



# 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**

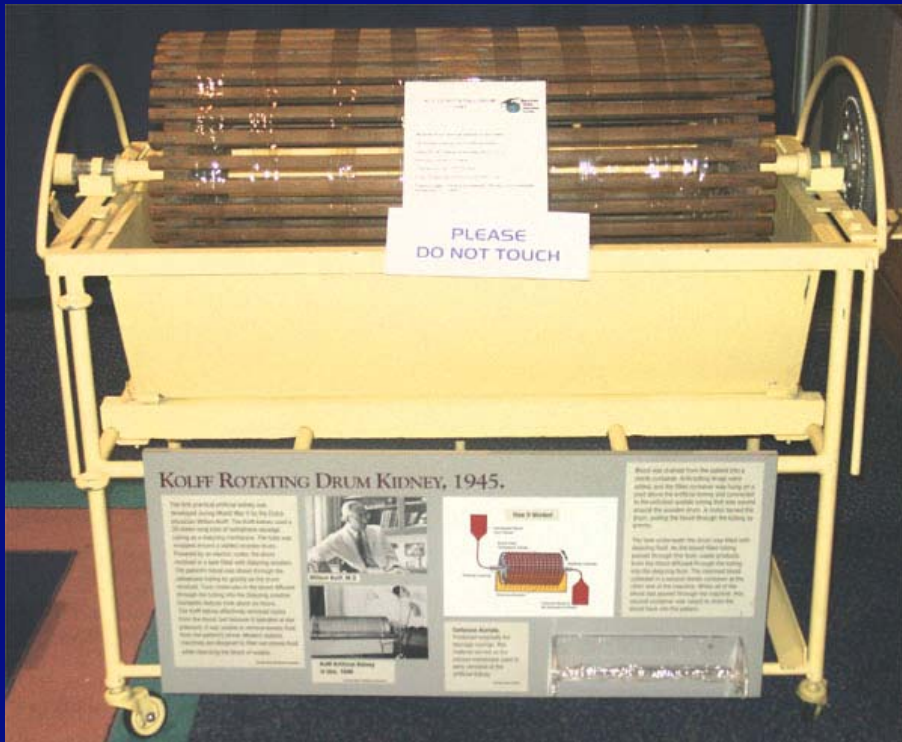
# Dr. Willem Kolff

*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



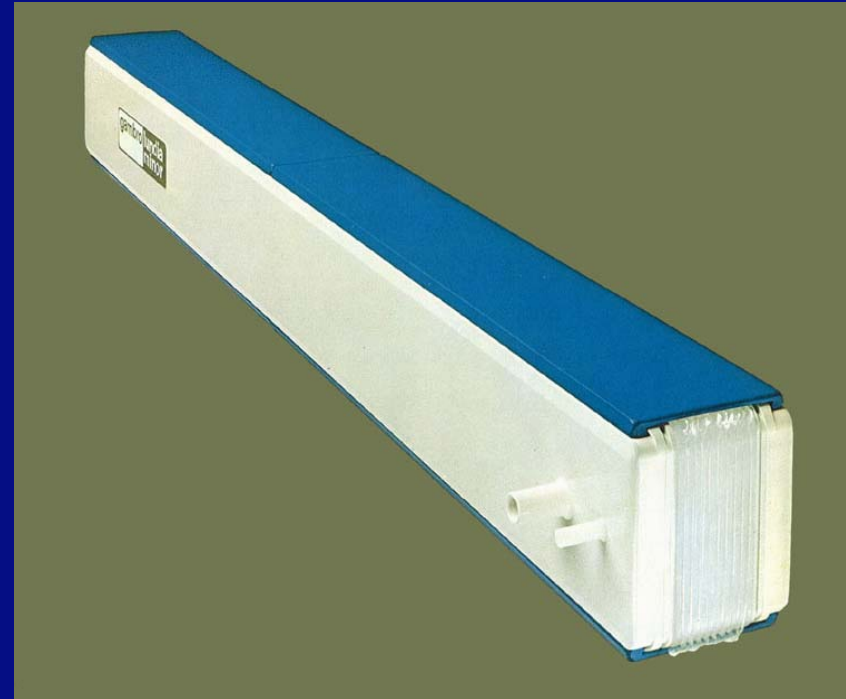
**Stewart Capillary**



**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**

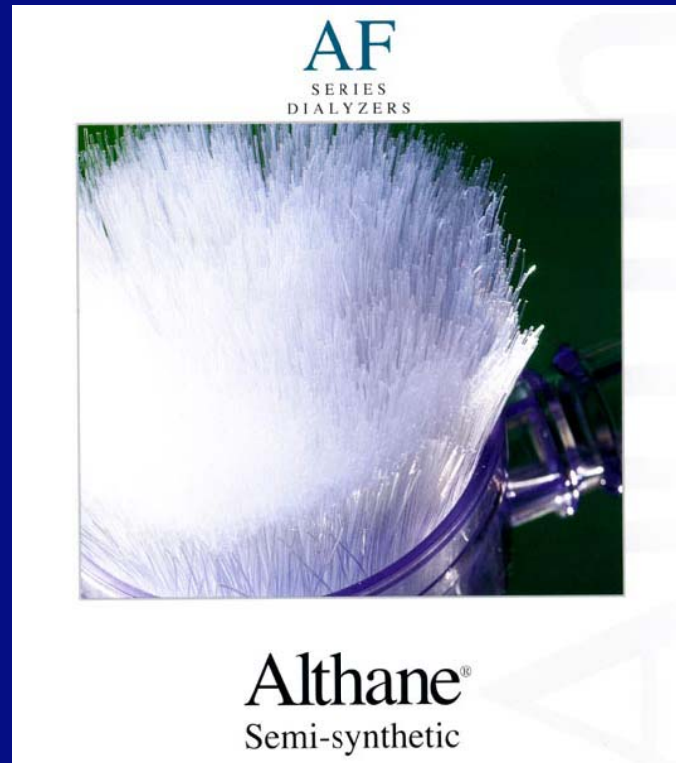


**FMC Optiflux**

**Hollow Fiber Dialyzers, *ca.* 2000+**

# Manufacturing Related Patient Disaster

*53  
