Epigenetic Regulation of Hematopoiesis and Acute Leukemia

Alireza Heidari¹,²,³,⁴*, Elena Locci¹,²,³ and Silvia Raymond¹,²,³

¹Faculty of Chemistry, California South University, 14731 Comet St. Irvine, CA 92604, USA
²BioSpectroscopy Core Research Laboratory, California South University, 14731 Comet St. Irvine, CA 92604, USA
³Cancer Research Institute (CRI), California South University, 14731 Comet St. Irvine, CA 92604, USA
⁴American International Standards Institute, Irvine, CA 3800, USA

*Corresponding Author: Alireza Heidari, Faculty of Chemistry, California South University, 14731 Comet St. Irvine, CA 92604, USA, email id: Scholar.Researcher.Scientist@gmail.com; Alireza.Heidari@calsu.us; Central@aiusi-usa.org

Received Date: Sep 16, 2021 / Accepted Date: Sep 30, 2021 / Published Date: Nov 03, 2021

Abstract

The cell cycle of such a subject has been thoroughly studied, yet here we are examining for the second time that we have entered a new phase; Biology always has new insights to show us. This data was amazing. This map is based on this beautiful circular pattern that we have identified as all the different stages of the cell cycle. Have a disease. When Placer and colleagues used the ccAF tool to analyze cell data for glioma tumors, we found that tumor cells were often in the G0 or G1 nerve growth state. With tumor aggression, fewer cells remain at rest in the G0 nerve state. This means that more cells are growing and growing in the tumor. We also found that G0 neurotoxicity was independent of the rate at which the tumor proliferated or the rate at which cells divided and formed new cells. It was an interesting finding from our results that inertia itself could be a different biological process. This is also a potential point where we can look for new drug therapies. If we can calm more cells to that state, the tumors will be less invasive. We also

Keywords: Cancer; Cells; Tissues, Tumors; Prevention, Prognosis; Diagnosis; Imaging; Screening; Treatment; Management


Copyright: This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. Copyright © 2021; Alireza Heidari
used their ccAF tool to find new states at the beginning and end of the cell cycle that exist between commonly known states. These are among the topics of the next stage of their research. We are thinking about ways to explore them and learn more about the biology of entering and leaving the cell cycle, because these are really important points where cells go G1 or G0. Discovering what puts a cell into a split cycle or puts it to rest in G0 can help understand the process of tumor growth. The main feature of any cancer is cell proliferation. If we could get into this place and understand what these mechanisms are, we could change their speed [1-510].

**Results and Discussion**

A mutation that fuses two unrelated genes can cause a process similar to the one seen when oil and water are mixed, but we do not mix. This process, called fluid-liquid phase separation, takes place inside the cell nucleus and provides the formation of chambers with different physical properties that can enhance cancers such as acute leukemias. Phase separation and its role in cancer has been a missing piece in understanding this disease. This finding is one of the first to link phase separation to cancer formation. This discovery offers new insights into a complex, multi-step process that is the steps of biology and physics. To help unravel the process, the researchers performed laboratory tests on cancer cells that carried a common fusion gene called NUP98-HOXA9. This aberrant fusion is only in the blood cells of patients with leukemia. Because similar gene combinations have been observed in other malignancies, the mechanism we have described could explain other types of cancer. We believe that our research could provide new and innovative ways to attack cancer cells. Inside the proteins produced by NUP98-HOXA9, there are unstructured stretches known as intrinsic irregular regions, or IDRs. The role of IDRs has been a mystery, but researchers have shown that IDRs, when we reach critical concentrations in the nucleus, separate the liquid-liquid phase from the NUP98-HOXA9 proteins, causing NUP98-HOXA9 to be phased or partial. Be divided. One way in which liquid-liquid phase separation can alter the behavior of NUP98-HOXA9 proteins is by causing them to bind more strongly to target genes. Binding of DNA to NUP98-HOXA9 proteins, when separated, creates a unique pattern called the superimposed amplifier. The strong, highly amplifying binding of NUP98-HOXA9 proteins to DNA leads to greater activity of this agent, which predisposes to the formation of invasive leukemias. Formed disrupts or dissolves, can be a therapeutic agent, we hope to be able to investigate possible therapeutic agents for phase separation, because we know that this process can also affect neurodegenerative diseases such as Alzheimer's. The researchers also discovered that phase separation can affect the three-dimensional structure of the genome by creating chromatin rings that organize the genome and help control active and inactive regions, but changes in this structure can cause human disease.

