

Canadian Imported Surgical & Dental Allograft, Allograft Substitute, & Acellular Dermal Matrix Study 2010



A Decision Resources, Inc. Company

**CANADIAN IMPORTED SURGICAL & DENTAL ALLOGRAFT, ALLOGRAFT SUBSTITUTE, &
ACELLULAR DERMAL MATRIX STUDY 2010**
RFP1630

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Published March 2010 by

Millennium Research Group, Inc.
175 Bloor St. East, South Tower, Suite 701
Toronto, Ontario
M4W 3R8
Canada
T: 416-364-7776
F: 416-364-8246

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Production of this advice/report has been made possible in part through a financial contribution from Health Canada.

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Methodology

Research Methodology

The following report uses a number of methodologies to gather and present data and analysis. At the outset, a large survey of secondary sources is conducted. These sources act as the basis for the primary research stage, which builds and enhances the quantitative and qualitative attributes of the early research. Secondary sources include:

Government Sources:

- Securities and Exchange Commission filings
- Canadian Institute for Health Information
- Health Canada Web site

Allograft, allograft substitute, and acellular dermal matrix (ADM) companies:

- Annual reports, product brochures, corporate profiles, etc.

Internal Databases and Reports:

- Previous reports on similar/related sources

General Internet Searches, Medical Literature, and Newspaper/Magazine Searches:

- Identifying various centers of specialization and articles that might provide leads for primary research.

The secondary research stage builds the foundation for the primary research. The primary research methodology has four steps:

Step 1: The first step involves an impartial scan of all the information gathered during the secondary research stage to determine its utility based on the specific requirements of this report. Each piece of information is, thus, either discarded or marked as high or low priority. It is then organized appropriately as determined by the structure and sectioning of the report.

Step 2: At this stage, early assumptions are formed as to the implications of the information for the various allograft, allograft substitute, and ADM market segments. These assumptions are then used to determine hypotheses using both inductive and deductive approaches. On the quantitative front, these hypotheses result in full historical and projected market data sets (market sizes [units and CA\$] and market shares).

Step 3: At this stage, the research is in position for its most important primary phase—expert interviews. Throughout the secondary research, industry and medical experts are identified. These experts are now contacted by telephone and asked to participate in interviews on recent trends and developments in the industry. Interviews are either conducted at the time of the initial call or scheduled at the convenience of the expert. Interview questions are tailored to the expertise of the particular interviewee, although in most cases, the most important questions are asked of all experts. The questions are largely based on the assumptions and hypotheses developed in Step 2, which are then either augmented, discarded, or adjusted, based on the views and positions put forth. Attempts are made, whenever possible, to cross-check the views of various experts against each other and reach positions of consensus on issues and market numbers.

In addition, a sample of relevant physicians is also interviewed by telephone. Physicians are asked to comment on various issues/trends, both in their own practice and in the overall market. The responses provided are then used to strengthen or augment the assumptions and hypotheses developed during the primary research phase.

Step 4: The final stage of primary research involves individual and group analysis by Millennium Research Group. All research results are assessed and cross-checked thoroughly to determine their validity, relevance, and weight. From this process, qualitative conclusions are reached and data points finalized.

Forecast Methodology

In addition to Steps 1 through 4 (as outlined above), the following “bottom-up” methodology was followed in developing forecast assumptions for this report.

A comprehensive breakdown of various allograft, allograft substitute, and ADM procedures was prepared using data from several sources including professional associations, government statistics, and private research/media sources. Industry experts and practitioners were consulted to ensure accuracy and verify observed trends. As a cross-check, total industry revenues available through 10-Ks and other sources were compared against modeled industry revenues.

Using the best estimates of industry experts, practitioners, private research/media sources, and in-house experts, year-by-year growth rates and average selling prices were applied individually to each subcategory to derive forecasts. These estimates were cross-checked by industry experts (marketing managers, product managers, CEOs, etc.) and further refined.

Overall findings were compared against market and procedure forecasts published by other sources to ensure reasonable estimates.

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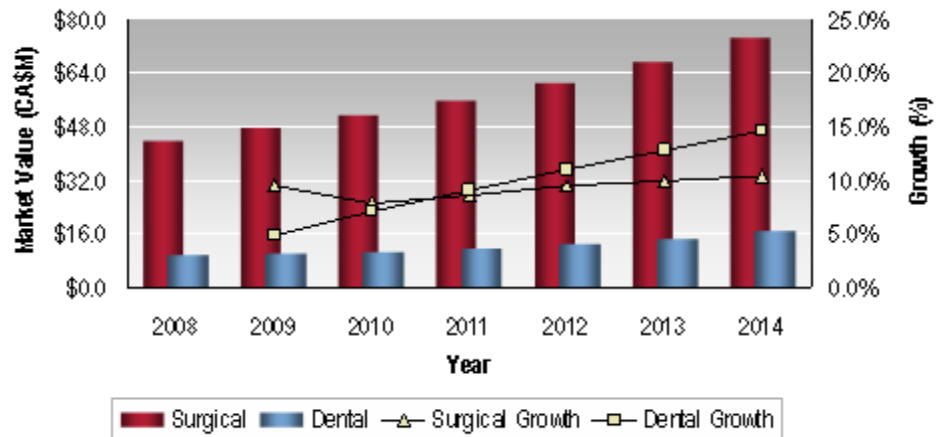
The Canadian musculoskeletal and soft tissue imported allograft, allograft substitute, and acellular dermal matrix (ADM) market comprises nonproprietary (NP) allografts, proprietary allografts (including demineralized bone matrices [DBMs]), machined bone, other allografts (such as bone morphogenetic proteins [BMPs]), allograft substitutes (synthetic, xenograft, and autologous-based), and ADMs. For the purposes of the surgical market, ADMs include those that are allograft based, but also encompass allograft substitutes that can be used in place of allograft-based ADMs. Synthetic ADMs, although not commonly referred to as “synthetic ADMs,” have been classified as such for the purpose of this report and include synthetic products/meshes. With regard to the dental market, the term ADM refers to human-derived dental membranes (soft tissue), while all dental membranes that are not derived from cadaveric tissue (soft tissue) are included in the dental allograft substitute market. Procedures that involve the use of imported allograft, allograft substitutes, and ADMs include all surgical and dental procedures—except cardiovascular and ocular procedures—performed across Canada, excluding Quebec.

The overall Canadian imported musculoskeletal and soft tissue allograft, allograft substitute, and ADM market is expected to grow at a steady compound annual growth rate (CAGR) of 9.5 % through 2014 and will be driven primarily by the rise in adoption of allograft substitutes and DBMs. The uptake of these materials will be supported by an increase in surgeon awareness due to more marketing from the competitors in these segments. The aging demographic in Canada will fuel demand for the use of all allograft and allograft substitutes by spurring growth in the incidence of disease that is treated with musculoskeletal and soft tissue grafts. Additionally, the use of autogenous tissue can lead to donor site complications, ranging from prolonged wound drainage to permanent gait disturbances in cases of iliac crest harvesting. Nevertheless, the high prices associated with many allografts, allograft substitutes, and ADMs will hinder adoption of these materials to some extent as hospitals attempt to operate within cost constraints.

The decrease in growth from 2009 to 2010 in the surgical market (as shown in Exhibit 1) was due in large part to the introduction of allograft-based ADMs in 2009. Because of this, synthetic ADMs—which are the most widely used type of surgical ADM in Canada—experienced a larger decrease in pricing growth that year as companies reduced prices in order to maintain a competitive advantage. This drop in average selling prices (ASPs) was the primary cause of the decline in market growth from

2009 to 2010. Restricted ASP growth for synthetics will likely continue for the first few years that allograft ADM products are available but are expected to begin to approach previous rates near the end of the forecast period. This will occur as the novelty of the newly available allografts wears off. The combination of both driving and limiting factors in the imported musculoskeletal and soft tissue allograft, allograft substitute, and ADM market is nonetheless projected to result in modest market expansion going forward.

Exhibit 1: Imported Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Market, by Type, Canada (CA\$), 2008–2014



Source: Millennium Research Group.

Market Definitions

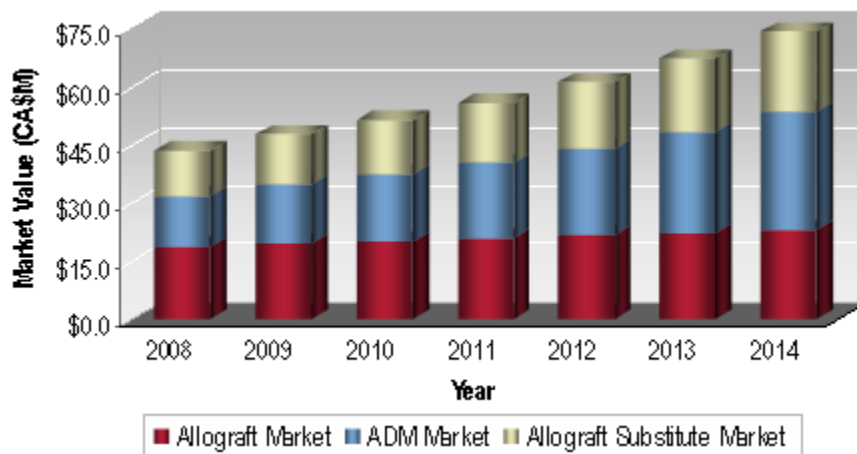
The Canadian surgical (nondental) imported allograft, allograft substitute, and ADM market comprises the following: NP allografts (including bone and soft tissue grafts), proprietary allografts (including DBMs and cancellous/corticocancellous chips, powders, etc.), machined bone grafts, BMPs, platelet concentrate systems (PCS), bone marrow aspirate (BMA) systems, synthetic bone graft substitutes, synthetic soft tissue products, xenograft bone graft substitutes, xenograft soft tissue products, and ADMs. This study focuses primarily on imported products that are used across Canada, excluding Quebec, and does not include materials utilized in cardiovascular or ocular procedures.

The Canadian market for imported dental allografts and allograft substitutes comprises sales of dental allografts—musculoskeletal allografts and ADMs—and allograft substitutes. For the purpose of this report, ADMs used in the dental market refer to dental membranes. Musculoskeletal allografts can be further broken down into NP and proprietary grafts; however, due to Canadian Blood Services and Millennium Research Group's agreed upon definition of what constitutes an NP allograft, there are no imported NP allografts in Canada for dental applications. As a result, dental NP allografts are not included in the valuations in this report. Cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables are defined as proprietary allografts. Allograft substitutes for dental applications include xenografts and synthetics in the hard tissue space and non-human-derived dental membranes in the soft tissue space. The Canadian dental allograft and allograft substitute market is composed entirely of imported products sold throughout Canada, excluding Quebec.

Imported Surgical Musculoskeletal & Soft Tissue Allograft, Allograft Substitute, & Acellular Dermal Matrix Market

The Canadian surgical allograft, allograft substitute, and ADM market is anticipated to undergo strong growth through 2014. This will be due to a rise in the number of procedures performed, such as spinal fusions and large-joint reconstructions—stemming mostly from the aging population—that often require the use of these materials. Additionally, the increasing shift away from the use of autograft, which mitigates the need for a second donor morbidity site, will also encourage adoption of allografts, allograft substitutes, and ADMs. Compared to the allograft segment, revenue expansion in the Canadian allograft substitute market will be more robust because companies in the latter segment heavily promote the use of their products. The imported allograft market will not grow as quickly because imported tissue is most often used when there is a lack of supply of domestic tissue, which is seldom. Furthermore, competitors in the imported allograft segment, which typically consist of US tissue banks with limited promotional budgets, engage in fewer marketing initiatives, thus contributing to lesser revenue growth. Some Canadian tissue banks, particularly those responsible for tissue within their own institution or surrounding areas, are also increasingly working one-on-one with surgeons and hospitals to ensure that needs are being met. This will be achieved by informing physicians and facilities of the availability of more donor tissue or by recommending the use of alternative donor tissue available domestically (in cases where a type of tissue is unavailable). This will thus mitigate the need for imported allograft tissue in some cases. Despite the factors limiting the imported allograft segment, the overall surgical allograft, allograft substitute, and ADM market is expected to grow robustly over the forecast period to reach a value of nearly \$75 million by 2014 (see Exhibit 2).

Exhibit 2: Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Market, by Segment, Canada (CA\$), 2008–2014



Source: Millennium Research Group.

Imported Surgical Allograft Market by Tissue Type

The imported surgical allograft market was smaller than the allograft substitute market in Canada in 2009 due to the presence of domestically available products, which limited the number of imported NP allograft units sold in the country. Although there is sometimes a lack of supply of domestic tissue in Canada, overall surgical procedure volumes where NP allografts are used are still very low in the country compared to other developed countries, such as the US, based on per capita usage. Consequently, the amount of NP allograft available domestically is often sufficient and imports are not required. Additionally, allograft substitutes are available to surgeons when there is limited availability of other materials.

Almost all imported surgical NP allograft tissue come from the US (one provider is located in France). Some of these companies, such as small, regional American tissue banks, only provide tissue to Canada if it is requested specifically and if they have sufficient quantities of material or the material has been on the shelf for a long period of time. Industry sources have indicated that most of these small US-based tissue banks give US facilities and surgeons first priority for their tissue. US tissue banks that have a larger presence in Canada through wide distribution networks and partnerships with medical device companies still indicate that the market for imported NP allografts in the country is very small due to the availability of domestically sourced allografts. Furthermore, many physicians are willing to use lower-priced domestic allografts and to process these materials to suit their surgical and budgetary needs. For instance, if ground cancellous chips and granules are not manufactured at local tissue banks, a surgeon can take other pieces of NP allograft bone and cut it themselves. Overall, the demand for imported tissue remains limited due to the small number of procedures relative to the US that require the use of these NP allografts.

Nevertheless, imported allograft market revenues are projected to expand over the forecast period partly due to overall increases in Canadian surgical procedure volumes, which predominantly comprise orthopedic procedures. Most surgeons who work with imported allograft tissue are satisfied with the imported allografts they are using and are unlikely to drastically change their usage of imported products. This will help sustain imported allograft sales to some extent through 2014. The imported allograft market will, however, be slightly restricted by the expanding domestic allograft market in Canada because a number of domestic tissue banks are developing their businesses and providing more tissue to their clients, thus decreasing the need for imported tissue. This will encourage greater collaboration between Canadian tissue banks and health care facilities in the country. In cases where materials are unavailable or limited in supply locally, tissue banks can suggest alternatives, such as other similar tissue types.

Across the country, downward pressure will be exerted on ASPs due to budgetary concerns among health care facilities. Hospitals in Canada receive a budget from the government for the entire year and as of March 2010, most hospitals were operating

at a deficit. As a result, industry sources indicate that Canadian hospitals are increasingly pressuring companies to lower product pricing or negotiating discounts on single items as well as bundled product purchases in order to curb costs. This trend will likely offset some of the growth in the imported allograft market over the forecast period. Nevertheless, steady surgical procedure volumes will continue to support demand for the use of imported allografts, which is projected to fuel strong expansion of revenues through 2014.

In 2009, the vast majority of sales within the imported surgical allograft market was generated through other allografts (see Exhibit 3 and Exhibit 4), which encompasses both BMPs and allograft-based rotator cuff reinforcement grafts. BMPs, in particular, have been well received in the Canadian market because of their osteogenic properties and due to strong marketing by Medtronic Spinal & Biologics and Stryker, leaders in the BMP space. Only two BMPs are available in Canada: Stryker's Osteogenic Protein-1 (OP-1), which is indicated for long-bone nonunions, and Medtronic Spinal & Biologics' INFUSE, which is indicated for lumbar fusions. Canadian surgeon acceptance of BMPs has been positive due to their osteogenic properties, which promote a highly successful fusion. Because of this, both INFUSE and OP-1 are commonly used off-label and in a large variety of procedures across Canada. The products' high success rates, coupled with their high ASPs have enabled BMPs to be the primary revenue generator for the other allograft segment in Canada. At the same time, however, a significant limiter of BMP unit sales in the Canadian market will be the products' considerable cost, which is especially high in comparison to less expensive allograft substitutes and autograft tissue. Because many Canadian hospitals must operate within strict budgets, purchasing higher-priced products such as BMPs is often unfeasible. Because less costly options are available, most uses of BMPs are only approved by the hospital if a surgeon has made a case for their use—typically cases involving older patients with poor bone quality or when the patient is willing to pay for the product themselves.

