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IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF ORANGE,

CENTRAL JUSTICE CENTER

THE PEOPLE OF THE STATE OF CALIFORNIA,

Plaintiff,

vs.

DV BIOLOGICS, LLC; DAVINCI BIOSCIENCES, LLC; ANDRES ISAIAS; ESTEFANO ISAIAS, SR; ESTEFANO ISAIAS, JR and DOES 1-10

Defendants

Case No.: 30-2016-00880665-CU-BT-CJC

CIVIL COMPLAINT FOR VIOLATIONS OF BUSINESS AND PROFESSIONS CODE SECTION 17200 (UNLAWFUL, UNFAIR AND FRAUDULENT BUSINESS PRACTICES)

Filing Fees Exempt (Govt. Code § 6103)

Judge Mary Fingal Schulte

The People of the State of California, by and through Tony Rackauckas, District Attorney for the County of Orange, hereby allege as follows:

INTRODUCTION

1. DV Biologics, LLC and DaVinci Biosciences, LLC obtained aborted fetus donations from Planned Parenthood and turned those donations into a profit-driven business. They did so by selling tissues and stem cells from the heart, lungs, kidneys, brain, intestines, skeletal muscle and bones of the aborted fetus donations. The companies advertised and sold

these "prenatal products" from 2009-2015 to companies all around the world, earning hundreds of thousands of dollars in revenue.

2. Although donations are permitted, the sale of fetal tissue and cells for "valuable consideration" is illegal under both California and federal law. (Cal. Health & Safety Code § 125320; 42 U.S.C. § 289g-2.) These laws were adopted to address the "significant ethical and policy concerns" that arose with the legalization of stem cell research and "to ensure that researchers have the tools necessary to fulfill the promise of stem cell research" -- an objective that cannot be achieved if stems cells are too expensive for the scientific community to acquire for research purposes. (Stats 2002, ch. 789 [S.B. No. 253] § 1 (g)-(h).)

3. Nonetheless, Defendants pressed onward, year-after-year, in an attempt to beat their "competition" and increase margins -- just as any profit-seeking enterprise may otherwise attempt to do. Indeed, rather than limiting their income on these sales, the companies intentionally set their prices as high as possible in an effort to maximize their profits. Sales and marketing staff were hired, paid commissions, and pressured to "push" sales in order to meet increasing revenue objectives every year. They were encouraged to offer discounts, coupons, and sales-pricing on fetal "products" to move "inventory" more quickly as well.

4. The business was lucrative. To be sure, fetal stem cell "products" were routinely sold at a 10-fold, or higher, mark-up over the minimal costs that were required to handle, process and distribute these "products" for sale. The company also charged packaging and handling fees, as well as marked-up shipping fees, so as to earn a little extra profit on every transaction.

5. It is estimated that the companies sold hundreds of different fetal tissue and stem cell "products" for valuable consideration in violation of the law. Each unlawful sale is a separate act of unlawful and unfair competition under California's Business and Professions Code Section 17200 for which civil penalties and injunctive relief are warranted and hereby sought by way of this Complaint.

JURISDICTION AND VENUE

6. At the relevant time period in this case, Defendants transacted business, employed workers and/or controlled a place of business in the County of Orange, in the state of California.

The unlawful conduct -- involving the unlawful sale of fetal tissue for valuable consideration -- occurred in the County of Orange, in the state of California at the Defendants' place of business.

7. Jurisdiction and venue are proper in this Court pursuant to California Code of Civil Procedure Sections 395 and 395.5 because the conduct giving rise to liability occurred in the County of Orange at the Defendants' places of business located at 1239 Victoria Street, Costa Mesa and 2667 Old Canal Road in Yorba Linda.

PARTIES

8. Tony Rackauckas, as District Attorney for the County of Orange, acting to protect the public from unlawful, unfair, or fraudulent business practices, brings this action in the public interest on behalf of the People. As such, the Plaintiff in this action includes the People of the State of California and the County of Orange (hereinafter, the "Plaintiff" or the "People").

9. Incorporated in November 2007, Defendant DaVinci Biosciences, LLC, is a Delaware Limited Liability Company with its principal place of business, as of June 24, 2015, located at 22667 Old Canal Road in Yorba Linda, in the County of Orange. Prior to June 2015, the principal place of business for DaVinci Biosciences was located at 1239 Victoria Street, Costa Mesa, in the County of Orange. The company filed an application for registration with the California Secretary of State in 2007; however, the California Franchise Tax Board forfeited the entity's powers, rights and privileges on July 28, 2015 and the entity's powers, rights and privileges have remained forfeited ever since.

10. Defendant DV Biologics, LLC was incorporated in Delaware on March 3, 2009, and shares its principal place of business, as of June 24, 2015, with DaVinci Biosciences, located at 22667 Old Canal Road in Yorba Linda, in the County of Orange. Prior to June 2015, the principal place of business for both companies was located at 1239 Victoria Street, Costa Mesa, in the County of Orange. The company filed an application for registration with the California Secretary of State in 2009; however, the California Franchise Tax Board forfeited the entity's powers, rights and privileges on November 3, 2014 and the entity's powers, rights and privileges have remained forfeited ever since.

11. DaVinci Biosciences is jointly owned and managed by Andres Isaias, Luis Isaias and Estefano Isaias. Andres Isaias, Luis Isaias, and Estefano Isaias also own and manage DV Biologics. The two companies share the same office space, employees, and management. The organization charts of both companies, demonstrating the unity of ownership, management and employees, in 2015 is attached hereto as **Exhibit A**. There is no separate accounting of the financials of the two companies; the accounting of revenue and expenses for both companies is 100% commingled. There is thus a unity of ownership and sharing of management, operations, revenues and expenses between the two companies such that there is little to no separation between the two. The two companies are alter egos of one another and are collectively referred to herein as "DV" or "Defendants."

12. Since 2012, the two companies also share office space, employees and operations with a third company called "TheBioBox LLC." TheBioBox LLC is a Delaware Limited Liability Company incorporated in 2012 which is doing business in California as a stem cell bank and laboratory. Defendant Andres Isaias is the President of TheBioBox. Andres Isaias applied to register TheBioBox as a foreign Limited Liability Company in the state of California in November 2012; however, the California Franchise Tax Board forfeited the entity's powers, rights and privileges on August 1, 2016 and the entity's powers, rights and privileges have remained forfeited ever since.

13. Defendant Andres Isaias is one of the founding members of the DV Defendants. In January 2011, he became the President of both companies and at all relevant time periods thereafter, he was the officer and manager in control of the business operations and activities of the DV Defendants. Andres Isaias, along with the other family members, managed and controlled the financial decisions, books and records for the DV companies from the time they were formed until the present date. Andres Isaias exercised control over the DV companies and directly participated in their operations by attending several business strategy and sales meetings at the California DV headquarters, facilitating an audit of the value of DV's inventory, and by requiring regular financial and other reports from DV employees from approximately 2009 to the

present date. Andres Isaias filed and signed, as President, the most recent Statement of Information for both DV Defendants with the California Secretary of State on January 31, 2011.

14. Defendants Estefano Isaias, Sr. and Estefano Isaias Jr., are father and son. Both Estefano Isaias, Jr. and Estefano Isaias, Sr. participated in the founding of the DV Defendants with Andres Isaias, who is the brother of Estefano Isaias Jr. and also the son of Estefano Isaias Sr. In January 2011, "Estefano Isaias" was designated as a manager and/or member of both companies and at all relevant time periods thereafter, has been one of the official managing members of the companies in control of the business operations and activities of the DV employees. Estefano Isaias, Jr., and Estefano Isaias, Sr, along with other family members, managed and controlled the financial decisions, books and records for the DV companies from the time they were formed until the present date. Both Estefano Isaias Jr., and Estefano Isaias Sr, exercised control over the DV companies and directly participated in their operations by working in concert with Andres Isaias to manage the companies, by attending several business strategy and sales meetings at the California DV headquarters, auditing the value of DV's inventory, and reviewing regular financial and other reports from DV employees from approximately 2009 to the present date. The individual defendants are collectively referred to herein as the "Isaias Defendants."

15. Plaintiff is ignorant of the true names and capacities of Defendants sued herein as DOES 1-10. inclusive, and therefore sues these Defendants by such fictitious names. Plaintiff will amend this complaint to allege their true names and capacities when ascertained.

GENERAL ALLEGATIONS

16. DaVinci Biosciences started doing business in Orange County as a biotechnology research and development laboratory in 2008. The company did not sell any products, or earn any revenue, but rather, dedicated its resources to "the discovery and development of cell-based therapeutics … that aid in the treatment of human degenerative disorders." (DV 2012 Business Plan.)

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17. According to the company's website:

> DaVinci Biosciences, LLC is dedicated to improving the quality of life for individuals suffering from degenerative disease and injury. Through responsible research and development, we strive to be innovative leaders in biotechnology and regenerative medicine; renowned worldwide for our scientific and medical achievements and contributions to the health and well-being of communities.

(http://dvbiosciences.com.) In particular, the company is "investigating the use of stem cells to treat patients suffering from" diseases like cardiovascular disease, neurological disease, autoimmune disease, as well as spinal cord injuries, arthritis and other sports injuries. (http://dvbiosciences.com/ clinical-applications /cardiovascular-diseases.).

18. A stem cell is "an unspecialized cell that gives rise to differentiated cells." (Merriam-Webster.com.) There are adult, embryonic and fetal stem cells in humans. Adult stem cells are located in blood, bone marrow and fatty tissues, and generally "act as a repair system for the body, replenishing adult tissues." (https://en.wikipedia.org/wiki/Stem_cell.) Embryonic stem cells are "derived from the inner cell mass of a blastocyst, an early stage embryo" which exists "4-5 days post fertilization." (*Id.*) Fetal stem cells may be located in the "organs of fetuses," "the tissue of the fetus proper" or "extraembryonic membranes." (*Id.*)

19. There is a "right to conduct stem cell research" in the State of California. (Cal. Const. Art. 35 § 5.) The research is believed to hold great promise for the future of medicine. According to DV's 2012 Business Plan, "[s]tem cells or cell therapies have been used for greater than 40 years" for the treatment of disease, and the "cell-based" market related thereto is estimated "to be in the several billion dollar range." (*Id.*)

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A. DaVinci Obtained And Used Aborted Fetus Donations From Planned Parenthood For Their Stem Cell Research

20. DaVinci Biosciences secured its first fetal tissue donations from Planned Parenthood in late 2008 for its research. DV continued to receive fetal tissue donations on a regular basis from Planned Parenthood until 2015. The companies obtained adult tissue samples from donations procured from local hospitals and/or tissue donation centers.

21. Since its founding, the work of DaVinci Biosciences has resulted in two published scientific papers. In its 2014 published study, DaVinci Biosciences reported the results of their initial research on "17- to 18-week-old pre-natal small intestine tissue made available from elective medical abortions," finding "that these cells are a potential in vitro model for drug discovery and development, and possibly in cell transplantation and tissue engineering studies." (Nasrallah et al., *Human Prenatal Small Intestine Cell as a Valuable Source of Stem Cells and Epithelial Cells: Phenotypic and Functional Characterization*, CELL & TISSUE TRANSPLANTATION & THERAPY 2014:6, at pp.1-9.) On July 8, 2015, the company announced that "their paper on 'Stem Cells Targeting Inflammation as Potential Anti-Aging Strategies and Therapies' has been accepted for publication in the peer-reviewed journal Cell & Tissue Transplantation & Therapy." (http:// www. dvbiologics.com/blog/2015/07/published-paper-stem-cells-targeting-inflammation-potential-anti-aging-strategies-therapies/.) The company reports that they are the "first to publish on the process of using stem cells as anti-aging strategies." (*Id.*)

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B. DV Biologics Was Launched In 2009 To Provide A Revenue Stream To The Research And Development Company

22. In early 2009, the Isaias Defendants and DaVinci's then-manager and "CEO" Francisco Silva, among others, collaborated and decided to expand the DaVinci business to include a revenue-driven unit. They decided to start selling products derived from the cells and tissues they were already collecting, processing, storing and using for research purposes. DV Biologics was then incorporated as the sister company to DaVinci Biosciences to generate income using the already established infrastructure of DaVinci Biosciences. DV Biologics began "commercial operations in May 2009 with a minimal product inventory and no marketing or sales." (DV 2012 Business Plan, at p.18.)

23. A few months later, DV launched its first marketing campaign to start producing sales. According to their marketing plan: "The marketing challenge for [2009-2010] will be to introduce our products in a politically conscious way given that the material is both human and in some cases pre-natal derived .... [¶] The challenge will be to form a sales tactic team, infiltrate markets ... to change existing buyer's outlook and purchasing behaviors ... [and to make] human cell-derived products well understood and appear worthy of any additional cost to purchase." (DV Biologics Marketing Plan 2009-2010.)

24. The companies hired an outside marketing consultant to develop marketing materials, including a catalog, to support their sales effort. The 2010 catalog was posted on the company's website in January 2010 and sent to various sales leads in an effort to drive sales.

25. In addition to "post-natal" and diseased tissues and cells, DV advertised the sale of numerous "pre-natal" "products," including fetal "tissue-derived cells" as part of their LIFEbank™ brand. Prenatal tissue and cells from fetal heart, brain, lungs, kidneys, liver, large

intestines, small intestines, skin, skeletal muscle and bones were all offered for sale. They advertised prices in a range as low as $40/vial for "Total RNA" cells from several fetal parts to as high as $1,100/vial for specific cells from fetal brain tissue. Most "products" were priced somewhere in the middle of this range, including, *e.g.*, $300-375/vial for fetal lung cells; $300-450/vial for fetal kidney cells; $500-700/vial for fetal heart cells; and $250-700/vial for fetal liver cells.

26. From one fetus donation, DV created dozens of different types of prenatal "products," and hundreds of individual units of each type for sale. DV was able to do so with a limited number of labor hours (ranging from approximately 2-9 labor hours per "product") and at very minimal costs (usually less than $20/vial). With just a few hours of time, and very little cost, therefore, DV scientists created hundreds of vials of fetal stem cells, which they packaged separately for sale on a per vial basis. DV maintained an inventory of vials "in stock," in one or two refrigerated locations (provided by DaVinci Biosciences) until sold. If they ran out of inventory, they could "easily" make more units from the prior fetus donations or secure a new donation to meet customer demands.

27. In addition to charging a price for each vial/unit of "product," DV also separately charged between $50-75 per purchase order for the "packaging and handling" and "dry ice" used to facilitate the delivery of the products to their customers. An additional "freight" or "shipping charge" was assessed to some customers as well.

28. Between 2009 and 2011, sales revenues nearly tripled as the business started to take shape. "Sales increased 59% in 2011 from 2010" and the DV "product catalog ha[d] grown to greater than 48 pages for 2011-2012." (DV 2012 Business Plan, at p.18.) Defendants sold both adult-derived and fetal-derived tissues and cells to pharmaceutical companies and academic

institutions around the world through a network of distributors. By the end of 2011, DV had 13 worldwide distributors in place and the majority of its revenue was earned from international sales. (*Id.*, at p.2.)

C. Management's 2012-2013 Directive To Push Sales, Beat The Competition, And Increase Revenue Drives Business Forward

29. In late 2011, at the direction of and with the knowledge and participation of the Isaias Defendants, DV executives met to strategize a business plan going forward. According to their 2012 Business Plan developed shortly thereafter, the Defendants' "3 year goals [were] to infiltrate the cell-based market, be a major competitor in the cell-based therapies and tools market for improving health and quality of life, and provide a healthy and conservative balance sheet." (DV 2012 Business Plan, at p.2.) Their "objective" was to develop their "business units into revenue and value generating subsidiaries." (*Id.*, at p.6.)

30. They planned to achieve these goals by "hiring a commercial representative" and/or "a dedicated sales/marketing person," increasing "the amount of marketing" and the "number of distributors throughout the world and tak[ing] advantage of the internet, distributors, newsletters, educational presentations, and direct marketing/sales." (*Id.*, at p.2) They planned "on penetrating the local American market" by securing a United States distributorship agreement. (*Id.*, at p.6.) DV Biologics was required to "market no less than 10 new products yearly." (*Id.*, at p.24.) Management set forth these directives with the "aim to increase sales yearly by no less than 30% each year for the next 3 years ..." (*Id.*, at p.6.)

31. By 2012, DV Biologics had over 500 products in its inventory "with some 13,900 units available," for sale -- an inventory that DV "valued at much greater than $4.4 Million

dollars." (*Id.*, at p.6.) At one point, based on an audit facilitated by the Isaias Defendants, the companies believed the value of the inventory could be as high as $10 million.

32. DV started implementing the directives of the 2012 Business Plan, including retaining additional sales personnel and increasing their marketing efforts by distributing their catalog, newsletters, product brochures and other materials at conferences, via email or by publishing the materials on their website.

33. There was little competition for the sale of many of their prenatal derived "products," so the company began a push to sell their prenatal stem cells as part of their direct marketing efforts. A fall 2012 newsletter, for instance, was distributed that featured small intestine epithelial cells (pD0015-F) for diabetes and weight control research. In late 2012, the DV catalog was also amended to more prominently highlight the distinction between prenatal derived and post-natal derived stem cells for their customers.

34. With a new "Regional Sales Manager" on board in early 2013, the Defendants then implemented a "2013 Sales Launch Plan" to further increase sales. "The primary objective of this plan" was to "help DV Biologics meet or exceed its bottom-line goals & objectives," including a goal to "[g]enerate $550,000 in gross revenue by the end of 2013." (2013 Sales Launch Plan, at p.6.) In addition to improving their "selling techniques," the 2013 Plan called for the hiring of two additional Sales Managers and focusing their efforts on selling "the hottest selling products" (which included, among others, DV's prenatal cardiac cells and small intestine epithelial cells). The 2013 Plan also documented the expectation that the "sales team will go 'above & beyond' what is generally expected," including engaging in "heavy prospecting" to generate "leads" and secure sales. (2013 Sales Launch Plan, at pp.9 & 11.)

35. Beginning in 2012, and continuing for years thereafter under the updated marketing and sales plans, there was a consistent top-down push for staff to sell more "product" and increase revenue. Beginning in 2013, sales staff were also financially incentivized to sell as much as possible by the payment of commissions.

36. From 2012-2015, DV advertised and successfully sold numerous "products," including both "prenatal" and "postnatal" human tissues, cells and systems. A copy of DV's 2013-2014 Catalog is attached hereto as **Exhibit B,** and is fully incorporated herein by reference. "Products" were sold to pharmaceutical companies, academic institutions and distributors both domestically and in countries around the world, including Japan, China, Singapore, Korea, Germany, Switzerland, Spain, Australia, Netherlands, Canada, and the United Kingdom.

37. Although DV did not achieve all of its optimistic revenue goals, their marketing efforts paid off. In both 2013 and 2014, the company grossed in excess of $400,000 in revenue, which was double the gross revenues earned in 2012. In 2015, DV continued its upward momentum and reached its earlier goal to exceed $550,000 in gross revenues. When subtracting the cost of goods sold, DV produced a gross profit on sales every year, except 2012.

38. From 2009-2015, the Defendants also collected approximately $56,678.09 in "packing and handling" fees, which was marked-up approximately 50% over the actual cost of packing and handling. Specifically, DV incurred a total cost of $26,740.92 for packing and handling, and thus profited on the "packing and handling" fees in the amount of approximately $30,000. As a reward to its employees, Defendants also paid commissions on the profits they earned from the packing and handling charges from 2013-2015.

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D. It Is Illegal To Sell Fetal Tissue And Cells For Valuable Consideration Under Both Federal And State Law

39. Under California Health and Safety Code Section 125320:

> (a) A person may not knowingly, for valuable consideration, purchase or sell embryonic or cadaveric fetal tissue for research purposes pursuant to this chapter.
>
> (b) For purposes of this section, "valuable consideration" does not include reasonable payment for the removal, processing, disposal, preservation, quality control, storage, transplantation, or implantation of a part.
>
> (c) Embryonic or cadaveric fetal tissue may be donated for research purposes pursuant to this chapter.
>
> (Cal. Health & Safety Code § 125320.)

40. If the "transfer [of fetal tissue] affects interstate commerce" it is also a violation of federal law to "knowingly acquire, receive or otherwise transfer any human fetal tissue for valuable consideration." (42 U.S.C. § 289g-2(a).) As above, "valuable consideration" does not include "reasonable payments associated with the transportation, implantation, processing, preservation, quality control, or storage of human fetal tissue." (42 U.S.C. § 289g-2(e)(3).)

41. The term "human fetal tissue" is defined broadly to include any "tissue or cells obtained from a dead human embryo or fetus after a spontaneous or induced abortion, or after a stillbirth." (42 U.S.C. § 289g-1(g).) The term "tissue" is also broadly defined generally to "mean[] a human cell, group of cells, including the cornea, sclera, or vitreous humor and other segments of, or the whole eye, bones, skin, arteries, sperm, blood, other fluids, and any other portion of a human body ..." (Cal. Health & Safety Code § 1635(c).)

42. DV knowingly sold hundreds of fetal tissue and stem cell "products" for valuable consideration in violation of these laws.

E. Defendants Set Prices For Fetal "Products" Arbitrarily, Without Any Attempt To Comply With The Law, In An Effort To Maximize Their Profits And Sales

43. In setting the prices for their prenatal "product" sales, DV ignored both federal and state laws that restrict earning "valuable consideration" on such sales entirely. There was no attempt to limit the prices charged on any of their prenatal "product" sales, or related fees, only to "reasonable payments associated with the transportation, implantation, processing, preservation, quality control, or storage of human fetal tissue" as the law requires. Indeed, there was no separate accounting for any such allowable charges conducted to support the prices DV charged for prenatal tissues and cells at all.

44. Instead, the majority of sales prices were arbitrarily set initially by the Director of Research and Development for DaVinci Biosciences, Rafael Gonzalez, who set prices based on the "market" value and what other potential "competitors" charged on similar research "tools." In a 2011 email he explained that he relied on the competitors to "do the analysis" on what prices to charge because "[i]f we were to price out each one it would be extremely time consuming."

45. Prices were also intentionally set as high as possible to leave room to offer discounts and negotiate a lower price so as to ensure a profit on sales even with discounts. According to DV's Chief Executive Officer, Francisco Silva's, 2010 directive: when setting prices: "we always negotiate from the top down."

46. Given this price-as-high-as-possible strategy, in an effort to drive sales, DV offered numerous discounts, including distributor discounts (20-30%); first time buyer discounts (10-15%); and bulk purchase discounts (sometimes as high as 50%). The company also regularly offered "sales" pricing promotions, including, for example, a "25% off" summer sale

and "25% off" fall promotion in 2013. Sales staff were given wide flexibility in using discounts in order to close a sale, because they all knew they still ended up "on top."

