ReNews®
A publication on dialyzer reprocessing
volume 11, 2007


...in this issue



# A Tale of Two Dialyzers

Your decision to utilize hollow fiber hemodialyzers just one time or to reprocess them is quite important and requires the evaluation of many factors. First and foremost are patient outcomes. Next come the economics. Lastly, two factors that remain largely overlooked are the conservation of non-renewable resources and the significant negative environmental impact created by the disposal of single-use dialyzers.

The reprocessing of hemodialyzers has been debated for many years, but yet continues to be an extremely viable practice from both the standpoint of patient outcomes and of economics.[1] Supporting this premise, a major US dialysis provider that re-uses dialyzers in the majority of its units consistently reports not only the highest levels of patients outcomes, but also excellent financial performance.

The life cycle of single-use and multiple-use dialyzers begins the same, but soon take dramatically different paths. From the prospective of the dialysis unit, the useful life of a single-use dialyzer seems pretty short and sweet. The dialyzer is used only once and then discarded as bio-hazardous medical waste. At first glance, what could be easier and better? However, upon closer inspection, one finds the manufacture of 15 single-use dialyzers consumes 14 times the amount of non-renewable resources than that of one multiple-use dialyzer that is used at least 15 times. Unfortunately, all dialyzers have a lifespan that far exceeds their short journey from the manufacturer to patient use, and have consequences that extend far beyond just placing the used dialyzer in the bio-hazardous "Red Bag" medical waste at the dialysis unit. The Red Bag medical waste must be collected by licensed bio-hazardous medical waste disposal companies. The Red Bags are then often transported out of state to be processed in order to render their contents non-infectious (e.g., by incineration, microwaving, autoclaving), and finally sent to a landfill for disposal. None of these remediation choices are without consequences.

The incineration of bio-hazardous medical waste produces a sterile end product, and reduces the volume of waste. However, this process itself consumes a significant amount of non-renewable resources, is expensive to operate and creates considerable concern about the health effects from

continued on page 2

## Life of single-use dialyzers

**Step 1** Oil extracted and converted to resin

**Step 2** Dialyzers are manufactured

**Step 3** Dialyzers are used by patients

**Step 4** Dialyzers are discarded as bio-hazardous medical waste

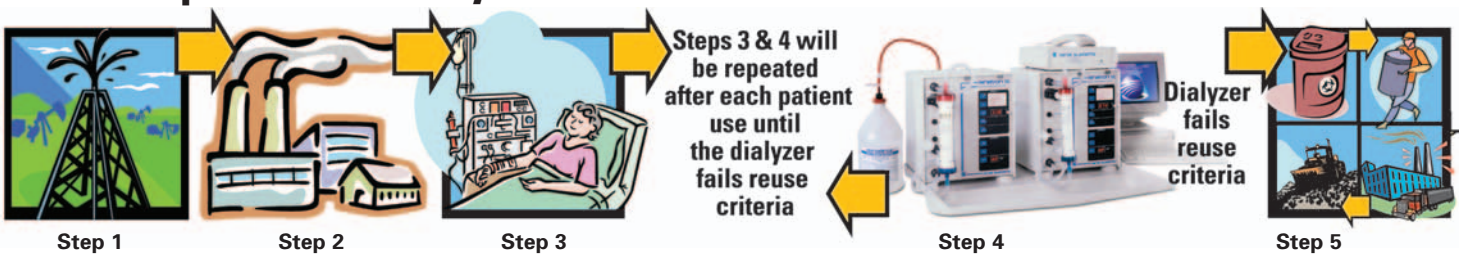
**Step 5** Dialyzers are picked up by a licensed bio-hazardous waste hauler

