Sterile Medical Packaging

US Industry Study with Forecasts to 2010 & 2015

Study #2119 | October 2006 | $4300 | 247 pages
## Table of Contents

### EXECUTIVE SUMMARY

### MARKET ENVIRONMENT
- General ........................................ 4
- Macroeconomic Environment ............ 5
- Population & Demographic Trends ..... 8
- Health Care Trends .......................... 10
  - Medical Conditions ....................... 12
    - Chronic Conditions ..................... 13
    - Acute Conditions ....................... 15
- Health Insurance Trends .................. 16
- National Health Expenditures ............ 20
- Medical Providers .......................... 23
  - Hospitals .................................. 25
  - Physicians ................................ 25
  - Dentists ................................... 26
  - Outpatient Facilities ...................... 27
  - Skilled Nursing Homes ..................... 28
- Patient Activity ............................. 28
- Surgical Procedures ........................ 30
- Outpatient Episodes ......................... 30
- Diagnostic Tests ............................. 32
- Medical Product Shipments ............... 33
  - Pharmaceuticals & Biologicals ....... 34
  - Surgical Products & Instruments .... 35
  - Surgical Appliances & Supplies ...... 36
  - Electromedical Equipment ............... 37
- In Vitro Diagnostic Products ............. 37
- Dental Products ............................. 38
- Ophthalmic Goods ........................... 38
- Other Medical Products .................... 38
- Pricing Trends ............................... 39
- Regulatory Considerations ............... 41
- Pharmaceuticals ............................ 42
- Medical Supplies & Devices .............. 43
- Sterilization Technology ................. 45

### PRODUCTS
- General ....................................... 49
- Unit Demand Patterns ..................... 52
- Cost Considerations ....................... 54
- Thermofomed Trays ....................... 55
  - Types of Thermofomed Trays ............ 57
  - Applications .............................. 58
  - Producers .................................. 59
- Pouches ...................................... 60
  - Types of Sterile Pouches ............... 61
  - Applications .............................. 63
  - Producers .................................. 64
- Sterile Bottles ............................... 64
- Sterile Glass Bottles ....................... 65
- Sterile Plastic Bottles ..................... 67
- Prefillable Inhalers ....................... 69
- Metered Dose Inhalers .................... 70
  - Types of Metered Dose Inhalers ...... 71
  - Applications .............................. 73
- Dry Powder Inhalers ...................... 74
  - Types of Dry Powder Inhalers ...... 74
  - Applications .............................. 75
- Product Development ....................... 76
- Sterilization Wrap .......................... 77
- Prefillable Syringes ...................... 79
- Injectors .................................... 81
- Cartridges .................................. 83
- Sterile Closures ............................ 85
- External Closures ......................... 86
- Rubber & Elastomer Stoppers .......... 88
- Blister & Clamshell Packs ............... 89
  - Types & Materials ....................... 90
  - Films ..................................... 91
  - Backings .................................. 93
  - Applications .............................. 94
  - Producers .................................. 95
- Vials & Ampuls .............................. 96
  - Vials ...................................... 97
  - Glass Vials ............................... 98
  - Plastic Vials ............................. 100
  - Ampuls .................................... 102
  - Plastic Ampuls ........................... 103
  - Glass Ampuls .............................. 104
- IV & Blood Containers ................. 105
- Semi-Rigid Containers .................. 106
- Mini-Bags .................................. 108
- Glass IV Containers ...................... 110
- Sterile Bags ................................ 111
  - Types & Features ......................... 112
  - Producers ................................ 115

### MATERIALS
- General ....................................... 116
- Plastic Resins .............................. 118
  - Polyvinyl Chloride ........................ 121
  - High Density Polyethylene ............ 126
  - Polypropylene ............................. 129
  - Thermoplastic Polyesters ............. 131
  - Low Density Polyethylene ............. 134
  - Thermoplastic Elastomers .......... 136
  - Polystyrene ................................ 137
  - Polycarbonate ............................ 139
  - Acrylic .................................... 141
  - Other Plastic Resins ................. 142
  - Glass Materials .......................... 145
  - Paper & Paperboard ...................... 146
  - Foil ....................................... 148
  - Stainless Steel ......................... 149

