

Where Do We Go from Here?

The rapid publication of several key papers in stem cell research in late 2007 has excited the scientific and lay communities. To put the discoveries into a large context, Focus spoke with Gladstone investigator and stem cell expert Bruce Conklin.

How would you rate the discovery of iPS cells?

This is perhaps the most significant biological discovery in the last several years. I cannot think of a discovery that will have such profound effects in so many fields.

Replace human embryonic stem cells?

No, human embryonic stem cells will remain the gold standard for many years to come. The iPS cells are mimicking a process that naturally occurs in early human development, so it will be important to be able to compare iPS cells with cells derived from early embryonic tissue. However, there certainly will be a major shift towards iPS cells over time.

And then...?

The major efforts will be in basic research. We will need to compare iPS cell characteristics with hES cells, differentiate them into many other cell types, and analyze the differentiated cells in

detail. I predict that iPS cells will be used eventually in regenerative medicine to repair damaged tissues and in drug screening to make new drugs or make current drugs safer.

What about clinical applications?

I predict the first medical uses of iPS cells will be for diagnostic purposes and then later for cell/tissue transplants. Diagnostic applications are easier to implement, and the iPS cells can be derived from people who have known genetic backgrounds and drug responses that will make iPS tests much more useful than hES cell tests.

Cell/tissue transplants are still years away since this is a new area of medicine and the risks are much greater. We will need to determine how to differentiate iPS cells so that they survive for a long time and do not form tumors. I predict that even the first trials will be just the beginning of new research challenges. For example, since the iPS cells will have to integrate into the native tissue, complex pathways involving signaling, migration, and integration with host tissues will have to work effectively. These challenges will keep us busy, but the tools are at hand to do many things that we once thought were impossible.

