HUDSON- BERGEN CHEMICAL SOCIETY

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THE DEPARTMENT OF BIOCHEMISTRY, CHEMISTRY AND PHYSICS, OLSEN COLLEGE OF ENGINEERING AND SCIENCE, FAIRLEIGH DICKINSON UNIVERSITY

27th Annual Student

Research Symposium and Awards Night

May 1, 2026

Hudson-Bergen Chemical Society

Subsection of the New York Section of

The American Chemical Society

Ish Kumar, Ph.D. May 1, 2026

Chair 2026

Hudson Bergen Chemical Society

Welcome to the 27th Annual Undergraduate Research Symposium and Student Awards Night, organized by the Hudson-Bergen Chemical Society in partnership with the Department of Biochemistry, Chemistry **and** Physics of Fairleigh Dickinson University. This symposium serves as a platform for students and their faculty mentors — representing colleges, and universities participating in the Society's subsection activities — to present the outcomes of their research endeavors.

We are pleased to honor outstanding graduating undergraduate students majoring in chemistry or

biochemistry, who will be recognized by the Hudson-Bergen Chemical Society Award for their exemplary contributions.

Congratulations to all presenters and award recipients. We take great pride in your achievements and talking about your work. We also hope that this event will encourage you to continue your journey into the magnificent world of science.

An event of this size cannot be organized without the help of many people, including the officers of Hudson Bergen Chemical Society, the students involved, and the members of the section. Together we can continue to advance the frontier of knowledge and make meaningful contributions to our field and society at large. A warm thanks to all.

The Hudson-Bergen Chemical Society is proud to recognize outstanding graduating students, the students presenting their work, and their mentors. Welcome to everybody!

The chemistry programs of the following colleges are members of the Hudson-Bergen Chemical Society

Bergen Community College

Fairleigh Dickinson University

New Jersey City University

Ramapo College of New Jersey

St. Peter's University

Stevens Institute of Technology

Hudson-Bergen Chemical Society Officers, 2026

Dr. Ish Kumar, Chair

Dr. Mihaela D. Leonida, Secretary

Dr. Stephen Anderson, Treasurer

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Dr. Yosra Badiei

Dr. Yufeng We

Mr. Thomas Drwiega

HUDSON-BERGEN CHEMICAL SOCIETY

2026 STUDENT AWARDS

The following students have been recognized for their academic achievements by the chemistry departments of their respective schools:

Maria Silva

Fairleigh Dickinson University

Fatima Rizwan

New Jersey City University

Alyana Coelho

Ramapo College of New Jersey

Harris Satti

St. Peter's College

HUDSON-BERGEN CHEMICAL SOCIETY

27th ANNUAL

STUDENT RESEARCH SYMPOSIUM

Fairleigh Dickinson University – Metropolitan Campus
May 1, 2026

Times: Student presentations : 4:30 pm

Dinner and Awards : 6:00 pm

Plenary lecture : 6:45 pm

Place: Dickinson Hall Room 4468

This year's symposium also features the lecture:

Computer-Aided Design and Optimization of Novel Inhibitors as Therapeutic Candidates

presented by

Junyong Choi, Ph.D.

Department of Chemistry and Biochemistry, Queens College - City University of New York

Junyong Choi, Ph.D.

Department of Chemistry and Biochemistry, Queens College - City University of New York

Abstract of the talk: Computer-aided molecular modeling is an efficient and cost-effective strategy for the discovery and development of small-molecule inhibitors in academic settings. This seminar highlights efforts to develop small-molecule inhibitors targeting *Trypanosoma brucei* Replication Protein A1 (TbRPA1) and Casein Kinase (CK1) for the treatment of infectious diseases and cancer, respectively. Specifically, this talk will cover the structure-based design and development of anti-*T. brucei* agent, which exhibits low nanomolar inhibition potency against *T. brucei* and over 2,000-fold selectivity versus human HeLa cells. In addition, a novel small-molecule inhibitor of CK1e was identified through in silico screenings of chemical libraries.