### APPLICATIONS
- General ....................................... 151
- Pharmaceuticals & Biologicals ........ 154
  - In Vitro Diagnostic Products ........ 156
  - Surgical Appliances & Supplies ..... 159
  - Other Product Applications .......... 162

### INDUSTRY STRUCTURE
- General ....................................... 165
  - Industry Characteristics ............... 166
  - Market Share ................................ 168
  - Competitive Strategies ................. 171
  - Packaging Product Companies ........ 171
  - Contract Packaging Firms .............. 172
  - Mergers, Acquisitions & Licensing Agreements ..................... 173
  - Marketing & Distribution ............... 174
  - Manufacturing ............................. 176

### COMPANY PROFILES
- Ahlstrom Corporation ..................... 179
- Alcan Incorporated ....................... 181
- Alcoa Incorporated ....................... 184
- Becton, Dickinson ......................... 192
- Bemis Company ................................ 194
- Braun (B.) Melsungen ..................... 196

(continued on next page)
(continued from previous page)
Cardinal Health..........................197
Degussa AG.........................201
DeRoyal Industries ...............203
DuPont (EI) de Nemours...........204
Eastman Chemical ..............206
ESCO Technologies ..........209
Gerresheimer Holdings ........210
Honeywell International......212
Hospira Incorporated...........214
HUECK FOLIEN .........................216
Kimberly-Clark Corporation ...218
Kloechner Pentaplast .........219
KNF Corporation ..............221
MeadWestvaco Corporation ...223
Medical Instill Technologies ...224
Medline Industries ..........225
Oliver Products ...............227
Owens-Illinois Group ........228
Pliant Corporation ..........230
Rollprint Packaging Products...231
SCHOTT AG ......................233
Superior Group .................235
Svenska Cellulosa AB ........236
Technipaq Incorporated .......238
Tekni-Plex Incorporated ....239
3M Company .......................240
TOLAS Health Care Packaging...241
Unicep Packaging Incorporated ...243
West Pharmaceutical Services ....245

7 Selected Patient Activity by Type 29
8 Medical Product Shipments
   by Type..............................34
9 Sterile Medical Packaging Prices..41

PRODUCTS
1 Sterile Medical Packaging
   Demand by Product Group ......51
Chilled Sterile Medical Packaging Demand by Product Group, 2005 ....52
2 Sterile Packaging Demand by Product Group...........53
3 Sterile Thermoformed
   Tray Demand ......................57
4 Sterile Pouch Demand ..........61
5 Sterile Bottle Demand ..........65
6 Prefillable Inhaler Demand ......70
7 Sterilization Wrap Demand ......79
8 Prefillable Syringe Demand ......80
9 Sterile Closure Demand ..........86
10 Sterile Blister & Clamshell
   Pack Demand ........................90
11 Vial & Ampul Demand ........97
12 IV & Blood Container Demand ...106
13 Sterile Medical Bag
   Demand by Application ........112

MATERIALS
1 Sterile Packaging Raw Material
   Demand by Type ................117
Chilled Sterile Packaging Raw Material
   Demand by Type, 2005..........118
2 Plastic Resin Demand in Sterile
   Medical Packaging by Type
   & Application.....................120
Chilled Plastic Resin Demand in Sterile
   Medical Packaging by Type, 2005 ....121
3 Polyvinyl Chloride Demand in
   Sterile Medical Packaging ......126
4 High Density Polyethylene Demand in Sterile Medical Packaging ...129
5 Polypropylene Demand
   in Sterile Medical Packaging ...131
6 Thermoplastic Polyester Demand in
   Sterile Medical Packaging ......134
7 Low Density Polyethylene Demand in Sterile Medical Packaging...136
8 Thermoplastic Elastomer Demand in Sterile Medical Packaging...137
9 Polystyrene Demand in Sterile Medical Packaging...139
10 Polycarbonate Demand in Sterile Medical Packaging...141
11 Acrylic Demand in Sterile
   Medical Packaging .................142
12 Other Plastics Demand in Sterile Medical Packaging...144
13 Glass Demand in Sterile
   Medical Packaging .................146
14 Paper & Paperboard Demand in
   Sterile Medical Packaging.......147
15 Foil Material Demand in
   Sterile Medical Packaging......149
16 Stainless Steel Demand in
   Sterile Medical Packaging.......150