**Step 6** Dialyzers are transported by licensed hauler to a medical waste processing facility

**Step 7** Dialyzers, after being rendered non-infectious, are placed in a landfill

MINNTECH® renal systems

# Life of reprocessed dialyzers




**Step 1** Oil extracted and converted to resin

**Step 2** Dialyzers are manufactured

**Step 3** Dialyzers are used by patients

**Step 4** Dialyzers are cleaned, tested and filled with Renalin solution

**Step 5** Dialyzers are transported to a medical waste processing facility and after being rendered non-infectious, are placed in a landfill

emissions and the ash that is produced in the communities where the incinerators are located.[2] Microwaving or auto-claving renders bio-hazardous waste non-infectious and does not produce emissions like incineration, but the process does nothing to reduce the amount of waste products disposed of in a landfill. Each landfill site has a limited capacity, and we continue to generate an ever-increasing amount of waste. At the current rate of solid waste generation, "the land required to accept waste generated by a community of 10,000 people in a single year is a one-acre area containing an eight-foot-deep pile of refuse."[3] New landfill sites must meet stringent geological, environmental, engineering and governmental specifications, which will most likely lead to increased disposal costs. Run-off from waste leachate (liquid produced in landfills) can leak from the containment liners into the ground and water supply. Containment liners consist of a layer of compacted clay and possibly one or more layers of an impermeable membrane, such as a high-density polyethylene. "Even the best liner and leachate collection system will ultimately fail due to natural deterioration… while corrective action may have already been triggered at many facilities, 30 years may be insufficient to detect releases at other landfills."[4] Modern landfills are not designed to break down waste, but instead to contain waste. "Biologically and chemically, a landfill is much more static than we commonly suppose. For some kinds of organic garbage, biodegradation goes on for a while and then slows to a virtual standstill. For other kinds, biodegradation never gets under way at all."[5] The materials used to construct dialyzers and the design of modern landfills leads to the conclusion that dialyzers placed in landfills will stay intact forever.

In one year alone, the re-use of all dialyzers would eliminate the non-renewable resource requirement for the production of up to 46,410,000 dialyzers, and over the next ten years, would reduce landfill waste by over 3/4 of a billion pounds.

## Is there a better way? Yes indeed!!

Dialyzers reprocessed on the Renatron® II Dialyzer Reprocessing System using Renalin®/Renalin® 100 Cold Sterilant solution follow the same first three steps as that of single-use dialyzers. However, in Step 4, instead of being disposed of as bio-hazardous medical waste and ending up in a landfill, dialyzers are reprocessed so that their useful life may be continued. After patient treatment the multiple-use dialyzer is cleaned, tested, filled with Renalin solution, sterilized during storage, rinsed and then used again by the same patient.

Dialyzers may be re-used only if they pass a fully automated and very stringent reprocessing protocol. Renalin/Renalin 100 Cold Sterilant byproducts degrade quickly and do not harm the environment.[6] When dialyzers reach the end of their useful life, they are handled and disposed of just like single-use dialyzers.

The re-use of dialyzers not only contributes to excellent patient outcomes, saves the center between $4.00 and $6.00 per treatment,[7] but also is much more beneficial from an environmental standpoint.

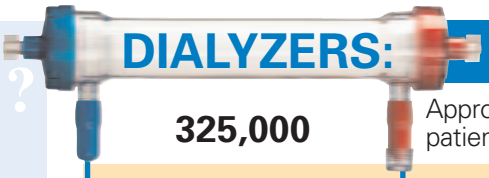
[1] ReNews Volume 7, 2005 Reprocessing: Valid and Viable
[2] What's Wrong With Incineration? Going Green: A Resource Kit for Pollution Prevention in Health Care; retrieved on 9/14/06 from *http://www.noharm.org/details.cfm?type=document&id=588*
[3] Hughes KL, Christy AD, Heimlich JE. Landfills: Science and Engineering Aspects. Retrieved on 9/14/06 from *http://ohioline.osu.edu/cd-fact/pdf/0137.pdf*
[4] Retrieved on 9/14/06 from *http://www.zerowasteamerica.org/Landfills.htm*
[5] William R, Cullen M, Five Major Myths About Garbage and Why They're Wrong. *Smithsonian, July 1992:* Retrieved on 7/13/06 from *http://www.plasticsresource.com/s plasticsresource/doc.asp?TRACKID=&CID=175&DID=487*
[6] Renalin 100 Cold Sterilant Concentrate IFU, page 6
[7] Parks MS, Reuse: Is It Right For Your Facility? Nephrol News, Issues 17:6 72-75, 2003