This hit was subsequently optimized using molecular modeling, organic synthesis, and biochemical assays, leading to the development of highly potent and selective CK1e inhibitors. Our in-house inhibitors represent promising candidates for further investigation in *in vivo* models of parasitic infection and human cancers. Overall, computer-aided molecular modeling is a powerful technique for the development of therapeutic candidates in medicinal chemistry research.

Bio note: Junyong Choi received his Ph.D. degree in bioorganic chemistry from Stony Brook University in 2009, under the direction of Prof. Dale Drueckhammer and Prof. Richard Lin. He studied the development of chemical agents targeting the mammalian target of rapamycin (mTOR). Dr. Choi started his postdoctoral training in the Roush Laboratory at The Scripps Research Institute – Florida as a Pfizer-Scripps Florida postdoctoral fellow in 2009, and after 3 years, he was promoted to Senior Research Associate. His research focused on medicinal chemistry by applying organic synthesis combined with computer-aided drug design techniques. In 2017, Dr. Choi moved to Queens College – City University of New York as an Assistant Professor, tenured in 2025. His research interests focus on the development of small-molecule inhibitors and peptidomimetics by applying organic synthesis, computer-aided molecular design, and biochemical assays.

PROGRAM

4:30 Opening of the symposium. Welcome – DH 4468

STUDENT PRESENTATIONS

ROOM DH 4468

4:40 Titanium Dioxide-Based 1D Nanorods for Photocatalytic Degradation of Organic Pollutants, Harris Satti and Yosra M. Badiei (mentor)

4:50 Green Synthesis of Chitosan Nanoparticles Encapsulating Phycocyanin and Catalase for Enhanced Stability and Antioxidant Activity, Lavanya Vemuri and Andrea Ougaard, Mihaela Leonida (mentor), Ish Kumar (mentor)

5:00 Sustainable Nitrogen-Doped Activated Carbons from Cashew Nut Shells as Metal-Free Catalysts for Advanced Water Treatment, Joy Ogunmileto, Ruth Sarah Davis Espinoza, Isabella Price, Paola de Souza Pauletto (mentor), Teresa Bandosz (mentor), Svetlana Bashkova (mentor)

5:10 Mass Spectrometric Quantification of Bromobenzene in Waste Acetone and Evaluation of Purification Strategies, Jaysen Pineda, Robert D Barrows (mentor), Svetlana Bashkova (mentor)

5:20 Exploring the Kinetic Activity of Matrix Metalloproteinases in the Presence of Activators and Inhibitors, Prachet Trivedi, Vidhi Ojha, Ish Kumar (mentor)

5:30 Oil-Based Cream Formulations: How Oil Type and EDTA Affect Viscosity and What That Means for Skin Health, Hassan Farooq, Ish Kumar (mentor)

ROOM DH 4469

4:40 The Effects of Dopamine on Crayfish, Camila Saunders, Brielle Schilling, Danielle Levy, Jayla Clark, Nya Blades, Jayden Mabry, Justin Cruz, Noemi Vasquez, Hara Rahman, Roslyn Zometa, Josh Stout (mentor)

4:50 Investigating the role of PMK-1 in cell migration during *C. elegans* development. Johnna Mainhart, Dr. Andre Wallace (mentor)

5:00 Dopamine Deception: Exploring The Inhibitory Effect of Dopamine Models. Adrianna Argenziano, Talia Baptiste, Cassandra Brown, Jayla Clark, Danielle Levy, MaryJane Limon, Daniel Mack, Andrea Ougaard, Irthu Pillai, Kenya Rodriguez, Brielle Schilling, Josh Stout (mentor)

5:20 Chemical Synthesis, Purification, and Characterization of S-Glycoside Derivative of 2-Acetamido-2-deoxyl-1-thio-β-D-glucopyranoside (GlcNAcβSG), Mukti Parmar, Ish Kumar (mentor)

5:10 Functional Comparison of Octopamine and Dopamine in Modulating Crayfish Locomotor Behavior, Danielle Levy, Brielle Schilling, Jayla Clark, Nya Blades, Jayden Mabry, Camila Saunders, Justin Cruz, Noemi Vasquez, Hara Rahman, Roslyn Zometa, Josh Stout (mentor)