47. As a result of the pricing structure and the various discounts available, the same "product" was randomly sold to different customers at different prices. The highest prices were typically charged to U.S. customers and educational institutions, while the deepest discounts were offered to international distributors in countries all around the world. Yet, the allowable costs to produce the same "product" did not vary from customer to customer. Thus, only the margin of profit changed, depending on the ultimate price that was negotiated, for each particular sale.

48. Sales personnel knew they were making money on sales, even despite large discounts. For example, in an October 2009 email exchange between DaVinci's Business Development Manager, Janna Lacher, and CEO, Francisco Silva, regarding the pricing of prenatal bone cDNA (pM007-cD), Janna Lacher confirmed her understanding that "it costs us roughly $25 per unit to manufacture and we are selling for $170." She said offering a 30-40% discount price "would leave us with a margin profit of $94-77 per unit" and if they increase the discount to 50%, they "would still have a marginal profit of $60 per unit."

49. Rafael Gonzalez also routinely mentioned how "easily" they could create tissue-derived "products" for sale when discussing pricing. In an email exchange in April 2014 regarding a promotional discount on "chondrocytes and muscle progenitors," Rafael Gonzalez explained: "margins on both products are much higher than 50%. The costs range from $40-50 per vial and we sell them at a 10 fold mar[k] up."

50. In July 2014, DV executives Rafael Gonzalez and Vice President of Sales, Tony Delamaza, specifically discussed the pricing of prenatal renal (kidney) fibroblasts via email.

Rafael Gonzalez explained that they were currently selling the "product" for $350/vial. He said there was no competition for this "product," the cost to make one vial of the postnatal fibroblast was only "in the range of 40 dollars a vial," and thus he recommended they raise the price to $375/vial. Tony Delamaza said he would work on a pricing formula "based on infrastructure, hours spent and intellectual property" but noted: "1000% gross does not seem unreasonable based on infrastructure and lack of competition." Consistent with DV's maximize-the-price culture, Tony Delamaza also said "if the market can handle a higher price then we will go with [that] since we will be giving discounts to the distributors." After this discussion, the 2015 list price for prenatal kidney fibroblasts was set at $450/vial.

51. In 2014 and early 2015, DV's management reviewed the actual cost, including labor, to produce products for purposes of evaluating more specifically the current pricing and their profit margins. The detail was reviewed and edited by Rafael Gonzalez and presented in a report to Tony Delamaza on January 14, 2015 entitled "Pricing per Product FINAL." Only one prenatal "product" type that was analyzed ("RNA products") at or around this time frame appeared to be selling below cost. For the remaining fetal products analyzed, it was clear that there was a substantial profit margin being earned on the prenatal sales, most of which were selling at a profit margin of 70% or more.

F. DV Sold Hundreds Of Units Of Fetal Tissue And Cells For Valuable Consideration

52. From August 2012 to October 2015, it is estimated, using DV's 2015 "Pricing per Product FINAL" analysis (the "2015 Analysis") that DV sold approximately 500 fetal tissue/cell "products" for valuable consideration.

53. For example, one of DV's 2015 "Top Seller" "products" was "Human Cardiomyocytes" cells (pC008-F) derived from fetal heart tissue donations. According to DV's

2015 Analysis, DV can produce 40 vials in a lot, at a cost (including labor) of $25.92 per vial. From 2012-2015, DV sold this "product" at prices of $350/vial (50% off pricing); $490/vial (distributor discount pricing); $560/vial; $595/vial (15% off discount pricing); and $700/vial. Profits on these sales ranged from $324.08 to $674.08 per vial, not including any profits earned on packaging and handling or any other fees charged.

54. One of DV's other 2015 "Top Seller" "products" included "Human Cardiac Progenitor" cells (pC0015-F) derived from fetal heart tissue donations. According to DV's 2015 Analysis, DV can produce 10 vials in a lot, at a cost (including labor) of $62.31 per vial. From 2012-2015, DV sold this "product" at prices of $455/vial; $520/vial; $552.50/vial and $650/vial. Profits on these sales ranged from $392.69 to $587.69 per vial, not including any profits earned on packaging and handling or any other fees charged.

55. Another "Top Seller" included "Human Whole Liver Cells" (pD001-F) derived from fetal liver tissue donations. According to DV's 2015 Analysis, DV can produce 10 vials in a lot, at a cost (including labor) of $18.46 per vial. From 2012-2015, DV sold this product at prices of $125/vial; $175/vial and $200/vial. Profits on these sales ranged from $106.54 to $181.54 per vial, not including any profits earned on packaging and handling or any other fees charged.

56. Similarly, for DV's "Top Seller" "Human CD34 Positive Cells" (pD002-F) derived from fetal liver tissue donations, DV could prepare 10 vials in a lot at a cost (including labor) of $126.17 per vial. DV sold this product at prices of $225/vial and $360 per vial, earning the Defendants a profit between $98.83 and $233.83 per vial on these sales, not including any profits earned on packaging and handling or any other fees charged.

57. DV's "Top Selling" "Stomach cells (uncultured)" (pD005-F), derived from fetal stomach tissue donations, sold for $210, $225 and $240 per vial. Ten vials could be produced in a lot of this product at a cost of $18.46 per vial (including labor). DV earned a profit in a range of $191.54 and $221.54 per vial for these product sales, not including any profits earned on packaging and handling or any other fees charged.

58. "Human Small Intestine Cells (uncultured)" (pD007-F) and "Human Large Intestine Cells (uncultured) (pD008-F), both derived from fetal intestine tissue donations could be produced for sale at a volume of 10 per lot and at a cost (including labor) of $18.46 per vial. These were also "Top Sellers." Prices of $210/vial, $255/vial and $300/vial were charged for these sales, earning DV a profit ranging from $191.54 to $281.54, not including any profits earned on packaging and handling or any other fees charged.

59. Another "Top Seller" included DV's "Human Small Intestine Epithelial Cells" (pD0015-F), also derived from fetal intestine tissue donations. Defendants produced 10 vials in a lot of this product at a cost of $35.91 per vial (including labor). From 2012-2015, DV charged various prices for this "product," including $297.50/vial (50% off discount pricing); $560/vial; $595/vial; $630/vial and $700/vial, therefore profiting in a range of $261.59 to $664.09 per vial on these sales, not including any profits earned on packaging and handling or any other fees charged.

60. With the exception of some of DV's "Total RNA" (-R) fetal tissue derived products, and a handful of free samples that were distributed at a loss, based on its own cost and profit-margin analysis, Defendants profited by large margins on the vast majority of its sales of fetal tissue stem cell "products" from 2009-2015. Defendants knowingly sold each of these "products" with the specific intent to profit on such sales. Each of the 500 prenatal "products"

that were sold for valuable consideration between August 2012 and the present date is a separate violation of both California and federal law for which civil penalties and an injunction preventing any further violations are sought by way of this action.

CAUSES OF ACTION

FIRST CAUSE OF ACTION

(Violation Of Business And Professions Code Section 17200

Against All Defendants)

61. Plaintiff realleges the allegations of paragraphs 1 through 60 above as though fully set forth herein.

62. From 2009-2015, Defendants advertised and sold hundreds of fetal tissue stem cell "products" at prices well in excess of the allowable "reasonable payment for the removal, processing, disposal, preservation, quality control, transplantation or implantation of a part." For every such sale, Defendants sold fetal tissue for valuable consideration in violation of California Health and Safety Code Section 125320 and 42 U.S.C. Section 289g-2.

63. Defendants' conduct was knowing and intentional and in complete disregard of the law. Indeed, rather than attempt to limit their income on sales to allowable amounts, Defendants ignored their legal obligations entirely and affirmatively set forth, at the direction of the Isaias Defendants, a business objective and plan to profit on their sales efforts. From 2009 to 2015, the company acted on these intentions with increasing efforts, resulting in hundreds of profitable sales of fetal tissue and stem cell "products" from 2009-2015. The Isaias Defendants had an obligation and duty to ensure that their companies complied with all such laws, but failed to prevent the violations and knowingly encouraged the unlawful activity to continue. Indeed, throughout, the pressure to make money selling "products" on DV employees was driven by the Isaias Defendants and the other "funding brothers."

64. Defendants' failure to comply with California Health and Safety Code Section 125320 and 42 U.S.C. Section 289g-2 amounts to an unlawful, unfair and fraudulent business practice under California Business and Professions Code Section 17200.

65. The People hereby seek civil penalties of up to $2,500 per violation to the maximum extent permitted by law for Defendants' illegal sales from August 2012 to the present date. It is estimated that DV sold 503 fetal tissue "products" for valuable consideration between August 2012 and the present date, and each such sale is a separate violation.

66. Additionally, the Defendants operated the DV companies without paying all required taxes/fees required for the right to transact business in California, thus resulting in the forfeiture of their rights and powers in the State by the California Franchise Tax Board. (Cal. Rev. & Tax Code §§ 23001 *et seq.*; Cal. Rev. & Tax Code §§ 25101; Cal. Corp. Code §§ 2100 *et seq.*; Cal. Corp. Code §§ 2258-2259.) For every day after November 3, 2014, when the DV Defendants operated their "product" sales business, and for every day after July 28, 2015 when the DV Defendants operated their stem cell research company, without paying all required taxes/fees and thereby reinstating their "powers, rights and privileges" forfeited by the California Franchise Tax Board, Defendants committed further unlawful, unfair and/or fraudulent business practices under California Business and Professions Code Section 17200. The People hereby further seek civil penalties of up to $2,500 per violation for every day the DV Defendants transacted business in the State with a "forfeited" status.

67. The People further hereby seek all appropriate injunctive relief pursuant to Business and Professions Code Section 17203 to prevent any further unlawful activity and any applicable restitution in an amount to be determined at trial.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff prays for judgment against Defendants, and each of them, as follows:

1. For civil penalties and restitution in an amount to be determined at trial;
2. An order enjoining Defendants, and each of them, from further violation of California and Federal laws concerning the sale of fetal tissue and cells and from continuing to engage in business in California while their powers rights and privileges remain forfeited;

3. An award of costs and any other applicable fees for prosecuting this action; and

4. Any such other relief as the Court may deem just and proper.

DATED: October 11, 2016

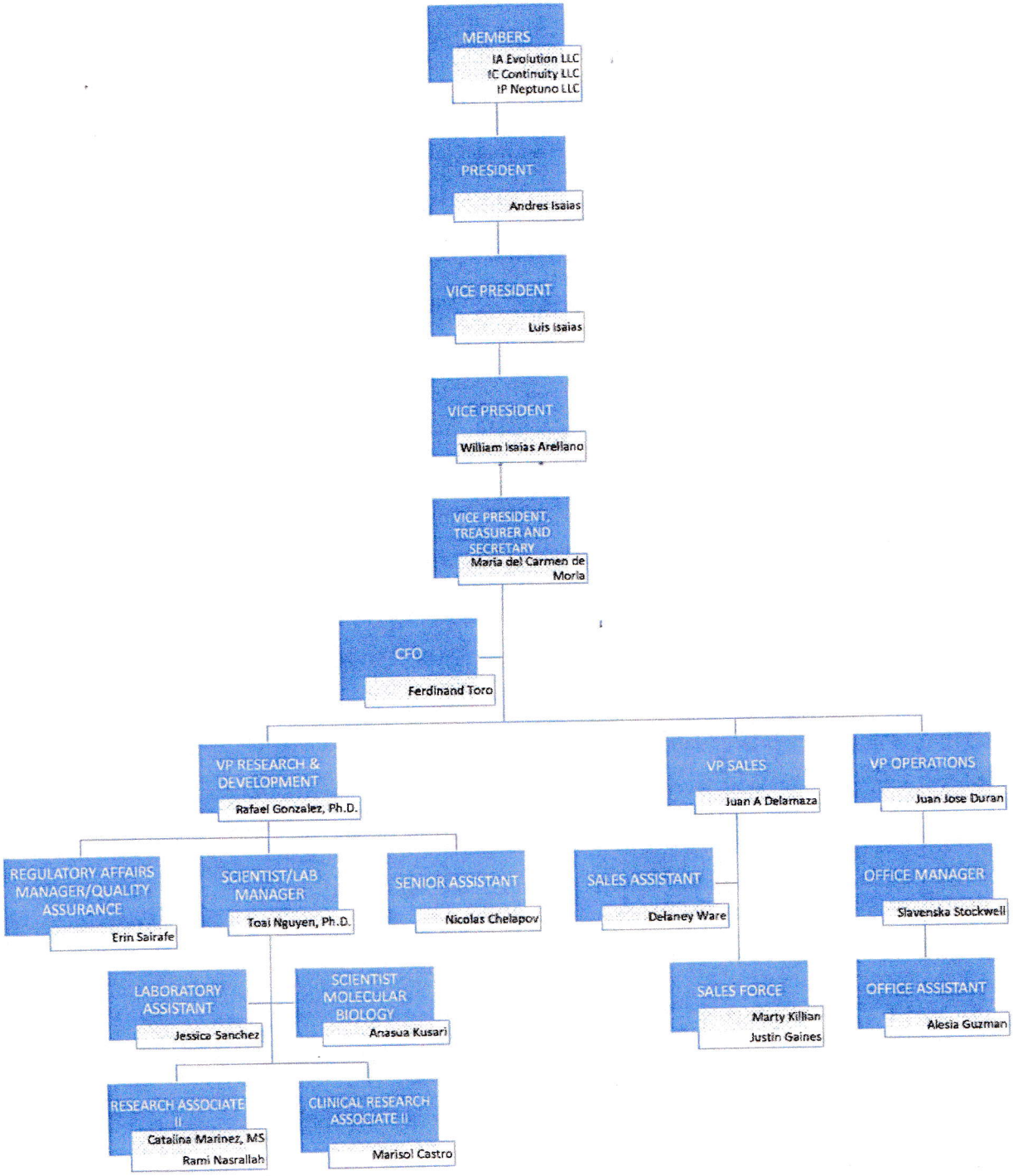
TONY RACKAUCKAS, DISTRICT ATTORNEY
COUNTY OF ORANGE, STATE OF CALIFORNIA

By: _____

KELLY A. ERNBY
Deputy District Attorney

EXHIBIT A

DaVinci Biosciences, LLC



DV Biologics, LLC

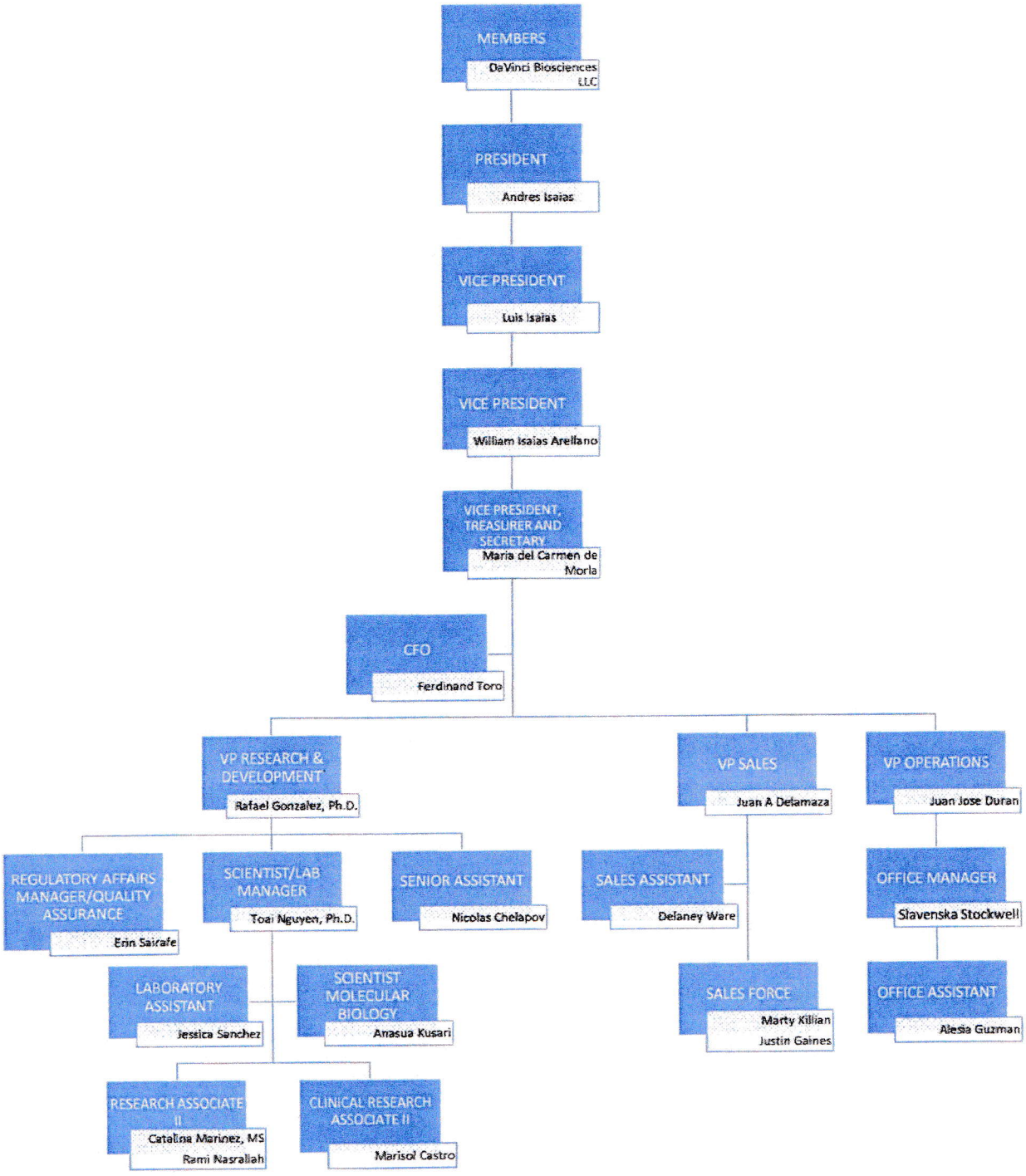
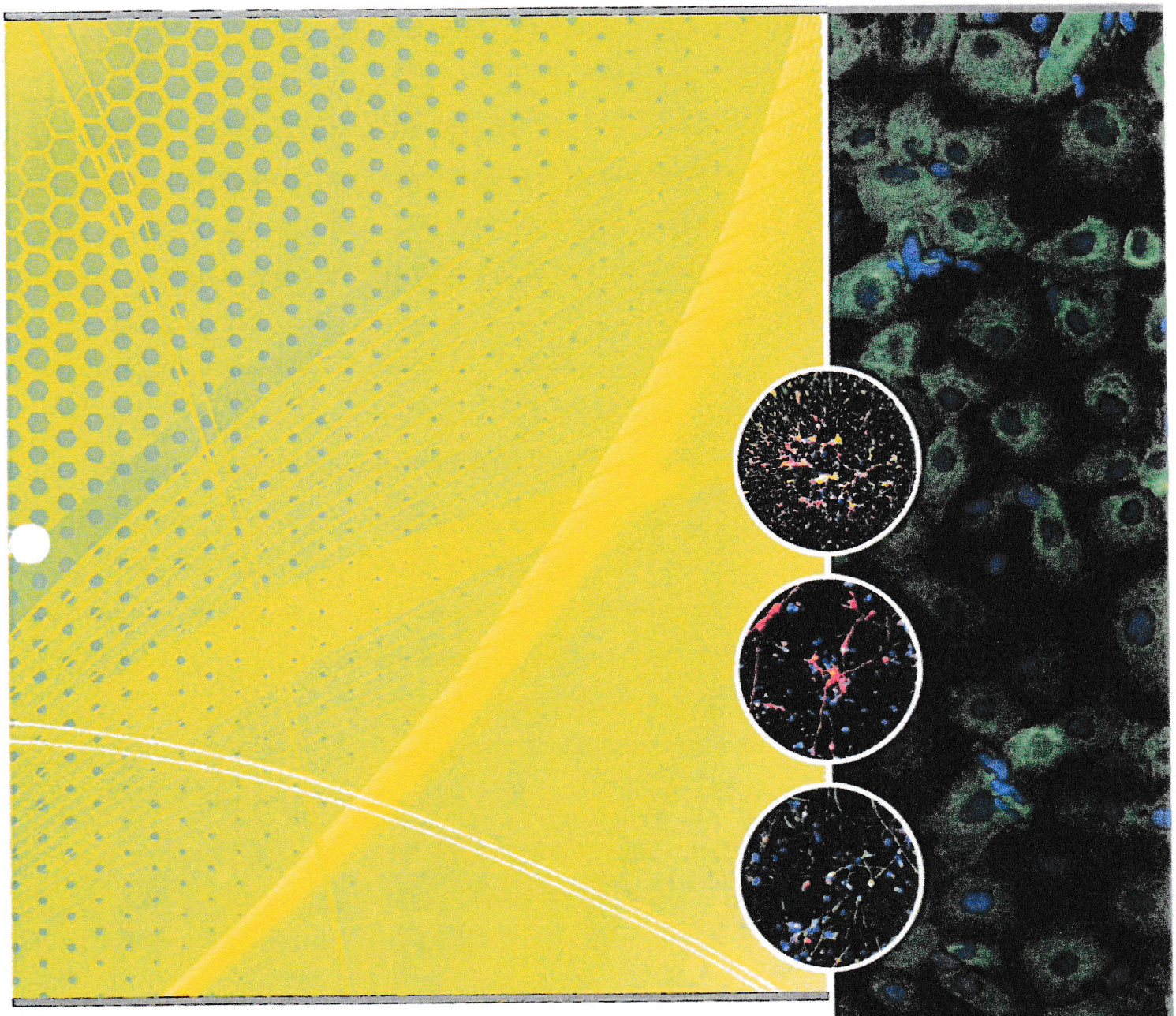


EXHIBIT B

2013-2014
CATALOG



dv biologics®

www.dvbiologics.com

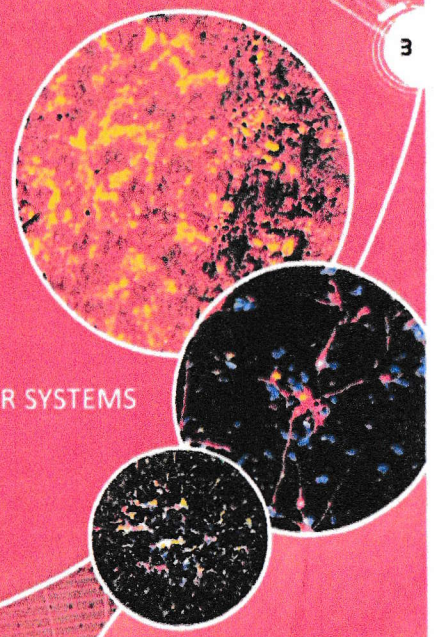
CELLutions for Innovation™

DV Biologics is a global supplier of human biological tools to academic institutions and pharmaceutical companies engaging in cell and drug based discovery and development. Our mission is to provide biological tools needed to advance the innovation of technology that will ultimately be used to treat or prevent many different human degenerative disorders and diseases.

