Drum,  
**ca. 1943**

Skeggs Leonards Plate,  
**ca. 1948**

*Photos shown here are courtesy of Home Dialysis Central*
Second Generation Dialyzers

Travenol-Kolff Coil,
ca. 1956

Kiil Plate Dialyzer,
ca. 1960
Third Generation Dialyzers

Stewart Capillary

Cordis Dow CDAKs

First Hollow Fiber Dialyzers, ca. 1964-1967
Evolution of Plate Dialyzers

Gambro Plate Dialyzers, *ca.* 1967-1979
Evolution of Coil Dialyzers

Travenol

Extracorporeal

Coil Dialyzers, ca. 1977-1978
Evolution of Hollow Fiber Dialyzers

Asahi AM Series

Travenol CF Series

Terumo Clirans Series

HF Dialyzers, ca. 1977+
Evolution of Hollow Fiber Dialyzers

Baxter CA170 High Efficiency
Baxter CT190G High Flux
FMC F80 High Flux

HF Dialyzers, ca. 1985+
Evolution of Hollow Fiber Dialyzers

Gambro Revaclear  
Baxter Xenium  
FMC Optiflux

Hollow Fiber Dialyzers, *ca.* 2000+
Manufacturing Related Patient Disaster

53 Sudden Patient Deaths

Althin/Baxter A, AF, AX Series

Perfluorocarbon Leak Test Agent Caused Gas/Foam Embolisms

Autumn of 2001
Early Dialysis Machines

Travenol RSP

Drake-Willock 4002

Dialysate Delivery Systems, ca. mid-1960s+
Early Dialysis Machines

Milton Roy Dialysate Delivery Systems
ca. 1964+
Devices Used with Delivery Systems

- Blood Pump
- Dialysate Conductivity Meter
- Air Detector

*Photo credit: W. Carlson - Minntech*
Dialysis Machine Evolution

Cobe C2/C2 RX

Extracorporeal SPS and Tri-Ex Dialyzer

ca. 1978+
Dialysis Machine Evolution

Cordis Dow Seratron
ca. 1979

Gambro AK-10
ca. 1977

FMC 2008A
ca. 1984
Dialysis Machine Evolution

Baxter 550

Baxter 1550

ca. 1987+

FMC 2008E
Dialysis Machine Evolution

Cobe C3  Hospal Integra  Braun HD-secura

First “Screen” Machines, ca. 1986+
Dialysis Machine Evolution

Drake-Willock System 1000  
*ca. 1991+

Althin Tina System 1000  
*ca. 1997+

Drake/Althin/Baxter
Dialysis Machine Evolution

Meridian
ca. 2000+

Aurora
ca. 2002+

Arena
ca. 2003+

Baxter
Dialysis Machine Evolution

FMC 2008K  Braun Dialog+  Gambro Phoenix

Prevalent in USA in 2010
Dialysis Machine Evolution

FMC 2008T

Fresenius in USA in 2011+
Dialysis Machine Evolution

Braun Dialog Plus w/ Adimea System
For Continuous Monitoring of Dialysis Dose

Beginning of Rx  Middle of Rx  End of Rx

B. Braun in USA in 2011+
Concentrate Mixing Systems

Minntech Renapak  
ca. 1989+

Renapak 2  
ca. 2000+

Rockwell CMS  
ca. 2000+
Reprocessing Systems

Too time consuming and expensive to rebuild.

Kiils Were Manually Reprocessed
Reprocessing Systems Evolution

Manual Reuse System

Designed for use with hollow fiber dialyzers.
Reprocessing Systems Evolution

Lixivitron

ca. 1979+

System was leased rather than purchased outright.

First Fully Automated System
Reprocessing Systems Evolution

Mesa Echo

Renal Systems Renatron

Seratronics DRS-4

Automated Systems, *ca.* Early 1980s+
Reprocessing Systems Evolution

Mesa Echo & DMS

Renal Systems Renatron II & Renalog DMS

Seratronics DRS-4 & DMS

ca. early 1990s+
Reprocessing Systems Evolution

Alcavis ARM

HDC Maky

ca. early 2000s+
Reprocessing Systems Evolution

ca. 2005+
Not Established in U.S.A.
Reprocessing Germicide Evolution (U.S.A.)

- Formaldehyde
- Puristeril
- Peracidin
- Glutaraldehyde
- Renalin
- Micro-X

PAAs
A Few Reprocessing Veterans

ca. 1989
A Few Reprocessing Veterans

c. 1992

c. 2000
Primary Water Treatment Devices

Deionization Systems
Primary Water Treatment Devices

Osmonics 19C
ca. 1970s+

GEM Water
ca. 1980s+

Reverse Osmosis Systems

Also: Millipore, Medro, etc. ca. 1980s+
Primary Water Treatment Devices

Osmonics/Mar Cor 23G  
*ca. 1994*+

Reverse Osmosis Systems

Mar Cor M4 series  
*ca. 1996*+
Primary Water Treatment Devices

Biopure/Mar Cor 4400
ca. 1996+

Zyza/Mar Cor V/Z
ca. 1997+

Reverse Osmosis Systems
Primary Water Treatment Devices

Gambro WRO series
ca. 1998+

US Filter Med-RO
ca. 1998+

Reverse Osmosis Systems
Primary Water Treatment Devices

Isopure MD440 & 470 Dual
ca. 2000+

Better Water Matrix
ca. 2005+

Reverse Osmosis Systems
Clinical & Technical Support Personnel:

A Very Important Part of Dialysis, Past, Present & Future!