Induced Pluripotent Stem Cells: Key Benchmarks, Market Forces, & Industry Events

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### ****Summary****

**Recent months have seen the first iPSC clinical trial in humans, creation of the world’s largest iPSC biobank, major funding awards, a historic challenge to the “Yamanaka Patent”, a Supreme Court ruling affecting industry patent rights, announcement of an iPSC cellular therapy clinic scheduled to open in 2019, and much more. Furthermore, iPSC patent dominance continues to cluster in specific geographic regions, while clinical trial and scientific publication trends give clear indicators of what may happen in the industry in 2015 and beyond.**

**Is it worth it to you to get informed about rapidly-evolving market conditions and key industry trends, or will you let your competition get the edge?**

### ****Induced Pluripotent Stem Cells: Key Benchmarks, Market Forces, & Industry Events****

Stem cell research and experimentation have been in process for well over five decades, as stem cells have the unique ability to divide and replicate repeatedly. In addition, their “unspecialized” nature allows them to differentiate into a wide variety of specialized cell types. The possibilities arising from these characteristics have resulted in great commercial interest, with potential applications ranging from the use of stem cells in reversal and treatment of disease, to targeted cell therapy, tissue regeneration, pharmacological testing on cell-specific tissues, and more.

Traditionally, scientists have worked with both embryonic and adult stem cells for research tools, as well as for cellular therapy. While the appeal of embryonic cells has been their ability to differentiate into any type of cell, there has been significant ethical, moral, and spiritual controversy surrounding their use. Although some adult stem cells do have differentiation capacity, it is often limited in nature, which results in fewer options for use.

Thus, induced pluripotent stem cells represent a promising combination of adult and embryonic stem cell characteristics.

### ****Induced Pluripotent Stem Cell (iPSC) Market****

Groundbreaking experimentation in 2006 led to the introduction of induced pluripotent stem cells (iPSCs). These are adult cells which are isolated and then transformed into embryonic-like stem cells through the manipulation of gene expression, as well as other methods. Research and experimentation using mouse cells by Shinya Yamanaka’s lab at Kyoto University in Japan was the first instance in which there was successful generation of iPSCs.[[1]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn1)

In 2007, a series of follow-up experiments was done at Kyoto University in which human adult cells were transformed into iPSCs. [[2]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn2) Nearly simultaneously, a research group led by James Thomson at the University of Wisconsin-Madison accomplished the same feat of deriving iPSC lines from human somatic cells.[[3]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn3)

Continued research and experimentation have resulted in numerous advances over the last few years. For example, several independent research groups have announced that they have derived human cardiomyocytes from iPSCs. These cells could be used in a laboratory context to test drugs that treat arrhythmia and other cardiac conditions, and in a clinical context they could potentially be implanted into patients with heart disorders.

Similar advances will continue to be perfected for use of reprogrammed adult cells in the treatment of other diseases and disorders. Original techniques for iPSC production, such as viral induced transcription processes, are being replaced with newer technologies as private industry joined with the scientific community to develop safer and more efficient methods of iPSC production.

As innovation around methods of iPSC production continues, clinical grade production of industrial quantities of iPSCs is now becoming possible due to sustained research and experimentation.

### ****Therapeutic Applications of Induced Pluripotent Stem Cells (iPSCs)****

While there has been continued excitement at the prospect of what such artificially re-manufactured cells could contribute to medical advances, there have also been setbacks along the way. By 2010, there were a number of private companies that were ready to capitalize on the breakthrough technology that iPSCs represent. One such company, Advanced Cell Technology (ACT), now named “[Ocata Therapeutics,](https://www.ocata.com/)” discovered several problematic issues while conducting experiments for the purpose of applying for U.S. Food and Drug Administration approval to use iPSCs in therapeutic applications. Concerns such as premature cell death, mutation into cancer cells, and low proliferation rates were some of the problems that surfaced.

As a result, the company shifted its induced pluripotent stem cell approach to producing iPSC derived human platelets. One of the benefits of a platelet-based product is that platelets do not contain nuclei, and therefore, cannot divide or carry genetic information. While nothing is completely safe, iPSC derived platelets are likely to be substantially safer than other currently available iPSC therapies, in which uncontrolled proliferation may be a concern. It also shifted to using embryonic stem cells for clinical trial purposes, despite the ethical concerns surrounding this cell type.