5:20 The Role of FSHR Gene Polymorphism in the Etiology of Recurrent Miscarriage: An Investigative Study, Rutvi Lad, Marion McClary (mentor)

6:00 Dinner and Awards

6:45 Plenary lecture: Computer-Aided Design and Optimization of Novel Inhibitors as Therapeutic Candidates. presented by Dr. Junyong Choi, Department of Chemistry and Biochemistry, Queens College - City University of New York

ABSTRACTS

Titanium Dioxide-Based 1D Nanorods for Photocatalytic Degradation of Organic Pollutants

Harris Satti and Yosra M. Badiei (mentor), Chemistry Department, Saint Peter's University, Jersey City, NJ

Titanium dioxide (TiO_2) nanoparticles (NPs) have been widely investigated for applications in photocatalysis, energy conversion, and environmental remediation. 1D-nanostructures, such as nanorods (NRs) are amongst the nanomaterial family due their large surface area and significant enhancements in photocatalytic properties. TiO_2 nanoparticles were first prepared from titanium isopropoxide using a hydrothermal autoclave method and subsequently converted into TiO_2 nanorod structures in NaOH-assisted autoclave synthesis under high pressure and temperature conditions. Polyaniline was then deposited onto the nanorods via $FeCl_3$-catalyzed oxidative polymerization, forming a TiO_2/PANI heterojunction. The formation of the composite was confirmed by ATR-FTIR spectroscopy which revealed characteristic vibrational IR bands, including prominent C–N stretching modes indicative of polyaniline that were absent in the TiO_2 nanorods. Scanning electron microscopy (SEM) imaging reveals distinct differences in nanostructured morphology, with TiO_2 nanorods (NRs) exhibiting elongated, anisotropic architectures, in contrast to the more isotropic and aggregated structures observed for anatase TiO_2 nanoparticles (NPs). The resulting light bluish-

green TiO_2/PANI composite was evaluated as a catalyst for photocatalytic degradation of persistent organic pollutants such as 2-mercaptobenzothiazole (2-MBT) and its photocatalytic activity will be compared to the pristine TiO_2 nanoparticles and TiO_2 nanorods. The improved charge transfer and the generation of reactive oxygen species to enable efficient photodegradation under solar illumination by these titania composites will be highlighted.

Green Synthesis of Chitosan Nanoparticles Encapsulating Phycocyanin and Catalase for Enhanced Stability and Antioxidant Activity

Lavanya Vemuri and Andrea Ougaard, Mihaela Leonida (mentor), Ish Kumar (mentor), Department of Biochemistry, Chemistry and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

Chitosan (2-amino-2-deoxy-β-D-glucan units linked 1à4 through glycosidic bonds) is non-toxic, biodegradable, and inexpensive as it is easily available from renewable natural sources (chitin from crustaceans and fungi) by chemical deacetylation or fermentation. Due to its size, nanochitosan is used in skin care for its own properties, as a vehicle for bioactive principles, and in wound care for its mucoadhesive and antibacterial properties. It has a high surface to volume ratio hence higher surface charge density and stronger biological activity than the starting chitosan. Chitosan nanoparticles (CNP) were prepared using a green procedure

and natural compounds with biological activity, with the objective to fight oxidative stress in general as well as aging and photoaging of the skin in particular. Spirulina extract in an aqueous solution of 1-ethyl-3-methylimidazolium tetrafluoroborate (main component: phycocyanin, PC) and catalase (CAT), both known antioxidants, were encapsulated in CNP using several PC:CAT ratios. The composites were characterized by: size, zeta potential value, FTIR spectra, encapsulation efficiency, and loading capacity. CAT retained activity after encapsulation and showed remarkable residual activity over 5 months. The particles displayed protective effect for phycocyanin when exposed to light. Their biological activity was evaluated using antioxidant assays and MMP-1 inhibition assays. The kinetics of phycocyanin release from the nanocomposites was monitored over 15 days. After an initial burst, all composites displayed sustained release and good mechanical stability of the matrices. The CNP nanocomposites enhanced the stability of PC and CAT and showed promise for applications in wound and skin care.