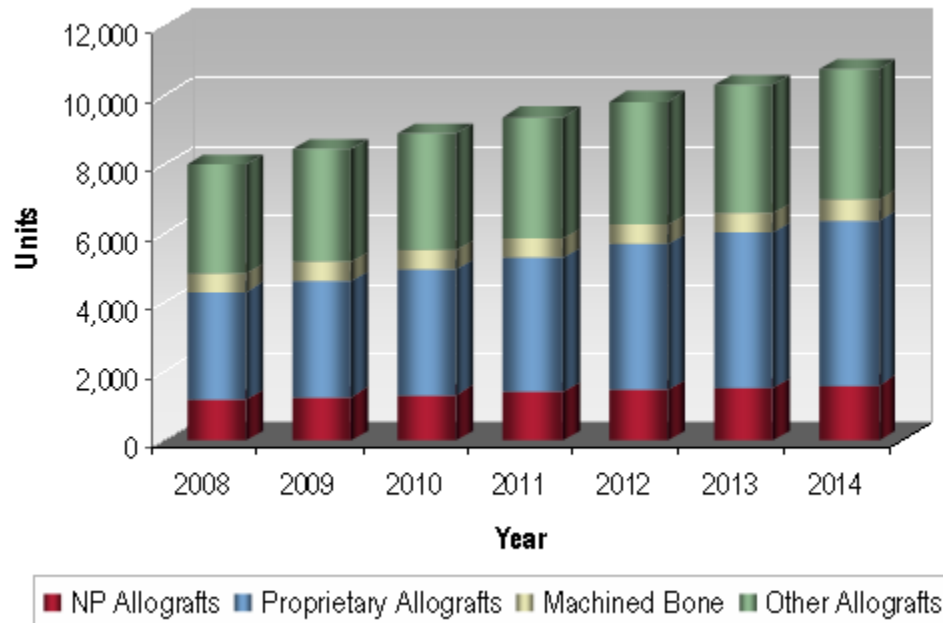
In addition to BMPs, allograft-based rotator cuff reinforcement grafts are also included in the other allograft market. The allograft-based rotator cuff reinforcement graft segment is made up solely of Wright Medical Technology's GRAFTJACKET. In general, the use of reinforcement grafts for rotator cuff repairs remains a relatively new concept among surgeons in Canada; however, when a reinforcement graft is used, it is most often an allograft-based graft. Synthetic and xenograft rotator cuff reinforcement grafts are also available, but some surgeons dislike using these materials because synthetics do not resorb and xenografts are associated with the potential risk for disease transmission. The high popularity of allograft-based rotator cuff reinforcement grafts is also due primarily to the leading competitor in the rotator cuff reinforcement graft market, Wright Medical Technology, which has successfully promoted and marketed its product among its large client base of sports medicine surgeons.

Proprietary allografts such as DBMs and cancellous chips and blocks also made up a large portion of total imported allograft units sold in Canada in 2009. The majority of

these sales were accounted for by DBMs because there are few cancellous or corticocancellous chips, powders, and granules imported into the country. Many surgeons favor the use of DBMs due to the material's easier handling characteristics in comparison to NP allografts and other proprietary allografts. The popularity of DBMs has resulted in the material being more heavily marketed in Canada by medical device companies such as Synthes and Wright Medical Technology. As of 2009, most imported proprietary allograft chips and NP allografts were sold through US tissue banks, such as the Musculoskeletal Transplant Foundation (MTF), which do not actively market the availability of these products. There are a couple of domestic companies, one of which is RegenMed, that have expressed interest in manufacturing and distributing locally made DBMs and expect to be producing the material in Canada by the middle of the forecast period. The presence of domestic banks that offer DBMs will limit the imported DBM market to some extent over the forecast period. This is because locally produced products will likely be sold at a reduced price due to lower overhead costs and the lack of other associated import expenses that are factored into foreign-produced products.

In Canada, all machined bone allografts used are manufactured exclusively outside of the country. The units of machined bone allograft sold are the lowest of all allograft segments due to the higher pricing associated with purchasing the products from a source outside of the country. Despite this, machined bone allograft units will grow in line with increases in overall spinal fusion volumes in Canada. This is because a number of surgeons prefer bone over metal or plastic in interbody fusions due to the belief that machined bone facilitates a more successful fusion.

Exhibit 3: Imported Surgical Allograft Units, by Tissue Type, Canada, 2008–2014



Notes:

(1) NP allografts include products for the femoral head, femoral condyle, whole or parts of proximal or distal bone shafts (femur, tibia, humerus), hemipelvis, cancellous bone, corticocancellous bone, cortical strut/screw/pin, bicortical strip, tricortical wedge, whole joint (knee, ankle, shoulder, elbow), patellar ligament, Achilles tendon, tibialis tendon, semitendinosus tendon, gracillus tendon, peroneous longus tendon, fascia lata, rotator cuff, meniscus, meniscus with tibial plateau, osteochondral plug, femoral hemicondyle, mandible, and dura mater.

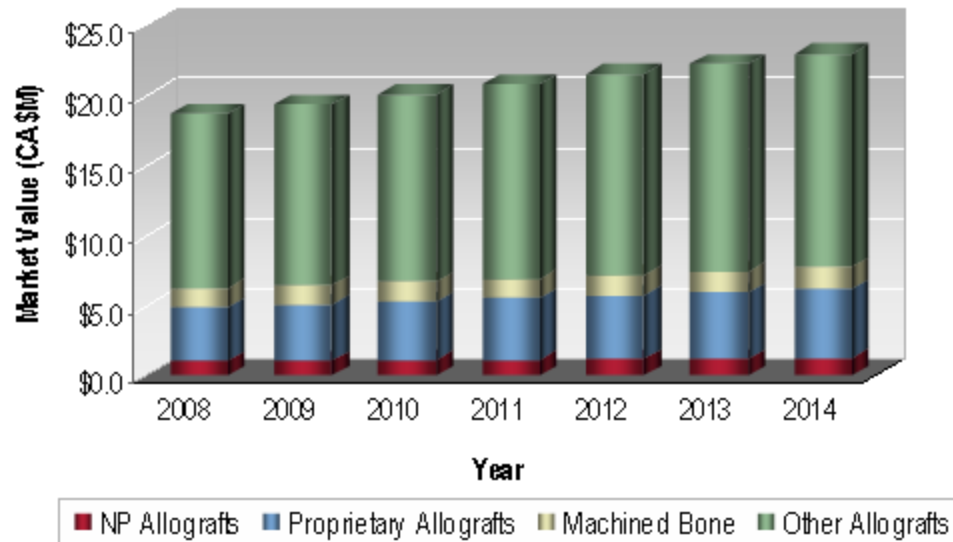
(2) Proprietary allografts include DBM paste, putty, and gel, as well as cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables.

(3) Machined bone includes bone screws, cages (cervical and thoracolumbar anterior lumbar interbody fusion, posterior lumbar interbody fusion, transforaminal lumbar interbody fusion, and lateral lumbar interbody fusion), and other machined products.

(4) Other allografts include osteobiologics such as BMPs and allograft-based rotator cuff reinforcement grafts.

Source: Millennium Research Group.

Exhibit 4: Imported Surgical Allograft Market, by Tissue Type, Canada (CA\$), 2008–2014



Notes:

(1) NP allografts include products for the femoral head, femoral condyle, whole or parts of proximal or distal bone shafts (femur, tibia, humerus), hemipelvis, cancellous bone, corticocancellous bone, cortical strut/screw/pin, bicortical strip, tricortical wedge, whole joint (knee, ankle, shoulder, elbow), patellar ligament, Achilles tendon, tibialis tendon, semitendinosus tendon, gracillus tendon, peroneous longus tendon, fascia lata, rotator cuff, meniscus, meniscus with tibial plateau, osteochondral plug, femoral hemicondyle, mandible, and dura mater.

(2) Proprietary allografts include DBM paste, putty, and gel, as well as cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables.

(3) Machined bone includes bone screws, cages (cervical and thoracolumbar anterior lumbar interbody fusion, posterior lumbar interbody fusion, transforaminal lumbar interbody fusion, and lateral lumbar interbody fusion), and other machined products.

(4) Other allografts include osteobiologics such as BMPs and allograft-based rotator cuff reinforcement grafts.

Source: Millennium Research Group.

Imported Surgical Allograft Substitute Market by Tissue Type

In Canada, allograft substitutes sold include synthetics, xenografts, and autologous-based products that can be used as an alternative to autografts. Compared to imported allografts, a significantly higher volume of imported allograft substitutes were sold in Canada in 2009. Going forward, sales of imported allograft substitutes are anticipated to expand at a faster rate than imported allograft units due to the growing trend toward the use of substitute materials in many surgical procedures. Although allografts are generally lower in price compared to most allograft substitutes available, some surgeons are hesitant to use cadaver tissue due to the risk of disease transmission and foreign body reactions, complications that have been historically associated with the use of some of these products. This will lead to the adoption of more allograft substitutes in Canada through 2014. Additionally, many allograft substitutes—especially newer material types such as injectable synthetic bone graft substitutes—have better handling characteristics than traditional allografts, such as NP allografts. For instance, many surgeons favor using putties and injectables that are easy to mold and distribute, particularly in minimally invasive procedures that are growing in popularity. As these novel materials are released and promoted by manufacturers, more surgeons will be aware of the benefits of they provide.

Over the forecast period, it is expected that the majority of allograft substitute units sold in Canada will be synthetic hard tissue products; sales of these products are projected to generate the bulk of allograft substitute revenues (see Exhibit 5 and Exhibit 6). In the country, a wide range of synthetic bone graft substitute products and sizes are available from the leading orthopedic and spine companies, such as Synthes and Stryker. These companies have heavily marketed their synthetic products, especially as graft extenders, which has facilitated unit sales. Synthetic bone graft substitutes can also be used in a wide variety of orthopedic procedures, ranging from spinal fusions to joint replacements to trauma surgery to craniotomies, providing a large number of potential surgeries the material can be used in.

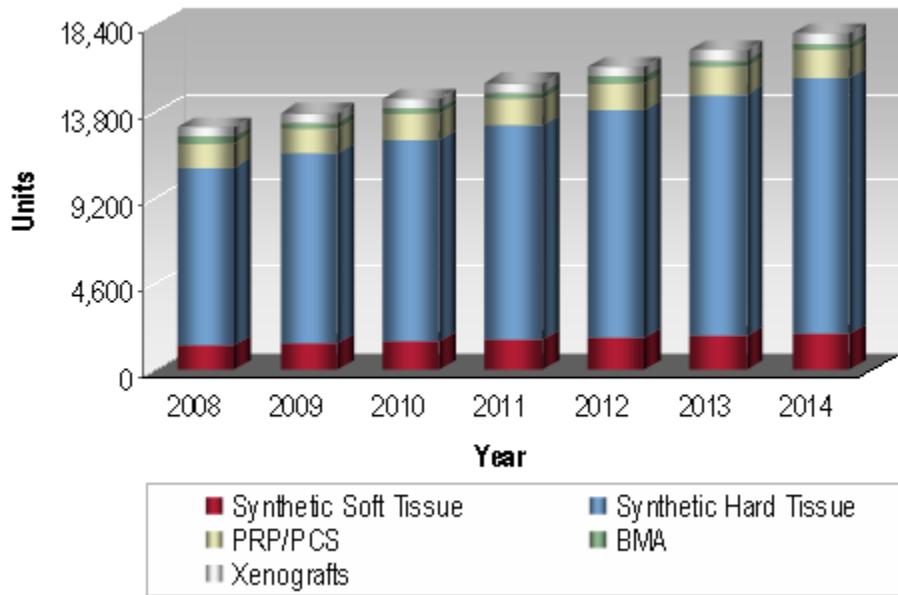
Several different types of synthetic soft tissue are available in Canada. One is the LARS ligament, or ligament augmentation device, which is composed of polyester fibers. The LARS ligament can be used in the knee, shoulder, elbow, or ankle, although knee surgeries account for the most common use of this device in Canada. Almost half of all the LARS ligaments sold in Canada occur in Quebec (which is not covered in this report). Surgeons outside of Quebec have been very wary of the product's use due to negative publicity surrounding other similar devices. Poor results regarding ligament augmentation devices were documented in the US, which caused the eventual discontinuation of most of these products in both the US and Canada. Because Canadian surgeons remain hesitant to adopt synthetic ligaments due to concerns regarding their efficacy and the sole competitor in the market is primarily in the Quebec market, unit sales in this segment will remain low over the

forecast period. Meshes for rotator cuff repair, such as Biomet's SportMesh, represent another type of synthetic soft tissue. Synthetic meshes are often preferred by some surgeons because there is no risk of disease transmission from synthetic materials. Unit sales of synthetic meshes will, however, likely be limited due to the presence of allograft-based meshes, which are popular due to the strong promotional efforts made by the leading competitor in this segment, Wright Medical Technology.

The use of autologous-based allograft substitutes, such as platelet rich plasma (PRP) and BMA, is growing in the US, but in general, Canadian surgeons have shown little interest. These products use the patient's own blood or bone marrow to create a fast-acting product that promotes bone growth and heals wounds. Many Canadian surgeons are, however, still unconvinced by the available supporting clinical data and do not view them as being absolutely necessary. As a result, few surgeons have worked with competitors to promote the use of autologous-based allograft substitutes or to lobby the government for coverage.

Some Canadian surgeons are hesitant about using xenograft-based products due to past reports of disease transmission and inflammatory responses associated with these materials. For spinal fusions, xenografts are rarely used. The material is considered antiquated compared to the many alternatives available and surgeons indicate that it is not often used anymore. For rotator cuff repair, a couple of large companies have xenograft products available in Canada, such as DePuy's Restore; however, as of 2009, xenografts were not strongly adopted in the country, partially due to the perceived potential risk of bovine spongiform encephalopathy (BSE) (or mad cow disease) and other potential disease transmissions that can occur with the use of animal-based tissue. Despite this limiting factor, it is projected that there will be an increase in the number of imported xenograft units sold in Canada over the forecast period, mainly from adoption of rotator cuff reinforcement grafts. This will occur as competitors in that segment increase the marketing and distribution of their products and work to supply additional clinical data to ease surgeon concerns regarding the potential issues associated with the use of xenografts.

Exhibit 5: Imported Surgical Allograft Substitute Units, by Tissue Type, Canada, 2008–2014

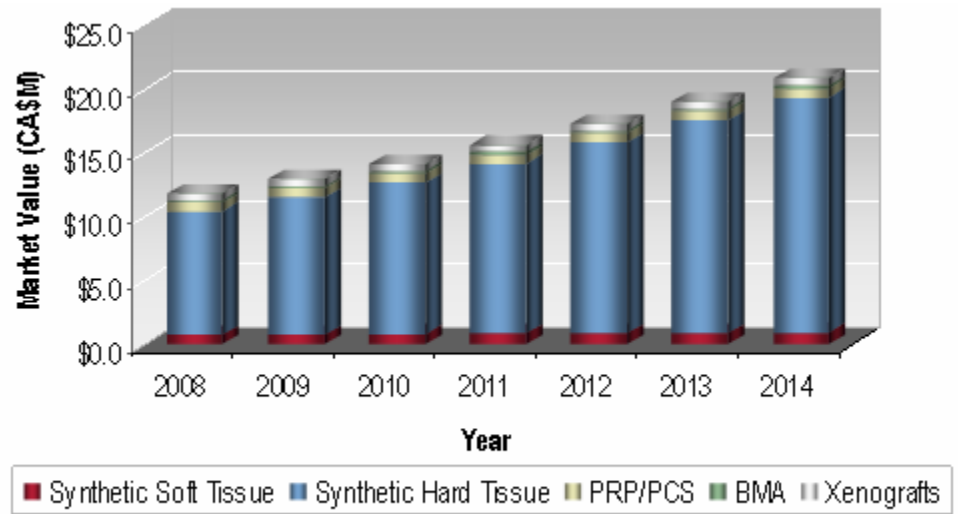


Notes:

- (1) Synthetic soft tissue includes synthetic ligaments and synthetic dura.
- (2) Xenografts include animal-based materials for rotator cuff repair, the spine, and dura.
- (3) All units in this graph are defined as the overall average size of each material used, except for synthetic hard tissue (where one unit is taken to be 9.3 cc) and xenografts for the spine (where one unit is taken to be 10 cc).

Source: Millennium Research Group.

Exhibit 6: Imported Surgical Allograft Substitute Market, by Tissue Type, Canada (CA\$), 2008–2014



Notes:

- (1) Synthetic soft tissue includes synthetic ligaments and synthetic dura.
- (2) Xenografts include animal-based materials for rotator cuff repair, the spine, and dura.
- (3) All units in this graph are defined as the overall average size of each material used, except for synthetic hard tissue (where one unit is taken to be 9.3 cc) and xenografts for the spine (where one unit is taken to be 10 cc).

Source: Millennium Research Group.

Imported Surgical ADM Market by Tissue Type

For the purpose of this study, all surgical ADM revenues are attributed to general applications. Allograft-based ADMs are composed of cadaver tissue and substitutes that can be used in place of allograft-based ADMs are composed of either xenograft or synthetic materials. Allograft-based ADMs are used mostly in hernia repair, although they can also be utilized in breast reconstruction. Both synthetic and xenograft ADMs are only used in hernia repair.

Through 2014, the general surgical ADM market—which for the purpose of this report is grouped under the orthopedic application—is expected to undergo robust growth (see Exhibit 7 and Exhibit 8). The first two allograft-based ADMs became available in Canada in early 2009. These were Synthes' DermaMatrix and LifeCell's AlloDerm, which are both composed of cadaver skin tissue. Over the forecast period, allograft-based ADM revenues are anticipated to increase rapidly due to a number of reasons. First, allograft tissue provides the most natural alternative to tissue repair other than the patient's own tissue. It is resorbable and is not associated with a risk of animal disease transmission (although there is some potential for human disease transmission and infection). Because of this, many surgeons perceive allograft-based ADMs to be an ideal solution for hernia repair. Second, Canadian surgeons are not big users of xenograft-based ADMs due to the potential of disease transmission; therefore, some surgeons use synthetics because it is the only other option and is far less expensive. Ideally, however, they would generally prefer to use a material that is not synthetic but more natural. Consequently, a number of surgeons will be more likely to shift away from xenograft and synthetic usage when given the choice of an allograft alternative. Thirdly, because allograft ADMs did not enter the Canadian market until just recently in 2009, there will likely be faster adoption in earlier years of the forecast period as early adopters and new surgeons begin to use the newest products available. Finally, companies with allograft-based ADMs will be implementing significant marketing initiatives in the hopes of expanding their presence across Canada over the forecast period. The net result of all of these factors is anticipated to contribute to considerable growth in the surgical allograft ADM market through 2014.