DV Biologics offers a diverse range of novel human biological tools and services that can be used to study various human pathological conditions in addition to an expanded product portfolio of unique cell types and tissue-derived products.

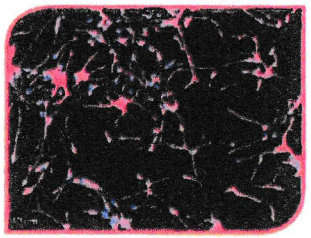
INSIDE

LIFEbank™ CELLULAR SYSTEMS



LIFEbank™ CELLULAR SYSTEMS

LIFEbank™ CS - Prenatal



CARDIOVASCULAR SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Heart Cells (Uncultured)	5 x 10^5 cells/vial	PC001-F	$500
Cardiomyocytes	5 x 10^5 cells/vial	PC008-F	$700
Cardiac Stromal Cells	5 x 10^5 cells/vial	PC009-F	$600
Cardiac Progenitor Cells	5 x 10^5 cells/vial	PC015-F	$650
Aortic Cells	5 x 10^5 cells/vial	PC016-F	$600

DIGESTIVE SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Liver Cells (Uncultured)	5 x 10^5 cells/vial	PD001-F	$250
CD34+ Liver Cells	5 x 10^5 cells/vial	PD002-F	$450
CD133+ Liver Cells	5 x 10^5 cells/vial	PD003-F	$775
Stomach Cells (Uncultured)	5 x 10^5 cells/vial	PD005-F	$300
Small Intestines Cells (Uncultured)	5 x 10^5 cells/vial	PD007-F	$300
Large Intestines Cells (Uncultured)	5 x 10^5 cells/vial	PD008-F	$300
Tongue Cells (Uncultured)	5 x 10^5 cells/vial	PD009-F	$350
CD34+ Endothelial Liver Cells	5 x 10^5 cells/vial	PD012-F	$650
CD34- Liver Cells	5 x 10^5 cells/vial	PD013-F	$200
Small Intestines Epithelial Cells	5 x 10^5 cells/vial	PD015-F	$700
Esophagus Epithelial Cells	5 x 10^5 cells/vial	PD016-F	$900
CD133- Liver Cells	5 x 10^5 cells/vial	PD021-F	$200

INTEGUMENTARY SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Skin Fibroblasts	5 x 10^5 cells/vial	PI001-F	$400

Human neural cells and neural progenitor cells

DV Biologics now offers human neural cells (uncultured) derived from whole brain and neural progenitor cells (neurospheres) (Fig 1) for your in vitro research studies.

The central nervous system (CNS) is the most complex biological structure which consists broadly of two classes of cells, neurons and glia.* Neurons are functional, trophic units of the CNS that process and transmit signals by electrochemical signaling. Glia perform a number of critical functions including structural support, metabolic support, insulation, and guidance of development.*

DV Biologics' human neural cells (PN001-F) and neural progenitor cells (PN003-F) offer researchers a unique opportunity to study the CNS in vitro. DV Biologics' human neural progenitor cells will enable the studies of the mechanisms of development and differentiation (Fig 2; Fig 3) that occur in the CNS. In addition, these cells can also be used for transplantation studies into animal models of traumatic injury and neurodegenerative diseases such as Parkinson's or Alzheimer's disease.

*Kendel ER, Schwartz JH, Jessel TM (2000). Principles of Neuroscience McGraw-Hill Professional

Fig 1. Human neurospheres are easily derived from DV Biologics' human neural cells.

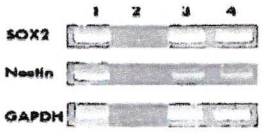


Fig 2. RT-PCR demonstrates DV Biologics' human neural cells and neural progenitor cells highly express early neural development markers Sox 2 and nestin. Lane 1. DV Biologics human neural progenitor cells, 2. no RT control, 3. NT2 cells, 4. DV Biologics' human neural cells.

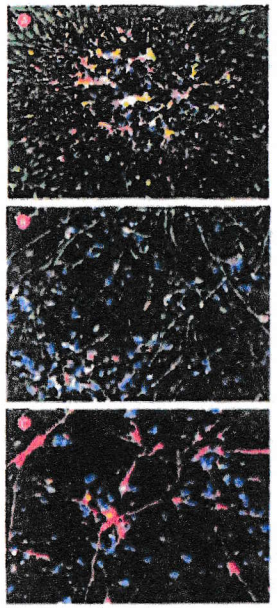
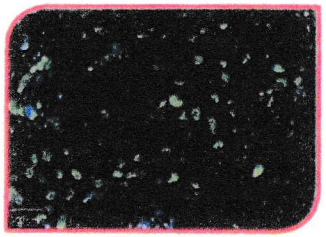


Fig 3. Immunocytochemistry staining demonstrates DV Biologics' human neural progenitor cells (A) express early neural markers nestin and A2B5 (red and green respectively). (B) express markers Beta-Tubulin 3 (green) CD133 (red) and (C) can be terminally differentiated in tyrosine hydroxylase (TH) (red) and NeuN (green) positive neuronal cells. Nuclei were stained with DAPI (shown in blue).

LIFEbank™ CELLULAR SYSTEMS

LIFEbank™ CS - Prenatal



HEMATOPOIETIC SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
CD34+ Bone Marrow Cells (Pooled)	Variable	PH003-F	Inquire
Bone Marrow Stromal Cells	5 x 10^5 cells/vial	PH005-F	$500
CD34- Bone Marrow Cells	5 x 10^5 cells/vial	PH008-F	$200
CD133- Bone Marrow Cells	5 x 10^5 cells/vial	PH016-F	$200

NEURAL SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Neural Cells (Uncultured)	5 x 10^5 cells/vial	PN001-F	$600
Neural Progenitor Cells	5 x 10^5 cells/vial	PN003-F	$900
PSA-NCAM+ Cells	5 x 10^5 cells/vial	PN004-F	$900
A2B5+ Neural Cells	5 x 10^5 cells/vial	PN006-F	$900

PULMONARY SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Lung Cells (Uncultured)	5 x 10^5 cells/vial	PP001-F	$300
Pulmonary Fibroblasts	5 x 10^5 cells/vial	PP002-F	$375
Pulmonary Epithelial Cells	5 x 10^5 cells/vial	PP007-F	$700

SKELETAL MUSCLE SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Skeletal Muscle Cells (Uncultured)	5 x 10^5 cells/vial	PM001-F	$500
Skeletal Muscle Progenitor Cells	5 x 10^5 cells/vial	PM002-F	$650
Skeletal Muscle Cells	5 x 10^5 cells/vial	PM003-F	$600
Osteoblasts	5 x 10^5 cells/vial	PM005-F	$300

URINARY SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Kidney Cells (Uncultured)	5 x 10^5 cells/vial	PU001-F	$300
Kidney Epithelial Cells	5 x 10^5 cells/vial	PU002-F	$450

Human Bone Related Products

Human bone is not as rigid a structure as it appears at first glance: this tissue is continuously remodeling itself by the coordinate action of osteoblasts (bone forming) and osteoclasts (bone resorbing cells). Equilibrium between the activities of these two cell types is vital for bone homeostasis.[1]

For scientists in the fields of clinical, regenerative, and basic bone research, the existence of appropriate tools is of crucial importance. DV Biologics now offers a comprehensive set of products facilitating even the most complex experiments. You can choose from the following selection:

- Human Osteoblast (PM005-F)
- Human Whole Bone Total RNA (PM007-R)
- Human Whole Bone cDNA (PM007-CD)
- Human Whole Bone Tissue Lysate (PM007-L)

DV Biologics osteoblasts (Fig.1-3) are high quality cells that are supplied after minimal number of passages, exhibiting characteristics specific for osteogenic lineage. They express a known set of osteoblastic markers (Fig. 2), and form calcium deposits when induced, as detected with Alizarin Red S (Fig.3). We are confident that this and additional products from our genomic/proteomic portfolio (Human Whole Bone Total RNA (PM007-R) (Fig.2), Human Whole Bone cDNA (PM007-CD) (Fig.2), and Human Whole Bone Tissue Lysate (PM007-L)) will enable your bone research needs, whether you are studying osteoporosis and related diseases, bone cancer, metabolic bone disorders, or performing tissue engineering.

1. Ducy et al. (2000) Science 289(5484): 1501–04

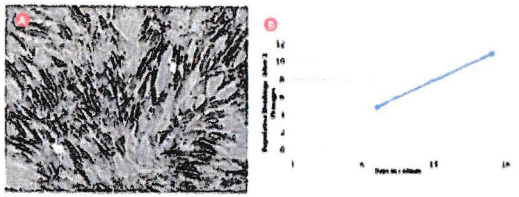


Figure 1: Human osteoblasts from DV Biologics. (A) Phase contrast image of the osteoblasts grown in culture for 5 days. (B) Graph of estimated population doublings for 2 passages.

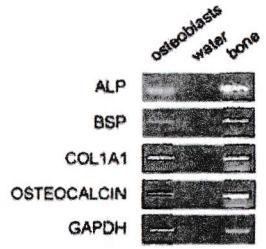


Figure 2: Human osteoblasts express markers specific for osteogenic lineage, as confirmed by RT-PCR. Total RNA was extracted, reverse transcribed and analyzed for the expression of alkaline phosphatase (ALP), bone sialoprotein (BSP), collagen type 1, alpha 1 (COL1A1) and osteocalcin. Human Whole Bone Total RNA (PM007-R) was used as a template for the synthesis of Human Whole Bone cDNA (PM007-CD), which served as a positive control (bone).

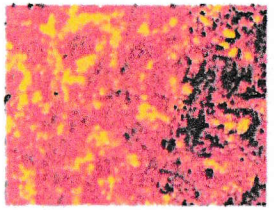


Figure 3: Human osteoblasts mineralize their extracellular matrix as detected by using Alizarin Red S. Photomicrograph was acquired using 40X objective.

LIFEbank™ CELLULAR SYSTEMS

LIFEbank™ CS - Postnatal

INTEGUMENTARY SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F	$300

GENERAL TISSUE SYSTEM-POST NATAL

Product	Quantity	Catalog Number	Price
Adipose Vascular Stromal Fraction (Uncultured)	5 x 10^6 cells/vial	AA001-F	$325
Adipose Stromal Cells	5 x 10^5 cells/vial	AA002-F	$375

CARDIOVASCULAR SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Cardiomyocytes	5 x 10^5 cells/vial	AC008-F	$850
Cardiac Stromal Cells	5 x 10^5 cells/vial	AC009-F	$700
Cardiac Progenitor Cells	5 x 10^5 cells/vial	AC015-F	$800
Valvular Interstitial Cells	5 x 10^5 cells/vial	AC024-F	$750

HEMATOPOIETIC SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Umbilical Vein Endothelial Cells (HUVEC)	5 x 10^5 cells/vial	AC005-F	$200
Wharton's Jelly Stem Cells	5 x 10^5 cells/vial	AC006-F	$450
Umbilical Cord Blood Mononuclear Cells	2.5 x 10^6 cells/vial	AC014-F-2.5	$75
Umbilical Cord Blood Mononuclear Cells	10 x 10^6 cells/vial	AC014-F-10	$200
Umbilical Cord Blood Mononuclear Cells	25 x 10^6 cells/vial	AC014-F-25	$325
Bone Marrow Mononuclear Cells	2.5 x 10^6 cells*	AH002-F-2.5	$50
Bone Marrow Mononuclear Cells	10 x 10^6 cells*	AH002-F-10	$150
Bone Marrow Mononuclear Cells	25 x 10^6 cells*	AH002-F-25	$300
CD34+ Bone Marrow Cells	5 x 10^5 cells/vial	AH003-F	$800
Bone Marrow Stromal Cells	5 x 10^5 cells/vial	AH005-F	$500
CD34- Bone Marrow Cells	5 x 10^5 cells/vial	AH008-F	$200
CD34+ Umbilical Cord Blood Cells (Pooled)	5 x 10^5 cells/vial	AH012-F	$700
CD34- Umbilical Cord Blood Cells (Pooled)	5 x 10^5 cells/vial	AH017-F	$200

REPRODUCTIVE SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Male Gonadal Stromal Cells	5 x 10^5 cells/vial	AR005-F	$550
Endometrial Menstrual Cells	5 x 10^5 cells/vial	AR007-F	$550

SKELETAL MUSCLE SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Skeletal Muscle Progenitor Cells	5 x 10^5 cells/vial	AM002-F	$800
Skeletal Muscle Cells	5 x 10^5 cells/vial	AM003-F	$600
Muscle Fibroblasts	5 x 10^5 cells/vial	AM008-F	$300
Osteoblasts	5 x 10^5 cells/vial	AM005-F	$400

* may ship as multiple vials

Human Small Intestine Epithelial Cells

Epithelial tissues line surfaces of structures and cavities throughout our body. Epithelial cells can be arranged in single (simple epithelium) or multiple layers (stratified epithelium). Based on their shape, epithelial cells can give rise to squamous, cuboidal, and columnar varieties. The lumen of the small intestine is lined with columnar epithelial cells.

Epithelial cells have various functions including secretion, selective absorption, protection, excretion and diffusion of diverse substances necessary for homeostasis. Researchers studying cellular functions, transport, differentiation, transformation, toxicity, systems biology and cancer would greatly benefit from DV Biologics human small intestine epithelial cells and related products.

DV Biologics supplies human small intestine epithelial cells (PD015-F) that exhibit a characteristic columnar appearance when grown on pre-coated plates (Fig. 1A). DV Biologics small intestine epithelial cells stain positive for cytokeratin 14 (CK-14), a marker indicative of epithelial cells (Fig. 1B). At the RNA level, both our human small intestine epithelial cells (PD015-F) and human whole small intestine cells (uncultured) (PD007-F) express markers CK-14 and Defensin (DEFA5) which is indicative of paneth cells located in the small intestines (Fig. 1C). DV Biologics small intestine epithelial cells may be passaged several times from their initial seeding. After a couple passages, the population doublings were estimated to be 4.8 with a doubling time of 65 hours (Fig. 2). Small intestine epithelial cells and related products (Table 1) are excellent tools for studying intestinal epithelium, its transformation, absorption, secretion, drug screening/development, toxicity, as well as tissue engineering [1].

Want to simplify your small intestine epithelial cell studies?
Need controls, RNA, cDNA or media for growing small intestine epithelial cells? Check out our related products (Table 1). We are here to facilitate your research needs.

1. Day (2006) Curr Stem Cell Res Ther. 1(1): 113-120.
2. Fagerholm (2007) J Pharm Pharmacol. 59(10): 1335-43.
3. Hayashi (2007) Drug Metab Pharmacokinet. 22(2): 67-77.

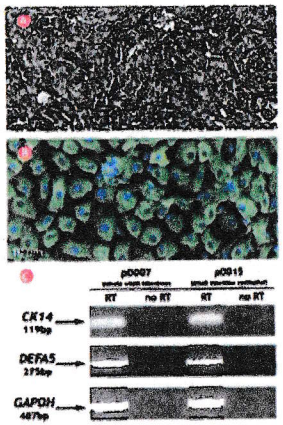


Figure 1. Purified human small intestine epithelial cells and derived molecular products. (A) Phase contrast picture of a large colony of small intestine epithelial cells shows columnar morphology following culture in Epithelial Pro-Condroned Media (D-PRO-015) for 5 days. (B) CK-14 expression in normal human small intestine epithelial cells by immunofluorescent staining after 7 days of in vitro culture. Anti-CK-14 antibodies are green fluorescent, nuclei are stained with DAPI (blue). (C) cDNA is synthesized from whole small intestine RNA (PD007-R) and small intestine epithelial RNA (PD015-R) by reverse transcription with oligo-d(T), and amplified by PCR using primer pairs specific for Cytokeratin-14 (CK14), Defensin-alpha 5 (DEFA5), and GAPDH. Results show that whole small intestine cells (PD007-F) and small intestine epithelial cells (PD015-F) express Cytokeratin-14, Defensin, and GAPDH mRNA.

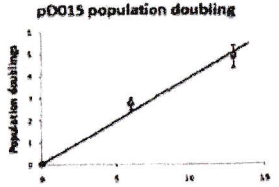


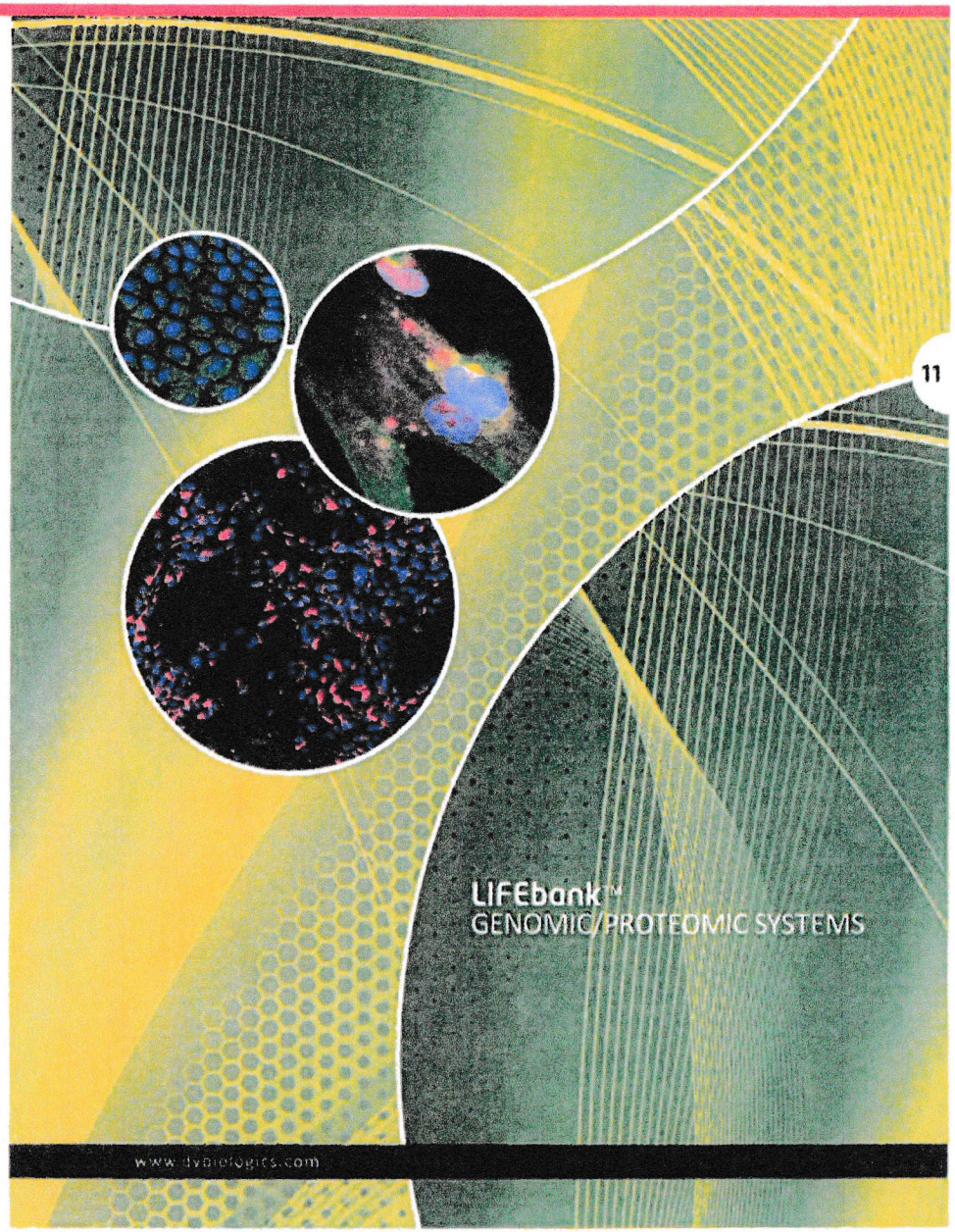
Figure 2. Graph of estimated population doublings after 14 days. Small intestine epithelial cells are seeded at 2×10^4/cm² in plasticware treated with coating solution (CCS102), in epithelial pro-conditioned medium (D-PRO-015), dissociated with cell dissociation solution (CCS101), and counted every 7 day-period. There are approximately 4.8 population doublings following 14 days in culture. Doubling time for small intestine epithelial cells is approximately 65 hours. Error bars denote ±10%.

LIFEbank™ CELLULAR SYSTEMS

LIFEbank™ CS - Postnatal

Product	Unit size	Cat #	Price
Small Intestines Cell, (Uncultured) (prenatal)	5.0×10^5	PD007-F	$300
Small Intestines Cell (Uncultured) Lysate, (prenatal)	100µg	PD007-L	$130
Small Intestines Cell (Uncultured) RNA, (prenatal)	10µg	PD007-R	$40
Small Intestines Cell cDNA, (prenatal)	20 rxns/vial	PD007-CD	$170
Small Intestines Tissue OCT Block, (prenatal)	1 block	PD024-FS	Inquire
Small Intestines Epithelial Cells,(prenatal)	5.0×10^5	PD015-F	$700
Small Intestines Epithelial Cell RNA, (prenatal)	10µg	PD015-R	$600
Small Intestines Epithelial Cell cDNA, (prenatal)	20 rxns/vial	PD015-CD	$550
Cell Dissociation Solution	20ml	CC5101	$50
Culture Vessel Coating Solution	10ml	CC5102	$45
Epithelial Pro-Conditioned Media	100ml	D-PRO-015-100	$185
Epithelial Pro-Conditioned Media	50ml	D-PRO-015-50	$125
Epithelial Pro-Conditioned Media	25ml	D-PRO-015-25	$75

Table 1: Small intestine epithelial cells and related products.