## Q&A ? ? ? ? ? ?

**Question:**
**Since the incineration of the components of dialyzers can lead to the production of extremely toxic dioxin, used hemodialyzers are increasingly being sent to landfills. Approximately how long does the polycarbonate casing, the urethane potting material and the synthetic fibers take to biodegrade?**

"When compared to human lifespans, the stability of the materials in hemodialyzers is essentially forever. The polycarbonate case will decompose very slowly if left on its own. Polycarbonate is usually rated as not hazardous (under current EPA regulations). However, additives used in polycarbonates such as bisphenol-A have been found in leachates from landfills (particularly those in organic rich sites). Polysulfone is relatively inert, being highly resistant to acids, alkali, concentrated electrolytes, oxidizers, surfactants and oils. It is also very resistant to compaction, and is resistant to high temperatures. In general, it is unlikely that polysulfone will break down significantly in a landfill in a time less than centuries. Urethane decomposition is faster than polycarbonate or polysulfone, but decays slower in clay soils

continued on page 5



## DIALYZERS: BY THE NUMBERS

| | |
|---|---|
| **325,000** | Approximate number of chronic hemodialysis patients in the U.S. |
| **153** | Number of treatments per year for the average chronic hemodialysis patient. |
| **49,725,000** | Number of single-use dialyzers that would be needed to treat all chronic hemodialysis patients in the U.S. for one year. |
| **$472,387,500** | Approximate dollar amount of sales, this year alone, which would be generated by hemodialyzer manufacturers if all patients in the U.S. were treated using single-use dialyzers at $9.50/dialyzer |
| **$59,670,000** | Approximate dollar amount of sales, this year alone, which would be generated by hemodialyzer manufacturers if all patients in the U.S. were treated using multiple-use dialyzers at $18.00/dialyzer. (Re-use average 15) |
| **$412,717,500** | Approximate dollar savings in dialyzer purchases, this year alone, if all patients in the U.S. were treated using multiple-use dialyzers. |
| **1.25** | Approximate weight, in pounds, of a single-use hemodialyzer before it is thrown away as medical waste |
| **62,156,250** | Amount of medical waste, in pounds, that single-use would generate in the U.S. in one year. |
| **2,728,137,859** | The approximate number of dialyzers (at a 6% annual growth rate) sitting in the ground, or being incinerated, in the U.S. by the year 2030 if we eliminated reuse. |
| **1/2 of FOREVER** | The half-life of a synthetic fiber single-use dialyzer discarded in a landfill. |
| **100%** | Percentage of a synthetic fiber hemodialyzer's components that come from oil. |
| **$25.71** | 2002 average annual crude oil price/barrel, in 2006 dollars. |
| **$40.42** | 2004 average annual crude oil price/barrel, in 2006 dollars. |
| **$78.40** | June 13, 2006: Record price, thus far, per barrel of oil. |
| **?** | Future price of an oil-based single-use hemodialyzer, taking into account an unknown increase in the price of a barrel of oil. |

MINNTECH® renal systems

ReNews
A publication on dialyzer reprocessing

# The Environmental Three R's


"Every year, Americans throw away 50 billion food and drink cans, 27 billion glass bottles and jars, and 65 million plastic and metal jar and can covers. More than 30% of our waste is packaging materials. Where does it all go? Some 85% of our garbage is sent to a dump or landfill, where it can take from 100 to 400 years for things like cloth and aluminum to decompose. Glass has been found in perfect condition after 4,000 years in the earth! We are quickly running out of space. It's time to learn the three R's of the environment: Reduce, Reuse, Recycle."[1]

## Reduce

"The United States Environmental Protection Agency (US EPA) defines source reduction as reducing the amount and or toxicity of waste before it is ever generated. This term is also frequently called waste prevention.