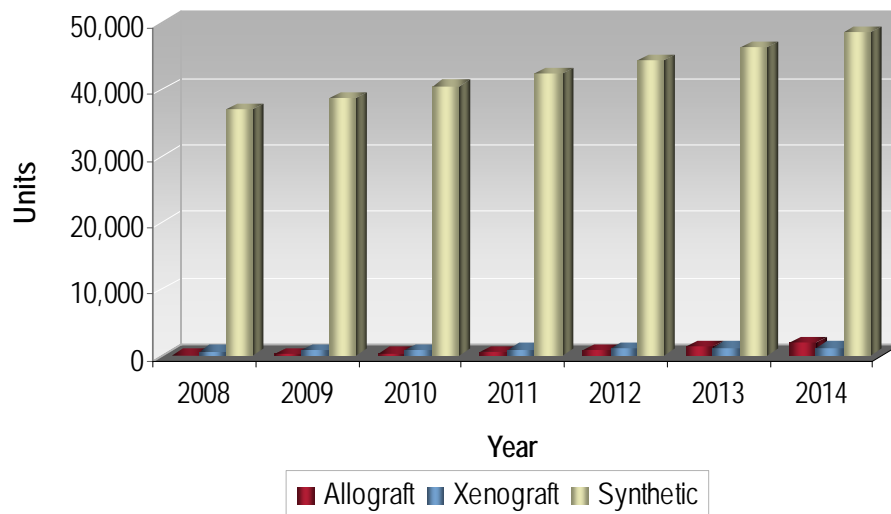
Both Synthes and LifeCell are aiming to increase their presence across Canada over the forecast period in order to promote their newly released products and to expand their revenues. As of 2009, however, most of these products were used solely for use in hernia repair and mostly in large city centers in Ontario, British Columbia, and Alberta. As these companies expand their sales forces and promotional efforts to target surgeons in other specialties, such as plastic surgery, and in other provinces, unit growth will likely be recognized.

In 2009, xenografts were the second-most commonly used type of ADM for hernia repair in Canada. Leading products in this category include Surgisis (Cook Medical), CollaMend (C. R. Bard), and Permacol (Covidien). This trend is expected to continue

for most of the forecast period until 2013, when allograft-based products is projected to surpass xenografts in total units sold. This is because in Canada, xenografts are generally not as well received as allografts or synthetics due to the potential risk of developing diseases such as mad cow disease. The concerns regarding the use of animal-derived materials will likely dampen unit growth in the xenograft segment over the forecast period. By 2011, however, LifeCell is expected to release a new product, Strattice, in the Canadian ADM market. Strattice is a xenograft-based mesh for hernia repair that reacts more similarly to human tissue. Due to the more natural composition of this product, adoption of xenografts is projected to rise, helping boost unit growth through 2014.

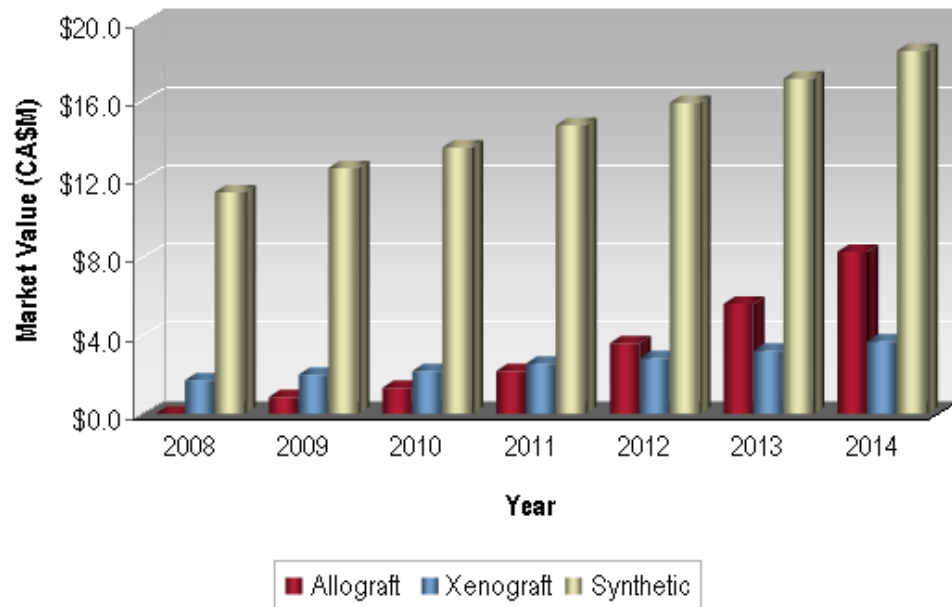
Synthetic meshes are by far the most often implanted in hernia repairs. Large companies, such as W. L. Gore, Cook Medical, and ETHICON, have been involved in this market for many years and will continue to utilize their vast resources to expand their clientele and to increase unit sales over the forecast period. Despite this, growth in the sales of synthetic meshes will be more modest compared to xenografts and allograft-based materials. This is because some surgeons, especially younger surgeons who are generally more open to trying new materials, will be interested in incorporating the use of newer products that offer benefits, such as allograft-based meshes that resorb naturally in the patient’s body.

Exhibit 7: Imported General ADM Units, by Tissue Type, Canada, 2008–2014



Source: Millennium Research Group.

Exhibit 8: Imported General ADM Market, by Tissue Type, Canada (CA\$), 2008–2014



Source: Millennium Research Group.

Imported Surgical Allograft, Allograft Substitute, and ADM Market by Application

In 2009, general orthopedics accounted for the majority of surgical allograft, allograft substitute, and ADM procedures performed in Canada, followed by neurosurgery, sports medicine, and craniomaxillofacial (CMF) surgery. The primary driver of overall surgical procedures performed will be attributed to the high number of orthopedic procedures, such as joint reconstruction and spinal fusion, performed in Canada each year. This is because these procedures require the most amount of tissue compared to other types of procedures. Because orthopedic surgeons perform almost all orthopedic procedures—with the exception of some spine procedures that are performed by neurosurgeons—this group performs almost all of the procedures that use imported allografts, allograft substitutes, and ADMs. As a result, in 2009, the vast majority of the revenues earned from these materials in Canada were composed of sales for general orthopedics applications (see Exhibit 9 and Exhibit 10). Also contributing to the large amount of revenue earned in the general orthopedics segment is the high price point associated with some of the newer available materials, such as BMPs, machined bone allografts, DBMs, and synthetics. Many orthopedic surgeons frequently use these materials because a number of the manufacturers of these products are orthopedic device companies and often target their promotional efforts to this specialty.

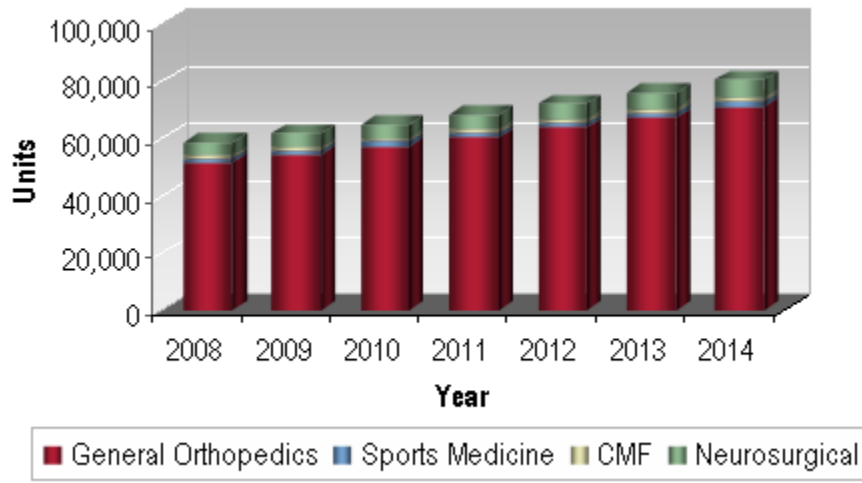
Neurosurgeons perform both spinal fusions and some cranial procedures that utilize allograft, allograft substitutes, and ADMs; this group contributed to the second-highest number of procedures performed using allografts, allograft substitutes, and ADMs in 2009. Accordingly, neurosurgical applications accounted for the second-largest amount of imported allograft, allograft substitute, and ADM revenues earned that year. This is mainly the result of the high number of spinal fusions and dural repairs performed that commonly use these materials. Imported tissue is more often used in spinal fusions and dural repairs compared to nearly all other applications because the products often used in these procedures—such as allograft chips and a wide range of allografts and alternatives, such as DBMs, BMPs, and xenografts—are only available through importation. Nevertheless, the neurosurgical market is projected to exhibit the lowest revenue growth through 2014 because neurosurgery volumes, especially spinal fusions, are expected to only grow modestly.

Sports medicine procedures, such as knee ligament and meniscus repairs, involve the use of soft tissue allografts, allograft substitutes, and ADMs, but are not performed as frequently in Canada compared to general orthopedic and neurosurgical procedures. This is because sports medicine procedures are applicable to a smaller subset of patients who sustain sports-related trauma and injury. Also, many sports medicine surgeons prefer to use autograft tissue for their procedures and do not frequently employ the use of imported allografts, allograft substitutes, or ADMs, thus resulting in lower procedure volumes involving the use of these materials. Furthermore, procedures that sport medicine surgeons specialize in are soft tissue

surgeries that do not often require bone graft substitutes, which represent a large portion of the Canadian imported allograft, allograft substitute, and ADM market. While sports medicine physicians do use allografts, they are often available from domestic tissue banks. Nonetheless, imported unit sales will be sustained by the high number of procedures requiring NP allografts, such as imported allografts for rotator cuff reinforcement. As a result, revenue growth in the sports medicine segment is expected to be the second fastest in the Canadian surgical imported allograft, allograft substitute, and ADM market through 2014.

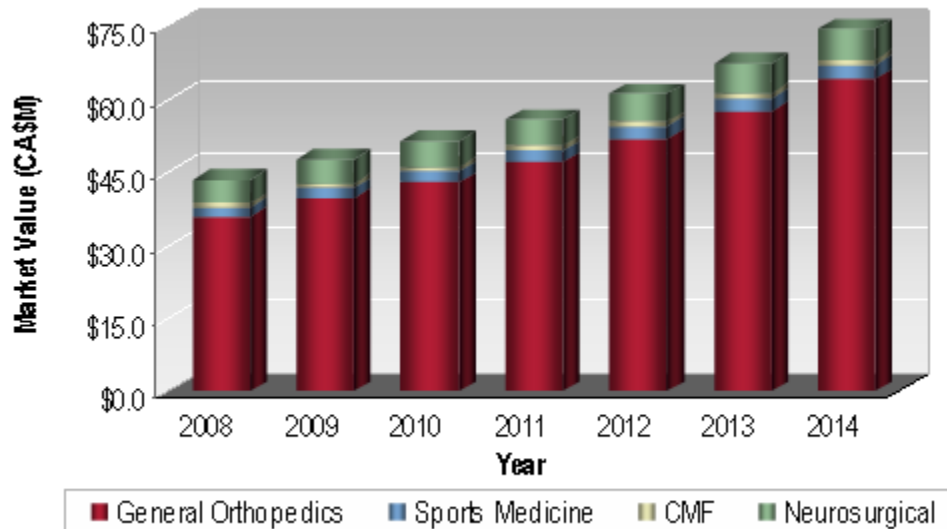
In Canada, revenues for imported allografts, allograft substitutes, and ADMs used in CMF applications were the lowest of all applications in 2009. Like sports medicine procedures, CMF surgeries are relegated to a limited number of trauma or cancer cases, which encompass a small subset of the national population. CMF surgeries involving the use of imported allografts, allograft substitutes, and ADMs will also likely be restricted through 2014 due to autografts being more commonly used for CMF procedures. Overall ASPs for materials in this application are also not as high as other applications because often, a lower volume of tissue is required for CMF procedures. Because the vast majority of procedures performed by CMF surgeons are caused by trauma or tumors, and only a finite number of trauma and tumor cases occur each year, no significant changes are anticipated to occur in terms of unit sales or revenue growth over the forecast period. Market growth is, however, projected to rise slightly due to the aging demographic in Canada. As individuals grow older, the risk of accidents and falls increases; greater age is also associated with a higher incidence of cancer. The aging Canadian population will thus contribute to the need for CMF surgeries, some of which will require the use of allograft, allograft substitutes, and ADMs. This driver will, however, be somewhat countered by ongoing public campaigns to raise awareness of the signs and symptoms of cancers, aneurysms, and other diseases, which will enable earlier diagnosis and treatment, sometimes eliminating the need for surgery.

Exhibit 9: Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Units, by Application, Canada, 2008–2014



Source: Millennium Research Group.

Exhibit 10: Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Market, by Application, Canada (CA\$), 2008–2014

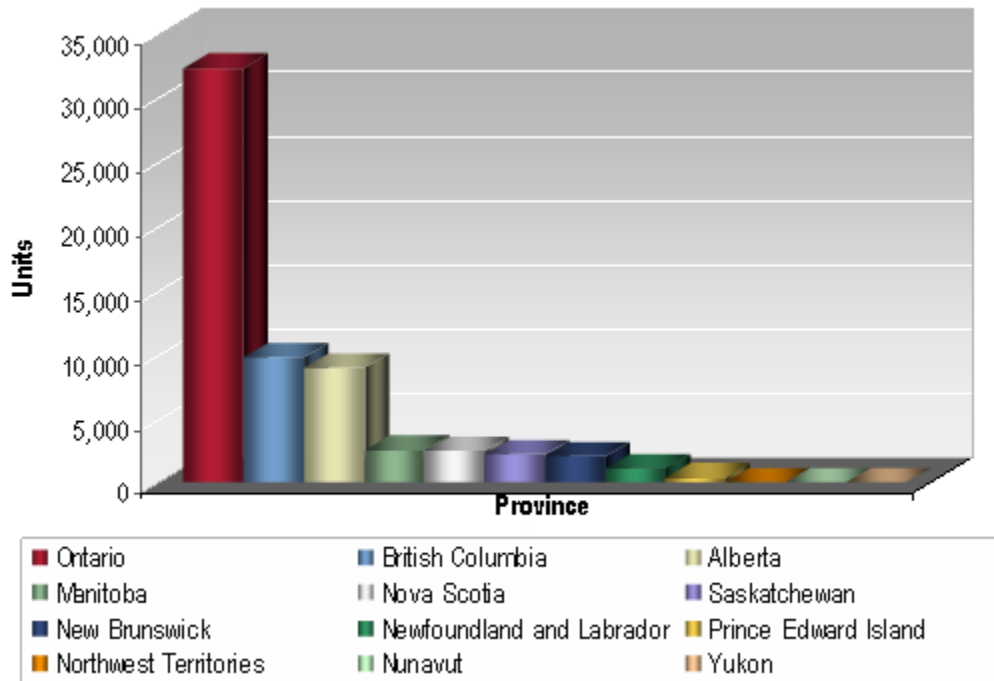


Source: Millennium Research Group.

Imported Surgical Allograft, Allograft Substitute, and ADM Market by Province/Territory

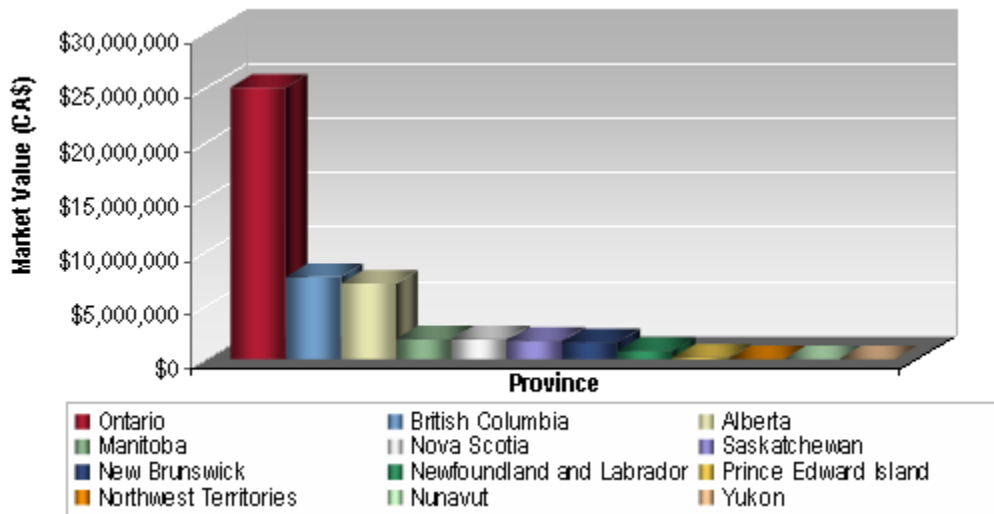
The distribution of imported surgical allograft, allograft substitute, and ADM units varies according to the distribution of surgical procedures performed across the Canadian provinces and territories (excluding Quebec) (see Exhibit 11 through Exhibit 18). The availability and use of these materials is primarily dependent on the province/territory's population, access to domestically available allograft tissue, and presence of sales representatives from the major distributors of these products. Provinces such as Ontario, British Columbia, and Alberta generally have the best access to these products due to the provinces' size and subsequent large hospital centers and regional tissue banks. Because the presence of sales representatives from the leading competitors of imported allografts, allograft substitutes, and ADMs is limited across the country due to the small size of the overall Canadian market, sales representatives who are in the country focus on the large city centers, such as Toronto and Ottawa. This enables them to maximize sales without increasing the costs that would be associated with traveling to all hospitals across the country. Also, the majority of Canadian hospitals do not perform the procedures that utilize allografts, allograft substitutes, and ADMs; those that do typically use very low volumes of the materials. The potential to market these products to Canadian hospitals is thus limited. Consequently, this provides little incentive for sales representatives to target hospitals and Canada unless a facility specifically asks a company for products.