LIFEbank™ GENOMIC/PROTEOMIC SYSTEMS

LIFEbank™ GP - Prenatal

NEURAL SYSTEMS - PRENATAL BRAIN

Product	Quantity	Catalog Number	Price
Neural Tissue Lysate	100 µg/vial	PN013-L	$130
Neural Tissue Total RNA	10 µg/vial	PN013-R	$40
Neural Tissue cDNA	20 rxns/vial	PN013-CD	$170
Neural Progenitor Cell Lysate	100 µg/vial	PN003-L	$500
Neural Progenitor Cell Total RNA	1 µg/vial	PN003-R	$500
Neural Progenitor Cell cDNA	20 rxns/vial	PN003-CD	$450
Spinal Cord Tissue Lysate	100 µg/vial	PN002-L	$130
Spinal Cord Tissue Total RNA	10 µg/vial	PN002-R	$40
Spinal Cord Tissue cDNA	20 rxns/vial	PN002-CD	$170

CARDIOVASCULAR SYSTEMS - PRENATAL HEART

Product	Quantity	Catalog Number	Price
Heart Tissue Lysate	100 µg/vial	PC020-L	$130
Heart Tissue OCT Block	1 block	PC020-FS	Inquire
Heart Tissue Total RNA	10 µg/vial	PC020-R	$40
Heart Tissue cDNA	20 rxns/vial	PC020-CD	$170
Cardiomyocyte Total RNA	10 µg/vial	PC008-R	$800
Cardiomyocyte cDNA	20 rxns/vial	PC008-CD	$700
Cardiomyocyte Lysate	10 µg/vial	PC008-L	$600
Cardiac Progenitor Cell Lysate	100 µg/vial	PC015-L	$500
Cardiac Progenitor Cells Total RNA	10 µg/vial	PC015-R	$600
Cardiac Progenitor Cell cDNA	20 rxns/vial	PC015-CD	$500
Aorta Tissue Lysate	100 µg/vial	PC003-L	$130
Aorta Tissue OCT Block	1 block	PC003-FS	Inquire
Aorta Tissue Total RNA	10 µg/vial	PC003-R	$40
Aorta Tissue cDNA	20 rxns/vial	PC003-CD	$170
Aortic Cell Lysate	100 µg/vial	PC016-L	$450
Aortic Cell Total RNA	10 µg/vial	PC016-R	$600
Aortic Cell cDNA	20 rxns/vial	PC016-CD	$500

Human Glial Progenitor Cells (A2B5+)

The two major types of glial cells in the brain are astrocytes and oligodendrocytes. Both cells are fundamental for the survival and proper function of neuronal cells and therefore have a remarkable utility for basic development, disease modeling, drug discovery, aging and therapeutic aimed studies.

Glial precursors can be identified during development and in adult brain by the expression of specific markers. One of the most recognized markers, ganglioside epitope 3, is recognized by the antibody A2B5. Thus, glial progenitors are frequently referred to as A2B5+ cells. It has been shown that upon differentiation, A2B5+ cells can give rise to both oligodendrocytes and astrocytes.

DV Biologics A2B5+ cells (PN006-F) are isolated using MACs technology, a proven highly efficient method for purification of glial progenitors from heterogeneous digestates of neural tissue[1]. Upon magnetic separation, more than 90% of the isolated cells are shown to express the antigen recognized by the antibody A2B5 (Figure 1). This population is also enriched in cells expressing GFAP (astrocyte marker) and O4 (oligodendrocyte marker) (Figure 2). Isolated A2B5+ cells can be expanded and passaged several times in culture (Figure 3). DV Biologics A2B5+ cultured cells express GFAP, NG2 and CNPase as demonstrated by PCR (Figure 4).

DV Biologics' cells offer researchers a unique opportunity to study human derived glial precursor cell populations in a variety of experimental approaches - ranging from gliogenesis and neurogenesis to neurodegenerative diseases.

1. Dzhelova D et al (2009). J Neuroscience Methods 184:88-94

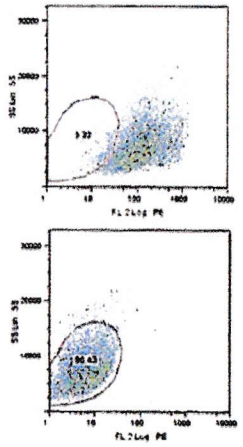


Figure 1: Flow cytometric analysis of thawed human isolated A2B5+ cells. Right panel shows immunoreactivity of the magnetic isolated glial progenitors with antibody A2B5 and left panel is showing the scatter properties of the isotype control.

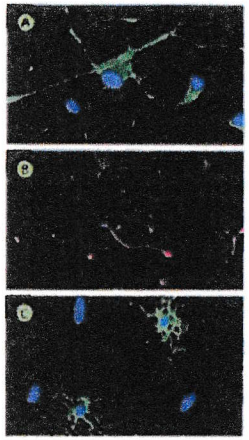
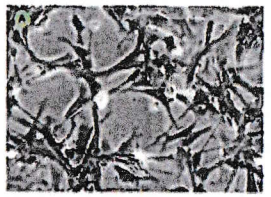


Figure 2: Characterization of DV Biologics A2B5+ cells upon thawing. Cells were thawed, plated for 24 hours, fixed and processed for immunofluorescence using A2B5 antibody (green) (A), GFAP (red) (B) and O4 (green) (C). Nuclei are stained with DAPI (blue).

Figure 3: Graph of estimated population doublings for A2B5+ cells.



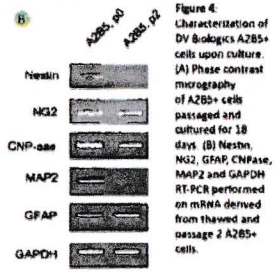


Figure 4: Characterization of DV Biologics A2B5+ cells upon culture. (A) Phase contrast micrography of A2B5+ cells passaged and cultured for 18 days. (B) Nestin, NG2, GFAP, CNPase, MAP2 and GAPDH RT-PCR performed on mRNA derived from thawed and passage 2 A2B5+ cells.

LIFEbank™ GP - Prenatal

LIFEbank™ GENOMIC/PROTEOMIC SYSTEMS

URINARY SYSTEMS - PRENATAL KIDNEY

Product	Quantity	Catalog Number	Price
Kidney Tissue Lysate	100 µg/vial	PU008-L	$130
Kidney Tissue OCT Block	1 block	PU008-FS	Inquire
Kidney Tissue Total RNA	10 µg/vial	PU008-R	$40
Kidney Tissue cDNA	20 rxns/vial	PU008-CD	$170
Kidney Epithelial Cell Lysate	100 µg/vial	PU002-L	$300
Kidney Epithelial Cell Total RNA	10 µg/vial	PU002-R	$400
Kidney Epithelial Cell cDNA	20 rxns/vial	PU002-CD	$300

INTEGUMENTARY SYSTEMS - PRENATAL SKIN

Product	Quantity	Catalog Number	Price
Skin Fibroblast Lysate	100 µg/vial	PI001-L	$200
Skin Fibroblast Total RNA	10 µg/vial	PI001-R	$300
Skin Fibroblast cDNA	20 rxns/vial	PI001-CD	$200
Skin Tissue Lysate	100 µg/vial	PI004-L	$130
Skin Tissue Total RNA	10 µg/vial	PI004-R	$40
Skin Tissue cDNA	20 rxns/vial	PI004-CD	$170

SKELETAL MUSCLE SYSTEMS - PRENATAL SKELETAL MUSCLE

Product	Quantity	Catalog Number	Price
Skeletal Muscle Tissue Lysate	100 µg/vial	PM015-L	$130
Skeletal Muscle Tissue OCT Block	1 block	PM015-FS	Inquire
Skeletal Muscle Tissue Total RNA	10 µg/vial	PM015-R	$40
Skeletal Muscle Tissue cDNA	20 rxns/vial	PM015-CD	$170
Skeletal Muscle Progenitor Cell Lysate	100 µg/vial	PM002-L	$600
Skeletal Muscle Progenitor Cell Total RNA	10 µg/vial	PM002-R	$550
Skeletal Muscle Progenitor Cell cDNA	20 rxns/vial	PM002-CD	$500
Skeletal Muscle Cell Lysate	100 µg/vial	PM003-L	$500
Skeletal Muscle Cell Total RNA	10 µg/vial	PM003-R	$700
Skeletal Muscle Cell cDNA	20 rxns/vial	PM003-CD	$600

SKELETAL MUSCLE SYSTEMS - PRENATAL CONNECTIVE TISSUE

Product	Quantity	Catalog Number	Price
Osteoblast Lysate	100 µg/vial	PM005-L	$200
Osteoblast Total RNA	10 µg/vial	PM005-R	$250

Human cardiomyocytes and related products

Cardiomyocytes are highly specialized heart muscle cells. The main function of these cells is to propel blood throughout the body by self-excitatory and involuntary contraction. They comprise 20% of the total number of cells in the heart, and due to their unique architecture, more than 90% of its mass[1]. The remaining cells are endothelial cells and fibroblasts. The heart was considered a terminally differentiated organ till very recently, when the existence of human cardiomyocyte progenitor cells was described, thus challenging a long-standing dogma[2].

Heart disease is the No.1 cause of death in USA. This justifies the need for an in vitro system which enables the studies of human cardiac muscle cell differentiation, growth, development, and regenerative medicine. In addition, an in vitro system would facilitate cardiac drug toxicology studies. DV Biologics is now highlighting a set of products that will undoubtedly help in the most sophisticated studies. DV Biologics offers human cardiac cells (uncultured) (AC001-F), human cardiomyocyte progenitor cells (AC015-F) (Fig.1), and human cardiomyocytes (AC008-F). Human cardiac cells are derived from heart dissociated into single cells, and can be used for isolation of cardiomyocyte progenitor cells and differentiated cardiomyocytes (Fig 2, 3). DV Biologics human cardiomyocyte progenitor cells express transcription factors indicative of cardiomyocyte predisposition and successfully differentiate into cardiomyocytes as shown by expression of sarcomeric structural proteins (Fig. 3). Our cardiomyocytes exhibit similar expression patterns with multinucleated features (Fig. 2), guaranteeing an excellent in vitro system even for your most demanding studies.

1. Lafontant, P.J.E., Field, L.J. Novartis Found Symp. 2006; 274: 196-276
2. Smits, A.M., et al. Nature Protocols 2009; 4(2): 232-243

Fig 1. Phase-contrast photomicrograph of cardiomyocyte progenitor cell culture.

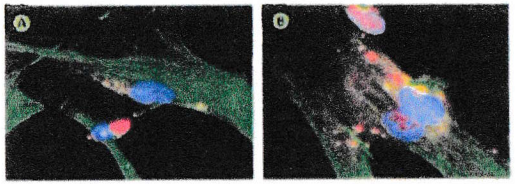


Fig. 2. Immunocytochemical analysis of cardiac lineage markers in DV Biologics cardiac cells and cardiomyocytes. (A) Cardiac cells were stained with actin (green) and myosin heavy chain (red) antibodies. (B) Cardiomyocytes express myosin heavy chain (green) and troponin T (red). Note the multinucleated pattern.

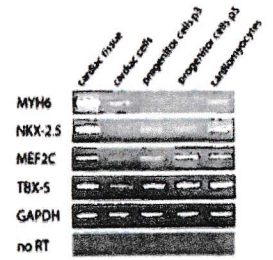


Fig 3. RT-PCR analysis of DV Biologics cardiac and cardiomyocyte progenitor cells. Whole cardiac tissue was used as a positive control. Our cardiac cells represent a mixture of cells that express cardiac structural proteins as well as cardiac transcripton factors. Cardiomyocyte progenitor cells can be propagated in culture (see passage 3 and 5(p3, p5)) and differentiated into functional cardiomyocytes expressing myosin heavy chain 6 after 2 week treatment. The markers used in the study were NKX-2.5, MEF2C, TBX-5, all transcription factors characteristic for cardiac lineage, as well as myosin heavy chain 6 (MYH6, also known as MyHC alpha), one of the major structural proteins in heart muscle.

SKELETAL MUSCLE SYSTEMS - PRENATAL CONNECTIVE TISSUE, continued

Product	Quantity	Catalog Number	Price
Osteoblast cDNA	20 rxns/vial	PM005-CD	$200
Bone Lysate	100 µg/vial	PM007-L	$130
Bone Total RNA	1 µg/vial	PM007-R	$40
Bone cDNA	20 rxns/vial	PM007-CD	$170
Muscle Fibroblast Lysate	100 µg/vial	PM008-L	$250
Muscle Fibroblast Total RNA	10 µg/vial	PM008-R	$300
Muscle Fibroblast cDNA	20 rxns/vial	PM008-CD	$350
Cartilage Tissue Lysate	100 µg/vial	PM009-L	$200
Cartilage Tissue Total RNA	10 µg/vial	PM009-R	$300
Cartilage Tissue cDNA	20 rxns/vial	PM009-CD	$350

HEMATOPOIETIC SYSTEMS - PRENATAL BONE MARROW

Product	Quantity	Catalog Number	Price
Bone Marrow Cell (Uncultured) Total RNA	10 µg/vial	PH001-R	$400
Bone Marrow Cell (Uncultured) cDNA	20 rxns/vial	PH001-CD	$350
CD34+ Bone Marrow Cell Total RNA	1 µg/vial	PH003-R	$1200
CD34+ Bone Marrow Cell cDNA	20 rxns/vial	PH003-CD	$1200
Bone Marrow Stromal Cell Lysate	100 µg/vial	PH005-L	$500
Bone Marrow Stromal Cell Total RNA	10 µg/vial	PH005-R	$800
Bone Marrow Stromal Cell cDNA	20 rxns/vial	PH005-CD	$600
CD34- Bone Marrow Cell Total RNA	1 µg/vial	PH008-R	$100
CD34- Bone Marrow Cell cDNA	20 rxns/vial	PH008-CD	$100
Spleen Tissue Lysate	100 µg/vial	PH007-L	$130
Spleen Tissue Total RNA	10 µg/vial	PH007-R	$40
Spleen Tissue cDNA	20 rxns/vial	PH007-CD	$170

DIGESTIVE SYSTEMS - PRENATAL

Product	Quantity	Catalog Number	Price
Liver Tissue Lysate	100 µg/vial	PD020-L	$130
Liver Tissue OCT Block	1 block	PD020-FS	Inquire
Liver Tissue Total RNA	10 µg/vial	PD020-R	$40
Liver Tissue cDNA	20 rxns/vial	PD020-CD	$170
CD34+ Liver Cell Lysate	100 µg/vial	PD002-L	$560
CD34+ Liver Cell Total RNA	1 µg/vial	PD002-R	$650

Purified CD133 Positive Human Cells

DV Biologics now offers high purity frozen CD133 positive (CD133+) human cells isolated from prenatal liver and bone marrow. CD133/AC133 (prominin-1) is a five transmembrane domain glycoprotein expressed on hematopoietic stem cells, endothelial progenitor cells, glioblastomas, and neural stem cells[1,2]. CD133/AC133+ cells are capable of long term hematopoietic repopulation and are thought to be more primitive than CD34+ stem cells. The specific functions of CD133/AC133 remain relatively unclear; however there is a vast amount of studies focusing on cancer and the role of CD133 as a stem cell since CD133 is found in certain cancers such as retinoblastoma[1].

DV Biologics' CD133+ cells are isolated using magnetic cell separation and are 87% pure populations, as confirmed by FACS analysis (Fig.1). RT-PCR supports and extends the data demonstrating expression of CD133 (Fig. 2). CD133+ cells can be used for various studies on hematopoiesis, cancer, differentiation, angiogenesis, colony formation, and surface marker expression. In addition, these cells provide a selective population useful for transplantation and tissue regeneration studies.

CD133+ cells isolated from the liver are easily differentiated into multiple cell types. We differentiated the cells into endothelial cells as confirmed by acetyl-LDL uptake assay (Fig.3) and into myocytes as indicated by multinucleated cells and immunocytochemistry analysis for the muscle specific marker α-sarcomeric actin (Fig. 4).

1. Shmelkov S. V., et al. Int J Biochem Cell Biol. 2005; 37(4): 715-9.
2. Mizrak D., Brittan M., Alison M. R. J Pathol. 2008; 214(1): 3-9.

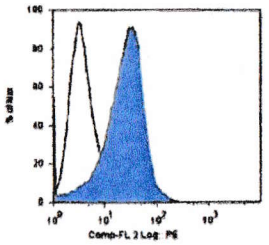


Figure 1: Flow cytometry analysis demonstrating CD133+ cells after staining with a CD133-PE conjugated antibody. The cells are 87% positive for CD133 after magnetic cell separation according to flow cytometry.

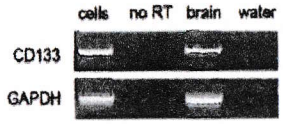


Figure 2: RT-PCR analysis demonstrates that CD133 positive cells after magnetic cell separation express CD133 at the RNA level. Lane 1 CD133+ cells, lane 2 no RT, lane 3 whole brain positive control, and lane 4 water negative control.

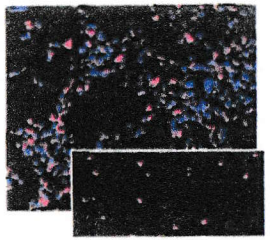


Figure 3: Immunocytochemistry (ICC) and ac-LDL uptake assay. After plating CD133+ cells and placing them into endothelial cell media, cells begin to form a cobblestone appearance (ICC for CD133+ in red, nuclei blue). After a few passages we measured their ability of incorporating acetyl-LDL which is indicative of endothelial cells using acetylated low density lipoprotein labeled with DiI (insert; cells shown in red). 10X magnification.

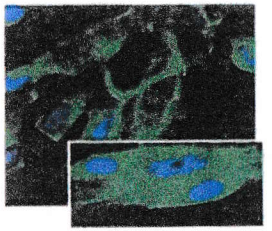


Figure 4: Immunocytochemistry assay demonstrating CD133 cells can be differentiated into myocytes. After treating the cells with specific growth factors, cells commence elongating and express the marker α-sarcomeric actin (green) and become multinucleated (DAPI in blue). Insert is a high magnification (60X) picture of a multinucleated cell.

DIGESTIVE SYSTEMS - PRENATAL continued

Product	Quantity	Catalog Number	Price
CD34+ Liver Cell cDNA	20 rxns/vial	PD002-CD	$600
CD133+ Liver Cell Lysate	100 µg/vial	PD003-L	$1000
CD133+ Liver Cell Total RNA	1 µg/vial	PD003-R	$1000
CD133+ Liver Cell cDNA	20 rxns/vial	PD003-CD	$1100
CD34+ Endothelial Liver Cell Lysate	100 µg/vial	PD012-L	$550
CD34+ Endothelial Liver Cell Total RNA	10 µg/vial	PD012-R	$600
CD34+ Endothelial Liver Cell cDNA	20 rxns/vial	PD012-CD	$500
CD34- Liver Cell Lysate	100 µg/vial	PD013-L	$75
CD34- Liver Cell Total RNA	1 µg/vial	PD013-R	$100
CD34- Liver Cells cDNA	20 rxns/vial	PD013-CD	$100
Stomach Tissue Lysate	100 µg/vial	PD022-L	$130
Stomach Tissue OCT Block	1 block	PD022-FS	$250
Stomach Tissue Total RNA	10 µg/vial	PD022-R	$40
Stomach Tissue cDNA	20 rxns/vial	PD022-CD	$170
Intestines Tissue Lysate	100 µg/vial	PD023-L	$130
Inteshines Tissue OCT Block	1 block	PD023-FS	Inquire
Intestines Tissue Total RNA	10 µg/vial	PD023-R	$40
Intestines Tissue cDNA	20 rxns/vial	PD023-CD	$170
Small Intestines Tissue Lysate	100 µg/vial	PD024-L	$130
Small Intestines Tissue OCT Block	1 block	PD024-FS	Inquire
Small Intestines Tissue Total RNA	10 µg/vial	PD024-R	$40
Small Intestines Tissue cDNA	20 rxns/vial	PD024-CD	$170
Small Intestines Epithelial Cell Lysate	100 µg/vial	PD015-L	$5 00
Small Intestines Epithelial Cell Total RNA	10 µg/vial	PD015-R	$600
Small Intestines Epithelial Cell cDNA	20 rxns/vial	PD015-CD	$550
Large Intestines Tissue Lysate	100 µg/vial	PD025-L	$130
Large Intestines Tissue Total RNA	10 µg/vial	PD025-R	$40
Large Intestines Tissue cDNA	20 rxns/vial	PD025-CD	$170
Tongue Cell (Uncultured) Lysate	100 µg/vial	PD009-L	$130
Tongue Cell (Uncultured) Total RNA	10 µg/vial	PD009-R	$40
Tongue Cell (Uncultured) cDNA	20 rxns/vial	PD009-CD	$170
Esophagus Tissue Lysate	100 µg/vial	PD026-L	$500
Esophagus Tissue OCT Block	1 block	PD026-FS	$450
Esophagus Tissue Total RNA	10 µg/vial	PD026-R	$500
Esophagus Tissue cDNA	20 rxns/vial	PD026-CD	$500

CD34 positive (CD34+) cells

DV Biologics now offers high purity frozen CD34 positive (CD34+) human cells isolated from human prenatal liver. CD34, a single cell-surface transmembrane glycoprotein, has become one of the most widely used markers of hematopoietic stem cells, expressed in non-quiescent or activated hematopoietic precursors, and absent from differentiated hematopoietic lineages. During early development, CD34 expression is present in hematopoietic progenitors of the yolk sac, the para-aortic splanchnopleura, and later in the aorta-gonad-meso-nephros. Shortly after the development of the liver primordia, hematopoietic progenitors expressing CD34 start colonizing the liver, which becomes the principal site for hematopoiesis for the rest of embryogenesis,until the hematopoietic progenitors start migrating to the bone marrow. In adults, CD34 is also expressed in vascular endothelia, primarily small vessels, a subset of stromal cells of bone marrow origin, and a subset of muscle-derived progenitor cells.*

DV Biologics' CD34+ human cells are isolated using magnetic cell separation and are 95% pure populations, as confirmed by FACS analysis (Fig.1) and Western Blotting (Fig.2). CD34+ cells can be used for various studies on hematopoiesis, differentiation, angiogenesis, colony formation, and surface marker expression. CD34+ cells can be differentiated into endothelial cells as confirmed by Ac-LDL uptake assay (Fig.3) and expression of the endothelial markers CD31 and Von Willebrand factor VIII (Fig. 4). These endothelial cells are also available from DV Biologics.

*Fumess SG, McNagny K. Immunol Res. 2006; 34(1):13-32.

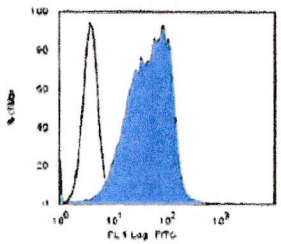


Fig.1. Flow cytometry analysis showing CD34+ cells isolated from fetal liver after staining with a CD34 FITC conjugated antibody. 95% of the cells were positive for CD34

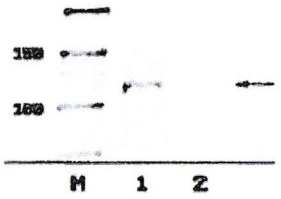


Fig.2. Western Blotting analysis of CD34 protein expression (110KDa, black arrow) in the CD34+ cell population after magnetic cell separation. M) Fluorescent marker 1) CD34+ cells 2) Mesenchymal Stem cells, used as a negative control.

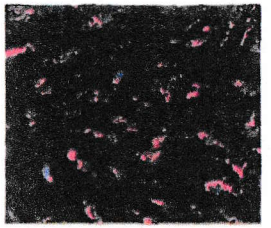


Fig.3 Ac-LDL uptake assay CD34+ cells were differentiated into endothelial cells. After few passages ,we measured their ability of incorporating acetyl-LDL (shown in red) previously labeled with DiI (3,3'-dioctadecyl-3,3,3',3'-tetramethylindocarbocyanine perchlorate). Nuclei were stained with Hoechst 33432 (shown in blue).