Source reduction is fundamentally different from recycling and disposal because it takes place before materials have been produced. For this reason, source reduction provides the best opportunity to save your center money. It allows you to avoid the expense of handling a portion of your waste stream, because you do not create that waste in the first place."[2]

Reprocessing of hemodialyzers is one of the most dramatic ways that that a dialysis facility can "reduce" the number of dialyzers a facility must purchase. Reducing the number of dialyzers coming into a facility is a fundamental step in source reduction.

Another consideration is the disposal requirement for extra packaging that the single use of dialyzers produce.. While this waste, if properly segregated, may not add to your bio-hazardous waste costs, it still adds to the solid waste removal budget, and this needless packaging is extra trash that ends up in an ever-increasingly taxed local landfill.

Although perhaps not an immediate concern for end-users here in the U.S., the effects of extra packaging generated by single-use devices have a detrimental effect on the manufacturer. In many parts of the world, packaging laws are beginning to regulate package disposal and hold manufacturers responsible for excess waste. Any extra costs incurred from these regulations will most likely be passed along to the consumer.

## Reuse

Reusing what can safely and effectively be used again is not only prudent; it is a common sense approach to dealing with both the economic and environmental aspects of today's medical landscape.

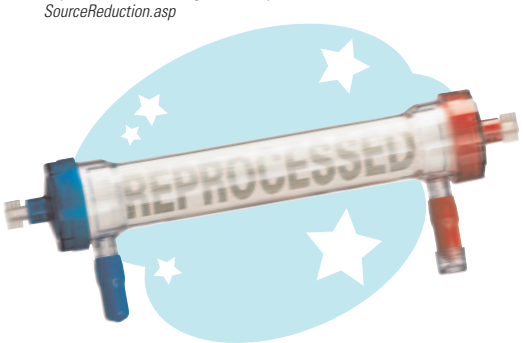
Automated reprocessing of hemodialyzers using the Renatron® Dialyzer Reprocessing System & Renalin® Cold Sterilant has an over 25 year proven track record of safety and efficacy and reuses the most costly non-pharmaceutical item of the dialysis treatment.

## Recycle

Neither single-use nor reprocessing recycles the components of a used dialyzer. However, with a reprocessing average of 15 uses per dialyzer, reprocessing will reduce the amount of bio-hazardous medical waste 14 fold.

The three R's – Reduce, Reuse and Recycle – not only benefit the environment; they can also have a significant benefit on the clinic's operating earnings.

[1] Retrieved on 7/20/06 from *http://www.factmonster.com/ipka/A0775891.html*
[2] Retrieved on 9/14/06 from *http://www.earth911.org/master.asp?s=lib&a=brrc/SourceReduction.asp*



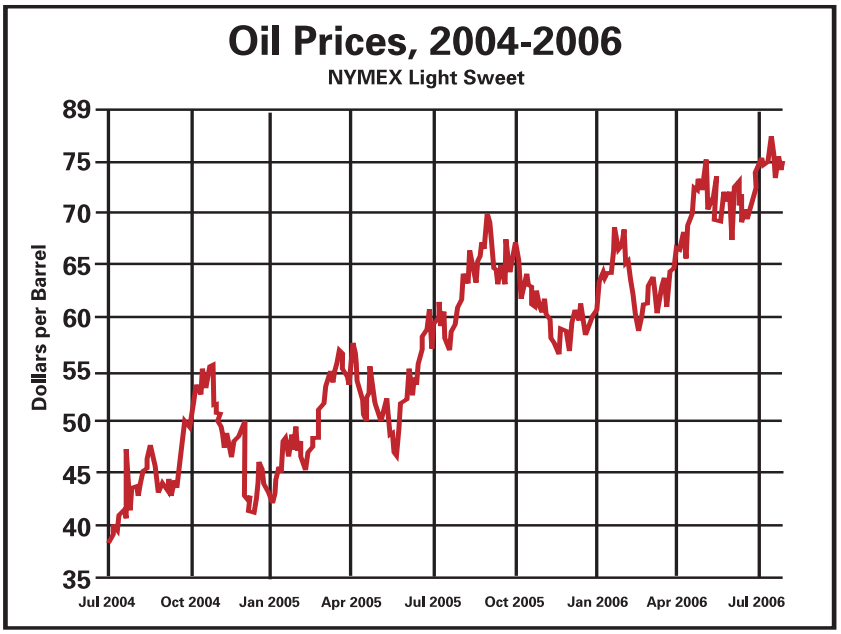
continued from page 3

(although heat will speed it up).