Exhibit 11: Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Units, by Province/Territory, Canada, 2009



Source: Millennium Research Group.

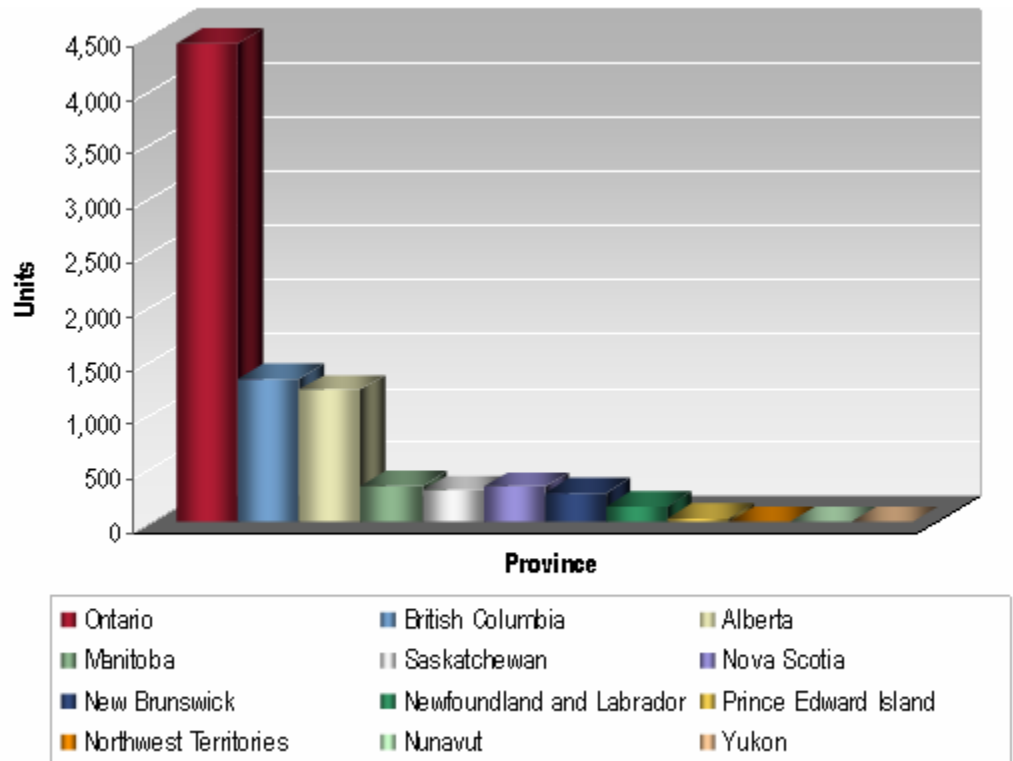
Exhibit 12: Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Market, by Province/Territory, Canada (CA\$), 2009



Note: Revenues were calculated assuming that ASPs were equal across all provinces.

Source: Millennium Research Group.

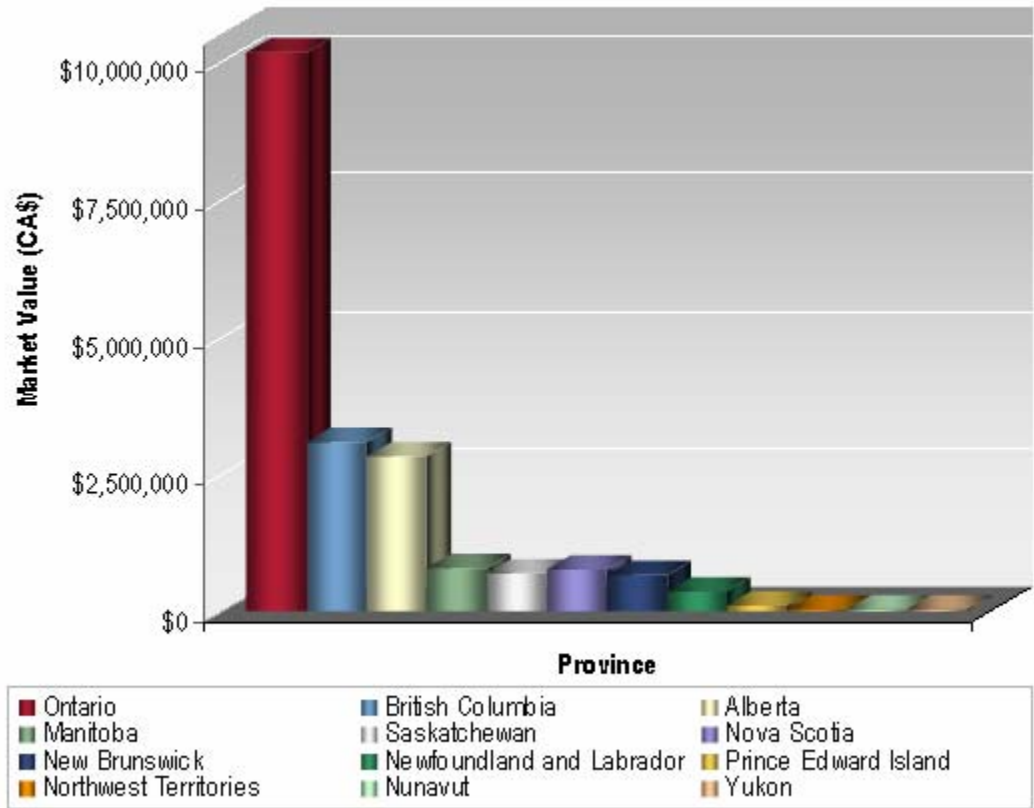
Exhibit 13: Imported Surgical Allograft Units, by Province/Territory, Canada, 2009



Note: These figures are derived from the total number of imported surgical musculoskeletal and soft tissue allograft, allograft substitute, and ADM units (as shown in Exhibit 11) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

Source: Millennium Research Group.

Exhibit 14: Imported Surgical Allograft Market, by Province/Territory, Canada (CA\$), 2009



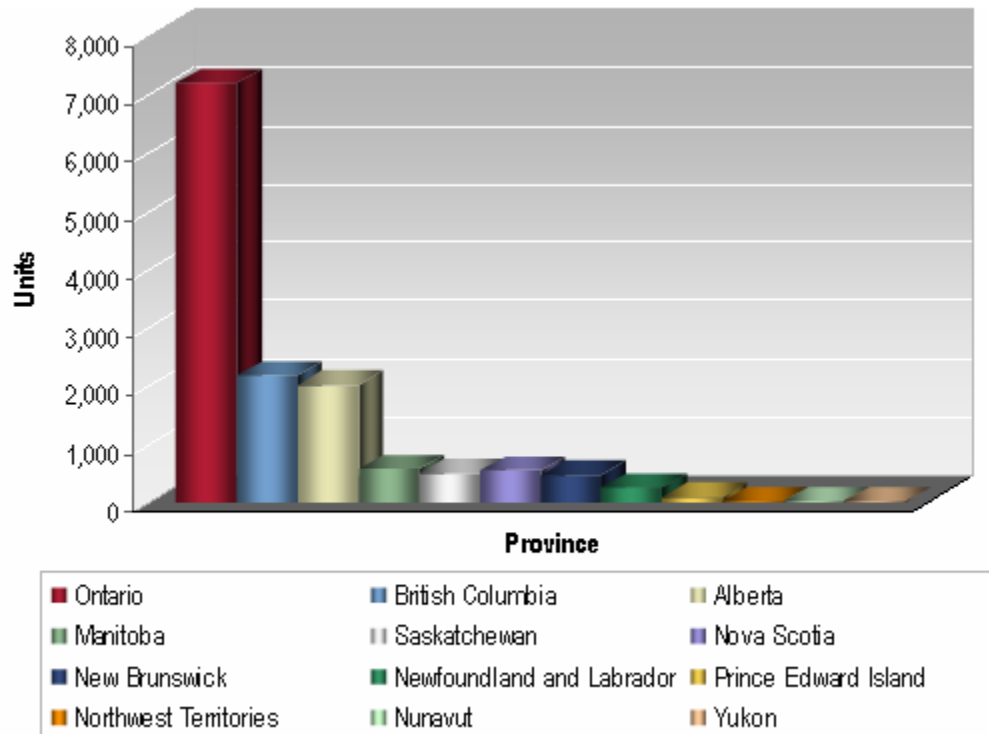
Notes:

(1) These figures are derived from the total market value of imported surgical musculoskeletal and soft tissue allografts, allograft substitutes, and ADMs (as shown in Exhibit 12) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

(2) Revenues were calculated assuming that ASPs were equal across all provinces.

Source: Millennium Research Group.

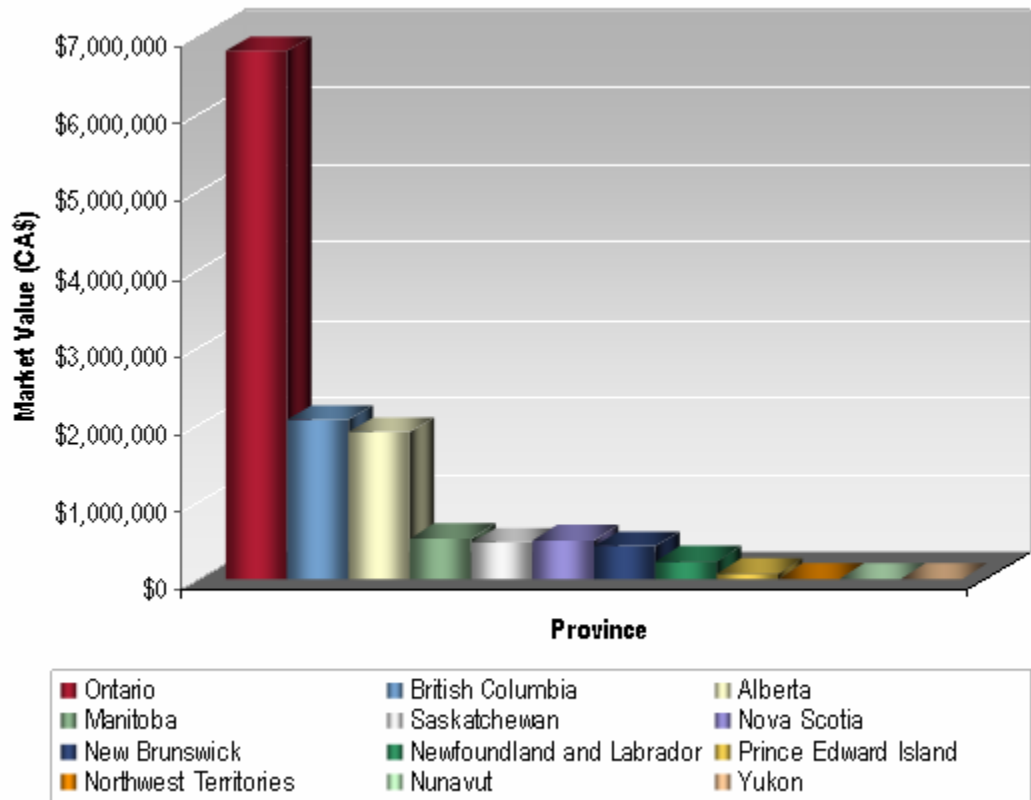
Exhibit 15: Imported Surgical Allograft Substitute Units, by Province/Territory, Canada, 2009



Note: These figures are derived from the total number of imported surgical musculoskeletal and soft tissue allograft, allograft substitute, and ADM units (as shown in Exhibit 11) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

Source: Millennium Research Group.

Exhibit 16: Imported Surgical Allograft Substitute Market, by Province/Territory, Canada (CA\$), 2009



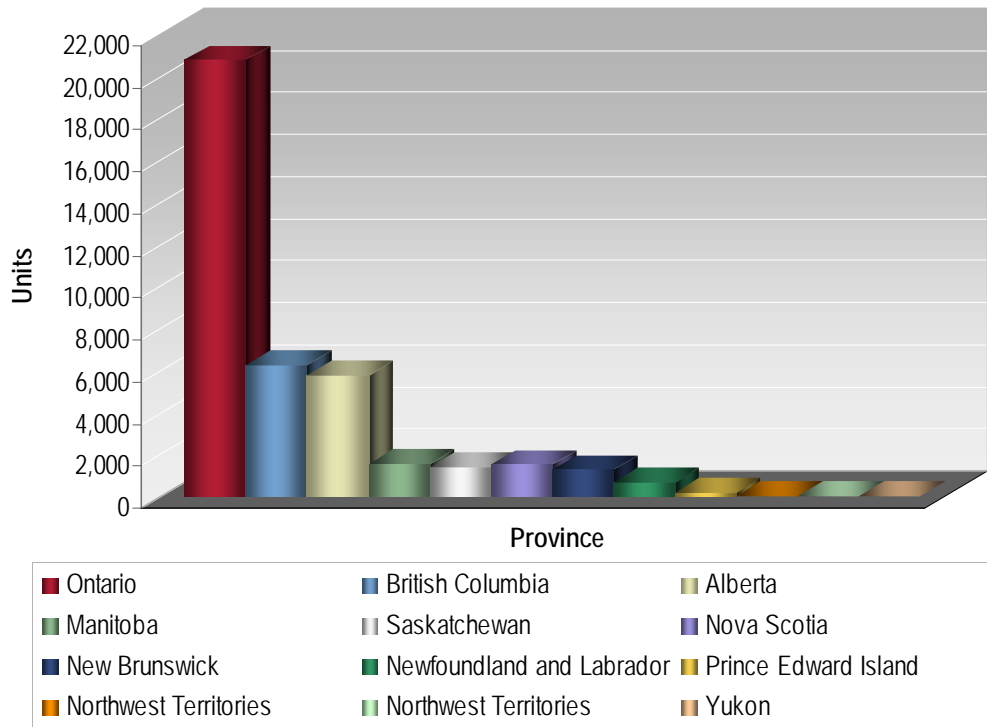
Notes:

(1) These figures are derived from the total market value of imported surgical musculoskeletal and soft tissue allografts, allograft substitutes, and ADMs (as shown in Exhibit 12) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

(2) Revenues were calculated assuming that ASPs were equal across all provinces.

Source: Millennium Research Group.

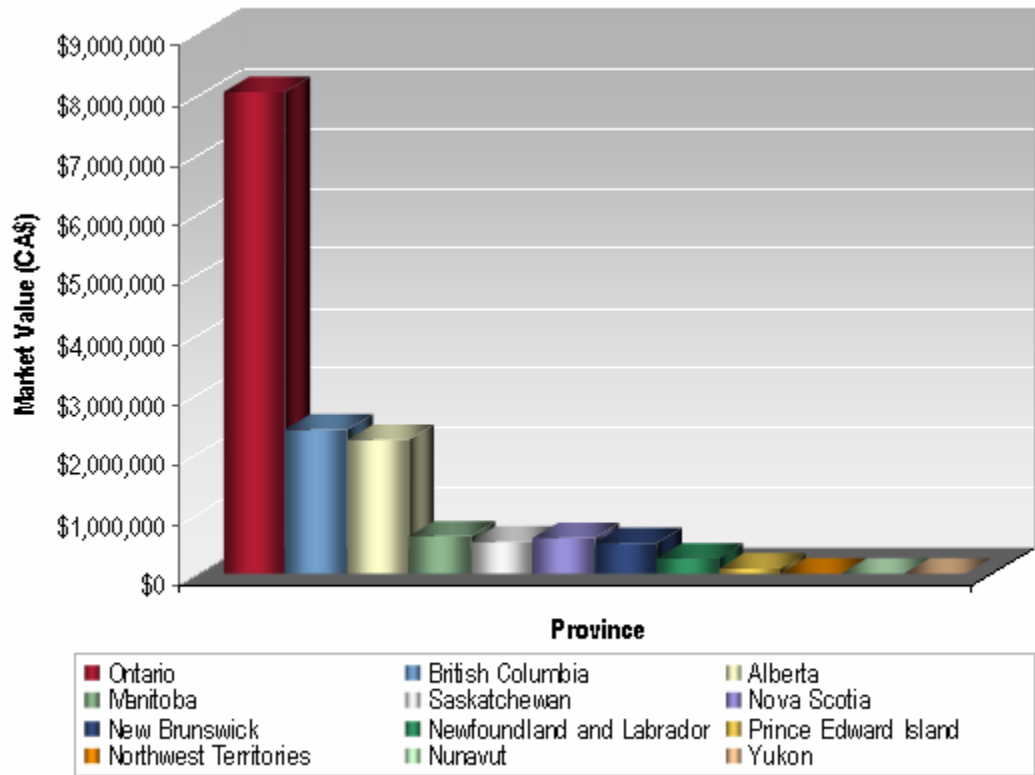
Exhibit 17: Imported General Surgical ADM Units, by Province/Territory, Canada, 2009



Note: These figures are derived from the total number of imported surgical musculoskeletal and soft tissue allograft, allograft substitute, and ADM units (as shown in Exhibit 11) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

Source: Millennium Research Group.