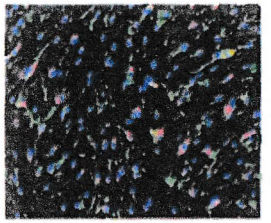


Fig.4 Immunocytochemistry assay showing CD34+ cells differentiated into endothelial cells. After few passages, cells express the endothelial markers CD31 (shown in green) and Von Willebrand factor VIII (shown in red). Nuclei were stained with Hoechst 33432 (shown in blue).

LIFEbank™ GP - Postnatal

GENOMIC/PROTEOMIC SYSTEMS

PULMONARY SYSTEMS: PRENATAL LUNG

Product	Quantity	Catalog Number	Price
Lung Tissue Lysate	100 µg/vial	PP006-L	$130
Lung Tissue OCT Block	1 block	PP006-FS	Inquire
Lung Tissue Total RNA	10 µg/vial	PP006-R	$40
Lung Tissue cDNA	20 rxns/vial	PP006-CD	$170
Pulmonary Fibroblast Lysate	100 µg/vial	PP002-L	$1500
Pulmonary Fibroblast Total RNA	10 µg/vial	PP002-R	$200
Pulmonary Fibroblast cDNA	20 rxns/vial	PP002-CD	$150

ENDOCRINE SYSTEMS: PRENATAL

Product	Quantity	Catalog Number	Price
Adrenal Gland Tissue Lysate	100 µg/vial	PE001-L	$80
Adrenal Gland Tissue RNA	10 µg/vial	PE001-R	$140
Adrenal Gland Tissue cDNA	20 rxns/vial	PE001-CD	$170
Adrenal Gland Tissue OCT Block	1 block	PE001-FS	Inquire
Thymus Tissue Lysate	100 µg/vial	PE003-L	$130
Thymus Tissue Total RNA	10 µg/vial	PE003-R	$40
Thymus Tissue cDNA	20 rxns/vial	PE003-CD	$170

NEURAL SYSTEMS: POSTNATAL

Product	Quantity	Catalog Number	Price
Neural Cell Total RNA	1 µg/vial	AN009-R	$525
Neural Cell cDNA	10 µg/vial	AN009-CD	$1000
Neural Cell Lysate	100 µg/vial	AN009-L	$800

INTEGUMENTARY SYSTEMS: POSTNATAL

Product	Quantity	Catalog Number	Price
Skin Fibroblast Lysate	100 µg/vial	AI001-L	$200
Skin Fibroblast Total RNA	10 µg/vial	AI001-R	$300
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD	$300
Skin Tissue Lysate	100 µg/vial	AI004-L	$250
Epidermis Tissue Total RNA	1 µg/vial	AI005-R	Inquire
Epidermis Tissue cDNA	20 rxns/vial	AI005-CD	Inquire
Epidermis Tissue Lysate	100 µg/vial	AI005-L	Inquire
Dermis Tissue Total RNA	1 µg/vial	AI006-R	Inquire
Dermis Tissue cDNA	20 rxns/vial	AI006-CD	Inquire
Dermis Tissue Lysate	100 µg/vial	AI006-L	Inquire

Human epithelial cells

"Epithelium" refers to the tissue covering and lining the inner and outer surfaces of the body, hollow organs and glands. Epithelial cells can be arranged in a single (simple epithelium) or multiple layers (stratified epithelium). Based on their shape, epithelial cells can give rise to squamous, cuboidal, and columnar varieties. Epithelial tissue has multiple functions: it protects other tissues from various insults, but also participates in secretion, absorption, excretion and diffusion of diverse substances necessary for homeostasis.

Researchers studying cellular function, transport, differentiation, transformation, toxicity, systems biology and cancer would greatly benefit from DV Biologics human epithelial cells, which are isolated from the esophagus and kidneys.

The esophagus is lined with epithelial cells, forming stratified squamous epithelium. We supply human esophageal epithelial cells (EEC) (PD016-F) that exhibit a characteristic cobblestone appearance (Fig. 1A) when grown on precoated plates. If kept in culture for longer periods of time, they spontaneously differentiate into stratified, elongated cells (Fig. 1B)[1]. The same phenomenon can be achieved by addition of Ca+ to the medium. DV Biologics normal human EECs could be passaged several times from its initial seeding. After a few passages, the population doublings were estimated to be 7.8 (Fig. 2). DV Biologics esophageal epithelial cells stain positive for cytokeratin 14 (CK-14), an intermediate filament protein known as a marker for squamous epithelium (Fig. 3). This product is an excellent tool for studying esophageal epithelium, its transformation, as well as tissue engineering.

DV Biologics kidney epithelial cells (PU002-F) represent a mixed population of epithelial cells isolated from the entire kidney. The cells express cytokeratins (Fig. 4)[2] and provide a superb system for research involving hypertension, diabetes, oncology, renal fibrosis, autoimmune disease, drug screening/development and toxicology.

1. Sato, N. and Hidomi, J. (2002) The Anatomical Record 267: 80-89
2. Lash, L.H. et al. (2001) J Pharmacol Exp Ther 296: 243-251

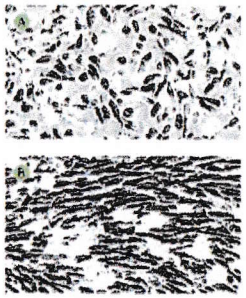


Fig 1. Primary culture of normal EECs. (A) Formation of EECs colony 72 hours post seeding (spread out as cobblestone-shaped cells). (B) Primary culture of normal human EECs after 5 days of culture. Notice remarkable change in morphology characterized by elongation of cytoplasm and stratification.

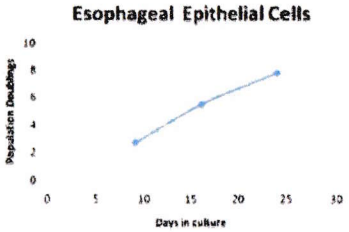


Fig 2: Graph of estimated population doublings for EECs. The total population doublings were 7.8.

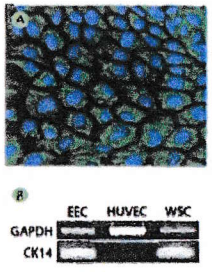


Fig 3. EECs express epithelium specific marker CK-14. (A) CK-14 expression in normal human EECs visualized (10X magnification) by immunofluorescent staining after 14 days of in vitro culture. CK-14 antibody are labeled green, nuclei are stained with DAPI (blue)(B) CK-14 and GAPDH RT-PCR performed on mRNA derived from normal human Epithelial Esophagus Cells (EECs), Human Umbilical Vein Endothelial Cells (HUVEC), and human whole skin tissue cDNA (WSC).

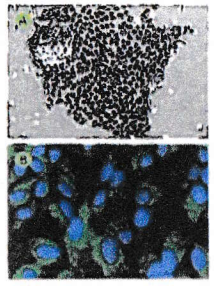


Fig 4. Characterization of DV Biologics kidney epithelial cells. (A) Kidney epithelial colony forming 16 hours after plating. (B) Cells were fixed and processed for immunofluorescence using CK-14 antibody (green). Nuclei are stained with DAPI (blue).

SKELETAL MUSCLE SYSTEMS - POSTNATAL SKELETAL MUSCLE

Product	Quantity	Catalog Number	Price
Skeletal Muscle Cell (Uncultured) Lysate	100 µg/vial	AM001-L	$130
Skeletal Muscle Cell (Uncultured) Total RNA	10 µg/vial	AM001-R	$40
Skeletal Muscle Cell (Uncultured) cDNA	20 rxns/vial	AM001-CD	$170
Skeletal Muscle Progenitor Cell Lysate	100 µg/vial	AM002-L	$600
Skeletal Muscle Progenitor Cell Total RNA	10 µg/vial	AM002-R	$750
Skeletal Muscle Progenitor Cell cDNA	20 rxns/vial	AM002-CD	$600
Skeletal Muscle Cell Lysate	100 µg/vial	AM003-L	$200
Skeletal Muscle Cell Total RNA	10 µg/vial	AM003-R	$400
Skeletal Muscle Cell cDNA	20 rxns/vial	AM003-CD	$400
Osteoblast Lysate	100 µg/vial	AM005-L	$300
Osteoblast Total RNA	10 µg/vial	AM005-R	$350
Osteoblast cDNA	20 rxns/vial	AM005-CD	$300
Bone Lysate	100 µg/vial	AM007-L	$150
Bone Total RNA	1 µg/vial	AM007-R	$260
Bone cDNA	20 rxns/vial	AM007-CD	$220
Cartilage Tissue Lysate	100 µg/vial	AM009-L	$300
Cartilage Tissue Total RNA	1 µg/vial	AM009-R	$500
Cartilage Tissue cDNA	20 rxns/vial	AM009-CD	$500
Synovial Tissue FFPE Block	1 block	AM010-PS	Inquire
Synovial Tissue OCT Block	1 block	AM010-FS	Inquire
Synovial Tissue Lysate	100 µg/vial	AM010-L	$500
Synovial Tissue Total RNA	1 µg/vial	AM010-R	$500
Synovial Tissue cDNA	20 rxns/vial	AM010-CD	$500
Synovial Fluid	1 ml	AM011-FL	Inquire

HEMATOPOIETIC SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Human Umbilical Vein Endothelial Cell Lysate	100 µg/vial	AC005-L	$200
Human Umbilical Vein Endothelial Cell Total RNA	10 µg/vial	AC005-R	$300
Human Umbilical Vein Endothelial Cell cDNA	20 rxns/vial	AC005-CD	$300
Wharton's Jelly Stem Cell Lysate	100 µg/vial	AC006-L	$500
Wharton's Jelly Stem Cell Total RNA	10 µg/vial	AC006-R	$600
Wharton's Jelly Stem Cell cDNA	20 rxns/vial	AC006-CD	$500
Umbilical Cord Tissue Lysate	100 µg/vial	AC007-L	$130
Umbilical Cord Tissue Total RNA	10 µg/vial	AC007-R	$40
Umbilical Cord Tissue cDNA	20 rxns/vial	AC007-CD	$170
Bone Marrow Cell (Uncultured) Total RNA	10 µg/vial	AH001-R	$250
Bone Marrow Cell (Uncultured) cDNA	20 rxns/vial	AH001-CD	$250
Bone Marrow Stromal Cell Lysate	100 µg/vial	AH005-L	$500
Bone Marrow Stromal Cell Total RNA	10 µg/vial	AH005-R	$700
Bone Marrow Stromal Cell cDNA	20 rxns/vial	AH005-CD	$550
CD34+ Umbilical Cord Blood Cell Lysate (pooled)	100 µg/vial	AH012-L	$400
CD34+ Umbilical Cord Blood Cell Total RNA (pooled)	1 µg/vial	AH012-R	$400
CD34+ Umbilical Cord Blood Cell cDNA (pooled)	20 rxns/vial	AH012-CD	$600
CD34- Umbilical Cord Blood Cell Lysate (pooled)	100 µg/vial	AH017-L	$150
CD34- Umbilical Cord Blood Cell Total RNA (pooled)	1 µg/vial	AH017-R	$150
CD34- Umbilical Cord Blood Cell cDNA (pooled)	20 rxns/vial	AH017-CD	$150

REPRODUCTIVE SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Male Gonadal Stromal Cell Lysate	100 µg/vial	AR005-L	$300
Male Gonadal Stromal Cell Total RNA	10 µg/vial	AR005-R	$300
Male Gonadal Stromal Cell cDNA	20 rxns/vial	AR005-CD	$200
Endometrial Menstrual Cell Lysate	100 µg/vial	AR007-L	$300
Endometrial Menstrual Cell Total RNA	10 µg/vial	AR007-R	$400
Endometrial Menstrual Cell cDNA	20 rxns/vial	AR007-CD	$400

CARDIOVASCULAR SYSTEMS - POSTNATAL HEART

Product	Quantity	Catalog Number	Price
Heart Cell (Uncultured) Lysate	100 µg/vial	AC001-L	$130
Heart Cell (Uncultured) Total RNA	10 µg/vial	AC001-R	$40
Heart Cell (Uncultured) cDNA	20 rxns/vial	AC001-CD	$170
Cardiomyocyte Lysate	100 µg/vial	AC008-L	$700
Cardiomyocyte Total RNA	10 µg/vial	AC008-R	$780
Cardiomyocyte cDNA	20 rxns/vial	AC008-CD	$700
Cardiac Stromal Cell Lysate	100 µg/vial	AC009-L	$550
Cardiac Stromal Cell Total RNA	10 µg/vial	AC009-R	$600
Cardiac Stromal Cell cDNA	20 rxns/vial	AC009-CD	$550
Cardiac Progenitor Cell Lysate	100 µg/vial	AC015-L	$600
Cardiac Progenitor Cell Total RNA	10 µg/vial	AC015-R	$750
Cardiac Progenitor Cell cDNA	20 rxns/vial	AC015-CD	$600
Right Atrium Tissue Lysate	100 µg/vial	AC020-L	$130
Right Atrium Tissue Total RNA	1 µg/vial	AC020-R	$40

CARDIOVASCULAR SYSTEMS - POSTNATAL HEART (continued)

Product	Quantity	Catalog Number	Price
Right Atrium Tissue cDNA	20 rxns/vial	AC020-CD	$170
Pericardium Tissue Lysate	100 µg/vial	AC021-L	$145
Pericardium Tissue Total RNA	1 µg/vial	AC021-R	$40
Pericardium Tissue cDNA	20 rxns/vial	AC021-CD	$170
Aortic Valve Tissue Lysate	100 µg/vial	AC022-L	$300
Aortic Valve Tissue Total RNA	1 µg/vial	AC022-R	$300
Aortic Valve Tissue cDNA	20 rxns/vial	AC022-CD	$300
Heart Auricle Tissue Lysate	100 µg/vial	AC023-L	$300
Heart Auricle Tissue Total RNA	1 µg/vial	AC023-R	$300
Heart Auricle Tissue cDNA	20 rxns/vial	AC023-CD	$300
Valvular Interstitial Cell Lysate	100 µg/vial	AC024-L	$700
Valvular Interstitial Cell Total RNA	10 µg/vial	AC024-R	$750
Valvular Interstitial Cell cDNA	20 rxns/vial	AC024-CD	$750
Mitral Valve Lysate	100 µg/vial	AC026-L	$300
Mitral Valve Total RNA	10 µg/vial	AC026-R	$160
Mitral Valve cDNA	20 rxns/vial	AC026-CD	$160

LYMPHATIC SYSTEMS - POSTNATAL

Product	Quantity	Catalog Number	Price
Adenoid Tissue Lysate	100 µg/vial	AL001-L	$300
Tonsil Tissue Lysate	100 µg/vial	AL002-L	$130
Tonsil Tissue Total RNA	1 µg/vial	AL002-R	$40
Tonsil Tissue cDNA	20 rxns/vial	AL002-CD	$170

GENERAL TISSUES - POSTNATAL

Product	Quantity	Catalog Number	Price
Adipose Tissue Lysate	100 µg/vial	AA003-L	$100
Adipose Tissue Total RNA	1 µg/vial	AA003-R	$130
Adipose Tissue cDNA	20 rxns/vial	AA003-CD	$170
Adipose Stromal Cell Lysate	100 µg/vial	AA002-L	$325
Adipose Stromal Cell Total RNA	10 µg/vial	AA002-R	$300
Adipose Stromal Cell cDNA	20 rxns/vial	AA002-CD	$300
Adipose Vascular Stromal Fraction (Uncultured) Lysate	100 µg/vial	AA001-L	$250
Adipose Vascular Stromal Fraction (Uncultured) Total RNA	10 µg/vial	AA001-R	$225
Adipose Vascular Stromal Fraction (Uncultured) cDNA	20 rxns/vial	AA001-CD	$225

Products for Research in Nutrition: Nutrient Absorption, Hormonal Influence, Molecular Regulation and Beyond.

In industrialized countries, where food abundance is the norm, nutrition appears increasingly to be involved in many aspects influencing the maintenance of good health of human populations. The subject of nutrition straddles diverse disciplines of health sciences, ranging from behavioral analyses of the masses, to the study of individual preferences of food taste as governed by hormonal fluctuations during development, to the cellular process of nutrient adsorption in the intestine, to the molecular regulation of genes involved in the perception and interpretation of good tasting food.

Coldwell et al [1] showed a correlation between growing bones in w and their high sugar preference, which opened a new venue of research in the various hormones that may be the cause or the results of bone growth and their relationships with adolescent metabolism. DV Biologics offers many sought after cellular and molecular products that are essential in bone development research. Other current areas of research focus on the influence of in utero environment on taste preferences of human infants and subsequent adults[2], which reveals still another less well explored area of research on how flavor molecules are absorbed through the intestine of the mother and presented to the developing fetus. DV Biologics is dedicated to offer scientists the highest quality genomic and proteomic biological products. They consist of human derived total RNA, cDNA and protein lysates, spanning various developmental stages.

All products are validated under strict quality assurance and control parameters, providing customers with reliable, quality products for reproducible results with maximum impact. Unless specified, each product is from a single source and non-pooled. Figure 1 shows how chondrogenic markers are expressed specifically in bone and cartilage products (PM007-R, and PM012-R, respectively), and how their relative levels can be estimated by real-time PCR. Figure 2 is another example of the tissue specific expression of neural markers in brain-derived products, neurospheres (PN003) and whole brain tissue (AN001, PN001).

1. Beauchamp GK, Mennella JA (2011). Flavor perception in human infants: Development and functional significance. Digestion 83 (Suppl 1):1-6

2. Coldwell SE, Oswald TK, and Reed DR (2009). A marker of growth differs between adolescents with high vs. low sugar preference. Physiol Behav. 96:574-580.

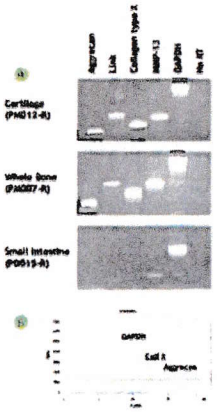


Figure 1. Expression of chondrogenic markers in human pre-natal cartilage, bone tissue and small intestine epithelial cells (HPIEC). (A) cDNA is synthesized from cartilage RNA (PM012-R), bone RNA (PM007-R) and HPIEC RNA (PD015-R) by reverse transcription, and amplified by PCR using primers specific for Aggrecan (AGG), Link, Collagen type X (COLX), MMP-13 and GAPDH. (B) Real Time PCR was performed using cartilage tissue cDNA, using specific primers for COLX, and AGG; GAPDH was used as internal control.

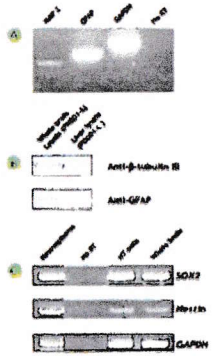


Figure 2. Expression of neural markers in human brain tissue. (A) cDNA is synthesized from adult brain tissue RNA (AN001-R) by reverse transcription, and amplified by PCR using primer pairs specific for MAP-2, glial fibrillary acid protein (GFAP) and GAPDH. (B) Western blot was performed using lysates of whole brain (PN001-L) and whole liver (PD001-L). (C) cDNA is synthesized from total RNA of prenatal neurospheres, neuroteratoma (NT) cells and whole prenatal brain by reverse transcription with oligo-(dT), and amplified using primer pairs specific for SOX2, Nestin and GAPDH

LIFEbank™ GENOMIC/PROTEOMIC SYSTEMS

LIFEbank™ GP - Postnatal

Need RNA, cDNA or protein lysate from hard-to-obtain tissues or cells?

DV Biologics is dedicated to offer customers the highest quality genomic and proteomic biological products. They consist of human derived total RNA, cDNA and protein lysates, spanning various developmental stages.

Our newest additions include genomic and proteomic products from a plethora of hard-to-obtain adult human tissues and cells such as whole bone, stomach tissue, aortic valve, uterine myoma, dermis and epidermis from normal and diseased states. DV Biologics offers an ever growing number of tools amenable to your research whether you are studying genetic disorders, cardiovascular diseases, bone homeostasis, adult stem cells, or cancer, just to name a few.

All products are validated under strict quality assurance and control parameters, providing customers with reliable, quality products for reproducible results with maximum impact. Unless specified, each product is from a single source and non-pooled. As an example, Fig 1. illustrates the quality control that all of our total RNA products are subjected to, ensuring a high degree of purity and intactness. DV Biologics RNA can be used in downstream applications such as RT-PCR, real-time RT-PCR, differential display, cDNA synthesis, Northern, dot, and slot blot analyses, primer extension, poly A+ RNA selection, RNase/S1 nuclease protection and microarrays.