Because of the relatively unreactive nature of the materials used in hemodialyzers, the biggest source of concern is the sheer volume of waste polymers that is generated by disposal of dialyzers into landfills. If reuse of hemodialyzers were to be eliminated and replaced by single-use devices, the buildup of this non-decomposing medical waste would approach staggering proportions. In 2006, the estimated number of patients on chronic hemodialysis was 325,000. Since there are approximately 153 treatments per year (on average) per patient, this results in just under 50 million single-use dialyzers that would be required to treat all patients for a year. Since the annual growth in numbers of chronic hemodialysis patients is approximately 6%, this would mean that, by the year 2030, there would be nearly 3 billion dialyzers either in landfills or being incinerated. The approximate weight of a single-use dialyzer, before being thrown away as medical waste, is 1.25 lb. Thus, over 62 million pounds of medical waste from dialyzers alone would be generated in a single year. This presents a

continued on page 8

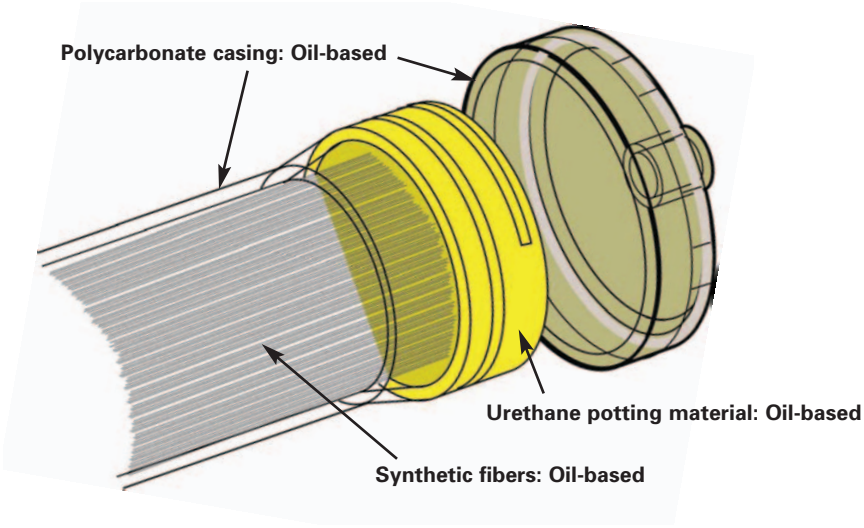
# Oil Prices & Dialyzer Costs



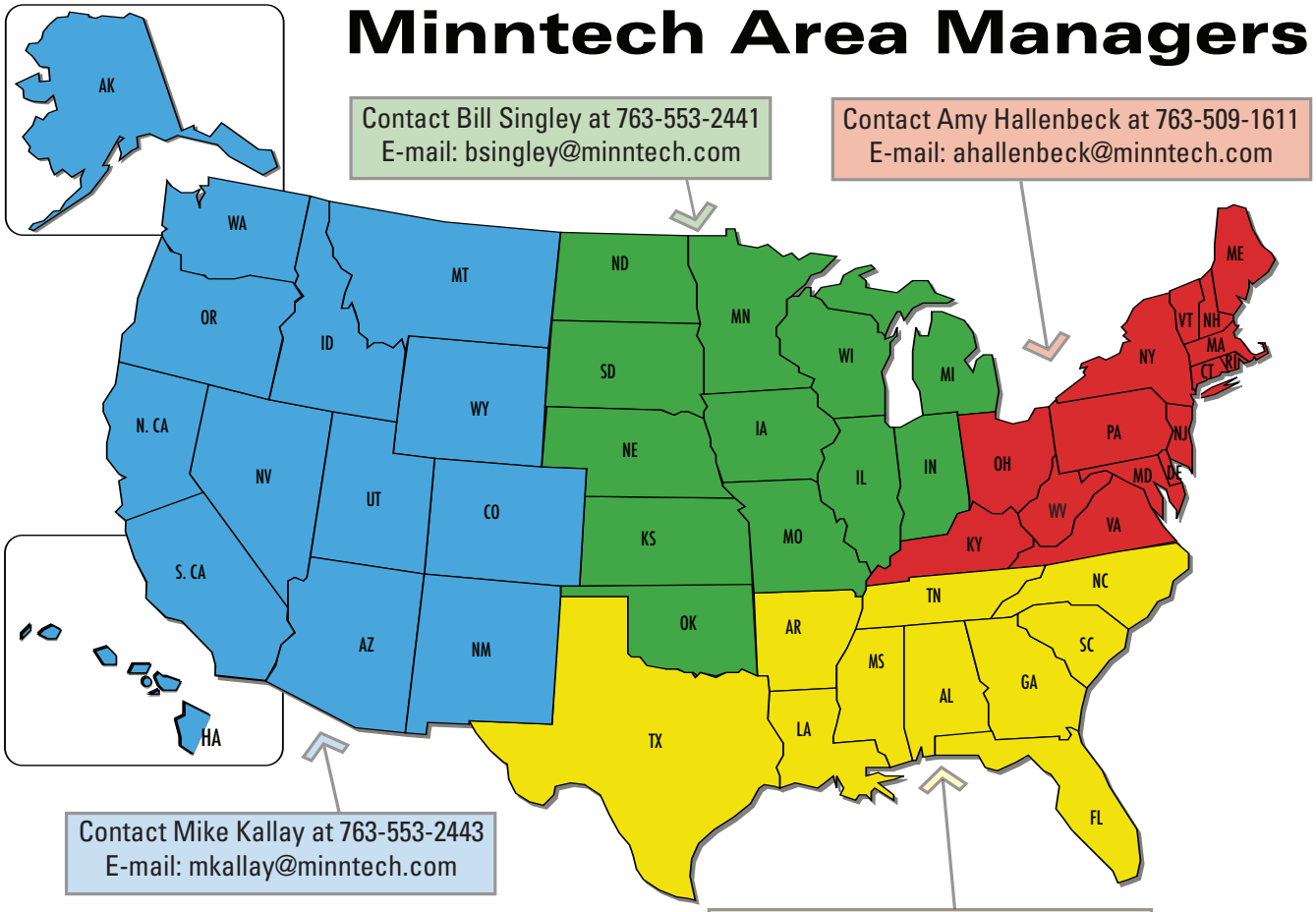

