SHORT COMMUNICATION

Abstract on genetics, stem cells, dna and rna: how humans are genetically coded to evolve versus how genetic expression will evolve human development?

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Abstract

The truth of reality with the awareness of the present moment may be too boring, frightening, or falsely reassuring to humanity. For these three simple reasons, humanity welcomes the future and struggles to forget the past. In the past 30 years, or three decades, evidence-based medicine has given the world the most advanced scientific data in all aspects of human life.

Technological advances have made this vast amount of evidenced based scientific data shareable to diverse populations, demographics, and societies. Since 1996, in the US alone, the National Institute of Health (NIH), the Center for Disease Control (CDC), National Center for Biotechnology Information (NCBI), The US National Library of Medicine (NLM.) and PubMed Central (PMC), US Department of Health and Human Services (HHS) have collected, analyzed, displayed, debated, and agreed upon programs, policies, laws, regulations, grants, contracts, and services to protect the health and safety of the United States population.

In 2022, the United States citizen population was listed as 333.29 million people in 50 states. The industry problems of economics, health and safety for humanity in the 20th century due to lack of knowledge have evolved to problems of vast knowledge with never ending desire for more knowledge at the expense of the quality of life for human beings. Humans have no regrets at bringing human life back from the dead. No heartbeat, no breathing, no problem bring on CPR with extraordinary life saving measures was the 20th century moto! Economic stability was foregone at the expense of research in every industry and field of study. As we enter the third decade of the 21st century, the human right to life is not only the right to life, but the right to a healthy quality of life yet to be defined.

As of 2014, The United States National Institutes of Health (NIH) initiated a requirement that all NIH grant recipients to use both male and female animals in their research. Historically, prior to 2014, only male animals were used in NIH research. From 2008-2014 and 2015 to 2023, the NIH an XLS spreadsheet as a visual of the research dollars in millions per year for each of the 308 disease categories. We now have a 6-year span of 308 disease areas to compare the male animal studies from 2008-2014 to the male and female animal studies from 2015-2023 [3].

Furthermore, in order for the United States citizens to vote for government leadership in healthcare, it is vital the United States closes the gap of human biology knowledge between patient or US citizen and healthcare provider to enhance personal healthcare outcomes as well as develop healthcare policy. Understanding the essential functions of the human body is a basic human right that benefits all humanity. The health of one human will benefit the health of another human. If a human does not comprehend the essential necessity of self-care, how can that human decide the health of another?

Keywords: Environmental Disasters, DNA

Introduction

The human survival response has propelled humanity's existence through the turmoil of environmental disasters, disease, disability, death, famine, poverty, tyranny, and war. The human

element of self-care and care for others allows for empathy and compassion bringing forth the birth of new life, the healing of the sick, the growth of food, separation of waste for disposal, clean water sanitation, shelter, and comradery. Evidenced based medicine provides a concrete foundation in describing human biology and reproduction over time as human evolution propels societies forth in human existence [1].

The NIH has spent the past 15 years and trillions of dollars in continuation of the human genome project, genetic and disease correlations, and stem cell research for regenerative medicine, gene therapy clinical trials, identification of source and function of stem cells in human and non-human sources. Genetics can be as simple as it can be complicated. Every human should have education for five basic human biology concepts regarding human stem cells:

Define each type of human stem cell.

Define where in the body each stem cell originates.

Define the functions stem cell types provide.

Describe the cost to each US citizen to support the NIH in stem cell research.

Describe laws and regulations health insurances must abide by so US Citizens have accessible, affordable, and applicable stem cell medicine in personal as a consumer of healthcare in clinical practice healthcare in the United States [2-4].

In 1994, National Institutes of Health Human Embryo Research Panel was created which consisting of ethicists, public policy analysts, and patients' advocates for the purpose of evaluating when and under what circumstances should human embryo research should be federally funded. The panel also submitted the "Report of the Human Embryo Research Panel" which reported on the moral and ethical controversies the research would create. In 1994, the panel agreed that unused gametes and embryos from fertility procedure like in vitro could be used for embryonic research purposes if informed consent from the donor was obtained by the researcher [5].