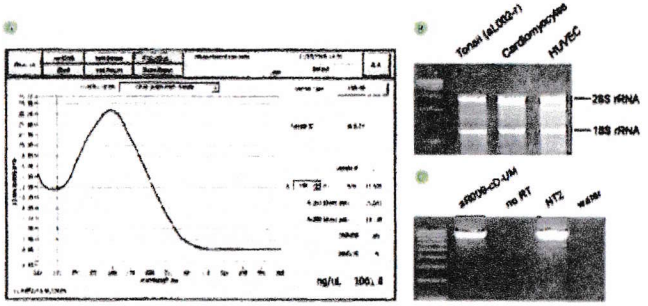
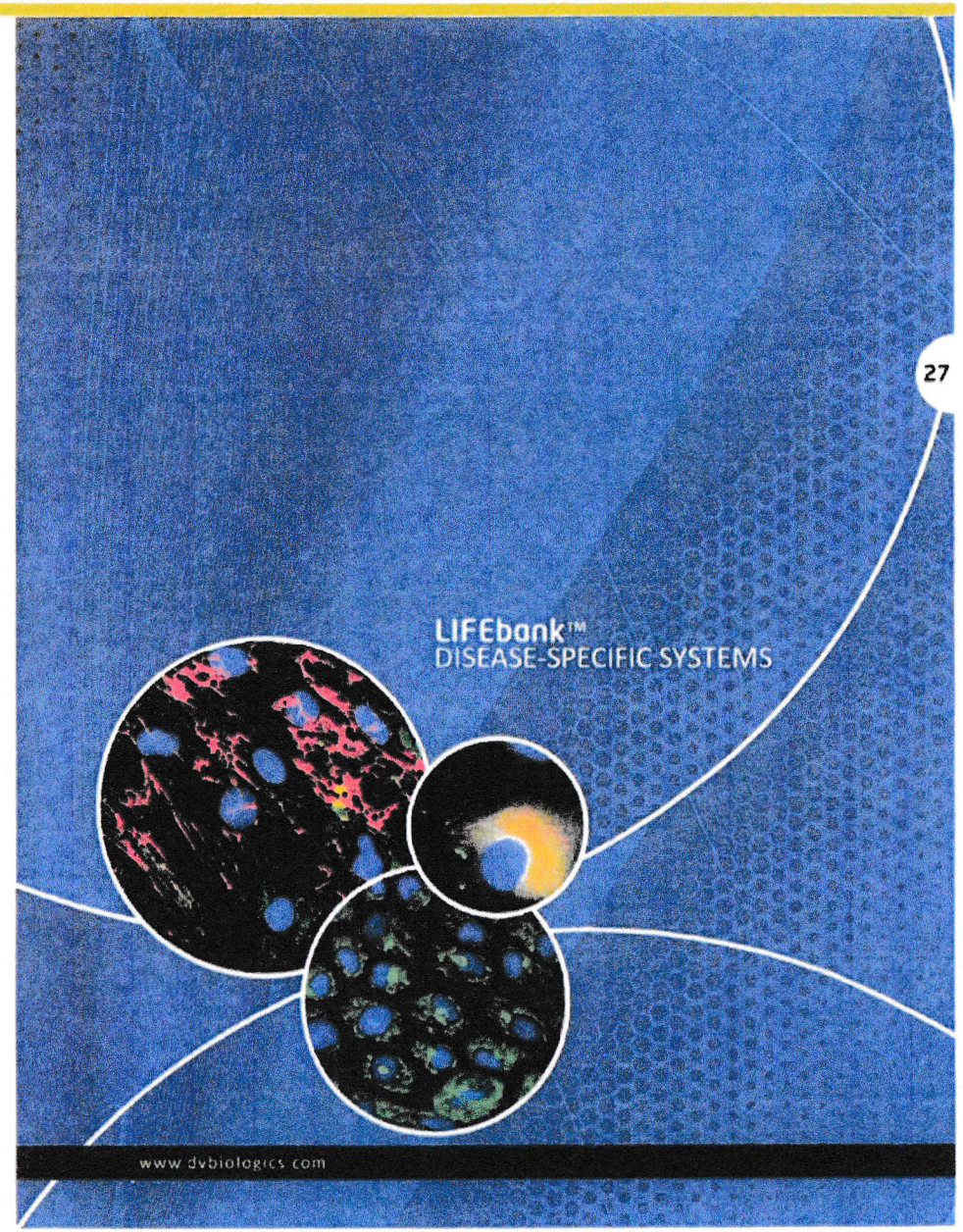
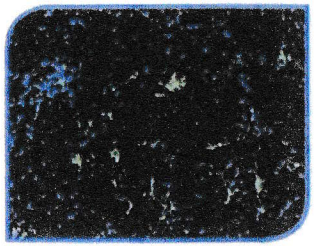
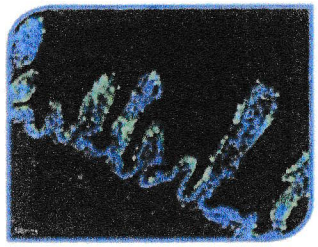


Figure 1: Quality control parameters for DV Biologics total RNA. (A) The purity of RNA is determined by spectrophotometry to obtain the A260/A280 ratio, which must range from 1.8-2.1. The example shown is the spectral analysis of Human Tonsil Total RNA (AL002-R). (B) Total RNA is analyzed by agarose gel electrophoresis. RNA integrity is determined visually by analyzing 18S and 28S ribosomal bands, as shown by a representative gel of DV Biologics human total RNAs (1 µg/lane). (C) RNA functionality is assayed by RT-PCR using primers for housekeeping gene GAPDH. This assay also confirms that the RNA is DNA-free. The example shown is the analysis of Uterine Myoma Total RNA (AR009-R-UM), used for the synthesis of AR009-CD-UM. The control cDNA is derived from NT2 cells RNA.





DV Biologics DISEASE LIST



Inquire about other available disease tissues/cells

LIFEbank™ — NEURODEGENERATIVE DISORDERS

Product	Quantity	Catalog Number	Price
AMYOTROPHIC LATERAL SCLEROSIS (ALS)			
Bone Marrow Mononuclear Cells	2.5 x 10^6 cells/vial	AH002-F-ALS-2.5	$100
Bone Marrow Mononuclear Cells	10 x 10^6 cells/vial	AH002-F-ALS-10	$300
Bone Marrow Mononuclear Cells	25 x 10^6 cells/vial	AH002-F-ALS-25	$600
Bone Marrow Stromal Cells	5 x 10^5 cells/vial	AH005-F-ALS	$1000
Bone Marrow Stromal Cell Lysate	100 µg/vial	AH005-L-ALS	$500
Bone Marrow Stromal Cell Total RNA	10 µg/vial	AH005-R-ALS	$800
Bone Marrow Stromal Cell cDNA	20 rxns/vial	AH005-CD-ALS	$600
Skin Fibroblasts	5 x 10^5 cells/vial	AL001-F-ALS	$800
Skin Fibroblast Lysate	100 µg/vial	AL001-L-ALS	$500
Skin Fibroblast Total RNA	10 µg/vial	AL001-R-ALS	$600
Skin Fibroblast cDNA	20 rxns/vial	AL001-CD-ALS	$600
TRANSVERSE MYELITIS (TM)			
Skin Fibroblasts	5 x 10^5 cells/vial	AL001-F-TM	$800
Skin Fibroblast Lysate	100 µg/vial	AL001-L-TM	$800
Skin Fibroblast Total RNA	10 µg/vial	AL001-R-TM	$800
Skin Fibroblast cDNA	20 rxns/vial	AL001-CD-TM	$700
ASTROCYTOMA (AC)			
Skin Fibroblasts	5 x 10^5 cells/vial	AL001-F-AC	$700
Skin Fibroblast Lysate	100 µg/vial	AL001-L-AC	$700
Skin Fibroblast Total RNA	10 µg/vial	AL001-R-AC	$700
Skin Fibroblast cDNA	20 rxns/vial	AL001-CD-AC	$600
GLIOBLASTOMA (GM)			
Skin Fibroblasts	5 x 10^5 cells/vial	AL001-F-GM	$700
Skin Fibroblast Lysate	100 µg/vial	AL001-L-GM	$700
Skin Fibroblast Total RNA	10 µg/vial	AL001-R-GM	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-GM	$600

LIFEbank™ Disease-Specific Systems

DV Biologics now offers a unique set of primary cells from various diseased states, ranging from polygenic diseases such as diabetes type 2, to rare genetic disorders, such as mucopolysaccharidoses. Our LIFEbank™ DISEASE-SPECIFIC SYSTEMS includes not only various cell types (dermal fibroblasts, mononuclear cells, bone marrow stromal cells, skeletal muscle cells, dental pulp cells, gonadal stromal cells) but most importantly, cells from the same pedigree. For example, DV Biologics Duchenne muscular dystrophy (DMD) set consists of cells derived from affected and unaffected family members (Fig 1). This unparalleled cellular pedigree isolated from skin, muscle and bone marrow is an effective tool for understanding the etiology and nature of this devastating disease. The existence of DMD patient fibroblasts (AI001-F-DMD) (Fig. 2-4) and muscle cells (AM001-F-DMD) facilitates the study of this disease. With the recent advancements in induced pluripotent stem cell (iPSC) reprogramming technology,* DV Biologics offers these cells as a novel tool for understanding genetic disease transmission, development and treatment. Our DMD pedigree system is the first commercially available tool that allows such a sophisticated study of muscular dystrophy. Furthermore, we offer patients' fibroblasts from additional disorders of various etiologies which will definitely facilitate toxicology testing, disease modeling, drug screening and iPSC technology. Try DV Biologics diseased fibroblasts and/or muscle cells for your next IPS experiments. We are confident they will help!

*Yamanaka, S. (2009). Cell 137, 13-17

DV Biologics offers a unique cell panel along with corresponding genomic/proteomic products from a family affected with Duchenne muscular dystrophy. Available are dermal fibroblasts (AI001-F-DMD), skeletal muscle cells (AM003-F-DMD), bone marrow mononuclear cells (AH002-F-DMD), and bone marrow stromal cells (AH005-F-DMD) from a muscular dystrophy patient. Dermal fibroblasts and skeletal muscle cells from both parents can be also purchased from DV Biologics, providing an exceptional advantage in studying Duchenne muscular dystrophy.

DV Biologics Duchenne Muscular Dystrophy pedigree cell package offers researchers unprecedented tools for your research needs. Our DMD pedigree gives you skeletal muscle and skin fibroblast cells from father, mother, and son. You will receive 6 vials of cells containing >500,000 cells in each one for your research needs.

ORDERING INFORMATION:

Description	Cat. #	Price
DMD Cell Package	DMD-CP	$ 3000

The set includes:
- Skin fibroblasts isolated from DMD patient
- Skin fibroblasts isolated from DMD male parent
- Skin fibroblasts isolated from DMD female parent
- Skeletal muscle cells isolated from DMD patient
- Skeletal muscle cells isolated from DMD male parent
- Skeletal muscle cells isolated from DMD female parent

DV Biologics genomics package consists of total RNA (10 µg each) and protein lysate (100 µg each) from patient's and parents' skin fibroblasts and skeletal muscle cells.

ORDERING INFORMATION:

Description	Cat. #	Price
DMD Genomic Skin Fibroblasts Package	AI001-DMD-GP	$ 1500

The set includes:
- Total RNA isolated from DMD patient
- Total RNA isolated from DMD male parent
- Total RNA isolated from DMD female parent
- Cell lysate isolated from DMD patient
- Cell lysate isolated from DMD male parent
- Cell lysate isolated from DMD female parent

Description	Cat. #	Price
DMD Genomic Skeletal Muscle Cells Package	AM001-DMD-GP	$ 2000

The set includes:
- Total RNA isolated from DMD patient
- Total RNA isolated from DMD male parent
- Total RNA isolated from DMD female parent
- Cell lysate isolated from DMD patient
- Cell lysate isolated from DMD male parent
- Cell lysate isolated from DMD female parent

Fig 1. Primary cell collection from a family affected with Duchenne muscular dystrophy.

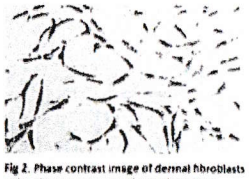


Fig 2. Phase contrast image of dermal fibroblasts isolated from a muscular dystrophy patient.

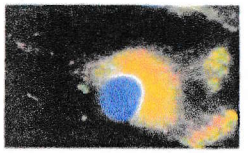


Fig 3. ICC staining of dermal fibroblasts from a muscular dystrophy patient double labeled with antibodies directed against human fibroblasts (green) and fibronectin (red). Nuclei are stained with DAPI (blue).

Fig 4. Fibroblast growth curve demonstrates that DV Biologics fibroblasts are expandable to greater than 35 population doublings.

LIFEbank™ DISEASE-SPECIFIC SYSTEMS

LIFEbank™ — NEURODEGENERATIVE DISORDERS, continued

Product	Quantity	Catalog Number	Price
GLIOBLASTOMA (GM)			
Glioblastoma Multiforme Cells (Uncultured)	5 x 10^5 cells/vial	AN010-F-GM	Inquire
Glioblastoma Multiforme Cell (Uncultured) Lysate	100 µg/vial	AN010-L-GM	$500
Glioblastoma Multiforme Cell (Uncultured) Total RNA	10 µg/vial	AN010-R-GM	$500
Glioblastoma Multiforme Cell (Uncultured) cDNA	20 rxns/vial	AN010-CD-GM	$500
Glioblastoma Multiforme Cell (Uncultured) FFPE Block	1 block	AN010-PS-GM	Inquire
NEUROFIBROMATOSIS (NF)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-NF	$800
Skin Fibroblast Lysate	100 µg/vial	AI001-L-NF	$700
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-NF	$800
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-NF	$700
PARKINSON'S DISEASE (PD)			
Skin Fibroblasts	5.0 x 10^5 cells/vial	AI001-F-PD	$800
Skin Fibroblast Lysate	100 µg/vial	AI001-L-PD	$500
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-PD	$600
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-PD	$600
HUNTINGTON'S DISEASE (HD)			
Skin Fibroblasts	5.0 x 10^5 cells/vial	AI001-F-HD	$900
Skin Fibroblast Lysate	100 µg/vial	AI001-L-HD	$550
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-HD	$650
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-HD	$650

LIFEbank™ — MUSCULAR DISORDERS

Product	Quantity	Catalog Number	Price
DUCHENNE MUSCULAR DYSTROPHY (DMD)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-DMD	$800
Skin Fibroblast Lysate	100 µg/vial	AI001-L-DMD	$400
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-DMD	$600
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-DMD	$600

Human Autoimmune Disease Systems

DV Biologics is now offering cells and cell based products from clinically diagnosed autoimmune disease patients for your research needs. Autoimmune diseases arise when tolerance to self antigens are lost. The resulting damage is an immune response that destroys normal body tissue. Autoimmune diseases are devastating and debilitating disorders afflicting greater than 23 million people with an estimated 100 billion in medical expenses in the United States alone[1]. It has been hypothesized that there is a close genetic relationship among many autoimmune diseases[2] (Fig 1). DV Biologics offers cell pedigrees of patients with various autoimmune diseases that may have a genetic link (Fig 1). We offer cells, cell pellets, and genomic/proteomic products of related patients with autoimmune diseases (Fig 2-4). In addition, DV Biologics carries cells and related products from various autoimmune diseases such as diabetes type I, Guillain-Barré syndrome, and psoriasis. Whether your research involves disease modeling, drug screening or the new state of the art inducible pluripotent stem cell (iPSC) reprogramming technology, we are confident that our extensive autoimmune disease cell systems will facilitate your research needs.

Autoimmune Cell Package Includes	Cat. #	Price
• Skin fibroblast isolated from arthritis patient	AI001-F-AR	$800
• Skin fibroblast isolated from SLE patient	AI001-F-SLE	$700
• Skin fibroblast isolated from RA patient	AI001-F-RA	$700
• Skin fibroblast isolated from Ps patient	AI001-F-PS	$800

Autoimmune Genomic Fibroblast Package Includes	Cat. #	Price
• Total RNA from arthritis patient fibroblast	AI001-R-AR	$600
• Total RNA from SLE patient fibroblast	AI001-R-SLE	$700
• Total RNA from RA patient fibroblast	AI001-R-RA	$700
• Total RNA from Ps patient fibroblast	AI001-R-PS	$600

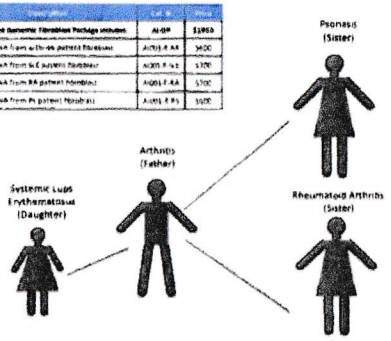


Figure 2: Autoimmune disease cell and genomic pedigree packages.
DV Biologics offers a unique cell panel along with corresponding genomic/proteomic products from a family afflicted with different autoimmune diseases. Available are dermal fibroblasts from an arthritis patient (AR) (AI001-F-AR), systemic lupus erythematosus (SLE) (AI001-F-SLE), psoriasis (Ps) (AI001-F-PS), and rheumatoid arthritis (RA) (AI001-F-RA). We can also provide you with the corresponding total RNA and/or cDNA, accelerating your autoimmune research needs. Purchase our autoimmune packages in order to save 25%.

1. American Autoimmune Related Diseases Association http://www.aarda.org
2. Baranzini S. (2009) Curr Opin Immunol 21(6): 596-605

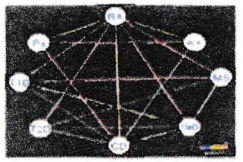


Figure 1: Disease similarity network. Genetic links for autoimmune diseases and diabetes type II represented by nodes of color. Single nucleotide polymorphism studies reveal shared susceptibility genes which each autoimmune disease has in common. (Figure from Baranzini S. (2009) The genetics of autoimmune diseases: a networked perspective. Curr Opin Immunol 21(6):596-605. RA-rheumatoid arthritis, SLE-systemic lupus erythematosus, MS-multiple sclerosis, CeD-celiac disease, CD-Crohn's disease; T2D-type 2 diabetes, T1D-type 1 diabetes, Ps-psoriasis.

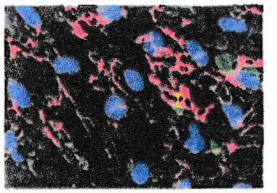


Fig 3: Immunocytochemistry staining of fibroblasts from an autoimmune disease patient double labeled with antibodies directed against human fibroblast (green) and fibronectin (red). Nuclei are stained with DAPI (blue).

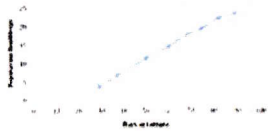


Fig 4: Fibroblast growth curve demonstrates that DV Biologics fibroblasts isolated from a patient with arthritis are easily expandable to greater than 20 population doublings.

LIFEbank™ — MUSCULAR DISORDERS, continued

Product	Quantity	Catalog Number	Price
DUCHENNE MUSCULAR DYSTROPHY (DMD)			
Skeletal Muscle Progenitor Cells	5 x 10^5 cells/vial	AM002-F-DMD	$1500
Skeletal Muscle Progenitor Cell Lysate	100 µg/vial	AM002-L-DMD	$1000
Skeletal Muscle Progenitor CellsTotal RNA	10 µg/vial	AM002-R-DMD	$1200
Skeletal Muscle Progenitor Cell cDNA	20 rxns/vial	AM002-CD-DMD	$1000
Skeletal Muscle Cells	5 x 10^5 cells/vial	AM003-F-DMD	$1100
Skeletal Muscle Cell Lysate	100 µg/vial	AM003-L-DMD	$500
Skeletal Muscle Cell Total RNA	10 µg/vial	AM003-R-DMD	$900
Skeletal Muscle Cell cDNA	20 rxns/vial	AM003-CD-DMD	$800
MUSCULAR DYSTROPHY (MD)			
Bone Marrow Mononuclear Cells	2.5 x 10^6 cells/vial	AH002-F-MD-2.5	$100
Bone Marrow Mononuclear Cells	10 x 10^6 cells/vial	AH002-F-MD-10	$300
Bone Marrow Mononuclear Cells	25 x 10^6 cells/vial	AH002-F-MD-25	$600
Bone Marrow Stromal Cells	5 x 10^5 cells/vial	AH005-F-MD	$1000
Bone Marrow Stromal Cell Lysate	100 µg/vial	AH005-L-MD	$600
Bone Marrow Stromal Cell Total RNA	10 µg/vial	AH005-R-MD	$800
Bone Marrow Stromal Cell cDNA	20 rxns/vial	AH005-CD-MD	$600

LIFEbank™ — ENDOCRINE DISORDERS

Product	Quantity	Catalog Number	Price
DIABETES TYPE 2 (DT2)			
Bone Marrow Mononuclear Cells	2.5 x 10^6 cells/vial	AH002-F-DT2-2.5	$90
Bone Marrow Mononuclear Cells	10 x 10^6 cells/vial	AH002-F-DT2-10	$270
Bone Marrow Mononuclear Cells	25 x 10^6 cells/vial	AH002-F-DT2-25	$540
Bone Marrow Stromal Cells	5 x 10^5 cells/vial	AH005-F-DT2	$800
Bone Marrow Stromal Cell Lysate	100 µg/vial	AH005-L-DT2	$400
Bone Marrow Stromal Cell Total RNA	10 µg/vial	AH005-R-DT2	$600
Bone Marrow Stromal Cell cDNA	20 rxns/vial	AH005-CD-DT2	$450

LIFEbank™ — JOINT DISORDERS

Product	Quantity	Catalog Number	Price
OSTEOARTHRITIS (OA)			
Synovial Tissue FFPE Block	1 block	AM010-PS-OA	Inquire
Synovial Tissue OCT Block	1 block	AM010-FS-OA	Inquire
Synovial Fluid	1 ml	AM011-FL-OA	Inquire

LIFEbank™ — AUTOIMMUNE DISORDERS

Product	Quantity	Catalog Number	Price
DIABETES TYPE 1 (DT1)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-DT1	$700
Skin Fibroblast Lysate	100 µg/vial	AI001-L-DT1	$500
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-DT1	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-DT1	$600
RHEUMATOID ARTHRITIS (RA)			
Synovial Tissue FFPE Block	1 block	AM010-PS-RA	Inquire
Synovial Tissue OCT Block	1 block	AM010-FS-RA	Inquire
Synovial Fluid	1 ml	AM011-FL-RA	Inquire
Dental Pulp Cells	5 x 10^5 cells/vial	AD010-F-RA	$1000
Dental Pulp Cell Lysate	100 µg/vial	AD010-L-RA	$1000
Dental Pulp Total RNA	10 µg/vial	AD010-R-RA	$1000
Dental Pulp Cell cDNA	20 rxns/vial	AD010-CD-RA	$900
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-RA	$700
Skin Fibroblast Lysate	100 µg/vial	AI001-L-RA	$700
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-RA	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-RA	$600
SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-SLE	$700
Skin Fibroblast Lysate	100 µg/vial	AI001-L-SLE	$700
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-SLE	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-SLE	$600

LIFEbank™ — AUTOIMMUNE DISORDERS, continued

Product	Quantity	Catalog Number	Price
PSORIASIS (PS)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-PS	$600
Skin Fibroblast Lysate	100 µg/vial	AI001-L-PS	$600
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-PS	$600
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-PS	$500
GUILLAIN BARRE SYNDROME (GBS)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-GBS	$800
Skin Fibroblast Lysate	100 µg/vial	AI001-L-GBS	$700
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-GBS	$800
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-GBS	$700

LIFEbank™ — CARDIOVASCULAR DISORDERS

Product	Quantity	Catalog Number	Price
ATRIOVENOUS MALFORMATION (AVM)			
Skin Fibroblasts	5 x 10^5 cells/vial	AI001-F-AVM	$700
Skin Fibroblast Lysate	100 µg/vial	AI001-L-AVM	$700
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-AVM	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-AVM	$600
DILATED CARDIOMYOPATHY (DCM)			
Bone Marrow Mononuclear Cells	2.5 x 10^6 cells/vial	AH002-F-DCM-2.5	$75
Bone Marrow Mononuclear Cells	10 x 10^6 cells/vial	AH002-F-DCM-10	$200
Bone Marrow Mononuclear Cells	25 x 10^6 cells/vial	AH002-F-DCM-25	$375
Bone Marrow Plasma	5 ml	AH011-FL-DCM	$100

LIFEbank™ — GENETIC DISORDERS

Product	Quantity	Catalog Number	Price
ROBERTSONIAN TRANSLOCATION (RTL)			
Gonadal Stromal Cells	5 x 10^5 cells	AR005-F-RTL	$1200
Gonadal Stromal Cell Lysate	100 µg/vial	AR005-L-RTL	$900
Gonadal Stromal Cell Total RNA	10 µg/vial	AR005-R-RTL	$1000
Gonadal Stromal Cell cDNA	20 rxns/vial	AR005-CD-RTL	$1000

