



# **Panama College of Cell Science**

## **Course Handbook**

A Summary of Course Descriptions

(Courses and Content of Courses Subject to Change Without Notice)

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*The Course Curriculum presented by the Panama College of Cell Science is as follows, and may be revised in any respect at any time without notice. All basic core biology courses are made relevant to human stem cell biology wherever possible.*

**Course #610: PCCS Biochemistry** - The study of biological molecules and main biological interactions, including Amino Acids, Peptides, Proteins, Carbohydrates, Lipids and Membranes, Nucleic Acids, Glycolysis, Citric Acid Cycle, Photosynthesis, Lipid Metabolism, DNA/RNA Structure and Replication, Protein Biosynthesis

**Course #612: PCCS Embryology and Developmental Biology** - Consideration of the development of a complete organism from a single fertilized zygote, with emphasis on human embryology and the development and identification of human stem cells. The course covers differentiation, types of early developmental cells, *in vitro* fertilization, the development of blast cells and germ layers, as well as the development of antigenic determinants as related to fetal stem cells.

**Course #614: PCCS Enzymology** - The purpose of the course is to study enzymatic reactions, and components such as enzyme, substrate, cofactor, coenzyme, activators, and inhibitors. Also covered are reaction rates. Review of enzyme assays and enzyme purification techniques.

**Course #616: PCCS Virology** - Although the course touches upon bacteriophage and plant viruses, emphasis is on animal virology. Viral structure and replication, viral recombination, virus-host interactions, antiviral drugs, vaccines, relation to immunology, and other similar topics are covered.

**Course #618: PCCS Molecular Biology (1)** - Course covers the synthesis, structure and function of proteins and nucleic acids, and fatty acids in various systems such as viruses, bacteria, and animal cells. Structure and function of mitochondrial DNA. Course continues into "PCCS Molecular Biology (2)".

**Course #620: PCCS Molecular Biology (2)** - A continuation of "PCCS Molecular Biology (1)", the course looks at gene expression and regulation, alone and as applicable to pluripotent stem cells.

**Course #622: PCCS Physiology and Human Anatomy** - The study of the human body and its parts. Structure and functions of organs and tissues, nerve and muscle feedback mechanisms, biological defense mechanisms, bone marrow and other sources of autologous stem cells.

**Course #624: PCCS Immunology** - The physical, chemical, and physiological characteristics of the human immune system, *in vitro*, *in situ*, and *in vivo*. Humoral and cellular immune response, autoimmune disease, hypersensitivities, immune deficiency, and transplant rejection. Also covered is the immunology of fetal stem cells and fetal cell transplantation, the immunology aspects of autologous stem cell transplantation, and embryonic stem cell transplantation.

**Course #626: PCCS Hormonal Rejuvenation** - Review and discussion of the hypothesis that aging is a disease. Characteristics and role of hormones in regulating human bodily function, with emphasis on hormone replacement therapy. The relationship between hormones and stem cell production and maturation is also explored.

**Course #630: PCCS Fundamentals of Stem Cell Biology** - The course covers fundamental properties of human stem cells, and their differentiation into specialized cell types. The course presents an overview of embryonic stem cells isolated from the developing mass of blastocytes, as well as adult stem cells and progenitor cells. Overview of bone marrow and umbilical cord blood sources, and creation and characterization of cloned cell lines. Self-renewal mechanisms, cell potency and potency definitions are also covered.

**Course #632: PCCS Stem Cells (Embryonic)** - The course looks at the isolation of human embryonic stem cells, cell culturing techniques, characteristics, development into the 3 primary germ layers, embryonic stem cell lines, difficulties of control, cell surface antigens and immunological considerations.

**Course #634: PCCS Stem Cells (Adult and Fetal)** - Tissue sources of human adult stem cells and fetal stem cells. Pluripotent vs multipotent cell types, and advantages in human treatment using multipotent stem cells. Comparison of autograft rejection to embryonic stem cells. Characteristics of stem cell wall antigenic determinants. The development of antigenic determinants in umbilical cord blood and fetal tissue. Amniotic stem cells. A review of techniques for inducing pluripotent stem cells, and significance of the procedure.

**Course #636: PCCS Stem Cell Laboratory Protocols** - The course covers techniques for isolating, collecting, and culturing human stem cells. Amniotic stem cell banks. A study of lineage as related to stem cell divisions. Signals and the reprogramming of stem cells. Discussion and review of hypothesis that a stem cell is a "stage" of cell, not a "type" of cell.

**Course #638: PCCS Human Regenerative Biology** - The course covers the meaning of human regenerative biology. Students conduct literature searches and consider current topics in this new field which straddles many scientific disciplines.

**Course #640: PCCS History of Medicine** - The course is intended to review the history of past medical advances as compared to the new field of stem cell treatments for disease. The "new medicine" that is human autologous stem cell treatment is placed in context to prior advances. The history of the international development of autologous adult stem cell treatments which have occurred at a rapid pace is contrasted to the failure of the USA to embrace and adopt this new treatment modality.

**Course #642: PCCS Disease Treatment with Autologous Stem Cells** - The course covers international treatments available using autologous stem cells (collected from the patient). The primary international treatment centers are reviewed. The mechanism of action is studied. The purpose of the course is to bring to light the many curative techniques being used internationally, such as the repair of severed spinal cord using neural stem cells isolated from the patients nose. It is hoped that the student can gain insight to the fact that these current international treatments are no longer "hypothetical", and hopefully will inspire the students to generate their own ideas for future work in their careers.

**Course #644: PCCS 644: Fetal and Embryonic Stem Cell Treatment** - A review of the techniques of using stem cells derived from human fetal tissue, and what diseases can be particularly controlled or cured. The course also includes a review of the current status of human embryonic stem cell treatments, why the international medical community has abandoned its interest in using embryonic stem cells, and also covering the two major drawbacks to embryonic stem cell therapy: Tendency toward proliferation (differentiation),

making stem cells almost impossible to control once injected into another body, resulting in a differentiated cell ball of many types referred to as a teratoma; and the problem of cell rejection due to having "foreign" cell membrane antigenic determinants requiring a patient to take immune suppressing drugs.

**Course #646: PCCS Growth Media, Cell Tagging, Cell Separation** - This course is directed toward an understanding of laboratory equipment and techniques used for "expanding" autologous stem cells collected from a patient. Current expansion procedures will be reviewed, and a consideration of theoretical new equipment that could be adapted or designed to make expansion more affordable will be offered.

**Course #680: PCCS Research Methodology and Writing** - Using examples, this course will review the scientific method, the basic format of a research paper, the importance and use of controlled experiments, and scientific writing practice.

**Course #682-700: Thesis Topic and Dissertation** - The student, with the guidance of the Faculty, will prepare an independent work suitable for publication. Additional information concerning the dissertation can be found at our web site by clicking on "Dissertation" which appears on the pulldown menu at "Academic Program". [Clicking Here](#) will take you to that link.

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