INDUCED PLURIPOTENT STEM CELLS: COMPETITIVE ANALYSIS OF THE U.S. PATENT LANDSCAPE

[MARCH 10, 2015](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/) [CADE HILDRETH (CEO)](http://www.bioinformant.com/author/infobioinformant-com/)

#### Role of Patent Analysis for Competitive Intelligence

In 2006, groundbreaking experimentation led to the discovery of induced pluripotent stem cells (iPSCs), which are adult cells that are transformed into embryonic-like stem cells through the manipulation of gene expression or other related methods.  In 2007, follow-up experiments proved human adult cells could be transformed into iPSC cells.  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, and 22% of all stem cell researchers self-report having used iPSCs within a research project. It is clear that iPSCs represent a lucrative product market, but  commercializing the cell type involves careful and due diligence, because the cells are still a relatively new discovery.

Because the iPSC industry is a rapidly-evolving area, major research findings and technical discoveries are frequently announced . Therefore, to launch iPSC products and technologies, one of the key areas that company management and investors must consider is the patent landscape for the cell type.

#### Induced Pluripotent Stem Cell (iPSC) Patent Landscape

The United States federal government supports a searchable patent database, the “[United State Patent and Trademark Office (USPTO) Full-Text and Image Database](http://www.uspto.gov/patents-application-process/search-patents).”[[2]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/%22%20%5Cl%20%22_ftn2) It is a flexible and essential tool for analyzing the patent landscape  of any stem cell type.

When assessing a specific cell type, such as induced pluripotent stem cells, the USPTO patent database provides crucial information for several business intelligence (CI) metrics of importance, including:

* **Dominant Industry Players:** Who is the the single largest patent assignee for the cell type? Who are other industry players who have substantial patent counts?
* **Newly Awarded Patents**: Are there recently submitted patent applications that (if approved) could affect your business?
* **New Legal Requirements:** Are there recently awarded patents that could create new legal requirements within the marketplace?
* **Patent Trend Rates:** What is the rate of patents submitted by year? Is the rate accelerating or de-accelerating over time? Is the change linear or exponential?
* **Patent Breakdown:** What patent categories have the highest count, and are therefore, the most competitive?
* **Predominant Focus:** What are most patents concerning? Can you identify a current theme within the research?
* **Geographical Regions:** Where can you identify geographical clusterings of patent activity?
* **Potential Commercial Partners:** Who are assignees being awarded a large number of patents?  Do these assignees represent valuable partners for research, collaboration, or similar?
* **Key Research Leaders:** Who are the investors listed on a landmark patent or on multiple patents? Are these investigators “thought” leaders within the industry whose research work you should follow?

#### Key Findings Revealed for the iPSC Patent Environment

While we cannot present a complete patent analysis for the iPSC sector within the scope of this blog, we are going to reveal four crucial findings for the iPSC patent landscape. These findings include:

1. **Key Patents in the iPSC Marketplace**
2. **Rates of iPSC Patent Activity by Year**
3. **iPSC Patents by Type**
4. **Geographical Clustering of iPSC Patents**

Each of these topics will be discussed in greater detail below, revealing crucial market findings to guide the decision-making of stem cell company executives, as well as iSPC industry investors.

#### Methodology of Induced Pluripotent Stem Cell (iPSC) Patent Analysis

For purposes of keeping this analysis specific to iPSCs, the following set of terms were screened for presence within the Title or Abstract of U.S. patents: [“Induced Pluripotent Stem Cell” OR ” Induced Pluripotent Stem Cells”] OR [“iPSC” OR “iPSCs”] OR [“iPS cell” OR “iPS cells “]. The Title and Abstract were chosen as the areas of the patent to search, because the Title is a highly-specific phrase that captures the focus of the patent and the Abstract is also limited to focused 2-3 sentence description, making it highly-focused and specific as well.

This search determines that there are 32 patents that have the above terms appearing within the Title or the Abstract of the patent.[[3]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/%22%20%5Cl%20%22_ftn3)  A complete list of these patents is shown below.

For reference, where the iPSC search terms above are searched within all fields of all U.S. patents issued to date (including within the Description, Specifications, Claims and more), 309 total results are returned.[[4]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/#_ftn3)  However, these patents are not included in the list below, because in these situations iPSCs are often referenced within a patent for purposes of describing prior methods, knowledge, or systems.