**Conclusions**

Our discovery is the first clear evidence of chromatin rings created by phase separation. It seems that this new class of rings, by binding chromatin regulatory regions to cancer genes, promotes it, thereby increasing the expression of cancer and lethality genes. Overall, the complex interactions of biology, physics, and genetics within the cell are now better understood because of this new research finding. Scientists hope to conduct more experiments in the laboratory to study specific aspects of this process in living organisms and other diseases in the near future.

**Acknowledgment**

This study was supported by the Cancer Research Institute (CRI) Project of Scientific Instrument and Equipment Development, the National Natural Science Foundation of the United Sates, the International Joint Bio Spectroscopy Core Research Laboratory Program supported by the California South
University (CSU), and the Key project supported by the American International Standards Institute (AISI), Irvine, California, USA.

References

18. Heidari A. 2016. Measurement the Amount of Vitamin D2 (Ergocalciferol), Vitamin D3 (Cholecalciferol) and Absorbable Calcium
(Ca²⁺), Iron (II) (Fe²⁺), Magnesium (Mg²⁺), Phosphate (PO₄⁻) and Zinc (Zn²⁺) in Apricot Using High-Performance Liquid Chromatography (HPLC) and Spectroscopic Techniques. J Biom Biostat. 7: 292.

19. Heidari A. 2016. Spectroscopy and Quantum Mechanics of the Helium Dimer (He²⁺), Neon Dimer (Ne²⁺), Argon Dimer (Ar²⁺), Krypton Dimer (Kr²⁺), Xenon Dimer (Xe²⁺), Radon Dimer (Rn²⁺) and Ununoctium Dimer (Uuo²⁺) Molecular Cations. Chem Sci J. 7: 112.


27. Heidari A. 2016. Discriminate between Antibacterial and Non-Antibacterial Drugs Artificial Neutral Networks of a Multilayer Perceptron (MLP) Type Using a Set of Topological Descriptors. J Heavy Met Toxicity Dis. 1: 2.


43. Heidari A. 2016. Linear and Non-Linear Quantitative Structure-Anti-Cancer Activity Relationship (QSACAR) Study of Hydrous Ruthenium (IV) Oxide (RuO2) Nanoparticles as Non-Nucleoside Reverse Transcriptase Inhibitors (NNRTIs) and Anti-Cancer Nano Drugs. J Integr Oncol. 5: 110.


52. Heidari A. 2016. Graph Theoretical Analysis of Zigzag Polyhexamethylene Biguanide, Polyhexamethylene Adipamide, Polyhexamethylene Biguanide Gauze and Polyhexamethylene Biguanide Hydrochloride (PHMB) Boron Nitride Nanotubes (BNNTs), Amorphous Boron Nitride Nanotubes (a-BNNTs) and Hexagonal Boron Nitride Nanotubes (h-BNNTs). J Appl Computat Math. 5: 143.


69. Heidari A. 2017. Polymorphism in Nano-Sized Graphene Ligand-Induced Transformation of \( \text{Au}_{38}\text{Ag}_{x}\text{Cu}_{y}\text{(SPh-tBu)}_{24} \) to \( \text{Au}_{38}\text{Ag}_{x}\text{Cu}_{y}\text{(SPh-tBu)}_{24} \) \((x = 1-12)\) Nanomolecules for Synthesis of \( \text{At}_{144}-\text{Ag}_{x}\text{Cu}_{y}\text{(SR)}_{60} \), \( \text{SC}_{60} \), \( \text{SC}_{120} \), \( \text{PET}_{60} \), \( \text{p-MBA}_{60} \), \( \text{F}_{60} \), \( \text{Cl}_{60} \), \( \text{Br}_{60} \), \( \text{I}_{60} \), \( \text{At}_{60} \), \( \text{Uus}_{60} \) and \( \text{SC}_{60}\text{H}_{13}_{60} \) Nano Clusters as Anti-Cancer Nano Drugs. J Nanomater Mol Technolog. 6: 3.