Sudden  
Patient  
Deaths*



*Autumn of  
2001*

**Althin/Baxter A, AF, AX Series**

**Perfluorocarbon Leak Test Agent  
Caused Gas/Foam Embolisms**

# Early Dialysis Machines



**Travenol RSP**

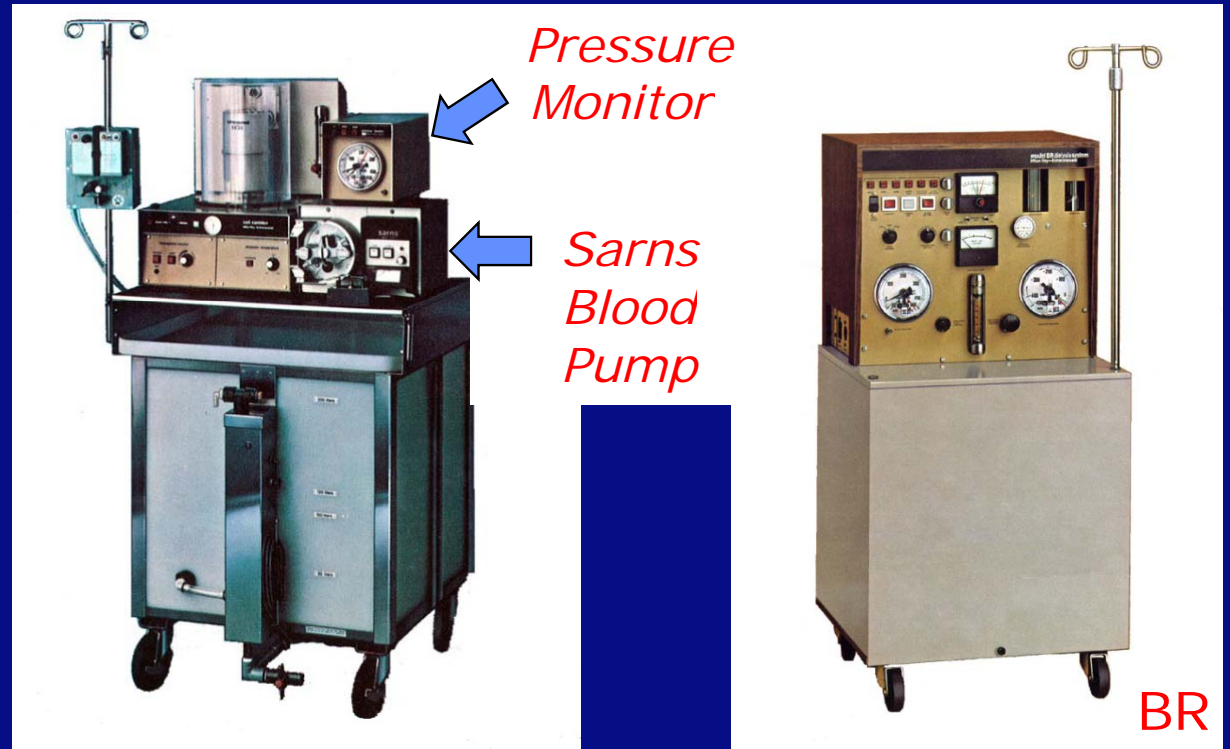


**Drake-Willock 4002**

**Dialysate Delivery Systems,  
*ca.* mid-1960s+**



# Early Dialysis Machines



**Milton Roy Dialysate Delivery Systems**  
*ca. 1964+*