APPLICATIONS
1 Sterile Medical Packaging
   Demand by Application ..........153
Chilled Sterile Medical Packaging
   Demand by Application, 2005 ..153
2 Pharmaceuticals & Biologicals:
   Sterile Medical Packaging
   Demand ................................156
3 Surgical & Medical Instruments:
   Sterile Medical Packaging
   Demand ................................158
4 In Vitro Diagnostic Products:
   Sterile Medical Packaging
   Demand ................................160
5 Surgical Appliances & Supplies:
   Sterile Medical Packaging
   Demand ................................162
6 Other Applications: Sterile
   Medical Packaging Demand.....164

INDUSTRY STRUCTURE
1 Sterile Medical Packaging
   Sales by Company, 2005........168
Chilled Sterile Medical Packaging
   Market Share, 2005 ...........170

List of Tables/Charts

EXECUTIVE SUMMARY
1 Summary Table........................3

MARKET ENVIRONMENT
1 Macroeconomic Indicators..........8
2 Population by Age Group ..........10
3 Medical Conditions ..............13
4 Health Insurance Coverage ......19
5 National Health Expenditures ....22
6 Selected Medical Providers
   by Type..............................24
Pharmaceutical and biological applications will lead growth in US sterile medical packaging demand as advances in the life sciences contribute new injectable and inhalation therapies for major diseases.

US demand to grow 6% annually through 2010

Sterile medical packaging demand in the US is forecast to expand 6.0 percent annually to $4.4 billion in 2010, comprising over 22 billion units. Pharmaceutical and biological applications will lead growth as new injectable and inhalation therapies for cancer, heart disorders and other major diseases are introduced. This trend will favor functional containers such as prefillable inhalers and syringes, both of which will grow at double digit rates.

Trays, pouches to remain important segments

Sterile medical trays and pouches will post below average gains but will remain important segments, combining for demand of more than $1 billion in 2010. The market for sterile thermoformed trays will gain upward momentum from advances in plastic and foil materials, which will broaden potential medical product applications. Multiple compartment trays that package all or most products required for specific patient procedures will offer the best opportunities based on infection prevention, labor saving and ease of storage advantages.

Pouches, plastic bags, blister packs among leading sterile containers

Improved strength, puncture resistance and barrier protection properties will keep sterile pouches the leading container for medium- to large-sized medical and dental devices and supplies, including catheters and related tubing apparatus, face masks and IV administration sets. Cost advantages will continue to favor the use of pouches over thermoformed trays in these applications. Plastic bags will remain the leading competitive container to pouches in the packaging of large medical supplies and devices with lower barrier protection requirements. The market for sterilization wrap will expand with upward trends in surgical procedures and increasing end-user preferences for higher quality nonwoven products.

Among other sterile containers, small blister packs with foil lidding will continue to dominate the packaging of contact lenses. Sterile plastic and glass bottles will remain the leading containers used for diagnostic reagents and sterile ophthalmic solutions.