**TABLE. Induced Pluripotent Stem Cell Specific U.S. Patents  (Search Terms Appearing within Title or Abstract of Patent; USPTO Database)**

|  |  |  |
| --- | --- | --- |
|  | **PATENT #** | **PATENT TITLE** |
| **1** | [8,642,334](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=1&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Methods of neural conversion of human embryonic stem cells |
| **2** | [8,628,963](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=2&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Medium composition comprising neuropeptide Y for the generation, maintenance, prolonged undifferentiated growth of pluripotent stem cells and method of culturing pluripotent stem cell using the same |
| **3** | [8,603,818](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=3&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | TGF-beta receptor inhibitors to enhance direct reprogramming |
| **4** | [8,551,472](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=4&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Method of making macrophage expressing an antibody directed against beta.-amyloid |
| **5** | [8,546,140](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=5&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Methods for the production of iPS cells using non-viral approach |
| **6** | [8,535,944](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=6&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Culturing embryonic stem cells, embryonic stem-like cells, or induced pluripotent stem cells with a Muc1 or Muc1\* ligand |
| **7** | [8,530,238](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=7&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Method of efficiently establishing induced pluripotent stem cells |
| **8** | [8,518,700](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=8&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Composition for reprogramming somatic cells to generate induced pluripotent stem cells, comprising Bmi1 and low molecular weight substance, and method for generating induced pluripotent stem cells using the same |
| **9** | [8,515,150](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=9&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Mathematical image analysis based cell reprogramming with applications for epigenetic and non-epigenetic base induced pluripotent stem cell derivation |
| **10** | [8,507,274](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=10&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Compositions and methods for promoting the generation of definitive endoderm |
| **11** | [8,496,941](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=11&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Vectors for generating pluripotent stem cells and methods of producing pluripotent stem cells using the same |
| **12** | [8,481,492](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=12&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Fusion protein and use thereof |
| **13** | [8,420,352](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=13&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Protein delivery system to generate pluripotent stem (iPS) cells or tissue specific cells |
| **14** | [8,372,642](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=14&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Differentiation of pluripotent cells |
| **15** | [8,349,609](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=15&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Differentiation of human embryonic and induced pluripotent stem cells |
| **16** | [8,323,971](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=16&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Differentiation of pluripotent cells into primary germ layer progenitors |
| **17** | [8,298,825](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=17&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | TGF-beta receptor inhibitors to enhance direct reprogramming |
| **18** | [8,278,104](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=18&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Induced pluripotent stem cells produced with Oct3/4, Klf4 and Sox2 |
| **19** | [8,268,621](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=19&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Methods of deriving definitive endoderm cells from pluripotent parthenogenetic stem cells |
| **20** | [8,257,941](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=20&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Methods and platforms for drug discovery using induced pluripotent stem cells |
| **21** | [8,211,697](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=21&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Induced pluripotent stem cells produced using reprogramming factors and a rho kinase inhibitor or a histone deacetylase inhibitor |
| **22** | [8,183,297](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=22&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Medium and device for proliferation of stem cells and treatment of cancer-related stem cell with resveratrol |
| **23** | [8,129,187](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=23&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Somatic cell reprogramming by retroviral vectors encoding Oct3/4. Klf4, c-Myc and Sox2 |
| **24** | [8,058,065](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=24&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Oct3/4, Klf4, c-Myc and Sox2 produce induced pluripotent stem cells |
| **25** | [8,048,999](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=25&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Nuclear reprogramming factor |
| **26** | [8,048,675](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=26&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Integration-free human induced pluripotent stem cells from blood |
| **27** | [7,410,797](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=27&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Meningeal-derived stem cells |
| **28** | [7,280,534](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=28&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Managed IP routing services for L2 overlay IP virtual private network (VPN) services |
| **29** | [7,150,990](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=29&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Self-renewing pluripotent hepatic stem cells |
| **30** | [6,808,392](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=30&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | System and method of developing a curriculum for stimulating cognitive processing |
| **31** | [6,703,017](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=31&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | Reversal of insulin-dependent diabetes by islet-producing stem cells, islet progenitor cells and islet-like structures |
| **32** | [6,007,993](http://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&u=%2Fnetahtml%2FPTO%2Fsearch-adv.htm&r=32&p=1&f=G&l=50&d=PTXT&S1=(((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).TI.+OR+((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)).ABTX.)&OS=ttl/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+OR+(induced+AND+pluripotent))+OR+abst/(iPSC+or+iPSCs+or+hiPSC+or+hiPSCs+or+(induced+AND+pluripotent))&RS=(TTL/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent))+OR+ABST/((((iPSC+OR+iPSCs)+OR+hiPSC)+OR+hiPSCs)+OR+(induced+AND+pluripotent)))) | In vitro test for embryotoxic and teratogenic agents using differentiation-dependent reporter expression in pluripotent rodent embryonic cells**Induced Pluripotent Stem Cell (iSPC) Patent Type** |