74. Heidari A. 2017. Concurrent Diagnosis of Oncology Influence Outcomes in Emergency General Surgery for Colorectal Cancer and Multiple Sclerosis (MS) Treatment Using Magnetic Resonance Imaging (MRI) and \( \text{Au}_{38}\text{(SR)}_{84} \), \( \text{Au}_{329}\text{Ag}(\text{SR})_{84} \), \( \text{Au}_{44}\text{SR}_{60} \), \( \text{Au}_{68}\text{(SR)}_{86} \), \( \text{Au}_{30}\text{(SPh)}_{44} \), \( \text{Au}_{38}\text{SC}_{2}\text{H}_{2}\text{Ph}_{24} \), \( \text{Au}_{2}\text{S}(\text{SC}_{12}\text{H}_{2}\text{Ph})_{15} \), \( \text{Au}_{3}\text{p(MBA)}_{15} \) and \( \text{Au}_{38}\text{(pMBA)}_{15} \) Nano Clusters. J Surgery Emerg Med 1: 21.


80. Heidari A. 2017. Integrative Approach to Biological Networks for Emerging Roles of Proteomics, Genomics and Transcriptomics in
the Discovery and Validation of Human Colorectal Cancer Biomarkers from DNA/RNA Sequencing Data under Synchrotron Radiation. Transcriptomics. 5: 117.
82. Heidari A. 2017. Treatment of Breast Cancer Brain Metastases through a Targeted Nanomolecule Drug Delivery System Based on Dopamine Functionalized Multi-Wall Carbon Nanotubes (MWCNTs) Coated with Nano Graphene Oxide (GO) and Protonated Polyaniiline (PANI) in Situ During the Polymerization of Aniline Autogenic Nanoparticles for the Delivery of Anti-Cancer Nano Drugs under Synchrotron Radiation. Br J Res. 4: 16.
105. Heidari A. 2017. Overview of the Role of Vitamins in Reducing Negative Effect of Decapeptyl (Triptorelin Acetate or Pamoate Salts) on Prostate Cancer Cells and Tissues in Prostate Cancer Treatment Process through Transformation of Malignant Prostate Tumors
111. Heidari A. 2017. Vibrational Decihertz (dHz), Centihertz (cHz), Millihertz (mHz), Microhertz (μHz), Nanohertz (nHz), Picohertz (pHz), Femtohertz (fHz), Attohertz (aHz), Zettahertz (zHz) and Yoctohertz (yHz) Imaging and Spectroscopy Comparative Study on Malignant and Benign Human Cancer Cells and Tissues under Synchrotron Radiation. International Journal of Biomedicine. 7: 335-340.
116. Heidari A. 2017. Vibrational Decahertz (daHz), Hectohertz (hHz), Kiloherzt (kHz), Megahertz (MHz), Gigahertz (GHz), Terahertz (THz), Petahertz (PHz), Exahertz (EHz), Zettahertz (ZHz) and Yottahertz (YHz) Imaging and Spectroscopy Comparative Study on Malignant and Benign Human Cancer Cells and Tissues under Synchrotron Radiation. Madridge J Anal Sci Instrum. 2: 41-46.
117. Heidari A. 2017. Fourier Transform Infrared (FTIR) Spectroscopy, Near-Infrared Spectroscopy (NIRS) and Mid-Infrared Spectroscopy (MIRS) Comparative Study on Malignant and Benign Human Cancer Cells and Tissues under Synchrotron Radiation with the
Passage of Time. Int J Nanotechnol Nanomed. 3: 1-6.s
119. Heidari A. 2018. Infrared Photo Dissociation Spectroscopy and Infrared Correlation Table Spectroscopy Comparative Study on Malignant and Benign Human Cancer Cells and Tissues under Synchrotron Radiation with the Passage of Time. Austin Pharmacol Pharm. 3: 1011.
129. Heidari A. 2018. Heteronuclear Correlation Experiments such as Heteronuclear Single-Quantum Correlation Spectroscopy (HSQC), Heteronuclear Multiple-Quantum Correlation Spectroscopy (HMQC) and Heteronuclear Multiple-Bond Correlation Spectroscopy (HMBC) Comparative Study on Malignant and Benign Human Endocrinology and Thyroid Cancer Cells and Tissues under Synchrotron Radiation. J Endocrinol Thyroid Res. 3: 555603.