*may ship in multiple vials

MUCOPOLYSACCHARIDOSIS (MPS)			
Skin Fibroblasts	5 x 10^5 cells	AI001-F-MPS	$800
Skin Fibroblast Lysate	100 µg/vial	AI001-L-MPS	$800
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-MPS	$800
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-MPS	$700

LIFEbank™ — DEGENERATIVE DISORDERS

Product	Quantity	Catalog Number	Price
LEGG-CALVE-PERTHES SYNDROME (LCP)			
Skin Fibroblasts	5 x 10^5 cells	AI001-F-LCP	$800
Skin Fibroblast Total RNA	10 µg/vial	AI001-R-LCP	$700
Skin Fibroblast cDNA	20 rxns/vial	AI001-CD-LCP	$600

LIFEbank™ — BLOOD DISORDERS

Product	Quantity	Catalog Number	Price
ACUTE LYMPHOBLASTIC LEUKEMIA (ALL)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-ALL	Inquire
Bone Marrow Mononuclear Cells	2.5x10^6 cells/vial	AH002-F-ALL-2.5	$200
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-ALL-10	$500
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-ALL-25	$950
Bone Marrow Plasma	5 ml	AH011-FL-ALL	$150
CHRONIC MYELOID LEUKEMIA, PHILADELPHIA + (CML+)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-CML+	Inquire
Bone Marrow Mononuclear Cells	2.5x10^6 cells/vial	AH002-F-CML+-2.5	$250
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-CML+-10	$550
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-CML+-25	$1000
Bone Marrow Plasma	5 ml	AH011-FL-CML+	$200
CHRONIC MYELOID LEUKEMIA, PHILADELPHIA - (CML-)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-CML-	Inquire
Bone Marrow Mononuclear Cells	2.5x10^6 cells/vial	AH002-F-CML-2.5	$200
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-CML-10	$500
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-CML-25	$950
Bone Marrow Plasma	5 ml	AH011-FL-CML-	$185

*may ship in multiple vials

LIFEbank™ — BLOOD DISORDERS, continued

Product	Quantity	Catalog Number	Price
AUTOIMMUNE HEMOLYTIC ANEMIA (AHA)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-AHA	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-AHA-2.5	$125
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-AHA-10	$250
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-AHA-25	$450
Bone Marrow Plasma	5 ml	AH011-FL-AHA	$150
MULTIPLE MYELOMA (MM)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-MM	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-MM-2.5	$300
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-MM-10	$600
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-MM-25	$1150
Bone Marrow Plasma	5 ml	AH011-FL-MM	$210
MYELODYSPLASTIC SYNDROME (MDS)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-MDS	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-MDS-2.5	$250
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-MDS-10	$550
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-MDS-25	$1000
Bone Marrow Plasma	5 ml	AH011-FL-MDS	$200
SEVERE IRON DEFICIENCY ANEMIA (SIA)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-SIA	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-SIA-2.5	$125
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-SIA-10	$250
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-SIA-25	$450
Bone Marrow Plasma	5 ml	AH011-FL-SIA	$125
LYMPHOPROLIFERATIVE SYNDROME (LPS)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-LPS	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-LPS-2.5	$175
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-LPS-10	$450
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-LPS-25	$850
Bone Marrow Plasma	5 ml	AH011-FL-LPS	$170
PANCYTOPENIA (PCP)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-PCP	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-PCP-2.5	$175
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-PCP-10	$450
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-PCP-25	$850
Bone Marrow Plasma	5 ml	AH011-FL-PCP	$170

*may ship in multiple vials

IDIOPATHIC THROMBOCYTOPENIA (ITP)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-ITP	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-ITP-2.5	$175
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-ITP-10	$450
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-ITP-25	$850
Bone Marrow Plasma	5 ml	AH011-FL-ITP	$160
PLASMACYTOMA (PC)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-PC	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-PC-2.5	$200
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-PC-10	$500
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-PC-25	$900
Bone Marrow Plasma	5 ml	AH011-FL-PC	$180
THROMBOCYTOPENIA (TP)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-TP	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-TP-2.5	$175
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-TP-10	$450
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-TP-25	$850
Bone Marrow Plasma	5 ml	AH011-FL-TP	$160
ACUTE MYELOID LEUKEMIA (AML)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-AML	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-AML-2.5	$250
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-AML-10	$550
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-AML-25	$1000
Bone Marrow Plasma	5 ml	AH011-FL-AML	$200
NON HODGKIN'S LYMPHOMA (NHL)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-NHL	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-NHL-2.5	$200
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-NHL-10	$500
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-NHL-25	$900
Bone Marrow Plasma	5 ml	AH011-FL-NHL	$180
ESSENTIAL THROMBOCYTOSIS (ET)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-ET	Inquire
Bone Marrow Mononuclear Cells	2.5x10^5 cells/vial	AH002-F-ET-2.5	$300
Bone Marrow Mononuclear Cells	10x10^6 cells*	AH002-F-ET-10	$600
Bone Marrow Mononuclear Cells	25x10^6 cells*	AH002-F-ET-25	$1150
Bone Marrow Plasma	5 ml	AH011-FL-ET	$210

*may ship in multiple vials

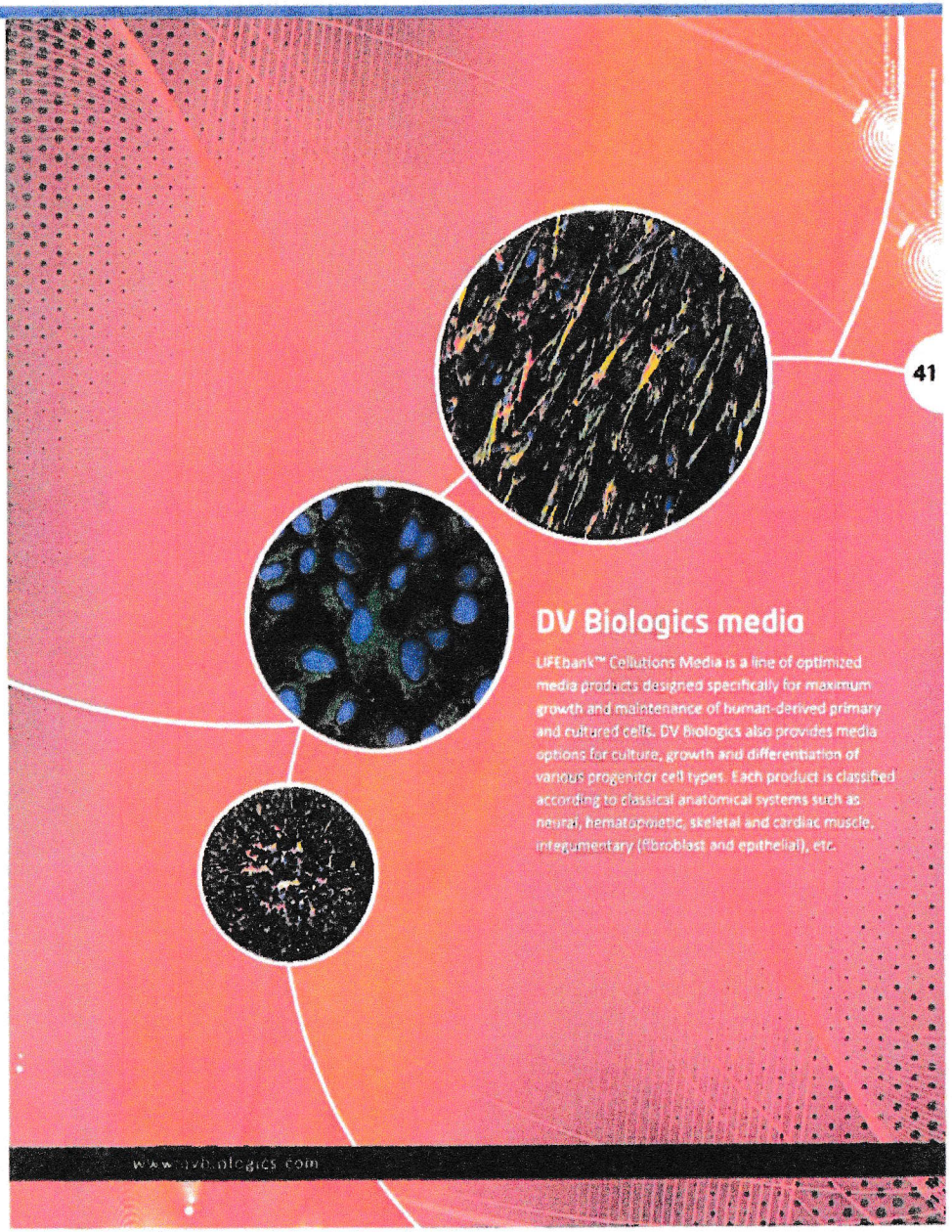
LIFEbank™ — BLOOD DISORDERS, continued

Product	Quantity	Catalog Number	Price
POLYCYTHEMIA (PCT)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-PCT	Inquire
Bone Marrow Mononuclear Cells	$2.5x10^5$ cells/vial	AH002-F-PCT-2.5	$200
Bone Marrow Mononuclear Cells	$10x10^6$ cells*	AH002-F-PCT-10	$500
Bone Marrow Mononuclear Cells	$25x10^6$ cells*	AH002-F-PCT-25	$900
Bone Marrow Plasma	5 ml	AH011-FL-PCT	$180
LEUKOPENIA ANEMIA (LP)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-LP	Inquire
Bone Marrow Mononuclear Cells	$2.5x10^5$ cells/vial	AH002-F-LP-2.5	$150
Bone Marrow Mononuclear Cells	$10x10^6$ cells*	AH002-F-LP-10	$300
Bone Marrow Mononuclear Cells	$25x10^6$ cells*	AH002-F-LP-25	$500
Bone Marrow Plasma	5 ml	AH011-FL-LP	$160
APLASTIC ANEMIA (AA)			
Bone Marrow Cell (Uncultured) FFPE Block	1 block	AH001-PS-AA	Inquire
Bone Marrow Mononuclear Cells	$2.5x10^5$ cells/vial	AH002-F-AA-2.5	$150
Bone Marrow Mononuclear Cells	$10x10^6$ cells*	AH002-F-AA-10	$300
Bone Marrow Mononuclear Cells	$25x10^6$ cells*	AH002-F-AA-25	$500
Bone Marrow Plasma	5 ml	AH011-FL-AA	$160

LIFEbank™ — REPRODUCTIVE DISORDERS

Product	Quantity	Catalog Number	Price
UTERINE MYOMA (UM)			
Uterine Myoma Lysate	100 µg/vial	AR009-L-UM	$500
Uterine Myoma Total RNA	10 µg/vial	AR009-R-UM	$500
Uterine Myoma cDNA	20 rxns/vial	AR009-CD-UM	$500

*may ship in multiple vials



DV Biologics media

LIFEbank™ Cellutions Media is a line of optimized media products designed specifically for maximum growth and maintenance of human-derived primary and cultured cells. DV Biologics also provides media options for culture, growth and differentiation of various progenitor cell types. Each product is classified according to classical anatomical systems such as neural, hematopoietic, skeletal and cardiac muscle, integumentary (fibroblast and epithelial), etc.

Cellutions Media

DV Biologics media

Product	Quantity	Catalog Number	Price
Cardiac Cellutions Medium	500 ml	C-MGRO-001-500	$150
Cardiac Cellutions Medium	100 ml	C-MGRO-001-100	$50
Cardiomyocyte Cellutions Differentiation Medium	500 ml	C-MDIFF-001-500	$150
Cardiomyocyte Cellutions Differentiation Medium	100 ml	C-MDIFF-001-100	$50
Cardiomyocyte Cellutions Maintenance Medium	500 ml	C-MAIN-001-500	$150
Cardiomyocyte Cellutions Maintenance Medium	100 ml	C-MAIN-001-100	$50
Muscle Cellutions Medium	500 ml	M-GRO-001-500	$175
Muscle Cellutions Medium	100 ml	M-GRO-001-100	$60
Muscle Cellutions Differentiation Medium	500 ml	M-DIFF-001-500	$150
Muscle Cellutions Differentiation Medium	100 ml	M-DIFF-001-100	$50
Neural Cellutions Medium	500 ml	N-GRO-001-500	$300
Neural Cellutions Medium	100 ml	N-GRO-001-100	$100
Neural Pro-Conditioned Medium	100 ml	N-PRO-001-100	$175
Neural Pro-Conditioned Medium	50 ml	N-PRO-001-50	$125
Neural Pro-Conditioned Medium	25 ml	N-PRO-001-25	$75
Fibroblast Cellutions Medium	500 ml	I-GRO-001-500	$125
Fibroblast Cellutions Medium	100 ml	I-GRO-001-100	$40
Fibroblast Cellutions PLUS Medium	500 ml	I-GRO-002-500	$175
Fibroblast Cellutions PLUS Medium	100 ml	I-GRO-002-100	$50
Epithelial Pro-Conditioned Cellutions Medium	100 ml	D-PRO-015-100	$185
Epithelial Pro-Conditioned Cellutions Medium	50 ml	D-PRO-015-50	$125
Epithelial Pro-Conditioned Cellutions Medium	25 ml	D-PRO-015-25	$75
Stromal Cellutions Medium	500 ml	H-GRO-005-500	$150
Stromal Cellutions Medium	100 ml	H-GRO-005-100	$60
Osteoblast Cellutions Medium	500 ml	O-GRO-001-500	$150
Osteoblast Cellutions Medium	100 ml	O-GRO-001-100	$50
Umbilical Vein Endothelial Cellutions Medium	500 ml	U-GRO-001-500	$170
Umbilical Vein Endothelial Cellutions Medium	100 ml	U-GRO-001-100	$60

Example: Images taken after using Cardiomyocyte Cellutions® Differentiation Medium:

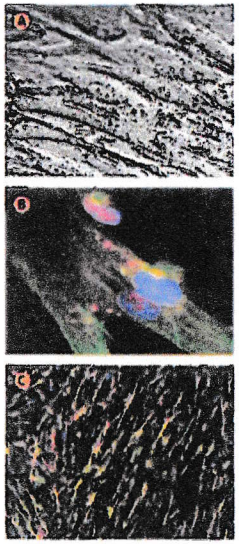


Fig. 1 A: Phase contrast photomicrograph of DV Biologics cardiomyocytes (PC008-F). Fig. 1 B and C: Immunocytochemical analysis of cardiomyocyte specific cells for DV Biologics cardiomyocytes and (B) DV Biologics cardiomyocytes were stained with actin (green) and myosin heavy chain (red) antibodies. (C) Cardiomyocytes express myosin heavy chain (green) troponin T (red). Note the multinucleated pattern.

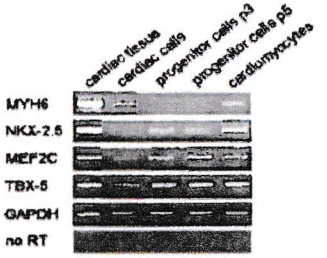


Fig. 2 RT-PCR analysis of DV Biologics cardiac and cardiomyocyte progenitor cells. Whole cardiac tissue was used as a positive control. Our cardiac cells represent a mixture of cells that express cardiac structural proteins as well as cardiac transcription factors. Cardiomyocyte progenitor cells can be propagated in culture (see passage 3 and 5 [p3, p5]) and differentiated into functional cardiomyocytes expressing myosin heavy chain 6 after 2 week treatment. Some of the markers used to validate the cardiac progenitor cells and cardiomyocytes are NKX-2.5, MEF2C, TBX-5, all transcription factors characteristic of cardiac lineage, as well as myosin heavy chain 6 (MYH6, also known as MyHC-alpha), one of the major structural proteins in heart muscle.

Example: Images taken after using Neural Cellutions Medium:

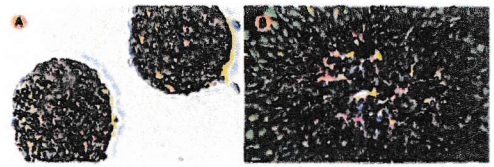


Fig. 1 A: Neurospheres. B. Nestin (red) and A2B5 (green)

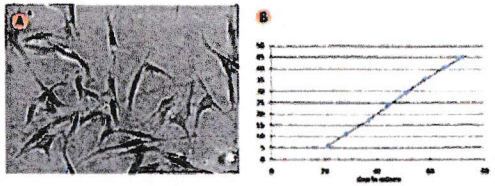


Fig. 2 A: Phase contrast photomicrograph of DV Biologics Fibroblasts (AI001-F) grown in Fibroblast Cellutions Media. Fig. 1 B: Growth curve of DV Biologics Fibroblast illustrates their population doublings when grown in Fibroblast Cellutions Media.

Example: Images taken using Pro-Conditioned Epithelial Cellutions Medium:

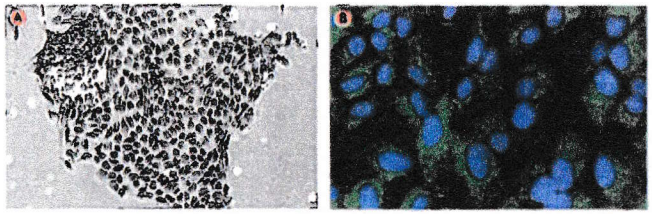


Fig 1. Characterization of DV Biologics kidney epithelial cells. (A) Kidney epithelial colony forming 16 hours after plating. (B) Cells were fixed and processed for immunofluorescence using CK-14 antibody (green). Nuclei are stained with DAPI (blue).

Example: Images taken using Stromal Cellutions Medium:

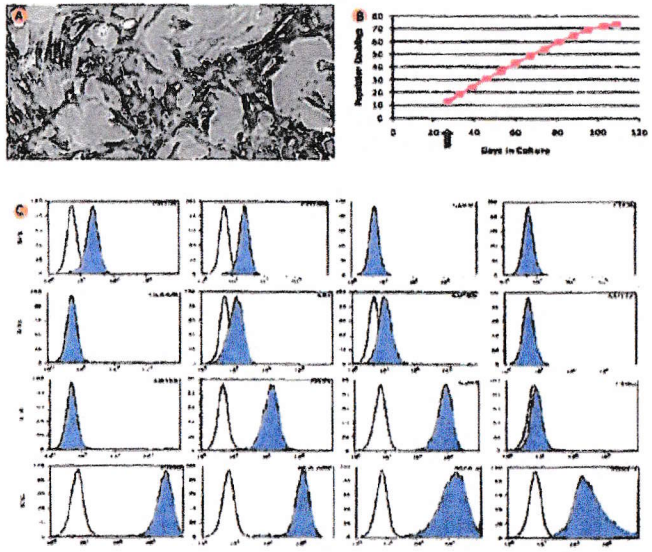


Fig. 2 (A) Phase contrast photomicrograph of DV Biologics Umbilical Cord Cells (aC006-f) grown in Stromal Cellutions Medium. Fig 2 B. Cells expand exponentially as illustrated by a population doublings curve. At 23 days in culture (arrow depicted), we were able to obtain greater than 2.0 X 10^8 Cells using Stromal Cellutions Medium. Fig 2 (C) Flow cytometry of DV Biologics Umbilical Cord Cells demonstrates they express markers indicative of the mesenchymal stem cell type when grown in Stromal Cellutions Medium.

Human Skeletal Muscle Progenitor Cells (Myoblasts)

The muscular system plays a crucial homeostatic role in generating movement and maintaining body temperature. Out of the three major muscle types (skeletal, smooth and cardiac), skeletal muscles are responsible for voluntary movement, in tight association with the somatic nervous system.

The elementary unit of skeletal muscle is the fiber-a long, multinucleated cell generated by the fusion of individual mononuclear myoblasts. The process of muscle formation, myogenesis, is an intricate process involving multiple intracellular signaling pathways[1], characterized by the expression of various muscle specific markers.
DV Biologics now offers human skeletal muscle progenitor cells (PM002-F) from normal, healthy tissue for your research needs. If you are a researcher interested in myogenesis, development or signaling, we are confident this product will facilitate your studies.

Furthermore, DV Biologics is introducing a unique set of products from our disease specific lines - human skeletal muscle progenitor cells (AM002-F-DMD) from Duchenne Muscular Dystrophy (DMD) patients (Fig 1). This is an unprecedented opportunity for researchers to study not only this devastating disease, but also gene and cell therapy in general. This previously unavailable very important tool is now accessible from DV Biologics. Human skeletal muscle myoblasts (AM002-F-DMD) from DMD patients are fully characterized. They express myoblast specific markers MEF 2C, Myf4, Myf5, vimentin and desmin (Fig. 2). In addition, when subjected to differentiation they express myotube specific markers (Fig. 3).

1. Kuntands, M.L. et al. (2004) Mol Cell Biol 24(11): 5340-52
2. Gunning, P. et al (1987) Mol Cell Biol 7(11): 4100-14.

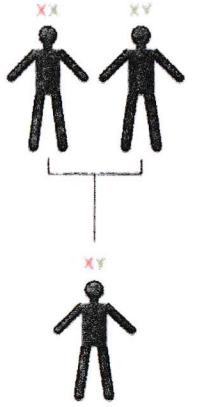


Figure 1: Duchenne Muscular Dystrophy is a X-linked recessive disease. The affected individuals have a mutation in the dystrophin gene. DV Biologics DMD myoblasts (AM002-F-DMD) are genetically analyzed as well.

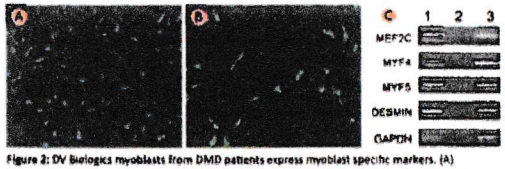


Figure 2: DV Biologics myoblasts from DMD patients express myoblast specific markers. (A) Immunofluorescent image of the myoblasts stained with desmin antibody (green) and nuclear dye DAPI (blue). (B) Cells were processed for immunofluorescence and stained with vimentin antibody (green) and DAPI (blue). (C) RT-PCR analyses indicate that the cells express mRNA for additional myoblast makers: MEF2C, Myf4, and Myf5, in addition to desmin. Lane 1 contains myoblast RNA lane 2 is a water control, whereas lane 3 is a skeletal muscle RNA, which serves as a positive control.

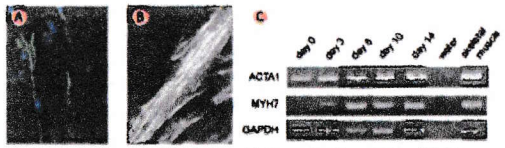


Figure 3: Upon differentiation, DV Biologics myoblasts upregulate the expression of myosin heavy chain (MYH7), skeletal muscle actin (ACTA1) and troponin I. (A) Immunofluorescent image of cells stained with troponin I antibody (green) and DAPI (blue). (B) Myosin heavy chain immunofluorescent staining. (C) RT-PCR analyses of cells collected at different time points after the start of the differentiation. Note that ACTA1 is present in confluent myoblasts (day 0), but its levels are upregulated as the differentiation progresses[2].