# Devices Used with Delivery Systems



**Blood Pump**

*ca. 1975+*



**Dialysate  
Conductivity  
Meter**



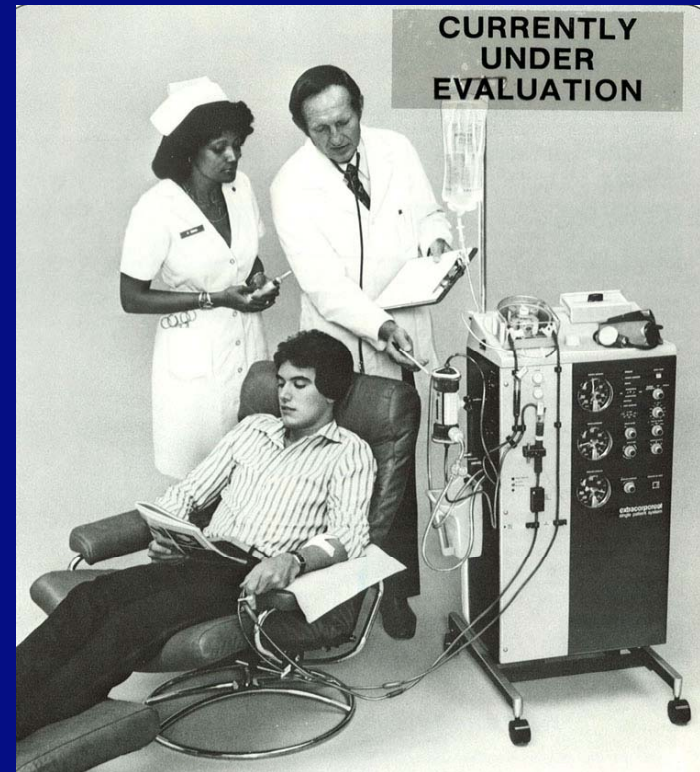
**Air Detector**

*Photo credit: W. Carlson - Minntech*

# Dialysis Machine Evolution



**Cobe C2/C2 RX**



**Extracorporeal SPS  
and Tri-Ex Dialyzer**

*ca. 1978+*

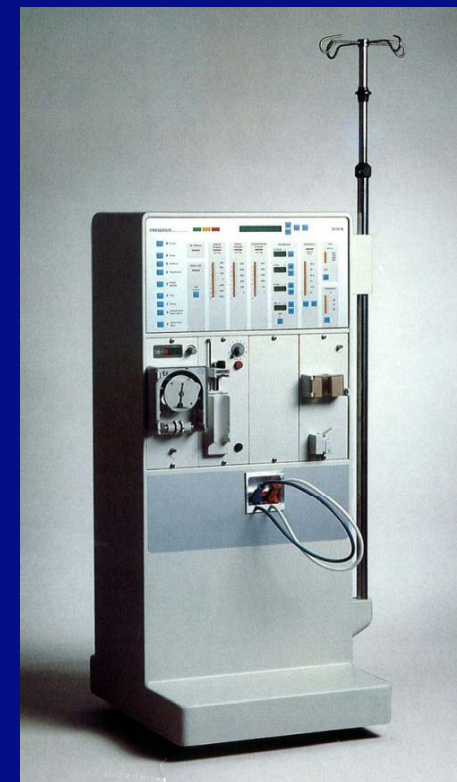
# Dialysis Machine Evolution



**Cordis Dow Seratron**  
*ca. 1979*



