HOW SECULAR BIOTECHNOLOGY WILL IMPACT THE FUTURE OF THE CATHOLIC HEALTHCARE SYSTEM AND CATHOLIC MEDICAL PRACTITIONERS

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The service of humanity leads us to insist, in season and out of season, that those using the latest advances of science, especially in the field of biotechnology, must never disregard fundamental ethical requirements by invoking a questionable solidarity which eventually leads to discriminating between one life and another and ignoring the dignity which belongs to every human being.~Pope John Paul II

FINANCIAL DISCLOSURE

Financial disclosure: Dr. Moy and family hold majority ownership in Cellular Engineering Technologies

QUESTIONS

- Catholic doctor, nurse, pharmacist or physician extender?
- Academic researcher in a secular institution?
- Student pursuing career in biotechnology?
- Catholic employee of a Catholic hospital?
- Catholic employee of a secular hospital?
- Catholic hospital administrator?
- Catholic Bishop?
- Catholic business owner?
- Catholic patient?

- Secular biotechnology receives little attention but will have the greatest impact on future of Catholic healthcare.

LEARNING OBJECTIVES

- Learn about the scientific, ethical and moral controversy in secular biotechnology.
- Learn the principals and laws governing human subject research and how applied to use of morally illicit cells in biotechnology.
- Learn the impact secular biotechnology on Catholic healthcare.
- Learn what steps needed to preserve Catholic healthcare and the Catholic identity.

CASE1-LEGAL CASE AGAINST HUMAN EMBRYONIC STEM CELLS

- In August 2010, as part of preliminary motions in Sherley vs Sebelius, Judge Royce C. Lamberth granted an injunction against federally funded embryonic stem cell (ESC) research.
- ESC research "clearly violates" the Dickey-Wicker Amendment.
- In September 2010, he refused to lift the injunction pending the conclusion of the case and the issuance of his ruling and a likely appeal.
- Obama Justice Department asked the US Court of Appeals for the District of Columbia Circuit to lift the injunction via an order pending the appeal of Judge Lamberth's ruling on April 29, 2011.
- Judge Lamberth was thereby obliged to reverse his ruling, and grudgingly dismissed the case entirely on July 27, 2011. The Supreme Court refused to hear an appeal.
- Did the case violate Dickey-Wicker Amendment?

CASE 2-THE NATIONAL INSTITUTE OF HEALTH ANNOUNCEMENT ON HUMAN-ANIMAL CHIMERAS

- In September 2016 NIH lifts its moratorium on funding human embryonic stem cells animal embryo chimeras.
- Part-human and part-animal organisms known as chimeras.
- The NIH allowed only one month to receive public comments.
- Published article in the Linacre Quarterly in 2017.
- Is this illegal? At what point would it be illegal?
- Is this a departure of historic NIH stem cell guidelines?
- Did NIH recently come up with idea to pursue this research?

CASE 3 PLANNED PARENTHOOD CAUGHT ON TAPE MODIFYING ABORTION METHOD TO PRESERVE FETAL BODY PARTS

- 2016 – Planned parenthood caught on video.
- State investigations underway to determine if federal laws being violated.
- Aborted fetal tissue is a commercial industry.
- Most national research foundations support the use in medical research.
- Cell lines derived from aborted fetal tissue used in for a variety of commercial products (gene therapy, biologics, cell therapy and vaccines).
- Scientific journals permit the use of aborted fetal tissue in publications.
- Is PP breaking any laws?

SECULARISM HAS EMBEDDED MORAL RELATIVISM IN HEALTHCARE

- Lack of moral voice against the disposal of vulnerable humans - Planned Parenthood.
- Gallop poll shows 68% of physicians believe physician-assisted suicide is morally acceptable and should be legalized – future implications.
- Threats against the medical conscience.
- Over 300 scientific and medical organizations advocate ESCR and many support the use of aborted fetal tissues (vaccines, gene therapy and biologics).
- Human cloning permitted in several states.
- FDA Acquiring 'Fresh' Aborted Baby Parts to Make Mice With Human Immune Systems
- Catholics unknowingly support ESCR and aborted fetal tissue research.
- Many Catholics and institutions know the truth but apathetic.