Media Reference

FIBROBLAST CELLUTIONS MEDIUM

Appropriate Cell Types	Cat #
Skin Fibroblasts (prenatal)	PI001-F
Skin Fibroblasts (postnatal)	AI001-F

EPIDERMAL CELLUTIONS MEDIUM

Appropriate Cell Types	Cat #
Bone Marrow Stromal Cells (prenatal)	PH005-F
Bone Marrow Stromal Cells (postnatal)	AH005-F
Bone Marrow Mononuclear Cells (postnatal)	AH002-F-2.5, -10 and -25
Umbilical Cord Blood Mononuclear Cells (postnatal)	AC014-F-2.5, -10 and -25
CD34+ Umbilical Cord Blood Cells (postnatal)	AH002-F 2.5, -10 and -25
All Diseased Bone Marrow Mononuclear Cells	
Umbilical Cord Cells (postnatal)	AH012-F
CD 133+ Bone Marrow Cells (postnatal)	AH004-F
CD34+ Bone Marrow Cells (postnatal)	AH003-F
Kidney Cells (postnatal)	AU001-F
Tongue Cells (postnatal)	AD009-F
Stomach Cells (prenatal)	PD005-F
CD34+ Liver Cells (prenatal)	PD002-F

NEURAL CELLUTIONS™ MEDIUM

Appropriate Cell Types	Cat #
Neural Cells (prenatal)	PN001-F
Neural Progenitor Cells (prenatal)	PN003-F
PSA-NCAM+ Neural Cells (prenatal)	PN004-F
A2B5+ Neural Cells (prenatal)	PN006-F

NEURAL PRE-CONDITIONED MEDIUM

Appropriate Cell Types	Cat #
Bone Marrow Stromal Cells (prenatal)	PH005-F
Bone Marrow Stromal Cells (postnatal)	AH005-F
Umbilical Cord Cells (postnatal)	AC006-F
CD133+ Bone Marrow Cells (prenatal)	PH004-F
CD34+ Bone Marrow Cells (prenatal)	PH003-F
Bone Marrow Mononuclear Cells (postnatal)	AH002-F-2.5, -10 and -25
All Diseased Bone Marrow Mononuclear Cells	

EPITHELIAL PRE-CONDITIONED MEDIUM

Appropriate Cell Types	Cat #
Kidney Cells (prenatal)	PU001-F
Kidney Epithelial Cells (prenatal)	PU002-F
Small Intestines Cells (prenatal)	PD007-F
Large Intestines Cells (prenatal)	PD008-F
Small Intestines Epithelial Cells (prenatal)	PD015-F
Esophagus Epithelial Cells (prenatal)	PD016-F

MUSCLE CELLUTIONS MEDIUM

Appropriate Cell Types	Cat #
Skeletal Muscle Cells (Uncultured) (prenatal)	PM001-F
Skeletal Muscle Progenitor Cells (prenatal)	PM002-F
Skeletal Muscle Progenitor Cells (postnatal)	AM002-F
Skeletal Muscle Cells (prenatal)	PM003-F
Skeletal Muscle Cells (postnatal)	AM003-F

MUSCLE CELLUTIONS DIFFERENTIATION MEDIUM

Appropriate Cell Types	Cat #
Skeletal Muscle Progenitor Cells (prenatal)	PM002-F
Skeletal Muscle Progenitor Cells (postnatal)	AM002-F

CARDIOMYOCYTE CELLUTIONS MAINTENANCE MEDIUM

Appropriate Cell Types	Cat #
Cardiomyocytes (prenatal)	PC008-F
Cardiomyocytes (postnatal)	AC008-F

CARDIOMYOCYTE CELLUTIONS DIFFERENTIATION MEDIUM

Appropriate Cell Types	Cat #
Cardiac Progenitor Cells (prenatal)	PC015-F
Cardiac Progenitor Cells (postnatal)	AC015-F

CARDIAC CELLUTIONS™ MEDIUM

Appropriate Cell Types	Cat #
Cardiac Cells (prenatal)	PC001-F
Cardiac Stromal Cells (prenatal)	PC009-F
Cardiac Stromal Cells (postnatal)	AC009-F
Cardiac Progenitor Cells (prenatal)	PC015-F
Cardiac Progenitor Cells (postnatal)	AC015-F
Aortic Cells (prenatal)	PC016-F

OSTEOBLAST CELLUTIONS MEDIUM

Appropriate Cell Types	Cat #
Osteoblast (prenatal)	PM005-F
Osteoblast (postnatal)	AM005-F

FIBROBLAST CELLUTIONS PLUS MEDIUM

Appropriate Cell Types	Cat #
Valvular Interstitial Cells (postnatal)	AC024-F

UMBILICAL VEIN ENDOTHELIAL CELLUTIONS MEDIUM

Appropriate Cell Types	Cat #
Umbilical Vein Endothelial Cells (HUVEC) (postnatal)	AC005-F

CELLutions Media

An essential part of successful cell culture lies within the media used. Without the appropriate nutrients and optimized reagents, in vitro cell culture could be an arduous task. DV Biologics has produced a line of optimized human cell culture media that facilitates your cell culture needs. Our media formulations ensure that your cell culture experiments produce quality reproducible results. Most importantly, when used in conjunction with our cells, we guarantee optimal yields which save you time and money.

DV Biologics various CELLutions media (page 42) were optimized for specific cell types. For instance, our Stromal CELLutions medium has been optimized for the maximal growth of bone marrow stromal (MSCs), umbilical cord stromal (Wharton's Jelly) or the derivation of stromal cells from mononuclear cells. When tested against the leading competitor's media, DV Biologics Stromal CELLutions medium outperformed by producing quality cells with greater yields (Figure 1). In addition, after several passages in our medium, the cells continue to express typical stromal and stem cell markers (Figure 2).

Whether you are growing fibroblasts, cardiac progenitor cells, epithelial cells, myoblasts, or stromal cells; our media are guaranteed to perform.

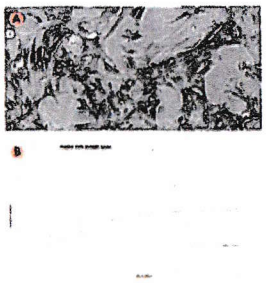


Figure 1: Stromal cells grown in DV Biologics Stromal Cellutions™ Medium have classic stromal morphology and outperform the leading competitor's media in cell yield. At passage 3, DV Biologics Stromal Cells (AC006-F) were seeded at 1000 cells/cm2 and grown in either Stromal Cellutions™ Medium or the leading competitor's MSC media. Cells were subcultured every 6-7 days for another 4 passages. Photomicrograph of cells grown with DV Biologics Stromal Cellutions™ Medium after 4 days in culture (A). Growth curve of stromal cells commencing at passage 3 demonstrating population doublings obtained after culture with both medias.

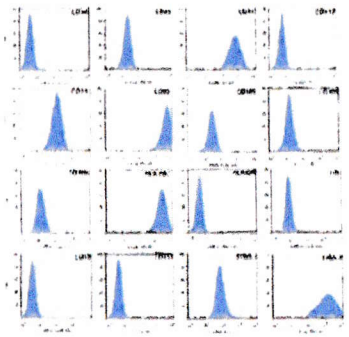


Figure 2: Flow cytometry of DV Biologics stromal cells after several passages grown in Stromal Cellutions™ Medium. DV Biologics stromal cells maintain typical MSC characteristics while maintained in Stromal Cellutions™ Medium. They are positive for markers such as CD90, CD44, CD73, CD105, CD106, CD166, STRO-1, and HLA-ABC. They are negative for markers CD34, CD45, CD117, HLA-DR, CD19, and CD133. In addition, they express SSEA-4, a marker indicative of stem cells.

BioSource CUSTOM SERVICES

DV Biologics offers custom cell characterization services to companies and research institutions specializing in the field of medicine, pharmaceuticals, cell and tissue engineering, and the development of cell replacements therapies. In addition, DV Biologics BioSource offers custom tissue procurement and cell derivation. Custom cell line characterization services are used to verify species, identify cell line, differentiation potential and to determine genetic stability of the client's cell line over time in culture. All services can be tailored to our client's specific needs.

BioSource ™ Tissue/Cell services include:

- Matched samples (cells and tissue blocks)
- Pedigree systems (diseased or non-diseased samples)
- Small and large scale custom tissue/cell procurement (multiple donors available)
- Diseased tissues (clinical history known)
- Tissue/cells for discovery of new therapeutic targets
- Tissue/cells for toxicology studies
- Growth and maintenance of cells
- Growth and maintenance of undifferentiated stem cells for in vitro differentiation into various lineages
- Analysis of gene expression patterns during culture and differentiation
- Creation of genetically modified cells for functional studies
- Cell viability studies

www.dvbiologics.com

Bone marrow biopsies with matching bone marrow

The different cells that make up blood are made in the bone marrow. Bone marrow biopsies are routinely performed and tested in order to evaluate bone marrow function and pathology. These tests enable physicians to diagnose several different hematological malignancies and enable researchers to study the underlying mechanisms and pathology of bone marrow related diseases.

DV Biologics BIOsource™ is a custom based tool system which facilitates your research needs. Whether you are requiring a specific cell, tissue type or cell characterization, DV Biologics BIOsource™ can help by offering the investigative tools to advance your innovative research. For instance, research in the field of cancer is on the rise with all the new promising therapies. Let DV Biologics BIOsource™ formalin fixed paraffin embedded bone marrow trephine biopsies from acute myeloid leukemia patients (Figure 1) along with matching whole bone marrow cells (AH001-F-AML) and/or mononuclear cells (AH002-F-AML) facilitate your research.We have a large repertoire of cancer samples available.

Need normal control tissue to run along with your experimental? We also carry normal formalin fixed paraffin embedded bone marrow trephine biopsies (Figure 2) and matching whole bone marrow cells (AH001-F) and/or mononuclear cells (AH002-F).

Whether your research is in the field of cancer, autoimmune, cardiovascular, or genetic disease, DV Biologics BIOsource™ can facilitate and expedite your research needs.

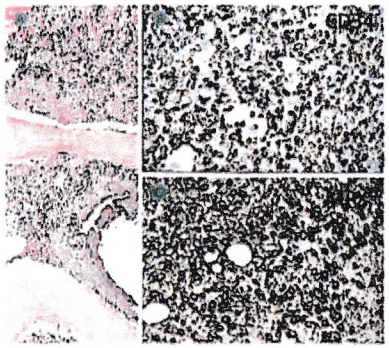


Figure 1: A stained section of a formalin fixed paraffin embedded bone marrow trephine biopsy from an acute myeloid leukemia patient. (A) Arrows depict hypertrophic cellular zones of a stained formalin fixed paraffin embedded bone marrow trephine biopsy. (B) Proliferation of CD 34+ cells depicted in an immunostained section. (C) Myeloid positive cells illustrated with myeloperoxidase (MPX) immunostaining.

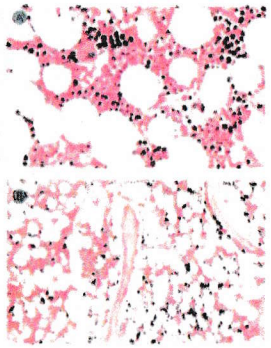


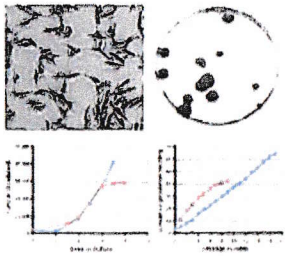
Figure 2: A stained section of a formalin fixed paraffin embedded bone marrow trephine biopsy from a normal donor (A, B).

BIOSOURCE™ CELL SERVICES

DV Biologics offers custom cell characterization services to companies and research institutions specializing in the field of medicine, pharmaceuticals, cell and tissue engineering, and the development of cell replacements therapies. Custom cell line characterization services are used to verify species, identify cell line, differentiation potential and to determine genetic stability of the client's cell line over time in culture. All services can be tailored to our client's specific needs.

BIOSOURCE™ GENOMIC SERVICES

Real-time PCR remains one of the most sensitive tools for quantitation of nucleic acids used today. The Genomics Core offers both custom and pre-optimized assays for an assortment of applications. We offer support in all aspects of the project from assay design to data analysis. It is our uncompromised attention to detail from sample QC to statistical analysis that sets our service apart from the others.

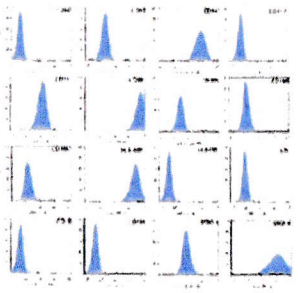


STEM CELL IDENTIFICATION

Stem cells are found in most tissues. DV Biologics can meet your research needs and identify your cell of interest.

Stem cell population isolated from tissue, expanded in culture for four passages retain typical fibroblast-like morphology and form colonies as tested by CFU assay.

Growth curve of stem cells. Clones were picked from the heterogeneous mixture of cells to determine doubling time and proliferation capacity.

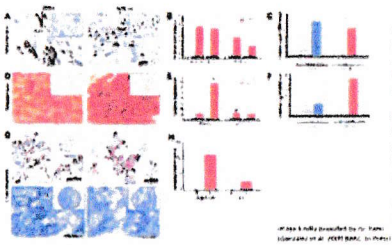


STEM CELL CHARACTERIZATION

DV Biologics offers a full range of services to fully characterize your cell needs. All of the data collected is under careful consideration of your needs.

Stem cells after four passages in vitro show typical bone marrow-derived MSCs profile of antigen expression: CD73+/CD166+/CD90+ and CD19-/ CD45-/CD11b-/ CD34-/HLA-DR.

Stem cells were found to be positive for several markers similar to those found in pluripotent stem cells.



ASSAY DEVELOPMENT

DV Biologics can develop assays to test your cells' ability to function under defined tested conditions. We can develop assays for both qualitative and quantitative analysis.

Stem cells after expansion in culture retain stem cell properties and potential to differentiate into adipocytes, osteocytes, and chondrocytes as shown by staining for lipid vacuoles, calcium deposits, and proteoglycans, respectively.

Image kindly provided by Dr. Patel (Gonzalez et al. 2009 BBRC)

Biosource - Synovial Tissue and Fluid

There are over 100 different types of arthritis. An estimated 46 million individuals in the United States (US) have arthritis and the numbers continue to increase each year. Close to one million individuals are admitted to hospitals each year because of their arthritis[1]. According to the Center for Disease Control and Prevention, in 2003 it cost the US a staggering $80.8 billion dollars in medical care expenses with some biologics costing 15,000 to $20,000 a year.

DV Biologics Biosource now offers synovial tissue (AM010-PS) and fluids (AM011-FL) from both normal and disease states for your research needs. Synovial tissue and fluids can enable your knowledge of disease mechanisms and allows you to correlate clinical symptoms with pathology. Most importantly, these observations may lead to the discovery of new therapeutic targets in arthritis disease.

DV Biologics carries synovial tissue and fluid biopsies from various arthritic states. In example, figure 1 illustrates a synovial biopsy from the knee of a patient diagnosed with chronic proliferative synovitis while figure 2 illustrates a mild non specific chronic synovitis. Early detection of inflammation through biopsies in the joint is of great importance because it may provide important prognostic information possibly leading to the development of preventative therapies being developed[2].

Whether you are looking for paraffin or frozen embedded synovial tissue and/or synovial fluids from normal or disease states such as rheumatoid arthritis, DV Biologics can help!

1. Stegel D. M. (2007). Chronic Arthritis in adolescence. Adolesc Med State Art Rev. 18(1):47-61.

2. Bresnihan B. (2003). Are synovial biopsies of diagnostic value? Arthritis Res Ther 5:271-278.

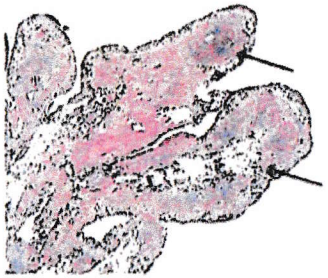


Figure 1: Gross morphological stain of a paraffin embedded synovial biopsy from the knee of a patient with chronic proliferative synovitis. The superficial layer has signs of degenerative tissue and hyperplasia of synoviocytes. Arrows point to dense areas of inflammatory cells, predominantly lymphocytes accompanied by neutrophils.

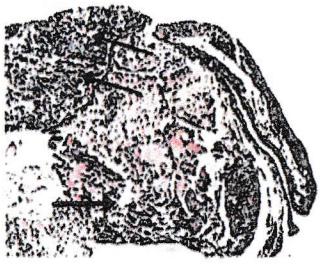


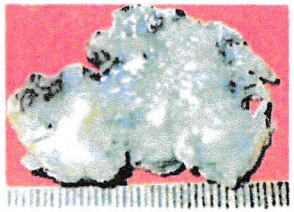
Figure 2: Gross morphological stain of a paraffin embedded synovial biopsy from the knee of a patient with mild non specific chronic synovitis. The superficial layer has signs of degeneration. The tissue illustrates signs of mild inflammation denoted by the arrows. There are areas of swelling with neovascularization denoted by the black arrow.

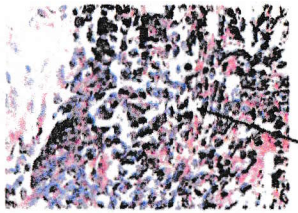
Glioblastoma Multiforme

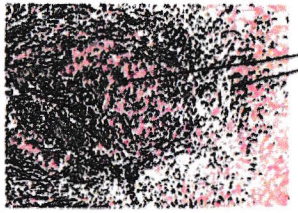
Glioblastoma multiforme (GM) is the most common and aggressive type of tumor of the brain which involves glial cells. Although it represents approximately 52% of all parenchymal and 20% of all intracranial brain tumors, GM only occurs in 2–3 individuals per 100,000 people in Europe and North America[1]. The hallmark of GM are the presence of small areas of necrotic tissue surrounded by anaplastic cells and hyperplastic blood vessels which differentiates the tumor from a Grade 3 astrocytoma[2].

DV Biologics now offers GM primary cells (AN010-F-GM) and formalin fixed paraffin embedded blocks (AN010-PS-GM) for your research needs. Interest in the field of GM has grown immensely because most patients die within one year. The use of DV Biologics GM primary cells and/or tissue blocks can enable your knowledge of disease mechanisms. Most importantly it will allow investigating GM at the molecular, cellular, and tissue levels. These observations may lead to the discovery of new therapeutic targets.

DV Biologics GM tissue and cells come with a patient clinical diagnostic report. Specific information or custom cell/tissue procurement from GM tissue may be available depending upon your needs.







DEEP PARIETO-OCCIPITAL REGION

Macroscopic Analysis
Oval tissue biopsy measuring 3.6 x 2.5 x 1.5 cm, area of sectoning grayish white, central region creamy yellowish and soft. Sample was processed further for histological analysis.

Microscopic Analysis
Histological sections demonstrate glial cell neoplasm, dense celular proliferation, signs of anaplasia as evidenced by macronucleosis, hyperchromatism, pleomorphism, and mitotic activity. Distortion of cell polarity in relation to the nucleus and cytoplasm. Proliferation of endothelial vessels, extensive area of necrosis surrounded by neoplastic cells.

Diagnostic
Glioblastoma Multiforme

Ethics Policy and Practices

Statement on Ethical Research

DV Biologics considers strong ethical principles to be a necessary and integral part of scientific research, especially when it comes to the use of donated biological materials. We only accept tissue that would otherwise be discarded as a byproduct of a medical procedure. Tissue donation has zero effect on the donor's medical care. All biological material is obtained through informed consent and donor privacy is protected and respected.

Informed Consent

Each informed consent form is written to take into account the specific type of biological material being donated and to communicate the intended research uses to the potential donor. All forms are approved and reviewed annually by our independent review committee (IRB). DV Biologics and the IRB work together to protect the rights and privacy of all donors and to ensure that tissue is collected in accordance with scientific, ethical and regulatory guidelines.

Protecting the Privacy of Donors

We understand that the procurement, storage and use of human biological material are an essential part of research. DV Biologics is dedicated to protecting the privacy of individuals that act as donors to further these research efforts. We work intimately with a network of hospitals and physicians to protect donor privacy at all times and to make certain that all donations are given anonymously.

Statement of Quality

At DV Biologics, it is our mission to pursue ways to continuously improve the quality of our products and services. We comply with internal quality policy as well as with the international standards for Quality Management Systems as defined by the ISO 9001:2008. To that end, our Quality Management System was certified by IAPMO R&T in 2012—a copy of our [illegible] is available at dvbiologics.com.

Our work product is governed by a system of formal standard operating procedures (SOPs). SOPs govern the entire process from processing tissue through shipment to the customer. After meeting or exceeding internal requirements, each product is sold with a complete Certificate of Analysis that indicates test results for cell count & viability, sterility assurance & pathogen testing, and donor information.

Ways To Place An Order

Orders may be placed by phone, fax, email or through the online ordering system. Download a [illegible] at dvbiologics.com.

Processing:

Most products are processed within [illegible] days. Some products may require further validation of processing. Contact us for a more accurate shipment date.

Shipping & Delivery:

All orders originate from DV Biologics headquarters in Southern California and, unless specified, freight is pre-paid and added to your invoice. Domestic shipments typically arrive within 3 working days. International shipments typically arrive within 5 working days—barring customs delays—and are shipped on Monday or Friday to avoid weekend delivery.

Conditions:

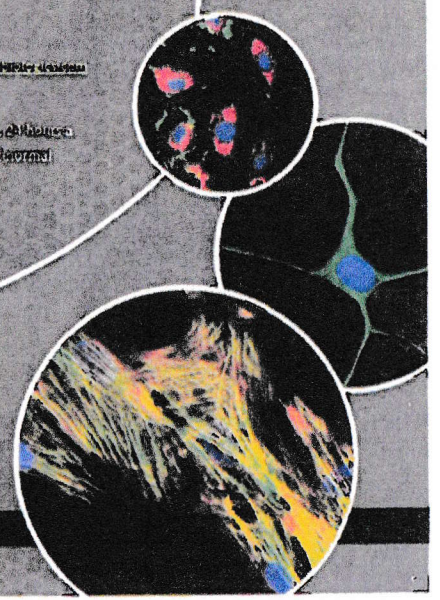
Products are sold for [illegible] use only and are not to be administered to humans for any purpose. As a condition of purchase, the purchaser shall not make products available for the purpose of further resale or alter the product label and the DV Biologics mark of origin without the express written permission of DV Biologics.

Contact Us:

[illegible]

Ordering Hours:

Monday through Friday, 7:00 am – 3:00 pm PST. Orders may be placed 24 hours a day, 365 days a year by email or fax. Orders received outside of normal business hours will be processed the following day.



Tech Support

If you have technical questions about any of our products or for general inquiries, please contact us at 1 (888) 773-5549 or email us at [illegible]