**Gambro AK-10**  
*ca. 1977*



**FMC 2008A**  
*ca. 1984*



# Dialysis Machine Evolution

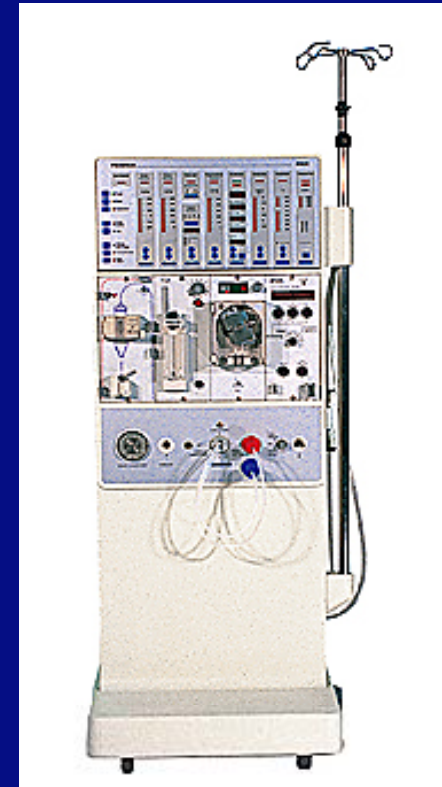


**Baxter 550**



**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

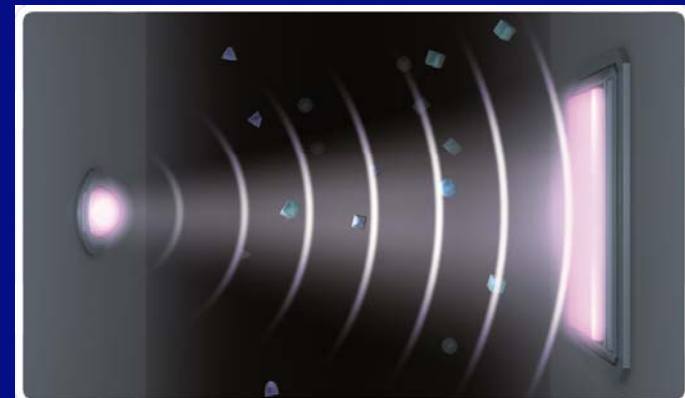
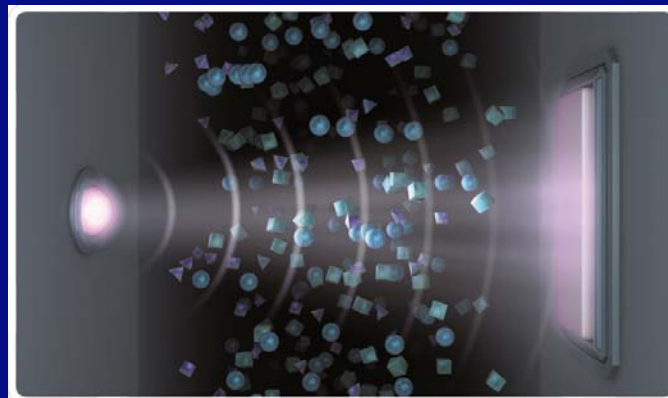
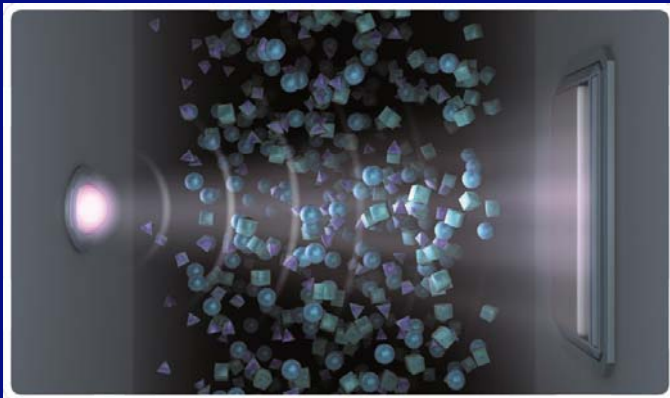
*Braun Dialog Plus w/ Adimea System  
For Continuous Monitoring of Dialysis Dose*