DRUG CLASSES AND ASSOCIATION WITH HESC AND ABORTED FETAL TISSUE

- Small molecules
  - Abortifacients
  - Screened with HESC and aborted fetal tissue
- Vaccines
  - WI-38, MRC-5 (childhood vaccines e.g. MMR).
- Gene therapy and gene editing
  - AAV-HEK293
- Protein (biologics) therapy
  - HEK-293 and PERC6 (20% of industrial protein bioprocessing)
- Cell therapy
  - CAR-T-Lentivirus and Retrovirus-HEK293
  - Type 1 DM and Spinal Cord Injury (HESC)

Outside of BMT, adult stem cell have received few approvals by regulatory bodies.

Administer in Hospital Setting

HISTORICAL HIGHLIGHTS OF HUMAN SUBJECT RESEARCH

- Pre-Nazi era: Academia supported euthanasia, sterilization and government over individual rights.
- December 9, 1946 - USA vs Karl Brandt or Doctor Trial.
- 1947 Nuremberg Code: First human subject research guidelines.
- 1964 - Declaration of Helsinki: Justice provision added but no safeguards for vulnerable groups.
- 1966 – Beecher Report: Highlighted unethical research in the US.
- 1973 – Tuskegee Syphilis Study

1974 NATIONAL RESEARCH ACT

- Creates the National Commission for the Protection of Human Subjects in Biomedical and Behavioral Research.
- The commission created a set of required rules that govern human-subject research.
  - Respect for subjects as “autonomous agents”.
  - Informed consent.
  - Surrogate responsibilities for research subjects.
  - Minimization of harm.
  - Observance of justice to the the research subject with regard to benefits and risks.
  - Individuals with lower capacity for making decisions require special protection.
  - Originally no distinction between fetus in utero and aborted fetus.

CONCEPT OF "MINIMAL RISK"

- The National Commission initially prohibited fetal research from elective abortion based on a standard of "minimal risk" to the fetus.
- No distinction between aborted fetus and one carried to term.
- DHEW (now HHS) pushed for waivers of the minimal risk criteria.
- Moratorium on waivers for several years.
- NIH pushed for a lift on the moratorium.
- President Clinton signed executive order lifted the moratorium.
- Executive order has never been reversed even with Republican presidents.

1974 NATIONAL RESEARCH ACT APPLICATION TO CURRENT USE OF ESC

- Human embryonic stem cells requires the destruction of a human embryo.
- Human embryos are regarded as human subjects with diminished autonomy and vulnerability
- Human embryonic stem-cell research should be illegal.
- Yet secularist treat the case differently:
  - a) Ignorant of the law
  - b) NRA does not apply because embryos do not have the status of human persons.

DICKEY-WICKER AMENDMENT

- Law passed in 1995 and signed into law by President Bill Clinton.
- Prohibits DHHS from using federal funds to create human embryos.
- SEC. 509. (a) None of the funds made available in this Act may be used for--(1) the creation of a human embryo or embryos for research purposes; or (2) research in which a human embryo or embryos are destroyed, discarded, or knowingly subjected to risk of injury or death greater than that allowed for research on fetuses in utero under 45 CFR 46.208(a)(2) and Section 498(b) of the Public Health Service Act (42 U.S.C. 289g(b)) (Title 42, Section 289g(b), United States Code).
- Law does not mention any provision of using established embryonic stem cell lines.
- Sherley vs Sebelius - Judge Royce C. Lamberth's decision was incorrect.