Retrieved on 9/6/06 from *http://en.wikipedia.org/wiki/Oil price increases of 2004 and 2005*

The price of a barrel of crude oil fluctuates constantly and has increased significantly in the last two years.

The components of synthetic-fiber dialyzers, the casing, urethane potting material and the polysulfone fiber are all derived from oil. Many dialyzer manufacturers typically have annual contracts with escalation clauses that mandate increased costs for oil-based resins as the price of oil increases.



# Minntech Area Managers




Contact Bill Singley at 763-553-2441
E-mail: bsingley@minntech.com

Contact Amy Hallenbeck at 763-509-1611
E-mail: ahallenbeck@minntech.com

Contact Mike Kallay at 763-553-2443
E-mail: mkallay@minntech.com

Contact Stuart Geller at 763-553-2442
E-mail: sgeller@minntech.com

# Calendar of Events

## FEBRUARY 2007

**American Health Quality Association (AHQA) 2007 Annual Meeting (www.ahqa.org)**
February 12 - 16
New Orleans, LA

**2007 CMS/Forum of ESRD Networks' Annual Meeting (www.esrdnetworks.org)**
February 24 - March 3
Baltimore, MD

## MARCH 2007

**The National Association of Nephrology Technicians/ Technologists (NANT)**
***Why We Do What We Do in Dialysis…Back to the Basics* - 24th Annual National Symposium (www.dialysistech.net)**
March 9 - 11
Atlanta GA