145. Heidari A. 2018. Adsorption Isotherms and Kinetics of Multi-Walled Carbon Nanotubes (MWCNTs), Boron Nitride Nanotubes (BNNTs), Amorphous Boron...
Nitride Nanotubes (a-BNNTs) and Hexagonal Boron Nitride Nanotubes (h-BNNTs) for Eliminating Carcinoma, Sarcoma, Lymphoma, Leukemia, Germ Cell Tumor and Blastoma Cancer Cells and Tissues. Clin Med Rev Case Rep. 5: 201.


165. Heidari A. 2018. Cadaverine (1,5-Pentanediamine or Pentamethylenediamine), Diethyl Azodicarboxylate (DEAD or DEADCAT) and Putrescine (Tetramethylenediamine) Nano Molecules Incorporation into the Nano Polymeric Matrix (NPM) by Immersion of the Nano Polymeric Modified Electrode (NPME) as Molecular Enzymes and Drug Targets for Human Cancer Cells, Tissues and Tumors Treatment under Synchrotron and Synchrocyclotron Radiations. Hiv and Sexual Health Open Access Open Journal. 1: 4-11.

166. Heidari A. 2018. Improving the Performance of Nano-Endofullerenes in


170. Heidari A. 2018. Uranocene (U(C₈H₈)₂) and Bis (Cyclooctatetraene)Iron (Fe(C₈H₈)₂ or Fe (COT)₂)-Enhanced Precatalyst Preparation Stabilization and Initiation (EPPESSI) Nano Molecules”, Chemistry Reports. 1: 1-16.


180. Heidari A. 2018. Heteronuclear Single-Quantum Correlation Spectroscopy (HSQC) and Heteronuclear Multiple-Bond Correlation Spectroscopy (HMBC) Comparative Study on Malignant and Benign Human Cancer Cells and Tissues with the Passage of Time under
186. Heidari A. 2018. Fucitol, Pterodactyladiene, DEAD or DEADCAT (DiEthyl AzidoDiCarboxylaTe), Skatole, the NanoPutians, Thebacon, Pikachurin, Tie Fighter, Spermidine and Mirasorvone Nano Molecules Incorporation into the Nano Polymeric Matrix (NPM) by Immersion of the Nano Polymeric Modified Electrode (NPME) as Molecular Enzymes and Drug Targets for Human Cancer Cells, Tissues and Tumors Treatment under Synchrotron and Synchrocyclotron Radiations. Glob Imaging Insights. 3: 1-8.
188. Heidari A, Gobato R. 2018. First-Time Simulation of Deoxyuridine Monophosphate (dUMP) (Deoxyuridylic Acid or Deoxyuridylate) and Vomitoxin (Deoxynivalenol (DON)) ((3α,7α)-3,7,15-Trihydroxy-12,13-Epoxytrichotheec-9-En-8-One)-Enhanced Precatalyst Preparation Stabilization and Initiation (EPPSI) Nano Molecules Incorporation into the Nano Polymeric Matrix (NPM) by Immersion of the Nano Polymeric Modified Electrode (NPME) as Molecular Enzymes and Drug Targets for Human Cancer Cells, Tissues and Tumors Treatment under Synchrotron and Synchrocyclotron Radiations. Parana Journal of Science and Education. 4: 46-67.
189. Heidari A. 2018. Buckminsterfullerene (Fullerene), Bullvalene, Dickite and Josiphos Ligands Nano Molecules Incorporation into the Nano Polymeric Matrix (NPM) by Immersion of the Nano Polymeric Modified Electrode (NPME) as Molecular Enzymes and Drug Targets for Human Hematology and Thromboembolic Diseases Prevention, Diagnosis and Treatment under Synchrotron and Synchrocyclotron Radiations. Glob Imaging Insights. 3: 1-7.