Plastic resins to stay top sterile packaging material

Based on improving intrinsic properties, breadth of applications served and overall low cost advantages, plastic resins will continue to dominate the market for sterile packaging raw materials. Reflecting strong barrier protection, borosilicate glass will see favorable growth in preffillable syringe and parenteral vial applications. Among other sterile packaging raw materials, foil will claim the most revenues based on widening uses in tray and blister pack lidding.
MATERIALS

Foil

Demand for aluminum foil materials in sterile medical packaging products will increase at a compounded annual growth rate of 4.0% to reach 85 million pounds valued at $170 million in 2010. Foil’s excellent processing and barrier qualities as well as cost effectiveness will fuel favorable growth. Leading uses of foil in sterile packaging applications include backings for blister packs, lidding for trays, and laminations for high barrier pouches and bags. Foil is valued for its moisture resistance, heat tolerance, processing ease and compatibility with radiation sterilization. The excellent barrier properties of foil also lengthen the shelf life of enclosed medical supplies products and provide protection against permeation by carbon dioxide, oxygen and other gases, as well as moisture.

In sterile packaging, aluminum foil derives most demand from uses in backings for blister packs, lidding for trays, and in laminations for high barrier pouches and bags. In addition, aluminum foil is used in outer vial closures (i.e., aluminum tear tops). Foil is valued for its moisture resistance, heat tolerance, processing ease and compatibility with radiation sterilization. The excellent barrier properties of foil also lengthen the shelf life of enclosed medical supplies products and provide protection against permeation by carbon dioxide, oxygen and other gases, as well as moisture.

Leading producers of aluminum foils for sterile and other medical packaging include Alcan, Alcoa, HUECK FOLIEN, Kloeckner Penta-plast and Tekni-Films. One notable material for sterile medical packaging applications is HUECK FOLIEN PROTECCO high-security foil that inhibits the counterfeiting of medical products. PROTECCO foils can be custom printed with producer logos, holographic and Guilloche patterns, ultraviolet light fluorescent features and micro-image types to verify the authenticity of enclosed medical products. The foils can be processed on the same equipment as conventional foil lidding, allowing for easy integration into packaging systems.

TABLE V-1
STERILE MEDICAL PACKAGING DEMAND BY APPLICATION
(million dollars)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medical Product Shipments (bil $)</td>
<td>152</td>
<td>245</td>
<td>379</td>
<td>530</td>
<td>735</td>
</tr>
<tr>
<td>$ sterile packaging/000$ shpts</td>
<td>11.9</td>
<td>10.0</td>
<td>8.7</td>
<td>8.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Sterile Packaging Applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharmaceuticals &amp; Biologicals</td>
<td>843</td>
<td>1167</td>
<td>1680</td>
<td>2420</td>
<td>3390</td>
</tr>
<tr>
<td>Surgical &amp; Medical Instruments</td>
<td>361</td>
<td>463</td>
<td>580</td>
<td>715</td>
<td>860</td>
</tr>
<tr>
<td>In Vitro Diagnostic Products</td>
<td>240</td>
<td>305</td>
<td>373</td>
<td>452</td>
<td>540</td>
</tr>
<tr>
<td>Surgical Appliances &amp; Supplies</td>
<td>187</td>
<td>238</td>
<td>297</td>
<td>365</td>
<td>445</td>
</tr>
<tr>
<td>Other</td>
<td>179</td>
<td>267</td>
<td>350</td>
<td>428</td>
<td>515</td>
</tr>
</tbody>
</table>

Copyright 2006 The Freedonia Group, Inc.
**COMPANY PROFILES**

**DeRoyal Industries Incorporated**
200 DeBusk Lane
Powell, TN 37849
865-938-7828
http://www.dereoyal.com

Annual Sales: $350 million (company would not verify, 10/06)
Employment: 2,325 (company would not verify, 10/06)

Key Products/Services: wound care kits, laceration trays, surgical and sterile procedure sets; and packaging and sterilization services

DeRoyal Industries is a privately held, vertically integrated manufacturer of health care products. The Company’s products include operating room procedural trays and tray kits for treating lacerations and other wounds. DeRoyal operates in four divisions: Wound Care, Acute Care, Original Equipment Manufacturing (OEM) and Patient Care.

