

3D-MATRIX LTD

(IN PARTNERSHIP WITH BD BIOSCIENCES)

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President of BD Biosciences: Edward Ludwig

Workforce: 28 000 employees

3D-Matrix Ltd (3DM) produces a synthetic hydrogel peptide material, trademarked PuraMatrix, which is used to create defined three-dimensional (3D) micro-environments for a variety of cell-culture experiments. The company develops novel medical therapies for accelerating wound healing and tissue regeneration across a range of medical indications. It has commercialized a family of self-assembling nano-scale scaffolds with applications in drug discovery, cancer biology, stem cell research and bio-production.

The company's medical devices act as a bridge in wound healing and tissue regeneration. They are resorbable, injectable nano-scale scaffolds capable of promoting the rapid in-growth of normal local tissue.

3DM is a privately held company based in Tokyo, Japan. Its primary focus is on regenerative medicine and on commercializing a self-assembling peptide technology under an exclusive worldwide licence granted by the USA's Massachusetts Institute of Technology (MIT). The material was originally discovered by Dr Shuguang Zhang at MIT in 1992. The company 3DM Inc was founded in Boston, Massachusetts, USA, in 2001. In September 2004, 3DM launched PuraMatrix hydrogels through its partnership with BD Biosciences (previously known as Becton, Dickinson & Co).

3D-Matrix Ltd, formerly known as 3D-Matrix Japan Ltd, was founded in May 2004 and acquired 3DM Inc in October 2007. With this acquisition, the Japanese company obtained worldwide commercialization rights to the peptide scaffold.

The following are also involved in running 3DM:

- Keiji Nagano, Chief Executive Officer, who established 3D-Matrix Japan and introduced PuraMatrix to Japan. The company has about 70 collaborators in leading Japanese academic and industrial laboratories in tissue engineering;
- John Maki, the Director of the company, who was a founding investor in 3DM;

- Lisa Spirio, Co-Founder and Director of 3DM's internal research projects, and external collaborations with numerous commercial and academic laboratories focused on cancer biology, stem cell biology and drug discovery.

In 2008, BD Biosciences oversaw the signing of an exclusive worldwide supply agreement between its subsidiary Discovery Labware and 3DM to distribute PuraMatrix products for research applications.

When the trademarked BD PuraMatrix peptide hydrogel is exposed to physiological salt conditions, the peptide component self-assembles into a 3D hydrogel with a nanoscale fibrous structure. In the presence of key bioactive molecules, this hydrogel promotes the attachment and differentiation of multiple cell types. It is biocompatible, resorbable, injectable and devoid of animal-derived material and pathogens.

The hydrogel has been shown to promote the differentiation of hepatocyte progenitor cells, rat pheochromocytoma cells, hippocampal neurons and endothelial cells. Studies have also demonstrated that the material supports the attachment of a variety of primary cell types, such as neuronal, fibroblast and keratinocyte, and transformed cell types. Other potential applications include stem cell proliferation, tumour cell migration and invasion, angiogenesis assays and *in vivo* analyses of tissue regeneration.

The nanofibre structure resembles that of natural collagen – with fibre diameter of 5–10 nm – and enables cell proliferation equivalent to that within collagen. PuraMatrix is similar to agarose, collagen and methylcellulose in that it will typically support the long-term growth of many different cell types, either for differentiation or tumorigenicity studies. Unlike collagen substrates and scaffolds, PuraMatrix will not shrink when fibroblasts and other cell types contract. It is often used at much lower concentrations than other hydrogels, improving nutrient diffusion, cell morphology and cell viability.

PuraMatrix forms a loose gel, allowing improved culture, the formation of complicated cell structures, analysis and the recovery of cells. In many cases, differential cell growth will be evident and it is much easier to isolate cells, deoxyribonucleic acid (DNA) and proteins from PuraMatrix than from other synthetic and animal-derived matrices.

The hydrogel has a range of potential applications, including tissue regeneration (for example, bone filling and wound healing), cell therapies and drug delivery systems.

BD Biosciences is a global medical technology company that manufactures and sells medical devices, instrument systems and reagents.

Originally, the company – founded in 1897 – sold syringes made of glass. The company started to manufacture its own surgical instruments after the acquisition of the Philadelphia Surgical Co.

In its modern incarnation, BD is focused on improving drug therapy, enhancing the quality and speed of diagnosing infectious diseases, and advancing the research and discovery of new drugs and vaccines. It has its headquarters in Franklin Lakes, New Jersey, USA, and employs about 28 000 people in about 50 countries throughout the world. The company serves healthcare institutions, life science researchers, clinical laboratories, industry and the general public.

The company is divided into three sectors: BD Medical, BD Diagnostics and BD Biosciences.

BD Medical specializes in supplying medical devices and developing injection- and infusion-based drug delivery systems. The BD Medical segment is focused on providing solutions to reduce the spread of infection, enhance diabetes treatment and advance drug delivery.

BD Diagnostics provides products for the safe collection and transport of diagnostics specimens, as well as instruments and reagent systems to detect accurately a broad range of infectious diseases, healthcare-associated infections and cancers.

BD Biosciences is focused on advancing the science and applications associated with cellular analysis and products that help grow living cells and tissue. The marketing of PuraMatrix is included in this segment.

FINANCIAL PERFORMANCE

BD Financial Performance 2006–2010

(US\$ thousand)	2006	2007	2008	2009	2010
Net sales	5 738 02	6 282 84	6 897 619	6 986 722	7 372 333
Net income	752 280	881 252	1 126 996	1 231 603	1 317 610
Net sales by sector					
Medical			3 542 712	3 556 694	3 796 432
Diagnostics			2 159 811	2 226 219	2 318 879
Biosciences			1 195 096	1 203 809	1 257 022

Source: BD.

In the third quarter of 2011, ended 30 June, BD posted net sales of \$2.014 billion—10% up on the third quarter of 2010. Reported revenue growth guidance for the full fiscal year 2011 was expected to be around 6% higher than the fiscal year 2010 result, owing to the anticipated effects of favourable currency movements. On a foreign currency-neutral basis, the company predicted growth of about 3% from the 2010 figure, mainly owing to lower-than-expected sales in Western Europe.