HISTORY OF IN VITRO FERTILIZATION (IVF) FOR MEDICAL RESEARCH

- During the Reagan and Bush administrations created an ethics advisory board to recommend federal funding on embryo research because of the emergence of IVF technology.
- The advisory board never approved federal funding for human embryo research.
- American Fertility Society and the American College of Obstetrics and Gynecology create the concept of the pre-embryo.
- Gave the embryo less status at the developmental stage before full uterine implantation.
- Led by Dr. Clifford Grobstein, a developmental biologist, and Father Richard McCormick, S.J., of the University of Notre Dame, a movement began to redefine the embryo and the beginning of life.
- In 1986 Dr. Grobstein and Father McCormick formed an ethics committee which reaffirmed statements removing the moral status and protection of the conceptus up to 14 days post-fertilization.

NIH REVITALIZATION ACT OF 1993

- Enacted by sponsors (Senator Edward Kennedy of Massachusetts and Representative Henry Waxman of California).
- Overturned the existing ethics advisory board created by the Reagan Administration.
- Allowed NIH to appoint a panel to identify areas of acceptable embryonic research.
- Panel outlined cases in which human embryos would be deemed acceptable.

RECOMMENDED USES FOR HUMAN EMBRYOS

- 1). The creation of human embryos as research objects.
- 2). The removal of ovaries from brain-dead women and aborted fetuses so eggs (ova) can be recovered for laboratory fertilization and manipulation.
- 3). The testing of a panoply of drugs on the developing human embryo.
- 4). The use of human embryos to create specific cell lines.
- 5). The freezing and saving of spare embryos for medical research.
- 6). The testing of new cell lines for contraception.
- 7). The fusion of animal species cells or DNA fragments with human embryos.

EXECUTIVE ORDERS GOVERNING HUMAN EMBRYO RESEARCH

- President Bush creates executive order prohibiting federal funding using ES cell lines created after Aug 9, 2001
- President Obama signs executive order in 2008 pursuant to expand ESCR.
- In 2009 NIH developed "Guidelines on Human Stem Cell Research".
- Guidelines prohibited:
  - Introduction of human pluripotent cells into early-stage embryos of non-human primates.
  - Breeding of animals containing human cells.
- NIH policy change with human and animal chimera in 2016.
- CRISPR experiments conducted in human embryos in 2017- ? violation of Dickey-Wicker.

HOW DO COUNTRIES GOVERN ANIMAL-HUMAN CHIMERAS?

- France
  - Chimeric human embryos are forbidden
  - Unclear whether human cells introduced into animal embryos are illegal
- United Kingdom
  - Allows for introduction of human embryonic cells and cells lines into animal embryos.
  - Allow CRISPR experimentation in IVF embryos
  - Illegal to transplant a chimeric embryo into an animal mother for further development.
- Germany
  - Forbids combining a human embryo with animal cells
  - Introduction of human cells into an animal embryo allowed
- Japan
  - Allows human-animal chimeric embryos to a maximum of 14 days post-fertilization
  - Animal-human chimeras not be allowed to breed

It's just a matter of time before animal genes will be introduced into human embryos and genetic manipulation of human embryos will become more common- at which point will this violate Dickey-Wicker?

42 U.S. CODE § 289G - FETAL RESEARCH

- **(a)** The Secretary may not conduct or support any research … unless the research—
  - **(1)** may enhance the well-being or meet the health needs of the fetus or enhance the probability of its survival to viability; **or**
  - **(2)** will **pose no added risk** of suffering, injury, or death to the fetus **and** the purpose of the research or experimentation is the development of important biomedical knowledge which cannot be obtained by other means.
- (b) Risk standard for fetuses intended equally for aborted fetuses and those carried to term (condition may conflict with (2)).
- PP may violate the law based on violating condition (2).