Over the next few years, iPSC research advances accelerated exponentially, with perhaps the most momentous milestone being the launch of the first clinical research trial ever involving the transplant of autologous iPSCs into humans (“autologous” meaning the cells are both derived and implanted into the same patient).

Previously, all clinical trials using iPSCs involved only the creation of iPSC lines from specific patient populations and subsequent evaluation of these lines for determining whether they could represent a good “model” for a disease of interest within that population.

### ****First Induced Pluripotent Stem Cell (iPSC) Clinical Trial in Humans****

Therefore, 2013 was the first time in which clinical research involving transplant of iPSCs into humans was initiated, led by Masayo Takahashi of the [RIKEN Center](http://www.riken.jp/en/) for Developmental Biology in Kobe, Japan. Dr. Takahashi and her team are investigating the safety of iPSC-derived cell sheets in patients with wet-type age-related macular degeneration.

While the trial was initiated in 2013 and production of iPSCs from patients began at that time, it was not until August of 2014 that the first patient, a Japanese woman, was implanted with retinal tissue generated using iPSCs derived from her own skin cells. A team of three eye specialists, led by Yasuo Kurimoto of the Kobe City Medical Center General Hospital, implanted a 1.3 by 3.0mm sheet of iPSC-derived retinal pigment epithelium cells into the patient’s retina.[[4]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn4) Preliminary results are indicating positive results for the participants in this iPSC clinical trial.

Interestingly, Ocata Therapeutics (previously ACT) is conducting similar research, but the company has moved away from its initial focus on iPSCs and has instead chosen to focus on human embryonic stem cells (hESCs). It is currently conducting clinical trials using retinal pigmented epithelial cells produced from hESCs for purposes of treating several types of macular degeneration. The company reported positive preliminary results, which were published in the Lancet in October 2014.[[5]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn5)

Also of great significance, Kyoto University Hospital in Kobe, Japan announced in February of 2015 that it will be opening an iPSC therapy center in 2019, for purposes of conducting clinical studies on iPSC therapies. The announcement has further positioned Japan as the leading nation committed to bringing iPSC therapies to clinic. Officials for Kyoto Hospital said it will open a 30-bed ward to test the efficacy and safety of the therapies on volunteer patients, with the hospital aiming to initiate construction at the site in February of 2016 and complete construction by September 2019.[[6]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn6)

Current research with iPSCs underway at Kyoto University includes differentiation of iPSCs into dopamine-releasing neurons for transplantation into patients who are afflicted with Parkinson’s disease. University researchers are also working on generating a formulation of platelets that will assist with blood clotting. Dr. Shinya Yamanaka, who is credited with discovering iPSCs in 2006 and who shared the 2012 Nobel Prize in Medicine for the discovery, leads the existing iPSC research center at Kyoto University.

As such, the two founders of iPSC technology (Dr. Shinya Yamanaka and Dr. James Thomson) remain two of the most significant influencers in the iPSC sector. Recall that Dr. Shinya Yamanaka, who will be operating the iPSC therapy center scheduled to open in Japan in 2019, created the first successful generation of iPSCs in 2006,[[7]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn7) and in 2007, performed follow-up experiments in which his team transformed human adult cells into iPSC cells.[[8]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn8) Nearly simultaneously, a research group led by James Thomson at the University of Wisconsin-Madison accomplished the same feat of deriving iPSC lines from human somatic cells.[[9]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn9) James Thomson is both the Founder and current Chief Scientific Officer of [Cellular Dynamics International](https://www.cellulardynamics.com/) (CDI), a leading supplier of human iPSC lines for purposes that include drug discovery, safety, stem cell banking, cellular safety, and more.

### ****Landmark Events Create Market Opportunities for iPSCs****

In 2009 [ReproCELL](https://www.reprocell.com/en), a company established as a venture company originating from the University of Tokyo and Kyoto University, was the first to make iPSC product commercially available with the launch of human iPSC-derived cardiomyocytes, which it called “ReproCario.”[[10]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn10) Other stem cell derived cardiomyocytes are now available commercially from Cellular Dynamics International, GE Healthcare, Cellectis, and others.