Exhibit 18: Imported General Surgical ADM Market, by Province/Territory, Canada (CA\$), 2009



Notes:

(1) These figures are derived from the total market value of imported surgical musculoskeletal and soft tissue allografts, allograft substitutes, and ADMs (as shown in Exhibit 12) and extrapolated from the total surgical procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

(2) Revenues were calculated assuming that ASPs were equal across all provinces.

Source: Millennium Research Group.

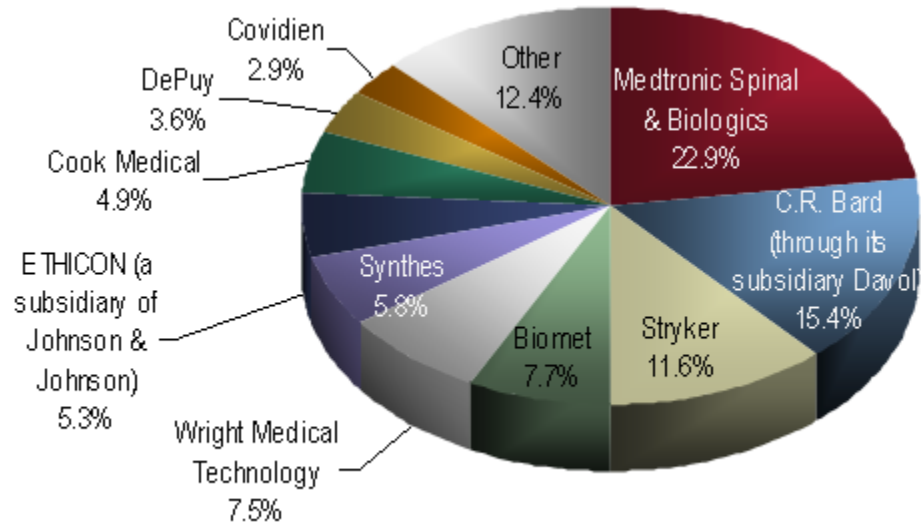
Imported Surgical Allograft, Allograft Substitute, and ADM Market Competitive Analysis

The Canadian imported surgical musculoskeletal and soft tissue allograft, allograft substitute, and ADM market comprises a wide variety of materials for a number of different procedures, which has led to an array of competitors within the market (see Exhibit 19 through Exhibit 22). The major competitors are, however, either large international tissue banks, such as RTI Biologics, or medical device companies that have a strong international presence, such as Stryker or Biomet. Many of the major US tissue banks also distribute through exclusive agreements, such as MTF and Synthes, or through nonexclusive agreements with a variety of companies in Canada, such as AlloSource, which collaborates with Medtronic Spinal & Biologics and Zimmer. In a few cases, foreign competitors distribute solely through Canadian companies, such as Integra LifeSciences, which distributes through Citagenix.

A large number of competitors in the imported allograft, allograft substitute, and ADM market are orthopedic focused. Most of the leading competitors, such as Synthes, Medtronic Spinal & Biologics, and Wright Medical Technology, have a strong presence in the general orthopedics and spine industries in Canada. As such, these companies are able to bundle their hardware and implants with their biologics in order to increase sales and boost market share. Consequently, companies have invested more resources to provide greater awareness, training, and education among surgeons in this space.

As of 2009, industry sources indicated that the Canadian biologics market as a whole remained a considerably undermarketed segment in contrast to the US. Most companies' sales representatives do not focus heavily on promoting their biologic products but more on the hardware due to the higher commissions recognized by the latter products. While it is possible to bundle both types of products together, many salespeople still focus on selling items that have a higher profit margin, such as total reconstructive joint or spinal fusion implants. As a result, even with the large number of companies in the general orthopedic market, the focus on the imported allograft, allograft substitute, and ADM market as a whole remains somewhat low.

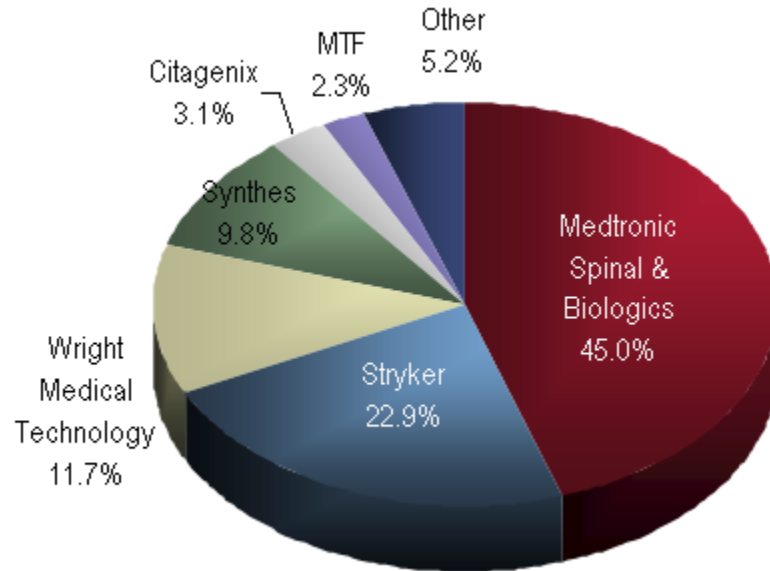
Exhibit 19: Leading Competitors in the Imported Surgical Musculoskeletal and Soft Tissue Allograft, Allograft Substitute, and ADM Market, as a % of Total, Canada, 2009



Note: Other includes AlloSource, Arteriocyte Medical Systems (through its distributor 3T Medical Systems), Arthrex, Atrium Medical, Bacterin International, BioMimetic Therapeutics (through its distributor Joint Solutions Alliance), Cascade Medical Enterprises, Citagenix, Codman, Community Tissue Services, GfE Medizintechnik, Harvest Technologies, Integra LifeSciences, J. K. Orthomedic, LifeCell, LifeNet Health, LifeLink Tissue Bank, MTF, Puget Sound Blood Center, RegenMed, Rocky Mountain Tissue Bank, RTI Biologics, Sorin Group, Synovis Life Technologies, Tissue Bank Manitoba, TissueNet, W. L. Gore, and Zimmer.

Source: Millennium Research Group.

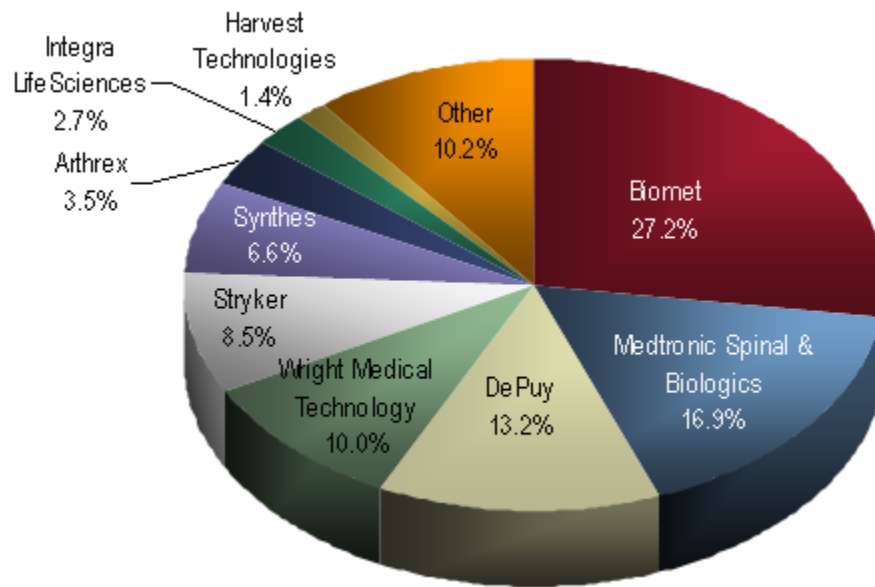
Exhibit 20: Leading Competitors in the Imported Surgical Musculoskeletal and Soft Tissue Allograft Market, as a % of Total, Canada, 2009



Note: Other includes AlloSource, Biomet, Bacterin International, Community Tissue Services, DePuy, LifeNet Health, LifeLink Tissue Bank, Puget Sound Blood Center, RegenMed, Rocky Mountain Tissue Bank, RTI Biologics, Tissue Bank Manitoba, and TissueNet.

Source: Millennium Research Group.

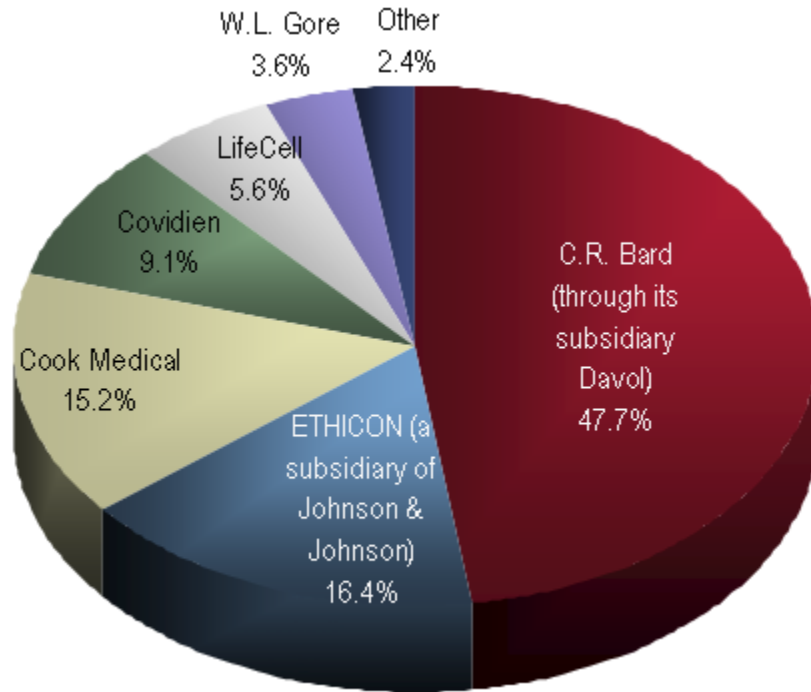
Exhibit 21: Leading Competitors in the Imported Surgical Musculoskeletal and Soft Tissue Allograft Substitute Market, as a % of Total, Canada, 2009



Note: Other includes Arterioocyte Medical Systems (through its distributor 3T Medical Systems), Arthrex, BioMimetic Therapeutics (through its distributor Joint Solutions Alliance), Cascade Medical, Citagenix, Codman, Cook Medical, J.K. Orthomedic, RTI Biologics, Sorin Group, Synovis Life Technologies, W.L. Gore, and Zimmer.

Source: Millennium Research Group.

Exhibit 22: Leading Competitors in the Imported Surgical Musculoskeletal and Soft Tissue ADM Market, as a % of Total, Canada, 2009



Note: Other includes Atrium Medical and GfE Medizintechnik.

Source: Millennium Research Group.

Imported Dental Musculoskeletal & Soft Tissue Allograft & Allograft Substitute Market

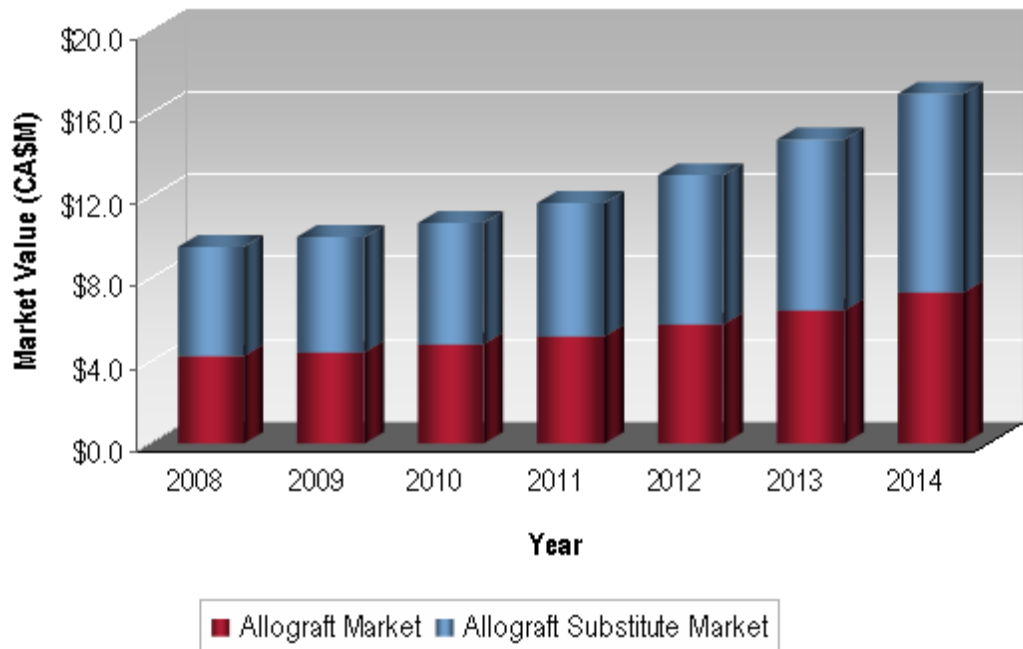
The market for dental musculoskeletal and soft tissue allografts and allograft substitutes in Canada (excluding Quebec) comprises sales of dental allografts—musculoskeletal allografts and ADMs—and allograft substitutes. For the purpose of this report, ADMs used in the dental market refer to dental membranes. Musculoskeletal allografts can be further broken down into NP and proprietary grafts; however, due to Canadian Blood Services and Millennium Research Group's agreed upon definition of what constitutes an NP allograft, there are no imported NP allografts in Canada for dental applications. As a result, dental NP allografts are not included in the valuations in this report. Cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables are defined as proprietary allografts. Allograft substitutes for dental applications include xenografts and synthetics in the hard tissue space and non-human-derived dental membranes in the soft tissue space. All dental allografts and allograft substitutes available in Canada as of 2009 were imported, and the first domestic provider of these products intended for dental applications is expected to enter the market by the middle of the forecast period. Sales of BMP products such as Medtronic Spinal & Biologics' INFUSE, which are also human-derived allografts, represent an emerging market, although industry experts believe that Canadian dental professionals will not adopt products like INFUSE in large numbers for another 10 years or so due to their high cost.

Through 2014, market expansion will be driven primarily by growth in the number of procedures involving dental bone grafts and dental membranes. This procedural growth will be supported by the increasing number of dental implant placements—a result of the aging population, greater patient desire for improved aesthetics, and wider public awareness of dental implant procedures—because a growing proportion of dental implant treatments involve a supplementary grafting procedure. The market will be further bolstered by moderate ASP increases as some manufacturers lift price freezes that had been in place to stabilize ordering volumes during the recession. Improving product technology is also projected to promote annual expansion of the number of dental implant treatments performed over the forecast period by increasing the feasibility of complex cases, thus spurring growth in related dental bone graft procedures and dental bone graft unit sales.

Limiting the market for dental bone grafts will be the growing awareness of oral health among the general population in Canada over the forecast period; as an increasing number of people become aware of the importance of oral health and more frequently visit their dentists, the severity of periodontal defect cases will decline, leading to fewer procedures requiring the use of dental bone graft materials. Industry sources noted that dental bone graft procedure volumes were also negatively affected by the global economic slowdown in 2008 and 2009. Procedures such as dental implant placements are often elective, and many individuals opted to curb their spending by postponing or forgoing dental procedures until the economy

appeared more stable. Despite this, the climbing number of imported dental allografts and allograft substitutes sold in Canada is expected to sustain robust market growth over the forecast period, with revenues approaching \$20 million by 2014 (see Exhibit 23).

Exhibit 23: Imported Dental Allograft and Allograft Substitute Market, by Segment, Canada (CA\$), 2008–2014



Note: For the purpose of this report, ADMs refer to dental membranes. ADM products (or soft tissue dental membranes) are included in the imported allograft and allograft substitute market analysis.

Source: Millennium Research Group.