President Barack Obama renewed The Dickey-Wicker amendment on 11 March 2009 in section 509 of H.R. 1105, the "Omnibus Appropriations Act, 2009." As of 2009, the amendment remains the only legal obstacle to the federal funding of experimentation on human embryos. The Dickey-Wicker Amendment started in 1996 as attachment to the appropriations bills for the Departments of Health and Human Services, Labor, and Education to restrict the use of federal funds for creating, destroying, or knowingly injuring human embryos. Human embryo defined as "human embryo or embryos' includes any organism, not protected as a human subject under 45 CFR 46 as of the date of the enactment of this Act, that is derived by fertilization, parthenogenesis, cloning, or any other means from one or more human gametes or human diploid cells." ("Can we do that here? An analysis of US federal and state policies [6,7].

However, The Dickey-Werner amendment did not prohibit embryo research, just the federal funding of embryo research. In 1998, James Thomson, from University of Wisconsin, created the first human stem-cell line using private funds. Harriet Rabb, a lawyer at the Department of Health and Human Services, argued that federal funding for embryo research experimentation but not the creation of an embryo should be allowed federal funding. The federal funding was for the research, not the creation of the embryo stem cell germ line.

Today, the National Institutes of Health Office of Intramural Research has replaced the Dickey-Werner amendment. Although the Dickey-Werner Amendment technically still exists [8-10].

Method

DNA, the human genetic code, one half from the father and one half from the mother, provides information starting from amino acids. These four amino acids, adenine, guanine, cytosine, and thymine create two fused carbon – nitrogen rings that bond with a sugar called deoxyribose and one phosphate group in a double helix form. The sugars and phosphates vertically on the outside as the backbone and the horizontal nitrogen bases bonded with hydrogen as the inner strength of the double helix.

RNA, the human transcription genetic, allows for genetic expression without altering the original DNA. RNA consists of adenine, guanine, cytosine, and uracil providing a single carbon-nitrogen ring allowing for manipulation of the RNA. RNA can perform as a messenger, a ribosome, a transfer, or a regulator of original DNA code. The messenger RNA is a transcript or copy of the original DNA code of amino acids sequencing. In the messenger RNA form, the amino acids sequencing code of the original DNA code is carried and to be read by the ribosome RNA structures. The ribosomal RNA structures need the transfer RNA to bring the amino acids sequencing code of the original DNA from the messenger RNA into the cell

ribosome structures where RNA synthesis occurs making protein. DNA cannot be transferred without RNA transcription (messenger RNA), RNA structures (ribosome RNA), and RNA information (transfer RNA) to complete protein synthesis. Simple [11].

Complicated involves microRNA which is single stranded RNA from plants, animals and some viruses to alter gene expression during RNA transcription, structure and transfer for protein synthesis, such as occurred with gain of function research and Covid 19. Small interference RNA goes a step farther to interfere with double helix structure of the original DNA amino acid code by degrading mRNA after transcription, preventing translation, in the expression of specific genetics.

Human Primordial Germ Cells (hPGCs) form around the time of implantation and are the precursors of eggs and sperm. Germ cells are sex cells solely responsible for sexual human reproduction. Human primordial germ cells (PGCs) are first seen in the yolk sac wall at 3 weeks gestation developing into the endoderm hindgut epithelium during week 4. The endothelium hindgut primordial germ cells then follow the sympathetic nervous system to the gonads at week 5. Gonad for the female is the fetal ovary and gonad for the male is the fetal testicle. Germ cells originate from primitive streak of the embryo. The germ cell contains genetic or DNA information. Gametogenesis is the development of germ cells into ovum by oogenesis and spermatogonia through spermatogenesis during embryonic development. Spermatogonia are immature sperm cells located around the periphery of the seminiferous tubules that develop by week 4 in the testes and remain dormant until male puberty. Primordial germ cells in the ovaries at week 4 are called oogonia. Oogonia progress into primary oocytes by the fifth week of gestation through oogenesis. The female fetal ovary can produce up to seven million primary oocytes, but through selective eliminated only two million oocytes remain at birth. Primary oocytes arrest at the first meiotic division in the fetal ovary and can remain dormant for 40-50 years. By puberty, only about 300,000 primary oocytes remain in the ovary for neurohormone development in preparation for pregnancy. Once puberty occurs for both male and female, the primary oocyte and male sperm are now called gametes. Gametogenesis is now complete [12-14].

Embryology starts with the trophoblast layer, blastocoel, and Inner Cell Mass (ICM) of the human blastocyst. Once the male gamete enters the female gamete fertilization occurs in the fallopian tube. The fertilized primary follicle is called a zygote which is surrounded by the zona pellucida while growing in the fallopian tube where it becomes a 16-cell solid ball called the morula.