**Renal Physician's Association (RPA) 2007 Annual Meeting (www.renalmd.org)**
March 9 -12
Baltimore, MD

**2007 Southeastern Kidney Council Annual Meeting (www.esrdnetwork6.org)**
March 15 -16
Greensboro, NC

## APRIL 2007

**National Kidney Foundation (NKF) 2007 Spring Clinical Nephrology Meetings (www.kidney.org)**
April 10 - 14
Orlando, FL

**2007 World Congress of Nephrology. Rio de Janeiro, Brazil - International Society of Nephrology (ISN) (www.wcn2007.org)**
April 21- 25
Rio de Janeiro, Brazil

**American Nephrology Nurses' Association (ANNA) 38th Annual National Symposium (www.annanurse.org)**
April 22- 25
Dallas, TX

## NANT Symposium FAQs

### *Back to the Basics: Why We Do What We Do*

**When?** March 9 - 11, 2007

**Where?** Downtown Atlanta Sheraton Hotel, Atlanta, GA

**How much does it cost?** For NANT members, early registration is extended to the 31st of January. Friday workshops on Vascular Access are FREE courtesy of Amgen, Inc. and Ensuring a Successful Audit FREE courtesy of Technical Education Foundation. Check our website www.dialysistech.NET for updates.

**What is included?** Opening reception in the Exhibit Hall on Friday, two days of classes, Saturday evening Club NANT (enough food for dinner!), Sunday lunch.

**Are there scholarships?** YES! Scholarship applications now available at www.dialysistech.NET.

**What does the hotel room cost?** $149 a night, plus taxes. You can share a room to save money.

**Can I take my certification exam before the Symposium?** Yes! We are offering the BONENT exam (CHT), NNCC exam (CCHT), and NNCO exam (CNCT or CNBT) – all on Friday morning, March 9th.

**How can I prepare to take the certification exam?** Certification Review course is on Thursday, March 8th.

**Where do I get more information?** Updates will be available at www.dialysistech.NET.

**Why should I send my technicians?** This is the ONLY conference designed to educate technicians. This year, we are going back to the basics... this is information that your technicians need to know.

**NEW! NANT Career Center:** Go to www.dialysistech.NET to see our new career opportunities - post your hemodialysis technician opportunities or find a new job.

Q&A

continued from page 5

serious challenge for which dialyzer reprocessing is a solution. Since the polycarbonate, urethane, and polysulfone all are derived from oil, their cost will also escalate as oil and refinement costs increase. This presents another cost factor that will be difficult to address in the long-term. The increasing cost of both the raw materials and the waste storage are likely to become dominant factors in the use of single-use dialyzers in the future."

*John Matta, Ph.D*
*Senior Scientist*
*Minntech Corporation*

**Question:**
**What impact does Renalin®/Renalin® 100 Cold Sterilant have on the environment?**

Renalin®/Renalin® 100 Cold Sterilant components dissociate and degrade rapidly while not harming the environment. Renalin's byproducts are oxygen, water and acetic acid. All byproducts are natural and, when properly diluted, safe to flush into a sanitary sewer system.[1,2] "**Acetic acid** (This name derives from acetum, the Latin word for vinegar.), is an organic chemical compound best recognized for giving vinegar its distinctive taste and pungent odor."[3]

[1] Renalin® 100 Cold Sterilant Concentrate IFU, page 6
[2] See local specific regulations
[3] Retrieved on 7/5/06 from *http://en.wikipedia.org/wiki/Acetic acid*


MINNTECH® renal systems

Minntech Corporation
14605 28th Avenue North
Minneapolis, Minnesota 55447-4822 USA
Telephone: (763) 553-3300
Fax: (763) 553-3387