Imported Dental Allograft Market by Tissue Type

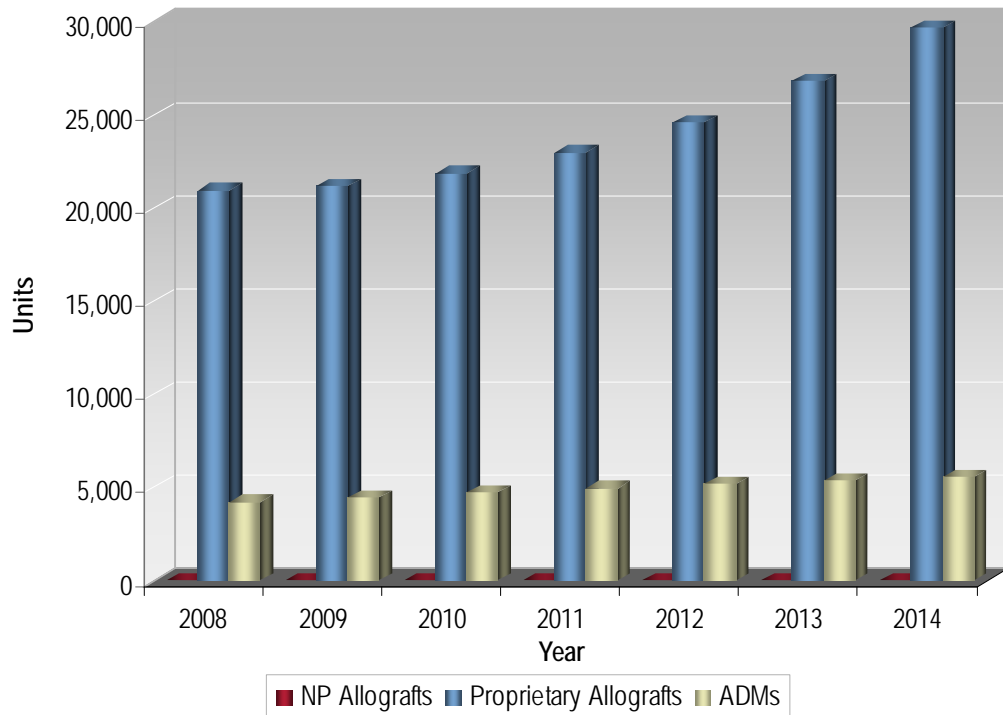
For the purpose of this report, proprietary allografts were the only type of dental allograft products in Canada in 2009, supported by strong clinical data demonstrating their success in allowing for bone growth at the treatment site. Furthermore, patented cleansing processes that are used to treat proprietary allografts are mitigating previously held fears of disease transmission and are contributing to greater clinical confidence in the materials. Proprietary allografts are commonly favored by clinicians because of their superior handling characteristics and broad range of applicability in various dental bone grafting applications—for example, Zimmer Dental's Puros DBM putty is premixed and packaged in a dispenser that allows for convenient delivery of the pliable material. As a result of their continued popularity, proprietary allografts will thus increasingly penetrate and dominate the Canadian dental allograft market, over the forecast period, with revenues approaching \$6 million by 2014 (see Exhibit 24 and Exhibit 25).

As of 2009, there were no providers of imported allograft products active in Canada. Industry experts have suggested that a rising number of US tissue banks will establish a presence in Canada over the forecast period, increasing the availability of proprietary bone graft materials in the country in response to the growing demand for bone graft materials in general. Adoption of proprietary allografts will likely remain moderate over the forecast period; although some allograft hard tissues are inexpensive, they often lack desirable handling characteristics and can be difficult to pack into defects. These represent disadvantages that will continue to impede unit sales growth in this segment through 2014.

A limited number of ADM products were available in Canada in 2009, which has restricted unit sales and revenue expansion in this particular segment. More importantly, some dental professionals have noted that the price premium attached to ADM products has yet to be justified by a significant decrease in the time required for these products to integrate into a patient's gingival tissue compared to other resorbable dental membrane substitutes. Consequently, over the forecast period, ADM unit growth is projected to slow as dentists increasingly shift toward substitutes in the soft tissue space.

Despite some of the aforementioned limiters, the overall imported dental allograft market in Canada is anticipated to expand at a CAGR of approximately 10% over the forecast period, driven primarily by growing unit sales in the proprietary allograft segment. Annual increases in ASPs across all segments will likely remain moderate throughout the forecast period and support market growth to a lesser extent.

Exhibit 24: Imported Dental Allograft Units, by Tissue Type, Canada, 2008–2014



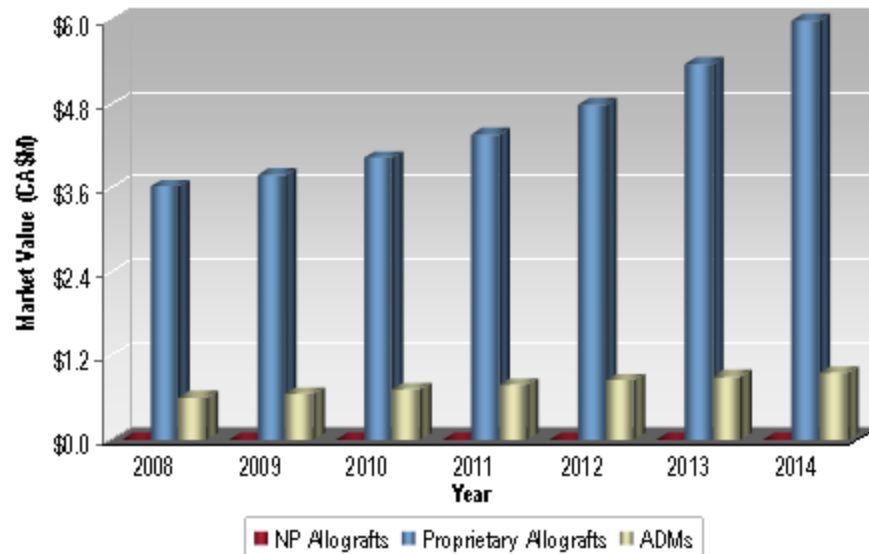
Notes:

(1) For the purpose of this report, ADMs refer to dental membranes.

(2) Under the definition agreed upon between Canadian Blood Services and Millennium Research Group, there are no imported NP allografts in Canada for dental applications. Cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables are defined as proprietary allografts.

Source: Millennium Research Group.

Exhibit 25: Imported Dental Allograft Market, by Tissue Type, Canada (CA\$), 2008–2014



Notes:

- (1) For the purpose of this report, ADMs refer to dental membranes.
- (2) Under the definition agreed upon between Canadian Blood Services and Millennium Research Group, there are no imported NP allografts in Canada for dental applications. Cancellous/corticocancellous chips, powders, cubes, granules, pellets, and injectables are defined as proprietary allografts.

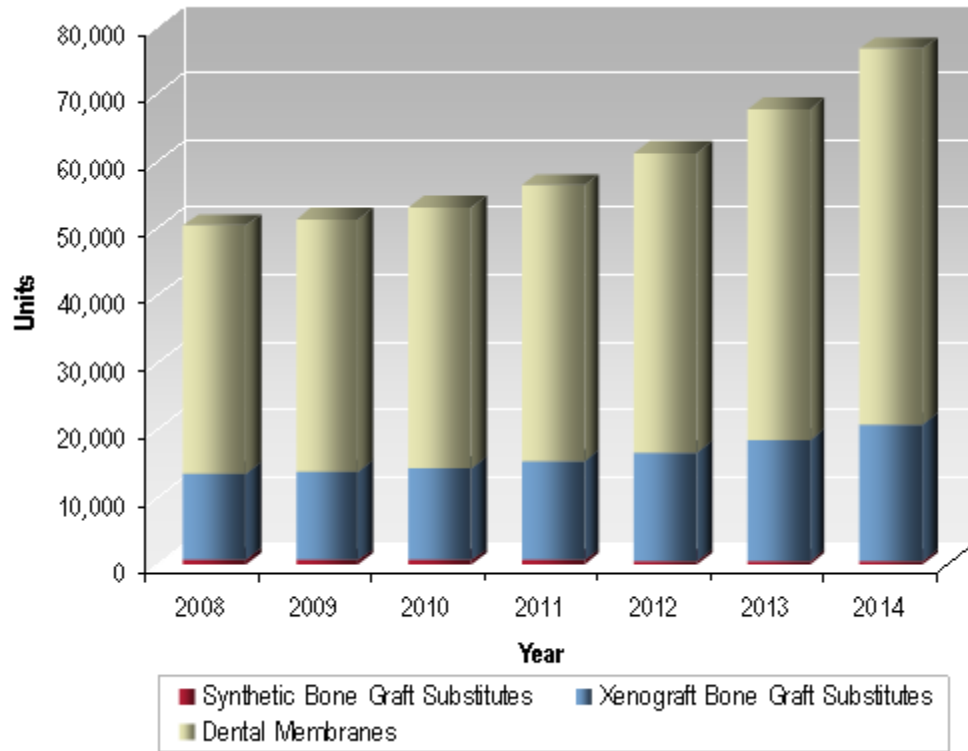
Source: Millennium Research Group.

Imported Dental Allograft Substitute Market by Tissue Type

Dental allograft substitutes considered in this report include xenograft and synthetic bone graft substitutes in the hard tissue space and non-human-derived dental membranes in the soft tissue space. Human-derived dental membranes are included in the dental allograft segment as ADMs. Through 2014, unit growth in the xenograft segment is projected to be spurred largely by the affordability of xenograft materials in comparison to synthetic and proprietary allograft products. Xenografts are, however, associated with concerns over BSE (or mad cow disease), which will likely somewhat limit the dental xenograft market's potential over the forecast period. The Canadian imported synthetic bone graft substitute market was less than one-tenth the size of the xenograft market in 2009 and is expected to continue to be overshadowed by the latter through 2014. This is because a limited number of synthetics were available in Canada as of 2009, and adoption of these brands was not widespread because proprietary allografts had penetrated the Canadian market early.

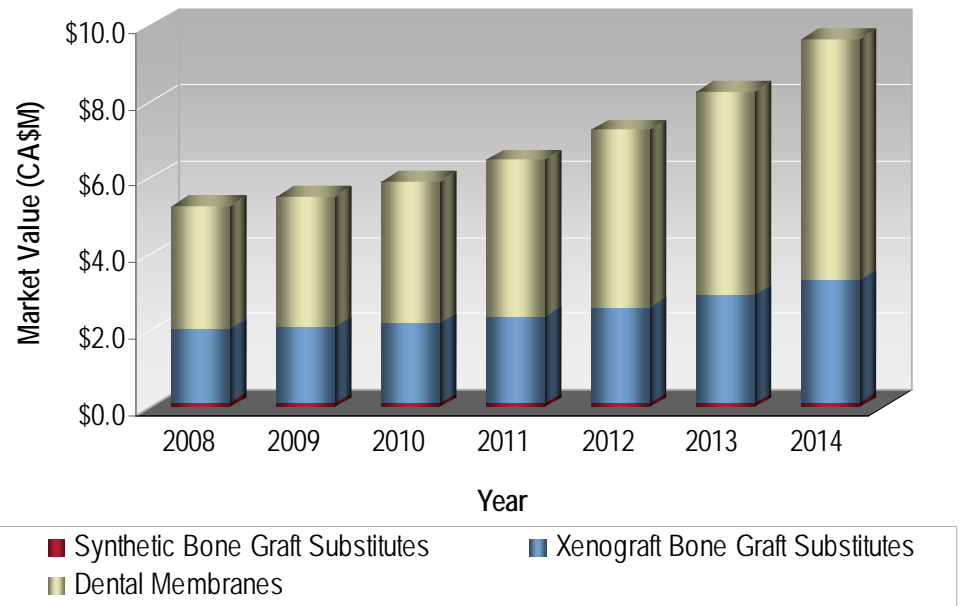
Of the dental allograft substitute markets covered, the non-human-derived dental membrane segment was the largest in 2009, with revenues exceeding \$5 million (see Exhibit 26 and Exhibit 27). This is because these products constitute the majority of dental membranes used in Canada due to the low availability of human-derived dental membranes. Additionally, dental professionals have noted that the price premium attached to dental ADM products has yet to be justified by a significant decrease in the time required for these products to integrate into a patient's gingival tissue compared to other resorbable dental membranes. Through 2014, the non-human-derived dental membrane market is anticipated to expand at a rate that mirrors that of the xenograft market, driven by increasing awareness among clinicians of the benefits of using dental membranes in dental bone graft procedures. In contrast, the market for synthetic dental bone graft substitutes is projected to stagnate over the forecast period due to the materials' perceived lack of osteoinductive and osteoconductive capabilities compared to xenografts and allografts. Overall, the Canadian dental allograft substitute market is expected to expand significantly through 2014, driven by greater clinician awareness of the benefits of using these materials during dental procedures.

Exhibit 26: Imported Dental Allograft Substitute Units, by Tissue Type, Canada, 2008–2014



Source: Millennium Research Group.

Exhibit 27: Imported Dental Allograft Substitute Market, by Tissue Type, Canada (CA\$), 2008–2014



Source: Millennium Research Group.

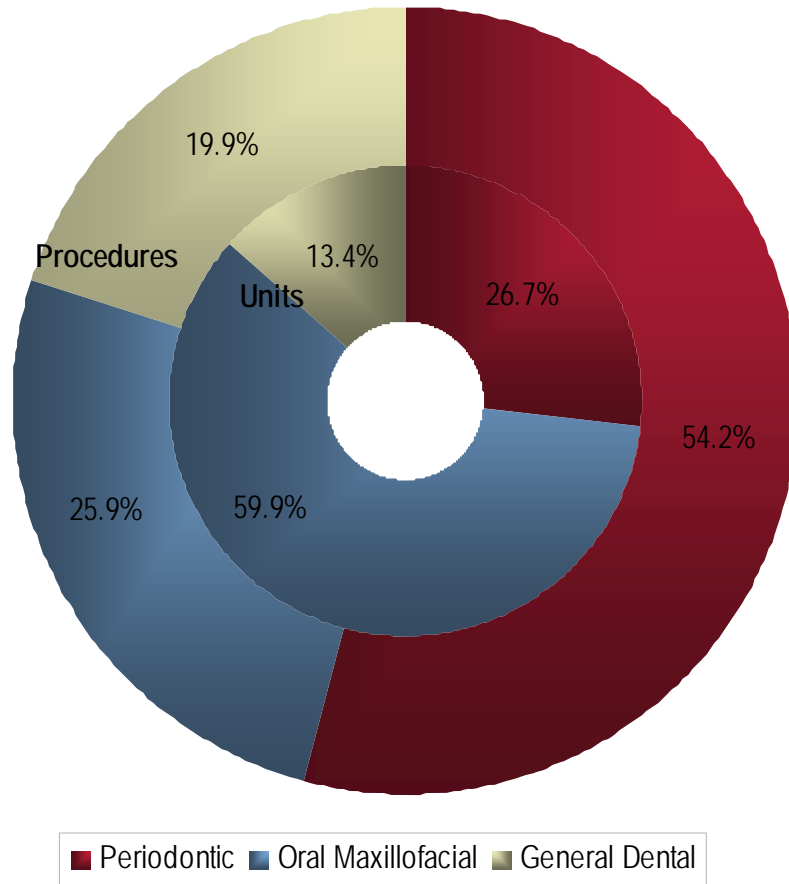
Imported Dental Allograft and Allograft Substitute Market by Application

For the purpose of this report, procedures that use allograft and allograft substitutes in the hard and soft tissue space include sinus lifts, ridge expansions, ridge augmentations, socket extractions and preservations, periodontic defect repairs, and the packing of bone graft substitute materials around a dental implant. The likelihood of each dentist specialty to perform these procedures varies, as does the size and complexity of the individual cases attended to by each. Periodontists typically perform the bulk of periodontic defect repairs and carry out sinus lifts, ridge augmentations, and ridge expansions that are of a moderate extent. Sinus lift procedures vary in terms of the volume of graft material used—this can range from 0.5 to 4 cc. On average, periodontists address the sinus lift cases that are in the middle of this range, tending to refer patients to an oral maxillofacial surgeon for larger and more complex cases. Because they perform the majority of the extensive grafting procedures in terms of graft volume, oral and maxillofacial surgeons use more units of graft material while performing comparatively fewer procedures than periodontists and general practitioners (GPs), as shown in Exhibit 28. General dental practitioners perform a very small proportion of sinus lifts, ridge augmentations, and ridge expansions, and the cases that these practitioners do address are typically minimally complex and involve volumes of bone graft material at the lower end of the range—only approximately 0.5 to 1 cc.

Although both periodontists and GPs will increasingly perform complex grafting procedures that involve more material over the forecast period, this trend is not likely to outweigh sheer unit sales for oral and maxillofacial applications, and the majority of unit sales in the Canadian dental allograft and allograft substitute market will thus continue to be generated from oral and maxillofacial applications through 2014 (see Exhibit 29 and Exhibit 30). Moreover, despite more complex cases being performed by GPs and periodontists, the majority of revenue growth in the periodontic and general dental segments is expected to be generated by an increase in smaller grafting procedures—such as socket extractions—per practitioner rather than a substantial increase in larger or more complex grafting cases, such as extensive sinus lifts. This is anticipated to contribute to the continued dominance of revenues from oral maxillofacial applications.

The market for imported dental membranes is expected to expand in line with the increasing number of dental procedures involving bone graft substitutes that are performed to create ideal conditions for dental implant placement. Because the number of 15 by 20 mm dental membrane units used per procedure does not vary significantly by application—as is the case with the volume of bone graft material—the majority of imported dental membrane units will likely be attributed to periodontic procedures due to the greater volumes in which they are performed.