ReproCELL’s innovation in the area of iPSC commercialization has been driven in part by joint research relationships it established in 2003 with Tokyo University and in 2004 with Kyoto University, the eventual site of iPSC discovery in 2006.[[11]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn11). Since 2009, ReproCELL has expanded its line of iPSC reagents and iPSC-derived cell lines to include heart, liver, and nerve cells.

The company primarily sells these products as research tools, although they also have the potential for use in toxicology and drug discovery applications.

**Currently, ReproCELL offers the following iPSC products:**[**[12]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn12)

* Research reagents optimized for human iPSC culture
* Human iPSC-derived cardiomyocytes, which launched in April of 2009 (the first iPSC product to be sold commercially)
* Human iPSC-derived neurons, launched in October of 2010
* Human iPSC-derived hepatocytes, launched in May of 2012
* Disease model cell generation using human iPS cell technologies

To date, ReproCELL has furthered its dominance in the area of iPSC products through a series of strategic acquisitions, including acquisition of Reinnervate, Stemgent, and BioServe Biotechnologies, all occurring in 2014. [[13]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn13)

[Cellular Dynamics International](https://www.cellulardynamics.com/) (CDI) is another major market player in the iPSC sector. Similar to ReproCELL, CDI established its “foothold” on the iPSC industry early, being founded in 2004 by Dr. James Thomson at the University of Wisconsin-Madison, who in 2007 subsequently derived iPSC lines from human somatic cells for the first time ever (although the feat was also accomplished simultaneously by Dr. Shinya Yamanaka’s lab in Japan).[[14]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn14) CDI currently holds more than 800 patents, which gives it a strong competitive position within the marketplace.

CDI has been promoting adoption of iPSC technology by adapting its methods to fit into standard clinical practice through the creation of individual stem cell lines from a standard blood draw.[[15]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn15) In a landmark event, the company went public in July 2013 with a public offering that raised $43 million dollars, securing its position as the global leader in producing high-quality human iPSCs and differentiated cells in industrial quantities

Then, in March of 2013, Cellular Dynamics International (CDI) and the Coriell Institute for Medical Research announced receipt of multi-million dollar grants from the [California Institute for Regenerative Medicine](https://www.cirm.ca.gov/) (CIRM) for the creation of iPSC lines from 3,000 healthy and diseased donors. CIRM awarded CDI $16 million to create three iPSC lines for each of 3,000 healthy and diseased donors and awarded the [Coriell Institute](https://www.coriell.org/) $10 million to set up and biobank the iPSC lines. The result will be the creation of the world’s largest human iPSC bank, an incredible feat.

Not surprisingly, Cellular Dynamics International has continued its innovation, announcing in February of 2015 that it would be manufacturing cGMP HLA “Superdonor” stem cell lines that will support cellular therapy applications through genetic matching.[[16]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn16)Currently, CDI has two HLA superdonor cell lines that provide a partial HLA match to approximately 19% of the population within the U.S., and it aims to expand its master stem cell bank by collecting more donor cell lines that will cover 95% of the U.S. population.[[17]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn17) The HLA superdonor cell lines were manufactured using blood samples, and used to produce pluripotent iPSC lines, giving the cells the capacity to differentiate into nearly any cell within the human body.

CDI also leads the iPSC market in terms of supporting drug development and discovery. For example, CDI’s “MyCell” products are created using custom iPSC reprogramming and differentiation methods, thereby providing biologically relevant human cells from patients with unique disease-associated genotypes and phenotypes.[[18]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn18) The company’s iCell and MyCell cells can also be adapted to screening platforms and are matched to function with common readout technologies.[[19]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn19)

CDI’s products are also used for high-throughput screening,[[20]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn20) and have been used as supporting data for Investigational New Drug (IND) applications submitted to the Federal Drug Administration (FDA).[[21]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn21) While there are other companies participating in this area – including ReproCELL, Cellectis, ArunA Biomedical, and others – competitors are limited and CDI currently leads the way.

The California Institute for Regenerative Medicine (CIRM), an organization tasked with deploying $3 billion dollars in California tax money to support the translation of stem cell research into clinical therapies, has increasingly been favorable toward funding iPSC research projects with a clinical (“translational”) focus. In one example, the Parkinson’s Institute was awarded $6.5 million to support four separate research projects focusing on development of patient-specific iPSCs from individuals with Parkinson’s disease.[[22]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn22)

Within a brief period of time, CIRM awarded $3 million to the Cedar-Sinai Medical Center for derivation of iPSCs from patients with inherited nerve disease and for research into the feasibility of transplanting these cells back into patients after genetic corrections have been applied.[[23]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn23) $1.3 million was next awarded to Stanford University to allow for creation of cardiomyocytes from iPSCs that can be used to explore causes of cardiovascular disease.[[24]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn24) Clearly, CIRM’s favorability toward funding iPSC research is gathering momentum.