DeRoyal Industries competes in the US sterile medical packaging industry through the Wound Care, Acute Care, and OEM divisions. Among the Wound Care division’s range of products are wound care kits and laceration trays. These kits and trays are pre-assembled, sterile and ready-to-use. The division’s wound care kits contain products needed for a dressing change or for a new procedure. These kits include many standard varieties such as intravenous start kits, dressing change kits, blood draw kits and dialysis kits. The Wound Care division’s laceration trays, which contain components for local anesthesia and instruments for suturing, include latex-free and three-compartment varieties. Moreover, the division can customize wound care kits and laceration trays to customer specifications.

**TABLE III-12**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital Admissions (million)</td>
<td>35.3</td>
<td>37.2</td>
<td>39.7</td>
<td>43.0</td>
<td>46.8</td>
</tr>
<tr>
<td>IV containers/admission</td>
<td>22.9</td>
<td>24.9</td>
<td>27.0</td>
<td>27.3</td>
<td>27.6</td>
</tr>
<tr>
<td>IV &amp; Blood Containers (mil units)</td>
<td>809</td>
<td>928</td>
<td>1070</td>
<td>1175</td>
<td>1290</td>
</tr>
<tr>
<td>Semi-Rigid Containers</td>
<td>434</td>
<td>505</td>
<td>584</td>
<td>635</td>
<td>690</td>
</tr>
<tr>
<td>Mini-Bags</td>
<td>339</td>
<td>401</td>
<td>473</td>
<td>532</td>
<td>595</td>
</tr>
<tr>
<td>Glass Containers</td>
<td>36</td>
<td>22</td>
<td>13</td>
<td>8</td>
<td>5</td>
</tr>
<tr>
<td>cents/container</td>
<td>13.7</td>
<td>14.9</td>
<td>15.3</td>
<td>16.6</td>
<td>17.8</td>
</tr>
<tr>
<td>IV &amp; Blood Containers (mil $)</td>
<td>111</td>
<td>138</td>
<td>164</td>
<td>195</td>
<td>230</td>
</tr>
<tr>
<td>Semi-Rigid Containers</td>
<td>85</td>
<td>108</td>
<td>129</td>
<td>154</td>
<td>180</td>
</tr>
<tr>
<td>Mini-Bags</td>
<td>20</td>
<td>26</td>
<td>33</td>
<td>40</td>
<td>49</td>
</tr>
<tr>
<td>Glass Containers</td>
<td>6</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>% IV &amp; blood containers</td>
<td>6.1</td>
<td>5.7</td>
<td>5.0</td>
<td>4.5</td>
<td>4.0</td>
</tr>
<tr>
<td>Sterile Medical Packaging (mil $)</td>
<td>1810</td>
<td>2440</td>
<td>3280</td>
<td>4380</td>
<td>5750</td>
</tr>
</tbody>
</table>

“Demand for semi-rigid IV containers will increase 3.6 percent annually to $154 million in 2010, representing 635 million units. These configurations will continue to account for the largest usage among IV containers, serving as the principal packaging for electrolytes, diluents, blood derivatives, irrigating fluids and nutritional preparations. Expanding preferences among hospitals and home health care organizations for higher cost, ready-to-use IV systems will impact favorably on demand for these containers. Conversely....”

--Section III, pg. 106
**Order Information**

Five Convenient Ways to Order

**ONLINE:** www.freedoniagroup.com

**MAIL:** Print out and complete the order form and send to The Freedonia Group (see address at the bottom of this form)

**PHONE:** Call toll free, 800.927.5900 (US) or +1 440.684.9600

**FAX:** +1 440.646.0484 (US)

**EMAIL:** info@freedoniagroup.com

---

**Free Handling & Shipping**

There is NO charge for handling or UPS shipping in the US. Expect delivery in 3 to 5 business days. Outside the US, Freedonia provides free airmail service. Express delivery is available at cost.

**Orders Outside of the US**

Checks must be made payable in US funds, drawn against a US bank and mailed directly to The Freedonia Group. For wire transfers please contact our customer service department at info@freedoniagroup.com. Credit cards accepted.