42 U.S. CODE § 289G–1 - RESEARCH ON TRANSPLANTATION OF FETAL TISSUE

- The Secretary may conduct or support research on the transplantation of human fetal tissue for therapeutic purposes.
- Informed consent of donor only after first consenting for the abortion.
- **Additional statement**
  - the attending physician makes a statement, made in writing and signed by the physician, declaring that—no alteration of the timing, method, or procedures used to terminate the pregnancy is made solely for the purposes of obtaining the tissue; and
  - the abortion is performed in accordance with applicable State law.

42 U.S. CODE § 289G–2 - PROHIBITIONS REGARDING HUMAN FETAL TISSUE COMMERCE

- Purchase of tissue- It shall be unlawful for any person to knowingly acquire, receive, or otherwise transfer any human fetal tissue for valuable consideration if the transfer affects interstate commerce.
- The term "valuable consideration" does not include reasonable payments associated with the transportation, implantation, processing, preservation, quality control, or storage of human fetal tissue.
- Illegal to solicit or accept tissue as directed donation for use in transplantation.
- Illegal to solicit or accept tissue from fetuses gestated for research purposes.
- Subject to federal audits.
- Criminal penalties for violations.

ETHICAL AND LEGAL SUMMARY USING MORALLY ILLICIT TISSUE

- Laws for morally illicit tissue reflect a lower standard than defined by the NRA.
- The government has historically been constantly pushing the limits of medical research ethics.
- The current laws remain vague, contradictory and unenforced.
- Executive orders violate standing laws.
- The minimal risk criteria for fetal research is largely ignored, unenforced and there're lower standards for animals research.
- **To reduce use of embryonic and fetal tissue:**
  - The fetal risk of suffering criteria needs better enforcement and alignment with animal research.
  - Every research proposal that uses ESC and fetal tissue should be approved by IRB (no Federal exclusions).
  - States have opportunity to impose additional restrictions on Federal statutes (e.g. IA Fetal Heart Tone Bill).
  - The "valuable consideration" clause needs to be redefined and institute barriers.

DILEMMA FOR PRO-LIFE

- Secularism dominates medical research and Catholic healthcare system is in jeopardy.
- Morally Illicit cells deeply embedded in every aspect of biotechnology.
- Vaccines, gene therapy, biologics, cell therapies are here to stay and making its way into the market place. and have to be administered in a hospital setting.
- Catholic hospitals face tough decision - lose market share or lose their Catholic identity.
- Pro-life health providers risk losing employment and clinical privileges.
- Pro-life scientists in industry and academia risk employment and being ostracized.
- Pro-life students pursuing biotechnology/medicine risk educational and job prospects.
- Pro-life patients may have no medical option but accept a treatment that uses an immoral cell.

VATICAN RESPONSE

- No specific statement in the *USCCB Ethical and Religious Directives for Catholic Health Care Services*.
- 2005 Pontifical Academy for Life Statement on Vaccines.
  - Degrees of cooperation with Evil.
  - Permissible if no ethical alternative exists.
  - Doctors and patients allowed conscience moral objection.
  - Moral duty to fight the pharmaceutical industry.
- Low priority by the Catholic church, USCCB, Catholic hospitals, universities and Catholic organizations to be pro-active.
- No financial skin in the game.

CATHOLIC RESPONSES IN HEALTHCARE

PASSIVE

- Historic protests always failed.
- Catholic universities' historically offered no alternatives in biotechnology.
- Catholic medical schools fate at risk from decades of avoiding biotech investments.

PRO-ACTIVE

- Sisters of Mercy and Franciscans
- Dr. Hilgers and Pope Paul VI Institute.
- JP2MRI and CET – industrial operation in biotechnology.

JP2MRI MISSION

ORIGINAL MISSION

- Educate public on medical ethics and biotechnology.
- Educate the pro-life community about secular research foundations.
- Advocate and lobby for adult stem cell research.
- Calls from pro-life individuals around the country to do more.