**Beginning of Rx**

**Middle of Rx**

**End of Rx**



**B. Braun in USA in 2011+**

# Concentrate Mixing Systems



**Minntech Renapak**  
*ca. 1989+*

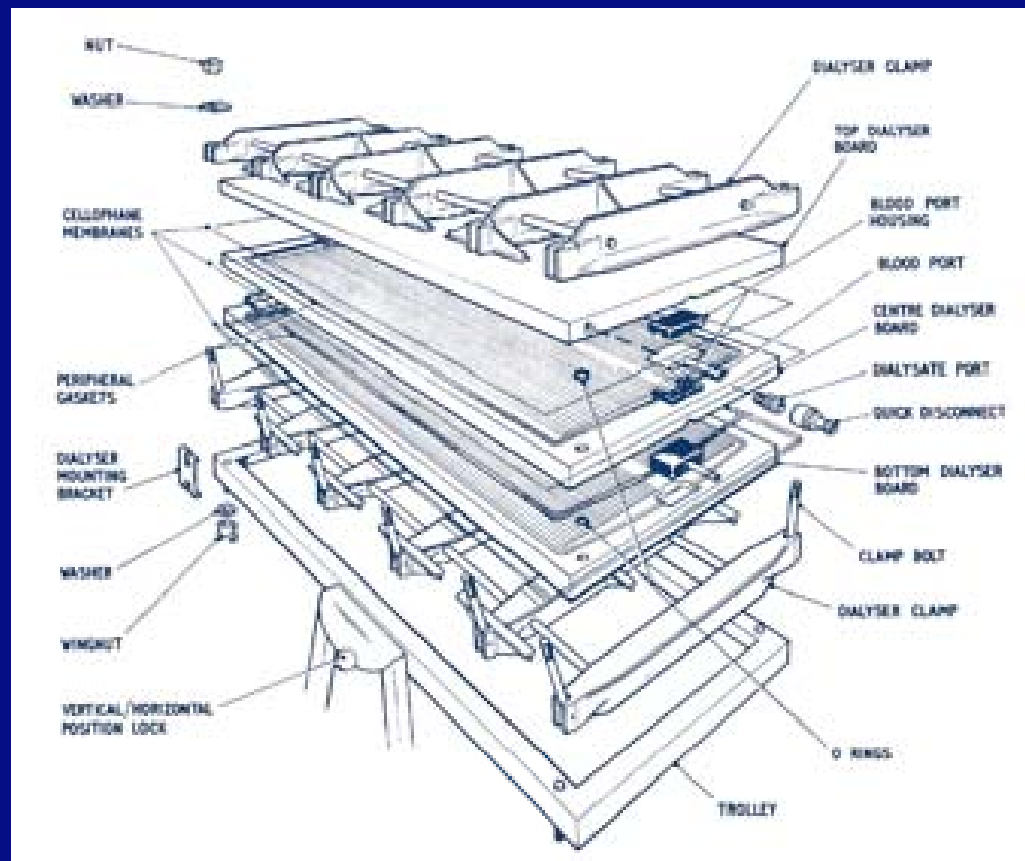


**Renapak 2**  
*ca. 2000+*



**Rockwell CMS**  
*ca. 2000+*

# Reprocessing Systems



**Too time consuming and expensive to rebuild.**

**Kiils Were Manually Reprocessed**



# Reprocessing Systems Evolution



**Designed  
for use with  