**Taken in aggregate, the iPSC market forces described above are creating incredible enthusiasm and commercial interest in the iPSC sector.**

Never before has there been such a rare combination of landmark events supporting development of iPSC tools, technologies, and importantly, therapies. Indeed, recent years have seen major advances in clinical research applications, production and differentiation technologies, and biobanking of iPSCs. There have also been major funding awards, large initial public offerings (IPOs), significant patent challenges, and more.

For companies and investors competing within the iPSC marketplace, it is critical to understand these major market events and how they are shifting industry dynamics.

### ****Induced Pluripotent Stem Cell (iPSC) Patent Challenges****

The patent environment for iPSCs is complicated, and there are a number of restrictions on how the cells can be used for commercial purposes. 2015 has witnessed a historic patent challenge, one that is challenging the way that iPSCs are derived and utilized for commercial purposes. The 2015 patent challenge could rival in importance the infamous Wisconsin Alumni Research Foundation (WARF) dispute that pertained to patents surrounding the derivation of human embryonic stem cells (hESCs).

Jeanne Loring of Scripps Research Institute, and two public interest groups, Consumer Watchdog and the Public Patent Foundation, challenged the WARF patents in 2006. To date, the WARF patent dispute has been the most defining patent dispute within the stem cell sector, although it was settled in U.S. courts between 2008 and 2010, [[25]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn25) appeals have continued through February of 2015.[[26]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn26)

In 2006, Drs. Yamanaka and Takahashi [filed a U.S. patent](http://www.personalizedmedicinebulletin.com/2014/08/20/yamanaka-ipsc-patent-challenged/) claiming a method for creating iPSCs titled “Oct3/4, Klf4, c-Myc and Sox2 produce induced pluripotent stem cells,” which was issued as U.S. Patent No. [8,058,065](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=8&f=G&l=50&co1=AND&d=PTXT&s1=8058065&OS=8058065&RS=8058065) on November 15, 2011. While there have been other patents issued pertaining to the cellular reprogramming and creation of iPSCs, this patent is the dominant one within the iPSC sector and the most common one that limits commercial development of iPSC products.

Often called the “Yamanaka Patent,” this famous patent is being challenged by a group called “BioGatekeeper.” If the “Yamanaka Patent” challenge is successful, it could spur incredible innovation within the stem cell sector by allowing for lower cost creation of iPSC products, technologies, and therapies. Currently, most companies are forced to pay licensing fees to use the methodology described in the “Yamanaka Patent,” fees which are often prohibitively expensive.

In February of 2015, a long series of appeals to WARF’s embryonic stem cell patents ended with the U.S. Supreme Court decision to not hear appeals to the case being brought by Consumer Watchdog of Santa Monica, California, and Jeanne Loring, head of the stem cell program at Scripps Research Institute.[[27]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn27)

The decision means that WARF will get to keep its patent rights for embryonic stem cells, discovered in 1998 by James Thompson, founder of CDI. Nonetheless, the challengers succeeded in preventing WARF from gaining rights over induced pluripotent stem cells, which would have given WARF nearly impenetrable control over pluripotent stem cells, as embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSC) are two of the most versatile stem cell types.[[28]](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftn28)

### ****Four Primary Areas of Induced Pluripontent Stem Cell (iPSC) Commercialization****

There are currently four major areas of commercialization for induced pluripotent stem cells, as described below:

**1) Drug Development & Discovery:**iPSCs have the potential to transform drug discovery by providing physiologically relevant cells for compound identification, target validation, compound screening, and tool discovery.

**2) Cellular Therapy:**iPSCs can be used for cellular therapy applications, including autologous transplantation and potentially gene therapy. The purpose of cellular therapy is to reverse injury or disease.

**3) Toxicology Screening:**iPSCs can be used for toxicology screening, which is the use of stem cells or their derivatives (tissue-specific cells) to assess the safety of compounds or drugs within living cells.