The morula transforms into the blastocyst which consists of the trophoblast layer, blastocele, and Inner Cell Mass (ICM). The trophoblast is the outer area of the blastocyst that utilizes the active transport of sodium ions and osmosis of water to form a fluid-filled cavity known as a blastocoel. The zona pellucida begins to disappear. The trophoblast splints into the syncytiotrophoblast and the cytotrophoblast. The syncytiotrophoblast of the outer trophoblast releases digestive enzymes to help with implantation and human chorionic gonadotropin (hCG) to produce progesterone to maintain the blastocyst. Both the syncytiotrophoblast and the cytotrophoblast build chorion that surrounds the inner mass cells to prepare for implantation. The cytotrophoblast, the inner trophoblast, containing the inner mass cells from the blastocyst then implants into the endometrial lining [15].

The ICM split into the bilaminar disc composed of the epiblast and the hypoblast. The hypoblast forms the yolk sac, and the epiblast forms the amnion. Once the amnion and the yolk sac have formed, a primitive streak will form in the amnion on the side closest to the yolk sac. The amnion cells gravitate to the primitive streak forming layers of cells in between the epiblast or ectoderm cells and the hypoblast or endoderm cells called the mesoderm cells. The primitive node, prechordal plate, notochordal plate grow and once fused together provide passage between the amniotic cavity and the yolk sac, known as the neuroenteric canal. Two edges of the notochordal plate will fuse to a solid mesoderm rod known as the notochord that provides structure to the midline of the embryo [16]. The human blastocyst, fetal ICM, and trophoblast have now gone through gastrulation to become a three-germ line human gastrula.

The three-germ line gastrula consists of the ectoderm, mesoderm, and endoderm. The ectoderm forms the skin, central & peripheral nervous systems. The notochord mesoderm rod will interact with the dorsal ectoderm to create the neural plate, neural groove, and neural tube which becomes the brain and spinal cord of the nervous system, a neuroectoderm. The entire neurons of the brain and central nervous system and all connecting nervous systems, pineal gland, pituitary, adrenal glands, medulla, cornea, lens of

the eye, hair, nose and mouth lining arise from the neuroectoderm. The mesoderm forms the muscular & skeletal systems, the cardiovascular system, the nephrology system, the hemopoietic system. The endoderm forms the respiratory system, enteric, and digestive system. Endoderm layer embryo organogenesis involves the trachea, lungs, liver and pancreas. The digestive tract is sectioned into foregut, midgut, and hindgut. The foregut includes the esophagus, pharynx, larynx, thyroid, parathyroid, alveolar lung cells, liver, digestive and biliary cells, stomach cells, and pancreas cells. The midgut is the small intestine cells. The hindgut is the large intestine cells. Day 23 -56 of gestation involves individual organ formation, upper and lower limb formation, and organ system functioning. By the end of week 8 a fetal heartbeat can usually be heard via ultrasound. Growth and further development of organ system interactions continue until birth [17].

Pluripotent ICM progenitor cells are descendants of embryonic pluripotent stem cells that can differentiate into any cell or tissue the body needs. Unipotent progenitor stem cells from the ectoderm include neural from neurons and nerve cells, oligodendrocytes, and astrocytes, skin cell epidermis, pigment cells melanocytes and adipose types as well as endoderm germ lines of trachea, lungs, liver, gut and digestive tract, and pancreas. Mesenchymal Stem Cells (MSC) arise from the mesoderm layer of the embryo for regenerative medicine processes like osteogenesis (bone), chondrogenesis (cartilage), myogenesis (skeletal and cardiac muscle), intestinal epithelial regeneration (gut). Hematopoietic stem cells from the MSC cells are two types: myeloid and lymphoid. Myeloid include erythrocytes, leukocytes, and thrombocytes. Lymphoid include B cells, natural killer cells, and T cells.

The embryo blastocyst, fetal amniotic fluid, and cord blood are all sources to obtain genetic or DNA information and first-generation stem cells which can be used for preimplantation blastocyst fluid testing, genetic testing, and pluripotent stem cell regenerative medicine research. The embryo blastocyst stem cells are retrieved from in vitro on day 5-7 after fertilization. It seems sufficient for biomedical, infertility, genetic testing, preimplantation blastocyst fluid testing, and pluripotent stem cell regenerative medicine research to maintain the 14-day rule for embryo research timeline [18].

Any research without specific clinical practice applications for improved functional human existence must be restricted until dying and death with dignity can be defined, agreed upon, and enacted and enforced in society. Hospice for humanity should be a focus before altering original DNA genetic code.

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