201. Heidari A. 2018. A Modern and Comprehensive Investigation of Inelastic Electron Tunneling Spectroscopy (IETS) and Scanning Tunneling Spectroscopy on Malignant and Benign Human Cancer Cells, Tissues and Tumors through Optimizing
204. Heidari A. 2018. 2-Amino-9-((1S, 3R, 4R)-4-Hydroxy-3-(Hydroxymethyl)-2-Methylenecyclopentyl)-1H-Purin-6(9H)-One, 2-Amino-9-((1R, 3R, 4R)-4-Hydroxy-3-(Hydroxymethyl)-2-Methylenecyclopentyl)-1H-Purin-6(9H)-One, 2-Amino-9-((1R, 3R, 4S)-4-Hydroxy-3-(Hydroxymethyl)-2-Methylenecyclopentyl)-1H-Purin-6(9H)-One and 2-Amino-9-((1S, 3R, 4S)-4-Hydroxy-3-(Hydroxymethyl)-2-Methylenecyclopentyl)-1H-Purin-6(9H)-One Enhanced Precatalyst Preparation Stabilization and Initiation Nano Molecules. Glob Imaging Insights. 3: 1-9.


221. Heidari A. 2019. The Hydrolysis Constants of Copper (I) (Cu⁺) and Copper (II) (Cu²⁺) in Aqueous Solution as a Function of pH Using a Combination of pH Measurement and Biospectroscopic Methods and Techniques. Glob Imaging Insights. 4: 1-8.


238. Heidari A. 2019. The Importance of the Power in CMOS Inverter Circuit of Synchrotron and Synchrocyclotron Radiations Using 50 (nm) and 100 (nm) Technologies and Reducing the Voltage of Power Supply. Radiother Oncol Int. 1: 1002-1015.


420. Heidari A. 2020. Oncological Study of Thin Layers of Imatinib Molecule Nanostructure for Chronic Myelogenous Leukemia (CML), Acute Lymphocytic Leukemia (ALL), Philadelphia Chromosome-Positive (Ph+), Gastrointestinal Stromal Tumors (GIST), Hypereosinophilic Syndrome (HES), Chronic Eosinophilic Leukemia (CEL), Systemic Mastocytosis and Myelodysplastic...


457. Heidari A, Gobato R. 2020. New Opportunities for Tensor-Free Calculations of...


470. Heidari A, Hotz M, MacDonald N, et al. 2021. Emerging Use of Osmium Dioxide (OsO$_2$) and Osmium Tetroxide (OsO$_4$) Nanoparticles in Prevention, Prognosis, Diagnosis, Imaging, Screening, Treatment and Management of Cancer under Synchrotron and
483 Heidari A, Hotz M, MacDonald N, et al. 2021. Rhodium (III) Oxide or Rhodium Sesquioxide (Rh₂O₃) and Rhodium (IV) Oxide (RhO₂) Effect on the Stop Growth of Cancer Cells, Tissues and Tumors under Synchrotron and Synchrocyclotron Radiations. Int J Hematol Oncol. 4: 106-149.
484 Heidari A, Hotz M, MacDonald N, et al. 2021. Removal Role, Application and Effect of Nanocluster Rhenium (IV) Oxide (ReO₂), Rhenium Trioxide (ReO₃) and Rhenium (VII) Oxide (Re₂O₇) Thin Films Delivery in...
488. Heidari A, Hotz M, MacDonald N, et al. 2021. Active Targeting of Rhenium (IV) Oxide (ReO₂), Rhenium Trioxide (ReO₃) and Rhenium (VII) Oxide (Re₂O₇) Nanoparticles as Cancer Therapeutics Swell-up to Kill Cancer Cells under Synchrotron and Synchrocyclotron Radiations. International Journal of Advanced Chemistry. 9: 103-121.