hollow fiber  
dialyzers.**

**Manual Reuse System**

# 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**

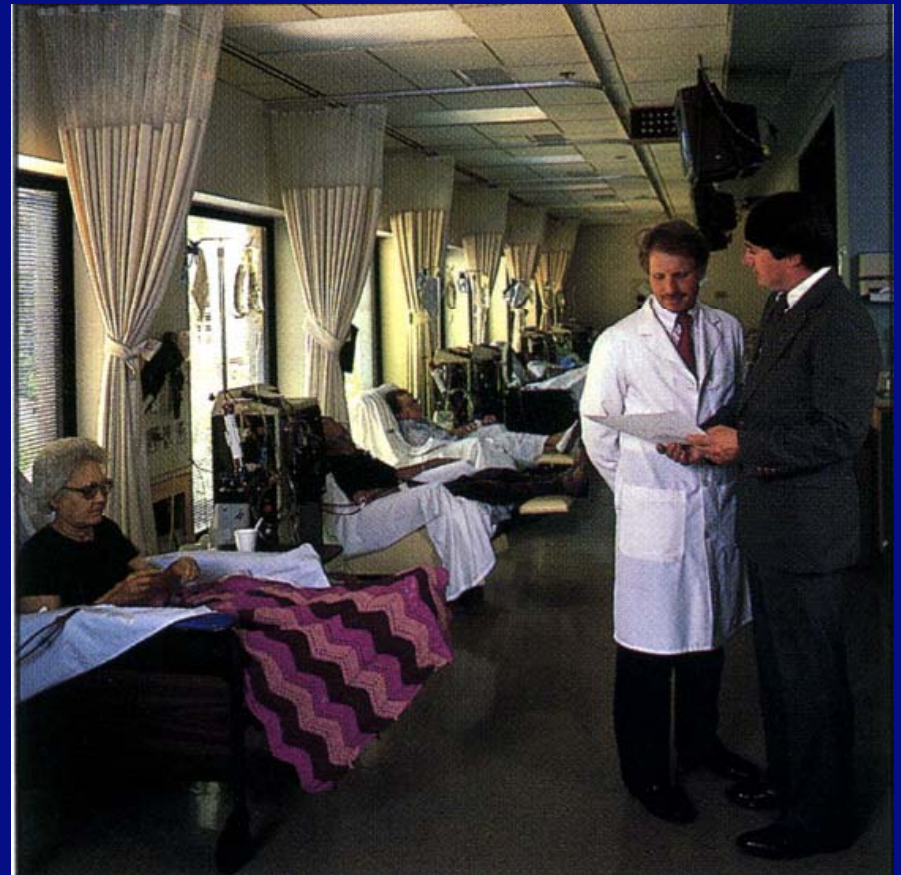


*PAAs*



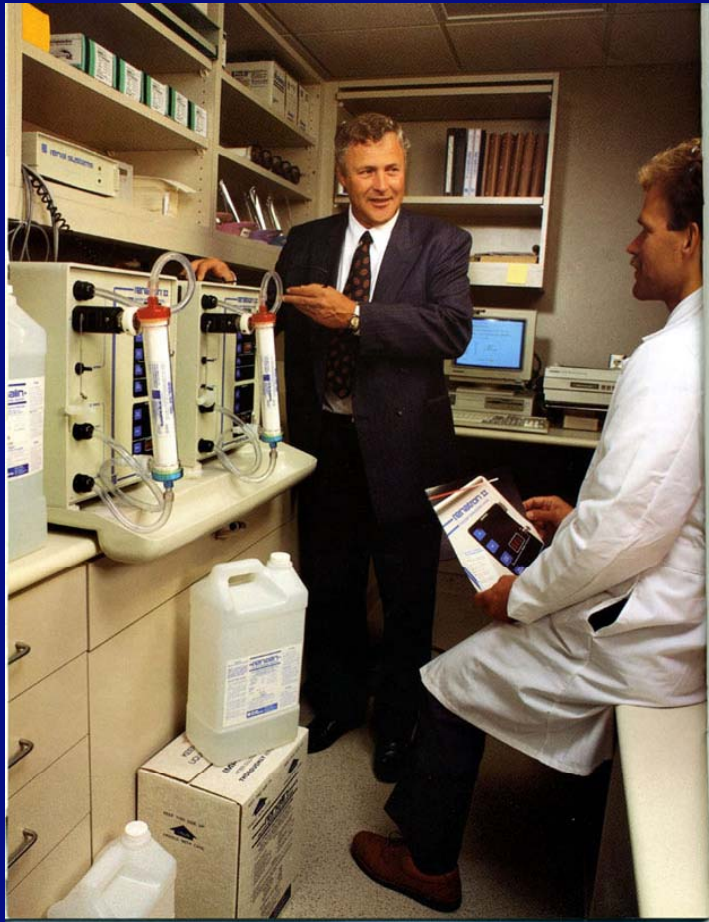
**Micro-X**

# A Few Reprocessing Veterans

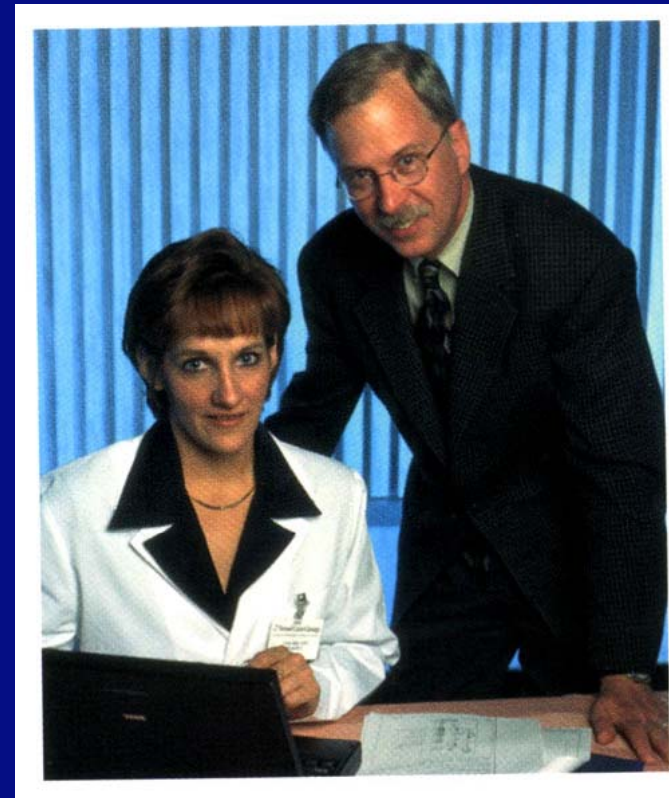


*ca. 1989*

# A Few Reprocessing Veterans



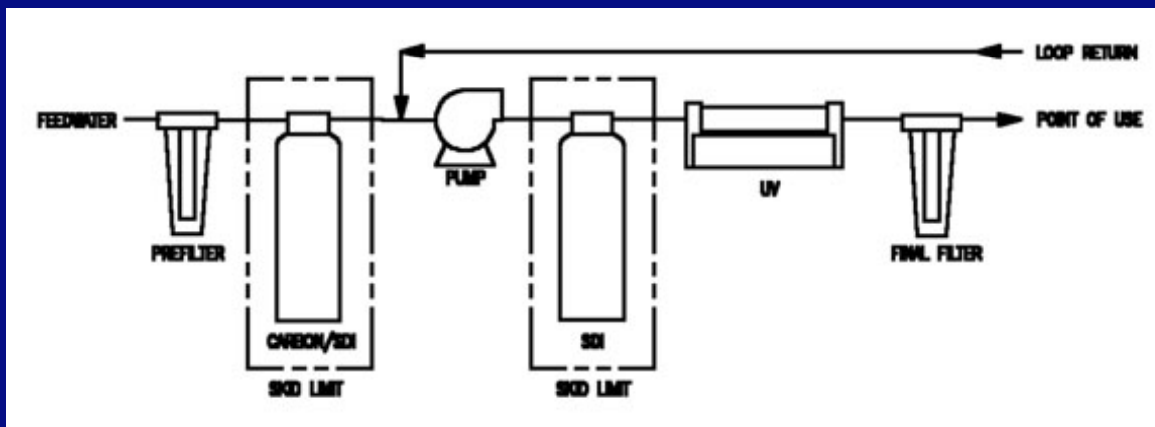
*ca. 1992*



*ca. 2000*



# Primary Water Treatment Devices



## Deionization Systems

# Primary Water Treatment Devices



**Osmonics 19C**  
*ca. 1970s+*



**GEM Water**  
*ca. 1980s+*

*Also:  
Millipore,  
Medro,  
etc.  
ca.  
1980s+*

**Reverse Osmosis Systems**



# Primary Water Treatment Devices



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



**Mar Cor M4 series**  
*ca. 1996+*

**Reverse Osmosis Systems**

# 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!