**4) Stem Cell Biobanking:** The goal of stem cell biobanking is to create a repository of stem cell specimens, including source tissue from which iPSCs can be derived, differentiated cell types produced from iPSCs, and disease tissues produced from iPSCs. Large-scale stem cell repositories provide researchers with the opportunity to investigate a diverse range of conditions using iPSC derived cells produced from both healthy and diseased donors. Importantly, these repositories can also greatly expand the capacity for global research and collaboration.

Each of these areas will be vital to the future commercialization of iPSCs. At this time, Cellular Dynamics International (CDI) is best positioned to excel in all areas, largely due to its participation in creating the world’s largest ever iPSC bank (funded through a CIRM grant and in partnership with Coriell Institute for Medical Research), and its ability to produce clinical grade iPSCs in industrial quantities.

However, there are other industry competitors that could be well-positioned to control one of these market areas, such as ReproCELL’s strong positioning in the iPSC reagent space. Therefore, smaller industry players may choose to specialize and compete in one of these market areas, with the potential for later expansion into other areas.

### ****Rapidly-Evolving Market Opportunities for Induced Pluripotent Stem Cells (iPSCs)****

Since the discovery of iPSCs a large and thriving research product market has grown into existence, largely because the cells are completely non-controversial and can be generated directly from adult cells. Today, the number of iPSC products sold worldwide is increasing with double-digit growth. In addition, 22% of all stem cell researchers now self-report having used iPSCs within a research project.

It is clear that iPSCs represent a lucrative product market, but methods for commercializing this cell type are still being explored, as clinical studies investigating iPSCs continue to increase in number.

Currently, nearly all clinical studies involving iPSCs are for the creation and evaluation of iPSC lines from specific patient populations in order to determine if these cell lines could be a good model for a disease of interest in that patient population. (See [ClinicalTrials.gov](https://clinicaltrials.gov/) for a current list of these trials.) However, the first clinical study involving transplant of iPSCs into humans was initiated in August 2013, as mentioned above.

### ****Market Leaders Have Begun to Emerge in All Areas of iPSC Development****

Finally, market leaders have begun to emerge in all areas of iPSC development, including:

* **Drug Development and Discovery:**Cellular Dynamics International (CDI) in Madison, Wisconsin
* **Cellular Therapy (Therapeutic Applications of iPSCs)**: RIKEN Center, in Kobe, Japan, and Kyoto University in Kyoto, Japan
* **Stem Cell Biobanking:**Cellular Dynamics International (CDI) in Madison, Wisconsin
* **iPSC Research Products**: ReproCELL in Kanagawa, Japan; Thermo Fisher Scientific in Rockville, MD; STEMCELL Technologies in Vancouver, Canada; and BD Biosciences in San Jose, California

### ****Understanding Rapidly-Evolving Needs of iPSC Researchers****

It can be a very difficult task to position your company to serve the rapidly-evolving of iPSC researchers. In a recent global strategic report published by BioInformant, titled the "[Complete 2015-16 Induced Pluripotent Stem Cell Industry Report](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/)," a end-user survey of 273 researchers that identify as having induced pluripotent stem cells as a research focus is included (131 U.S. / 143 International).

The survey findings reveal iPSC researcher needs, technical preferences, key factors influencing buying decisions, and more. For companies committed to dominating the iPSC product, technology, and therapy marketplace, this type of direct insight into the current activities and needs of iPSC researchers can be invaluable.

**Other key findings from this**[**2015-16 iPSC industry report**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/)**include:**

* Metrics, Timelines, Tables, and Graphs for the iPSC Industry
* Trend Rate Data for iPSC Grants, Clinical Trials, and Scientific Publications
* Analysis of iPSC Patent Environment, including Key Patents and Patent Trends
* Market Segmentation
* 5-Year Market Size Projections (2015-2019)
* Market Size Estimations, by Market Segment
* Updates on Crucial iPSC Industry and Technology Trends
* Analysis of iPSC Market Leaders, by Market Segment
* Geographical Assessment of iPSC Innovation
* SWOT Analysis for the iPSC Sector (Strengths, Weaknesses, Opportunities, Threats)
* Preferred Species for iPSC Research
* Influential Language for Selling to iPSC Scientists
* Breakdown of the Marketing Methods, including Exposure and Response Rates
* And Much More

### ****Summary of Key Benchmarks, Market Forces, & Industry Events****

Induced pluripotent stem cells represent a promising tool for use in the reversal and repair of many previously incurable diseases. The cell type represents one of the most promising advances discovered within the field of stem cell research during the past decade, making it important to optimally position yourself within the marketplace.