Authors’ Brief Biographies

Prof. Dr. lireza Heidari. Ph.D., D.Sc. is a Full Distinguished Professor and Academic Tenure of Chemistry and also Enrico Fermi Distinguished Chair in Molecular Spectroscopy at California South University (CSU), Irvine, California, USA. He has got his Ph.D. and D.Sc. degrees from California South University (CSU), Irvine, California, USA. Furthermore, he has double postdocs in Project Management, Oncology, Human Cancer Tissues and Synchrotron Radiation from Monash University, Melbourne, Victoria, Australia and also in Nano chemistry and Modern Molecular Electronic-Structure Computations Theory from California South University (CSU), Irvine, California, USA. His research interests include Biophysical Chemistry, Biomolecular and Biomedical Spectroscopy, Quantum Chemistry, Nano chemistry, Modern Electronic Structure Computations, Theoretical Chemistry, Mathematical Chemistry, Computational Chemistry, Vibrational Spectroscopy, Molecular Modelling, Ab initio & Density Functional Methods, Molecular Structure, Biochemistry, Molecular Simulation, Pharmaceutical Chemistry, Medicinal Chemistry, Oncology, Synchrotron Radiation, Synchrocyclotron Radiation, LASER, Anti-Cancer Nano Drugs, Nano Drugs Delivery,
Epigenetic Regulation of Hematopoiesis and Acute Leukemia

DOI: https://doi.org/10.36811/jca.2021.110015

JCA: November-2021: Page No: 237-275

ATR-FTIR Spectroscopy, Raman Spectroscopy, Intelligent Molecules, Molecular Dynamics, Biosensors, Biomarkers, Molecular Diagnostics, Numerical Chemistry, Nucleic Acids, DNA/RNA Monitoring, DNA/RNA Hypermethylation & Hypomethylation, Human Cancer Tissues, Human Cancer Cells, Tumors, Cancer Tissues, Cancer Cells, etc. He has participated at more than five hundred reputed international conferences, seminars, congresses, symposiums and forums around the world as yet. Also, he possesses many published articles in Science Citation Index (SCI)/International Scientific Indexing (ISI), Medline/PubMed and Scopus Journals. It should be noted that he has visited many universities or scientific and academic research institutes in different countries such as United States, United Kingdom, Canada, Australia, New Zealand, Scotland, Ireland, Netherlands, Belgium, Denmark, Luxembourg, Romania, Greece, Russia, Estonia, Ukraine, Turkey, France, Swiss, Germany, Sweden, Norway, Italy, Austria, Czech Republic, Hungary, Poland, South Africa, Egypt, Brazil, Spain, Portugal, Mexico, Japan, Singapore, Malaysia, Indonesia, Thailand, Taiwan, Hong Kong, Philippines, South Korea, China, India, Kingdom of Saudi Arabia, Jordan, Qatar, United Arab Emirates, etc. as research fellow, sabbatical and volunteer researcher or visitor and so on heretofore. He has a history of several years of teaching for college students and various disciplines and trends in different universities. Moreover, he has been a senior advisor in various industry and factories. He is expert in many computer programs and programming languages. Hitherto, he has authored more than twenty books and book chapters in different fields of Chemistry. Syne, he has been awarded more than one thousand reputed international awards, prizes, scholarships and honors. Heretofore, he has multiple editorial duties in many reputed international and peer-reviewed journals, books and publishers. Hitherward, he is a member of more than five hundred reputed international academic-scientific-research institutes around the world. It should be noted that he is currently the President of the American International Standards Institute (AISI), Irvine, California, USA and also Head of Cancer Research Institute (CRI) and Director of the Bio Spectroscopy Core Research Laboratory at California South University (CSU), Irvine, California, USA.

Elena Loci is a Ph.D. Candidate under the Supervision of Professor Alireza Haidari at Cancer Research Institute (CRI) and Bio Spectroscopy Core Research Laboratory at California South University (CSU), Irvine, California, USA.
Dr. Silvia Raymond, Ph.D., D.Sc. is the current Junior Postdoctoral Research Fellows under the Supervision of Professor Alireza Haidari at Cancer Research Institute (CRI) and Bio Spectroscopy Core Research Laboratory at California South University (CSU), Irvine, California, USA.