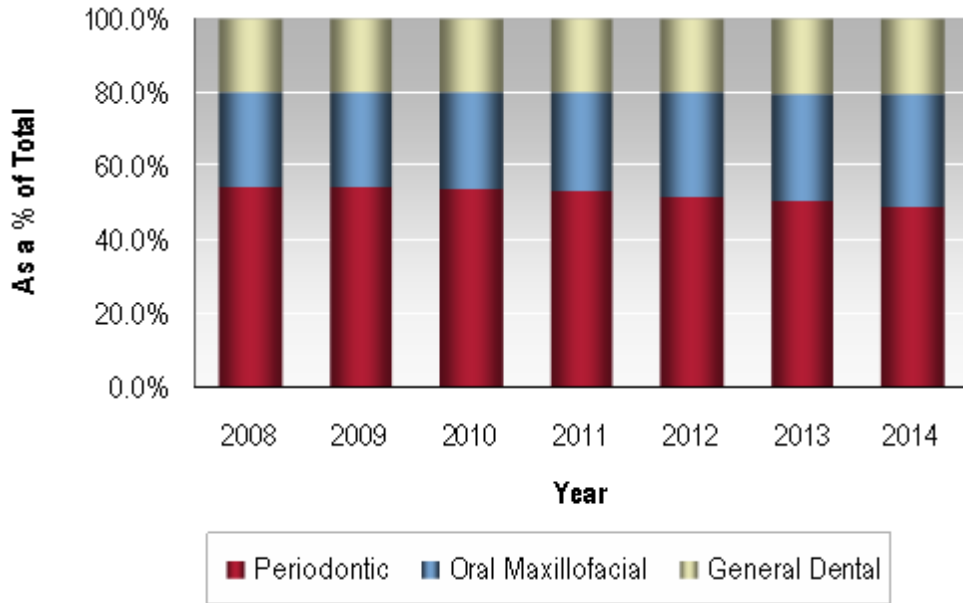
Exhibit 28: Imported Dental Allograft and Allograft Substitute Procedures and Units, by Application, as a % of Total, Canada, 2009



Note: A unit of dental allograft/allograft substitute hard tissue is defined as 1 cc, and a unit of ADM/dental membrane is defined as one 15 x 20 mm dental membrane.

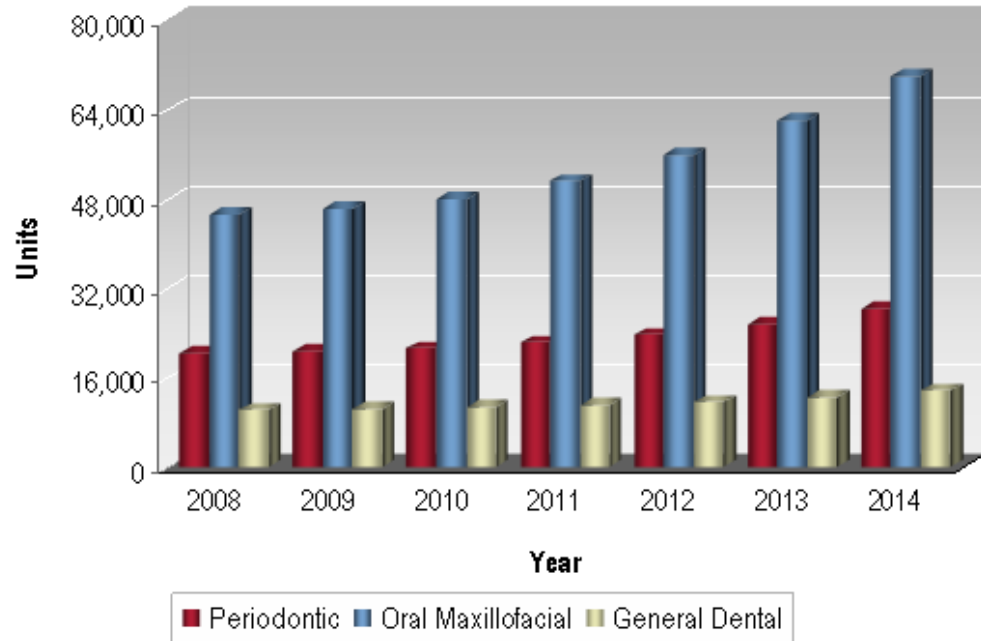
Source: Millennium Research Group.

Exhibit 29: Imported Dental Allograft and Allograft Substitute Procedures, by Application, as a % of Total, Canada, 2008–2014



Source: Millennium Research Group.

Exhibit 30: Imported Dental Allograft and Allograft Substitute Units, by Application, Canada, 2008–2014



Note: A unit of dental allograft/allograft substitute hard tissue is defined as 1 cc, and a unit of ADM/dental membrane is defined as one 15 x 20 mm dental membrane.

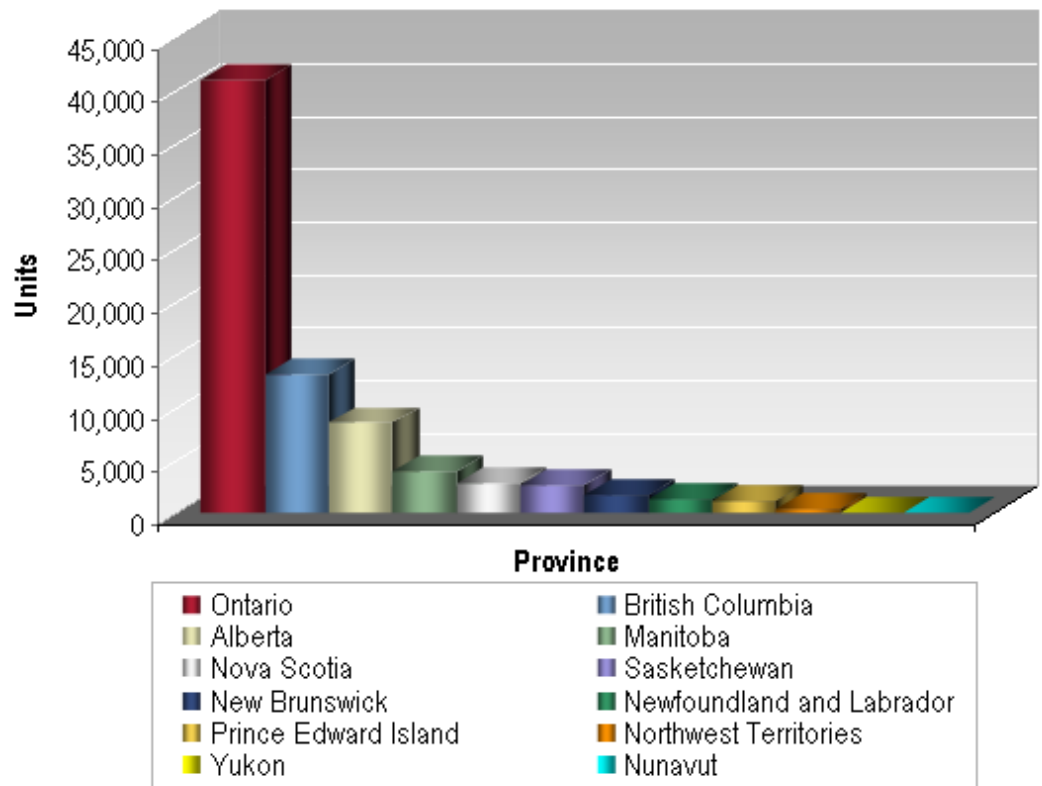
Source: Millennium Research Group.

Imported Dental Allograft and Allograft Substitute Market by Province/Territory

In 2009, the majority of dental procedures performed in Canada (excluding Quebec) involving imported dental allografts and allograft substitutes were carried out in the provinces of British Columbia and Ontario; over 70% of all procedures counted in Canada were performed in these two provinces (see Exhibit 31). This is expected to continue to be the case over the forecast period. The national market for dental biomaterials in both the hard and soft tissue space was largely underpenetrated as of 2009, meaning that much growth potential remains to be realized. The largest urban centers in the country lie in British Columbia and Ontario, and these provinces are anticipated to drive much of the procedural growth as a result of their higher population concentrations and the access they provide to dental clinics that offer dental implant services. Exhibit 32 through Exhibit 36 show units and revenues in the imported dental allograft and allograft substitute market by province/territory in 2009.

Although the breakdown by application discussed in the previous section applies to the overall Canadian dental allograft and allograft substitute market (excluding Quebec), further regional trends exist. In rural areas across the country, as well as in certain parts of Western Canada, many general dental practitioners are expanding their service offerings to include dental implant treatment and the bone graft procedures needed to supplement many dental implant cases.

Exhibit 31: Imported Dental Allograft and Allograft Substitute Units, by Province/Territory, Canada, 2009



Notes:

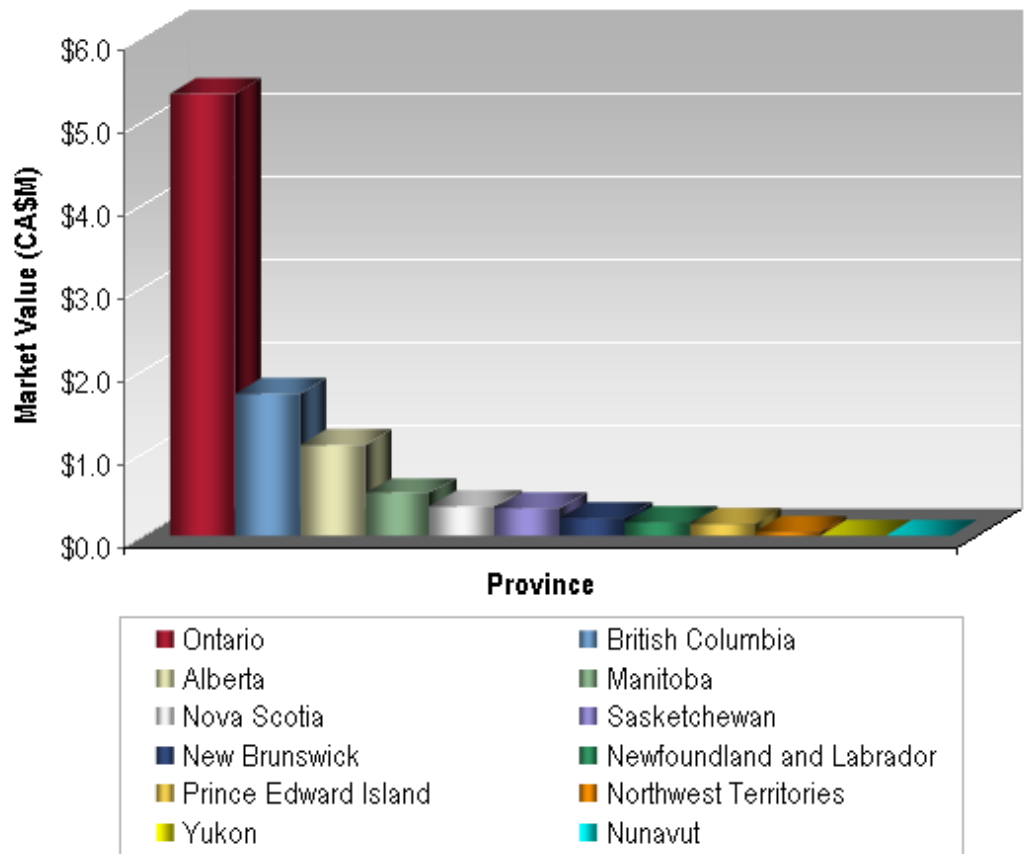
(1) Dental allograft includes dental allograft hard tissue and ADMs.

(2) Dental allograft substitute includes dental allograft substitute hard tissue and dental membranes.

(3) A unit of dental allograft/allograft substitute hard tissue is defined as 1 cc, and a unit of ADM/dental membrane is defined as one 15 x 20 mm dental membrane.

Source: Millennium Research Group.

Exhibit 32: Imported Dental Allograft and Allograft Substitute Market, by Province/Territory, Canada (CA\$), 2009

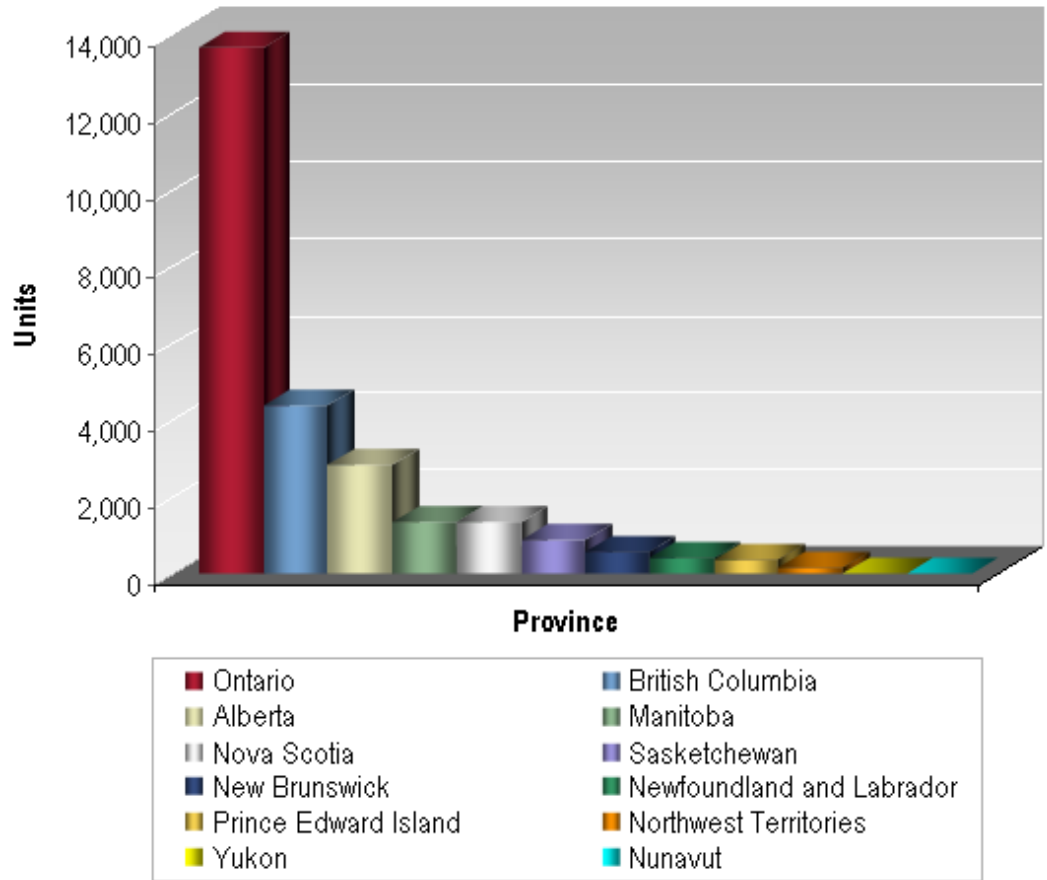


Notes:

- (1) Dental allograft includes dental allograft hard tissue and ADMs.
- (2) Dental allograft substitute includes dental allograft substitute hard tissue and dental membrane.
- (3) A unit of dental allograft/allograft substitute hard tissue is defined as 1 cc, and a unit of ADM/dental membrane is defined as one 15 x 20 mm dental membrane.

Source: Millennium Research Group.

Exhibit 33: Imported Dental Allograft Units, by Province/Territory, Canada, 2009



Notes:

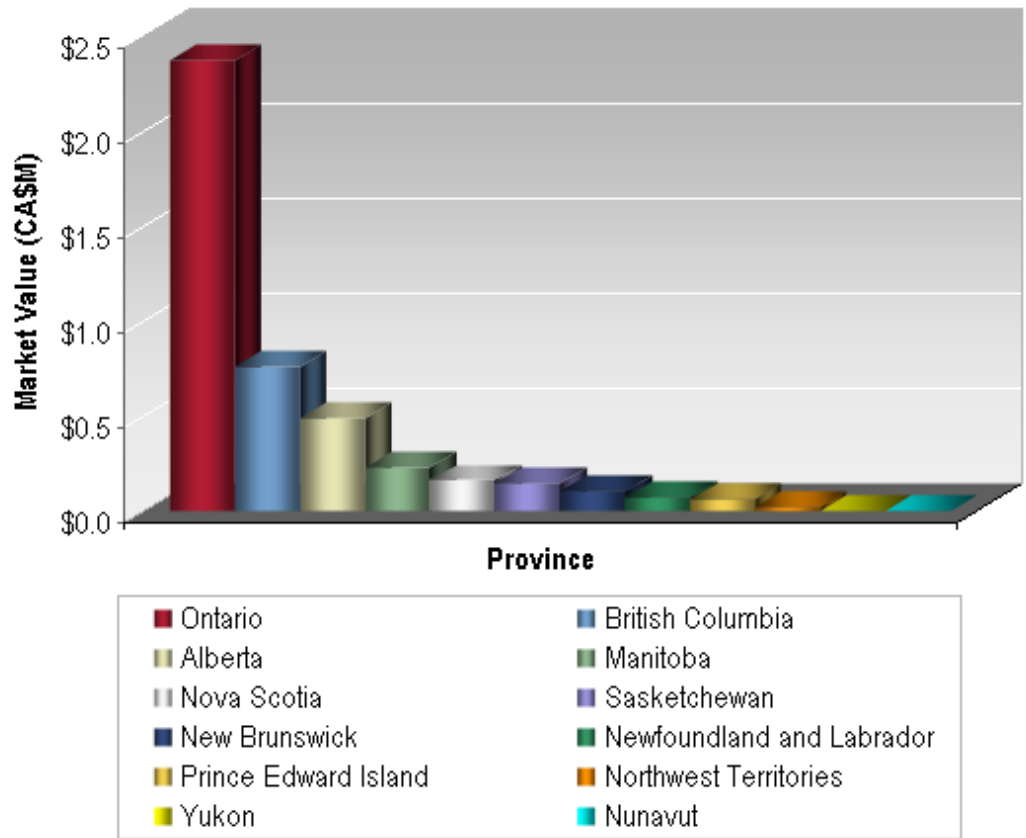
(1) Dental allograft includes dental allograft hard tissue and ADMs.