CURRENT MISSION

- Advance prolife research.
- Adopt a non-profit biotechnology model.
- Preserve the Catholic identity in biotechnology.
- Therapeutic priorities: neurodegenerative disorders, rare disease, cancer and regenerative medicine in unmet and underperformed needs.
- Foster an environment to create a generation of pro-life clinicians and scientists.

STARTUP CHALLENGES FOR JP2MRI (PERSONAL STORY)

REASONS NOT TO CHANGE JP2MRI MISSION

- Little money, no benefactor, no state support compared to other states.
- Lack of Catholic support.
- No personal publication record in stem cell biology and IA bottom in stem cell field.
- Numerous smart scientists around the globe had yet to develop a therapeutic that could replace an embryonic stem cell.
- Competing against entrenched medical foundations.
- Anti-Catholic sentiment among political class and some scientists.
- Solo medical practice.
- High likelihood of failure.

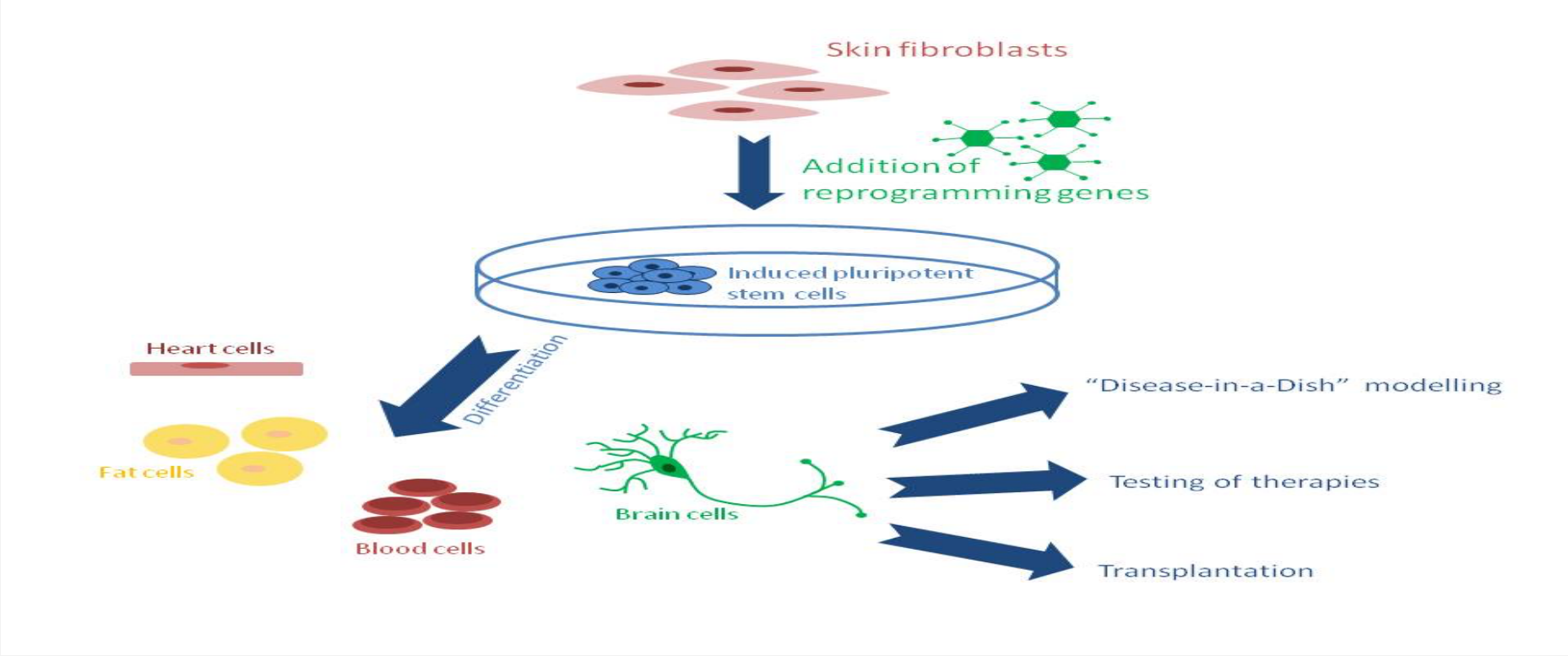
REASON TO CHANGE JP2MRI MISSION

- Courage
- Risk
- Sacrifice
- Heroism
- A judgment day of reckoning (Apostolate of the Laity).
- Matthew 6:19-21
- "Do not store up for yourselves treasures on earth, where moth and decay destroy, and thieves break in and steal. But store up treasures in heaven…..

JP2MRI HIGHLIGHTED ACCOMPLISHMENTS

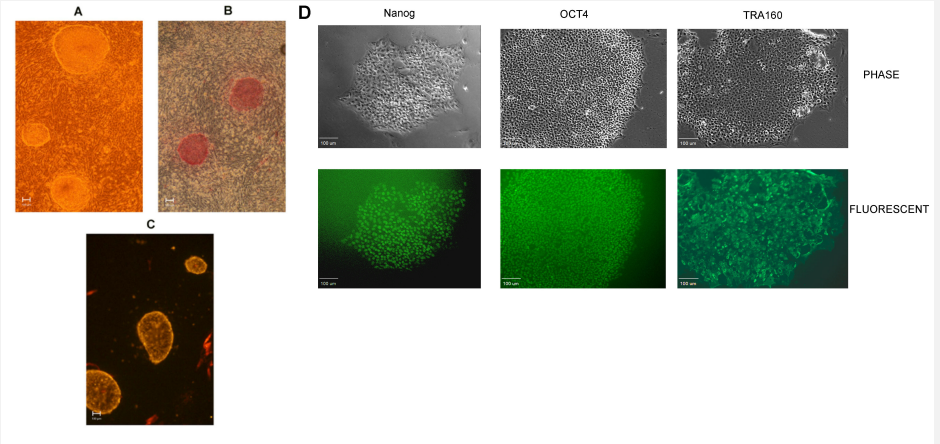
- Reduced cost of R/D by 75 percent.
- Largest pipeline of human somatic stem cells in the world.
- Only organization with virus and oncogene-free iPSC.
- Established expertise in synthetic biology.
- Only organization with stem cell that delivers multiple biologics.
- Only organization that can produce biologics from stem cells.
- Filed patent on iPSC technology.

WHAT ARE INDUCED PLURIPOTENT STEM CELLS (IPSC) AND THEIR SIGNIFICANCE?