**Corporate Use License**

Now every decision maker in your organization can act on the key intelligence found in all Freedonia studies. For an additional $2300, companies receive unlimited use of an electronic version (PDF) of the study. Place it on your intranet, e-mail it to coworkers around the world, or print it as many times as you like.

**Click here to learn more about the Corporate Use License**

---

**Order Form**

F-WEB.2119

**Sterile Medical Packaging** ........................................ $4300

☐ Corporate Use License (add to study price) *

☐ Additional Print Copies @ $500 each *

Total (including selected option) $________________________

☐ Enclosed is my check (5% discount) drawn on a US bank and payable to The Freedonia Group, Inc., in US funds (Ohio residents add 7.75% sales tax)

☐ Bill my company ☐ American Express ☐ MasterCard ☐ Visa

MM YY

Expiration

Signature ____________________________________________

**Name ____________________________________________

Title ____________________________________________

Company _________________________________________

Division _________________________________________

Street ________________________________ (No PO Box please)

City/State/Zip __________________________

Country ______________________________________

Phone ________________________________ Fax __________________

Email ______________________________________

**Save 15%**

If you order three (3) different titles at the same time, you can receive a 15% discount. If your order is accompanied by a check or wire transfer, you may take a 5% cash discount (discounts do not apply to Corporate Use Licenses).

---

**Individual Use License Agreement**

The undersigned hereby represents that the above captioned study will be used by only ___ individual(s) who are employees of the company and that the study will not be loaded on a network for multiple users. In the event that usage of the study changes, the Company will promptly notify Freedonia of such change and will pay to Freedonia the appropriate fee based on Freedonia’s standard fee schedule then in effect. Note: Entire company corporate use license, add $2300; one additional user, add $500; two additional users, add $1000; three additional users, add $1500.

Signature ____________________________________________

**Credit Card Orders**

For convenience, Freedonia accepts American Express, MasterCard or Visa. Credit card purchases must include account number, expiration date and authorized signature.

---

**Corporate Use License Agreement**

The above captioned study may be stored on the company’s intranet or shared directory, available to company employees. Copies of the study may be made, but the undersigned represents that distribution of the study will be limited to employees of the company.

Signature ____________________________________________

---

The Freedonia Group, Inc. 767 Beta Drive • Cleveland, OH • 44143-2326 • USA • Web site: www.freedoniagroup.com

Tel US: 800.927.5900 or +1 440.684.9600 • Fax: +1 440.646.0484 • e-mail: info@freedoniagroup.com

Page 7
About The Freedonia Group

The Freedonia Group, Inc., is a leading international industry market research company that provides its clients with information and analysis needed to make informed strategic decisions for their businesses. Studies help clients identify business opportunities, develop strategies, make investment decisions and evaluate opportunities and threats. Freedonia research is designed to deliver unbiased views and reliable outlooks to assist clients in making the right decisions. Freedonia capitalizes on the resources of its proprietary in-house research team of experienced economists, professional analysts, industry researchers and editorial groups. Freedonia covers a diverse group of industries throughout the United States, the emerging China market, and other world markets. Industries analyzed by Freedonia include:

- Chemicals
- Plastics
- Life Sciences
- Packaging
- Building Materials
- Security & Electronics
- Industrial Components & Equipment
- Automotive & Transportation Equipment
- Household Goods
- Energy/Power Equipment

Freedonia Custom Research

Freedonia Custom Research delivers the same high quality, thorough and unbiased assessment of an industry or market as an industry study. Since the research initiative is based upon a company’s specific needs, companies harness Freedonia’s research capabilities and resources to answer unique questions. When you leverage the results of a Freedonia Custom Research engagement, you are able to obtain important answers to specific questions and issues associated with: mergers and acquisitions, new product launches/development, geographic expansion, entry into new markets, strategic business planning, and investment and funding decisions.

Freedonia Custom Research is ideal for companies seeking to make a strategic difference in the status quo and focus on future business growth. Working side by side with clients, Freedonia’s team is able to define a research project that is custom-tailored to answer specific questions and provide the basis from which a company can make informed business decisions.