(2) These figures are derived from the total number of imported dental allograft, and allograft substitute units (as shown in Exhibit 31) and extrapolated from the total dental procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

(3) A unit of dental allograft hard tissue is defined as 1 cc, and a unit of ADM is defined as one 15 x 20 mm dental membrane.

Source: Millennium Research Group.

Exhibit 34: Imported Dental Allograft Market, by Province/Territory, Canada (CA\$), 2009



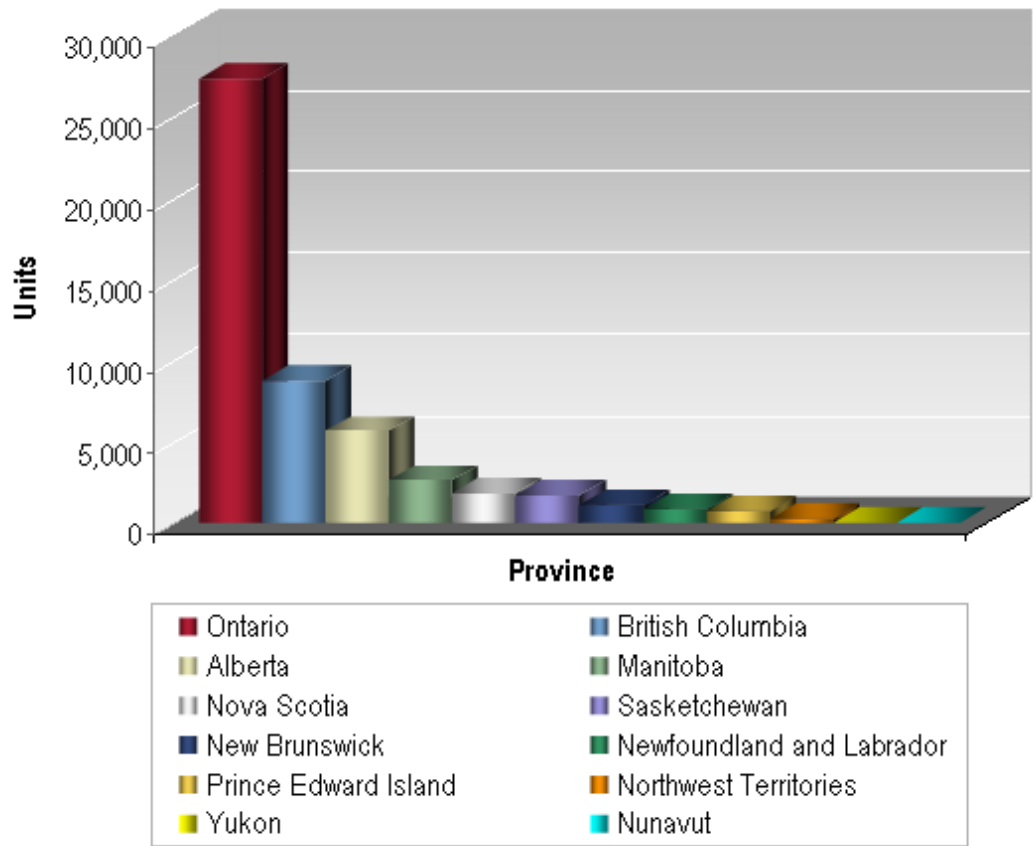
Notes:

(1) Dental allograft includes dental allograft hard tissue and ADMs.

(2) These figures are derived from the total market value of imported dental allografts and allograft substitutes (as shown in Exhibit 32) and extrapolated from the total dental procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

Source: Millennium Research Group.

Exhibit 35: Imported Dental Allograft Substitute Units, by Province/Territory, Canada, 2009



Notes:

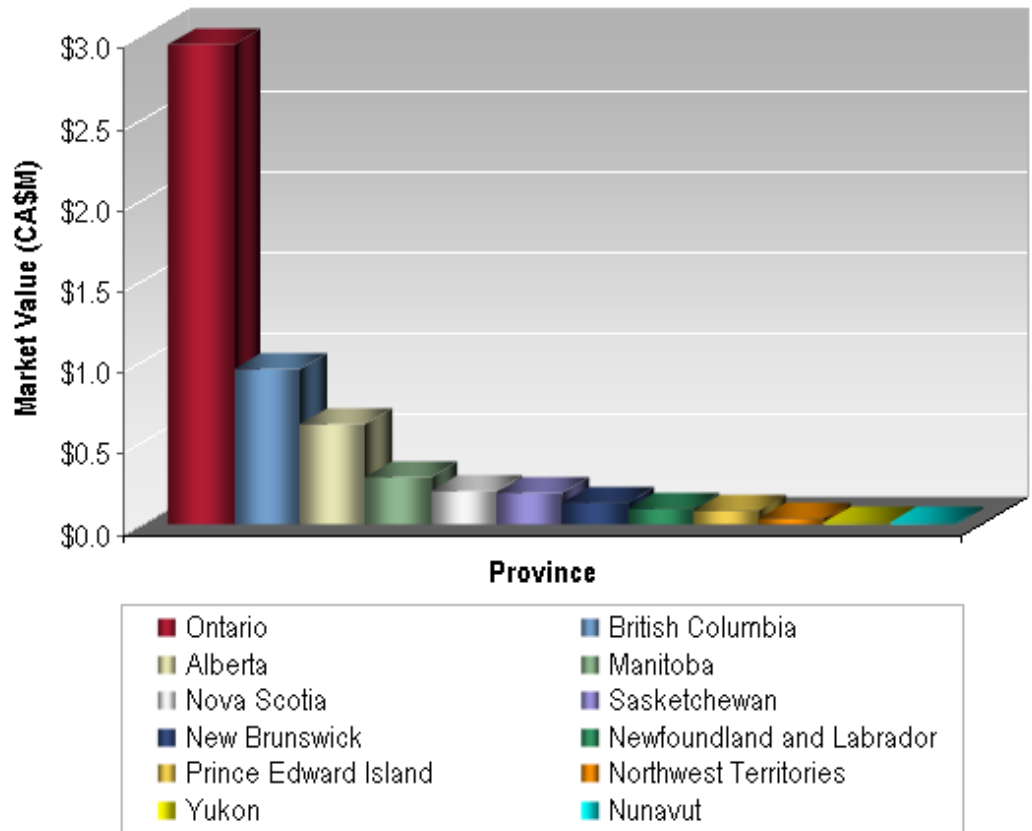
(1) Dental allograft substitute includes dental allograft substitute hard tissue and dental membrane.

(2) These figures are derived from the total number of imported dental allograft, and allograft substitute units (as shown in Exhibit 31) and extrapolated from the total dental procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

(3) A unit of dental allograft substitute hard tissue is defined as 1 cc, and a unit of dental membrane is defined as one 15 x 20 mm dental membrane.

Source: Millennium Research Group.

Exhibit 36: Imported Dental Allograft Substitute Market, by Province/Territory, Canada (CA\$), 2009



Notes:

(1) Dental allograft substitute includes dental allograft substitute hard tissue and dental membrane.

(2) These figures are derived from the total market value of imported dental allografts and allograft substitutes (as shown in Exhibit 32) and extrapolated from the total dental procedure volumes and proportions by province/territory. These figures do not take into account how the use of different tissue types varies by province/territory.

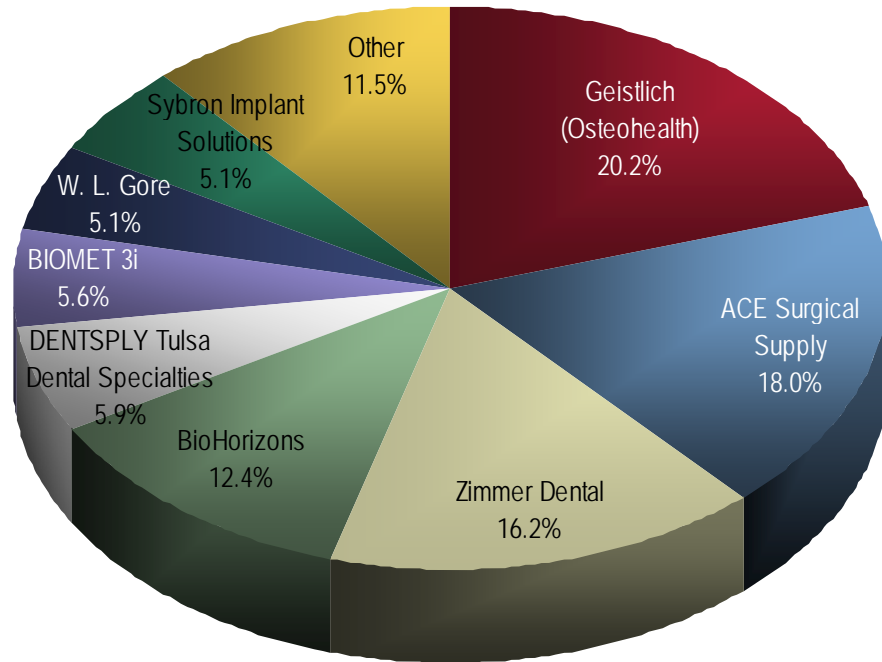
Source: Millennium Research Group.

Imported Dental Allograft and Allograft Substitute Market Competitive Analysis

The 2009 Canadian imported dental allograft and allograft substitute market was led by Geistlich (through its distributor Osteohealth), ACE Surgical Supply, Zimmer Dental (which also distributes products manufactured by RTI Biologics and Integra LifeSciences), BioHorizons, and DENTSPLY Tulsa Dental Specialties (which also distributes products for the MTF). Combined, these five companies held over 70% of the market share. The top four competitors offered products in both the dental bone graft substitute and dental membrane segments. As of 2009, the number of ADM products available in the dental space in Canada was very limited, including only BioHorizons' AlloDerm product and a few pericardium and fascia lata tissues provided by select tissue banks.

All competitors in the 2009 Canadian market for imported dental allografts and allograft substitutes were US-based. Despite this, industry experts estimated that this market remained largely underpenetrated by many US companies and organizations that had yet to establish a presence in Canada due to a shortage of allograft tissue in the US. Those US tissue banks that were active in the Canadian market reported that they had only a handful of dental clients in Canada. Consequently, the imported dental allograft market in the country was extremely concentrated and dominated by a small number of large and internationally successful dental implant manufacturers, supplying the Canadian market with the vast majority of the allograft substitute and ADM products available in the country. These large dental implant manufacturers have a particular competitive advantage in that their sales representatives can promote their companies as one-stop-shops for both dental implant and dental-implant-related products such as bone graft materials and dental membranes. Moreover, in conjunction with the continued launch of new products, manufacturers will increase their marketing efforts to promote sales in both the hard and soft tissue space, which will drive awareness, product adoption, and revenue growth. Exhibit 37 through Exhibit 39 display the leading competitors in the Canadian imported dental allograft and allograft substitute market in 2009.

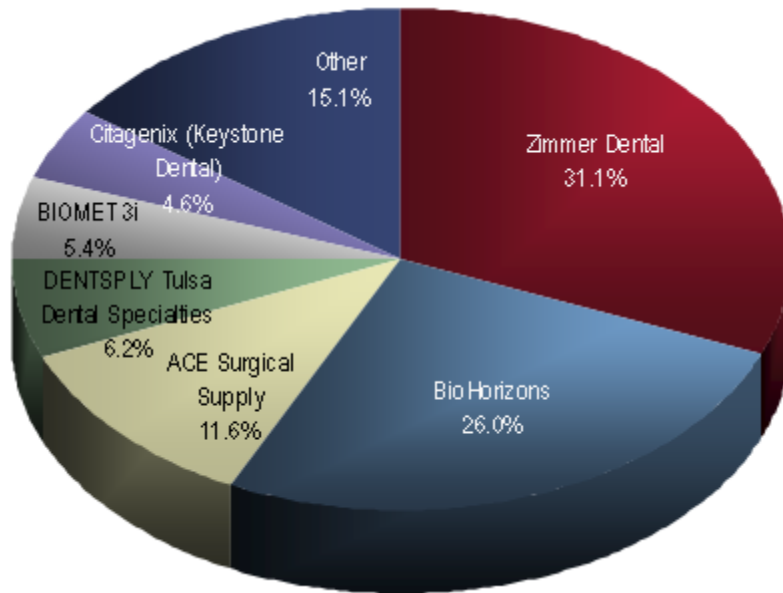
Exhibit 37: Leading Competitors in the Imported Dental Musculoskeletal and Soft Tissue Allograft and Allograft Substitute Market, as a % of Total, Canada, 2009



Note: Other includes AlloSource, Biocomposites, Citagenix (through its distributor Keystone Dental), Community Tissue Services, Exactech, Impladent, IMTEC, LifeNet Health, Pacific Coast Tissue Bank, RegenMed, Rocky Mountain Tissue Bank, Salvin Dental Specialties, and Straumann.

Source: Millennium Research Group.

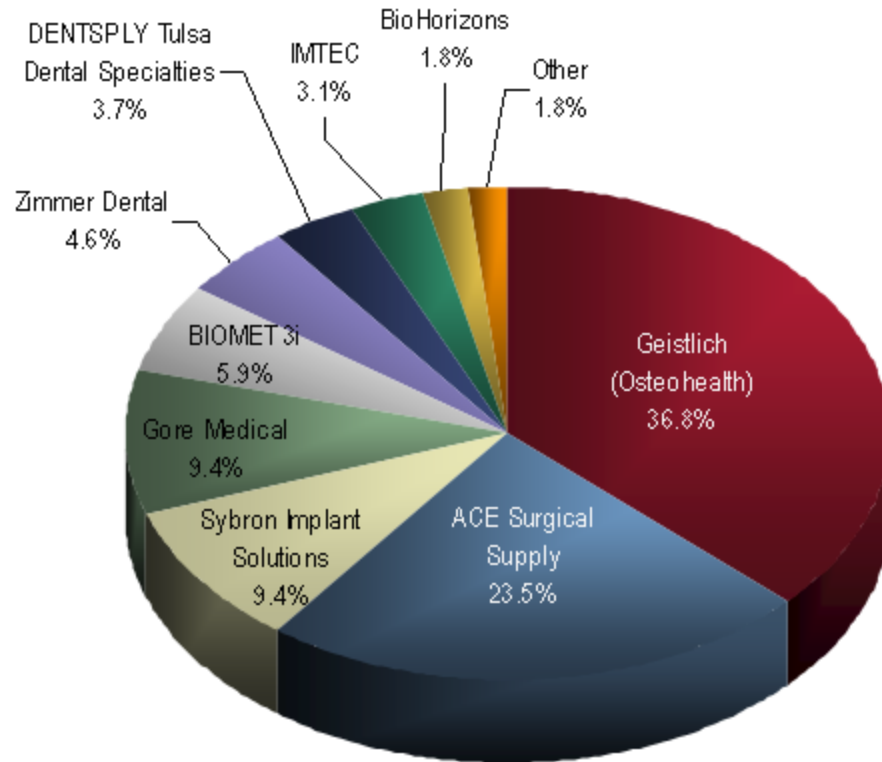
Exhibit 38: Leading Competitors in the Imported Dental Musculoskeletal and Soft Tissue Allograft Market, as a % of Total, Canada, 2009



Note: Other includes AlloSource, Biocomposites, Community Tissue Services, Exactech, Gore Medical, Impladent, IMTEC, LifeNet Health, Pacific Coast Tissue Bank, RegenMed, Rocky Mountain Tissue Bank, Salvin Dental Specialties, Straumann, and Sybron Implant Solutions.

Source: Millennium Research Group.

Exhibit 39: Leading Competitors in the Imported Dental Musculoskeletal and Soft Tissue Allograft Substitute Market, as a % of Total, Canada, 2009



Note: Other includes AlloSource, Biocomposites, Citagenix (through its distributor Keystone Dental), Community Tissue Services, Exactech, Impladent, LifeNet Health, Pacific Coast Tissue Bank, RegenMed, Rocky Mountain Tissue Bank, Salvin Dental Specialties, and Straumann.

Source: Millennium Research Group.

Appendix A

MRG Acronyms and Initialisms

Acronym/Initialism	Definition
ADM	Acellular Dermal Matrix
ASP	Average Selling Price
BMA	Bone Marrow Aspirate
BMP	Bone Morphogenetic Protein
BSE	Bovine Spongiform Encephalopathy
CAGR	Compound Annual Growth Rate
CMF	Craniofacial
DBM	Demineralized Bone Matrix
GP	General Practitioner
MTF	Musculoskeletal Transplant Foundation
NP	Nonproprietary
OP-1	Osteogenic Protein-1
PCS	Platelet Concentration System(s)
PRP	Platelet-Rich Plasma

Source: Millennium Research Group.