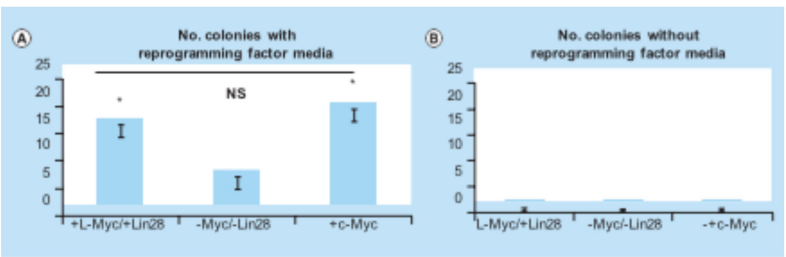


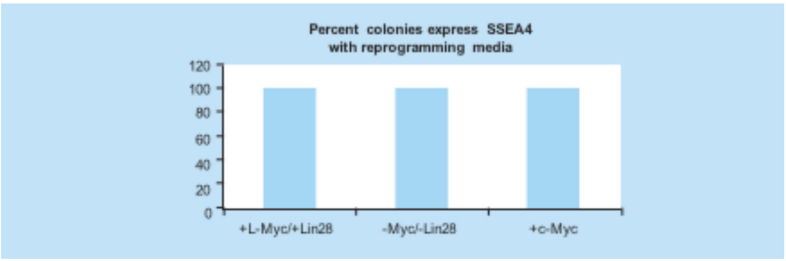
VIRUS-FREE AND ONCOGENE-FREE IPSC THROUGH EPISOMAL REPROGRAMMING

- 2006 –Yamanaka- develops first iPSC by retroviral delivery of Oct3/4, klf4, Sox2, and c-Myc but has neoplastic and infectious risk.
- Yamanaka received Nobel Prize.
- 2007 – Dr. Thomson-develops iPSC by retroviral delivery of Oct3/4, Sox2, Nanog, Lin28 but has neoplastic risk and infectious risk.
- c-Myc and Lin28 are responsible for the neoplastic risk.
- **2017 – CET/Jp2MRI publish first non-viral, oncogene-free iPSC approach.** *Future science OA.* 2017;3(3):Fso211.



tracked @ 97th percentile among 9 million scientific papers.





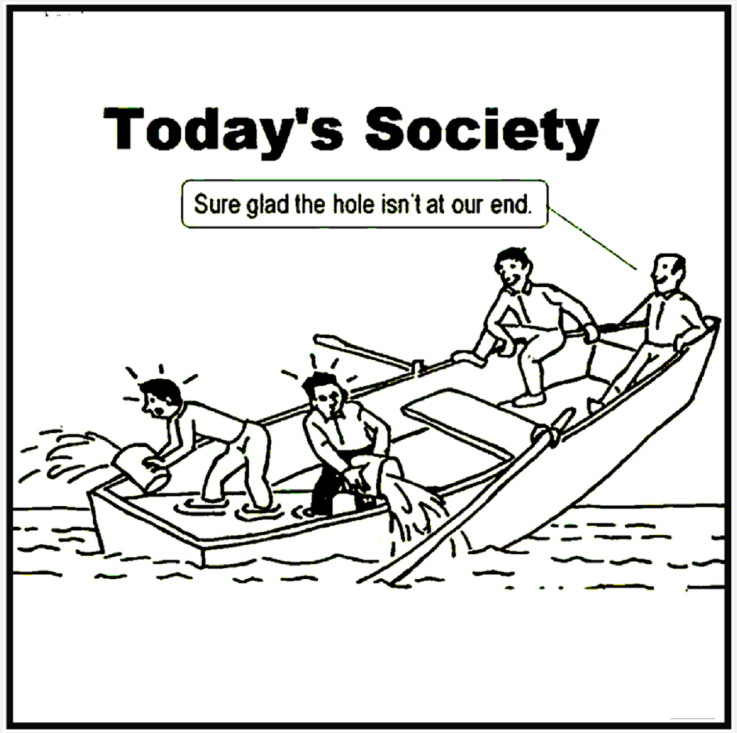
"…in my role as Editor-in-Chief of *Neurorehabilitation and Neural Repair Journal*, I can state emphatically that your technology is quite unprecedented in its translational value."- Randolph Nudo, PhD.

WHAT DO CATHOLICS NEED TO DO TO PRESERVE THE CATHOLIC IDENTITY IN HEALTHCARE?

- Educate
- Courage
- Risk
- Sacrifice
- Heroism

Matthew 19:24
“In fact, it's easier for a camel to go through the eye of a needle than for a rich person to get into God's kingdom."

STATE OF CATHOLIC SUPPORT TOWARDS TURNING THE TIDE IN SECULAR BIOTECHNOLOGY



RECOMMENDATIONS

- Innovation is the underpinning solution – technology has to be better.
- Innovation is very expensive.
- More due diligence by Catholics on secular medical research organizations.
- More due diligence by Catholic hospital networks on medical research.
- More communication and education by Catholic media.
- More investment by Catholic financial institutions and hospital foundations.
- More education, advocacy and priority within the USCCB.
- Vatican and US Catholic church needs to have more financial skin in the game.