#### Breakdown of Induced Pluripotent Stem Cell (iPSC) Patents, by Type

Furthermore, when iPSC patents within the United States Patent and Trademark Office (USPTO) database are screened by patent type, the following results are found. The table below (“Patents, by Type”) shows that induced pluripotent stem cell patents dealing with methods of differentiation are the most common patent type, representing 12 of 32 total patents.

|  |  |
| --- | --- |
| **PATENTS, BY TYPE** | **# OF PATENTS** |
| **Production** | 7 |
| **Method For Differentiating** | 12 |
| **Transplantation / Transfer** | 4 |
| **Other Topics** | 9 |
| **TOTAL PATENTS =** | **32** |

***Note***: Click image above to enlarge.

#### ****Geographical Clustering of Induced Pluripotent Stem Cell Patents****

Another key aspect of the iPSC patent environment to consider is what regions have high levels of iPSC patent activity. Currently, iPSC patent activity shows strong geographical clustering in four primary areas:

1. **Japan** – Japan was the original site of iPSC discovery in 2006.  It was also the site of the first derivation of iPSCs from human somatic cells in 2007 and the first iPSC clinical trial in humans in 2013. It is also the site of first proposed cellular therapy clinic for iPSC applications, scheduled to open in 2019.[[5]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/#_ftn3) It is not surprising to see Japan on this list.
2. **Madison, Wisconsin, USA** – Researchers at the University of Wisconsin-Madison created the first iPSCs from human somatic cells in 2007, at approximately the same time as Dr. Shinya Yamanaka’s team in Japan. Madison is also the site of the Wisconsin Alumni Research Foundation (WARF), a group that holds arguably the most powerful patents in the stem cell marketplace – patents controlling derivation of  embryonic stem cells.
3. **Boston, Massachusetts, USA -** Boston, MA is a hub of both biomedical research activity and applied stem cell science. It is home to the Whitehead Institute, Harvard University, and Advanced Cell Technology (ACT), a for-profit company that was an early competitor within the iPSC marketplace.
4. **California, USA** –  Finally, California is highly-regarded epicenter for stem cell research fueled by a $3 Billion budget that the state has allocated to support stem cell research.

Given the characteristics of the the regions described above, it is logical that each is a site of significant iPSC patent activity.

In summary, we wish you the ability to make informed, strategic, and most importantly, legal decisions, as you move forward with your iPSC product development or investment decisions.

#### ****Footnotes:****

[[1]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/%22%20%5Cl%20%22_ftnref1) The Research Portfolio Online Reporting Tools (RePORTer) database and search tool is supported by the U.S. Department of Health and Human Services (2014). Available at: <http://projectreporter.nih.gov/reporter.cfm>. Accessed February 1, 2014.

[[2]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/%22%20%5Cl%20%22_ftnref2) United States USPTO Patent Full-Text and Image Database (2014) Available at: http://www.uspto.gov/patents/process/search/#heading-1. The following set of comprehensive search terms was used: [“Induced Pluripotent Stem Cell” OR “Induced Pluripotent Stem Cells”] OR [“iPSC” OR “iPSCs”] OR [“hiPSC” OR “hiPSCs “]. Executed Feb 1, 2014.

[[3]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/%22%20%5Cl%20%22_ftnref3) An “Advanced Search” was executed within the United States USPTO Patent Full-Text and Image Database. Available at: http://patft.uspto.gov/netahtml/PTO/search-adv.htm. Executed Feb 1, 2014.

[[4]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/#_ftnref3) Ibid.

[[5]](http://www.bioinformant.com/induced-pluripotent-stem-cells-competitive-analysis-of-the-u-s-patent-landscape/#_ftnref3) The Japan Times, ‘Kyoto University Hospital To Open iPS Cell Therapy Center In 2019 | The Japan Times’. N.p., 2015. Web. 7 Mar. 2015.