View the fulll Executive Summary for the "[Complete 2015-16 Induced Pluripotent Stem Cell Industry Report](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/)" to learn more about emerging threats and trends within the iPSC industry that will affect you, your company, your products, and your investors.

### ****Recommended iPSC Industry Resources****

We recommend that you following these two research centers, as they are industry leaders in iPSC advances and clinical applications.

1. **Center for iPS Cell Research and Application, Kyoto University**: The world-first core institute dedicated to leading iPS cell research. See:<http://www.cira.kyoto-u.ac.jp/e/about/mission.html>
2. **RIKEN Center**: The site of the first clinical trial testing iPSC applications in humans, the RIKEN Center is a leader in the area of iPSC research. See:<http://www.riken.jp/en/research>

We also publish "iPSC Industry News Round-Ups" on our blog to help you make smarter decisions, faster:

1. **Induced Pluripotent Stem Cell News Round-Up| February 22 – 28, 2015:**Supreme Court Rules on Stem Cell, $100 Billion Proposed for International Stem Cell Collaboration, Japan to Launch iPSC Therapy Center, and More. See: <http://www.bioinformant.com/induced-pluripotent-stem-cell-news-round-up-february-22-28-2015/>
2. **Induced Pluripotent Stem Cell News Round-Up| February 15-22, 2015:**New Partnership Aims to Study Psychiatric Disorders Using iPSCs, iPSC Manufacturing Breakthrough, “Superdonor” Stem Cell Lines, and more. See:http://www.bioinformant.com/induced-pluripotent-stem-cell-news-round-up-february-2015/

### ****About BioInformant****

BioInformant is the only research firm that has served the stem cell sector since it emerged. Our management team comes from a BioInformatics background – the science of collecting and analyzing complex genetic codes – and applies these techniques to the field of market research. BioInformant has been featured on news outlets including the Wall Street Journal, Nature Biotechnology, CBS News, Medical Ethics, and the Centre for Commercialization of Regenerative Medicine (CCRM). Serving Fortune 500 leaders that include GE Healthcare, Pfizer, Goldman Sachs, Beckton Dickinson, and Thermo Fisher Scientific, BioInformant is your global leader in stem cell industry data. Visit us at [www.BioInformant.com](http://www.bioinformant.com/) to get educated about opportunities and threats within stem cell markets.

**Footnotes:**

[**[1]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftnref1) Kazutoshi Takahashi and Shinya Yamanaka. Induction of Pluripotent Stem Cells from Mouse Embryonic and Adult Fibrolast Cultures by Defined Factors. Cell. 2006 Aug 25;126(4):663-76.

[**[2]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftnref2) Takahashi, K., Tanabe, K., Ohnuki, M., Narita, M., Ichisaka, T., Tomoda, K. and Yamanaka, S. Induction of pluripotent

stem cells from adult human fibroblasts by defined factors. Cell, 2007 Nov 19; 131 (5), pp. 861–872.

[**[3]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftnref3) Yu J, Vodyanik MA, Smuga-Otto K, Antosiewicz-Bourget J, Frane JL, Tian S, Nie J, Jonsdottir GA, Ruotti V, Stewart R, Slukvin II, Thomson JA. Induced pluripotent stem cell lines derived from human somatic cells. Science. 2007 Dec 21;318(5858):1917-20.

[**[4]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftnref4) Cyranoski, David. ‘Japanese Woman Is First Recipient Of Next-Generation Stem Cells’. Nature (2014): n. pag. Web. 6 Mar. 2015.

[**[5]**](http://www.bioinformant.com/product/complete-2015-16-induced-pluripotent-stem-cell-ipsc-industry-report/#_ftnref5) Schwartz, Steven D et al. ‘Human Embryonic Stem Cell-Derived Retinal Pigment Epithelium In Patients With Age-Related Macular Degeneration And Stargardt’s Macular Dystrophy: Follow-Up Of Two Open-Label Phase 1/2 Studies’. The Lancet385.9967 (2015): 509-516. Web.

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