Sustainable Nitrogen-Doped Activated Carbons from Cashew Nut Shells as Metal-Free Catalysts for Advanced Water Treatment

Joy Ogunmileto[1], Ruth Sarah Davis Espinoza[1], Isabella Price[1], Paola de Souza Pauletto (mentor)[2], Teresa Bandosz (mentor)[2], Svetlana Bashkova (mentor)[1],[1]Department of Biochemistry, Chemistry, and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Madison, NJ, [2]The City College of New York and The Graduate School of City University of New York, Department of Chemistry and Biochemistry, 160 Convent Ave., New York, NY.

The increasing presence of pharmaceutical contaminants in water systems poses a significant challenge for environmental and public health, particularly in healthcare-related wastewater where antibiotics such as sulfamethoxazole (SMX) are frequently detected. Beyond direct toxicity, the persistence of antibiotics in aquatic environments contributes to antibiotic-resistant bacteria and the spread of antibiotic resistance genes (ARGs), underscoring the need for effective treatment technologies. In this context, metal-free catalysts have emerged as a promising alternative to conventional metal-based systems for advanced oxidation processes. In this work, nitrogen-doped activated carbons derived from renewable cashew nutshell biomass were synthesized and evaluated as metal-free catalysts for the removal of SMX through combined

adsorption and peroxymonosulfate (PMS)-based oxidation. The prepared materials exhibit tunable surface chemistry and pore structure, enabling investigation of structure–property relationships. The results demonstrate that both adsorption capacity and catalytic activity are governed by the interplay between surface functional groups and pore accessibility. Light irradiation enhances performance, highlighting the role of photo-induced electron transfer in PMS activation. Mechanistic studies reveal that SMX degradation proceeds through a non-radical pathway involving singlet oxygen, offering improved selectivity and reduced sensitivity to background constituents. Overall, this study shows that low-cost, biomass-derived nitrogen-doped activated carbons can function as effective metal-free catalysts for antibiotic removal from water.

Mass Spectrometric Quantification of Bromobenzene in Waste Acetone and Evaluation of Purification Strategies

Jaysen Pineda, Robert D Barrows (mentor), Svetlana Bashkova (mentor), Department of Biochemistry, Chemistry, and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Madison, NJ

Acetone is a widely used solvent in organic chemistry laboratories, yet its disposal presents economic and logistical challenges for academic institutions. Previous purification efforts, including simple distillation via rotary evaporation and filtration through activated charcoal, were

only partially effective, leaving behind unreacted bromobenzene from Grignard reactions performed in undergraduate laboratories. This project investigates the presence and quantification of bromobenzene in used acetone and evaluates improved methods for its detection and removal. Mass spectrometry was employed to more precisely determine bromobenzene concentrations, using calibration through serial dilutions and analysis of peak area to quantify contamination levels. These measurements enabled a more accurate assessment of waste acetone composition and informed subsequent purification strategies. The results support the potential of absorption-based methods, such as activated charcoal as a more practical and scalable alternative to traditional fractional distillation, a time and resource- intensive method. This work contributes to the development of more efficient solvent recovery practices in undergraduate laboratories, with implications for cost reduction and sustainability.

Exploring the Kinetic Activity of Matrix Metalloproteinases in the Presence of Activators and Inhibitors

Prachet Trivedi[1], Vidhi Ojha[2], Ish Kumar[3] (mentor), [1] Seton Hall University, South Orange, NJ. [2]John P Stevens High School, Edison, NJ, [3]Department of Biochemistry, Chemistry and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ.

Matrix metalloproteinases (MMPs) are zinc- and calcium-dependent enzymes that play essential roles in numerous physiological processes, including extracellular matrix remodeling, tissue repair, immune function, and cardiovascular regulation. Our laboratory has identified several catechol derivatives that act as modulators of MMP activity, exhibiting either activating or inhibitory effects depending on experimental conditions.In this study, we performed simulation experiments followed by kinetic data analysis using nonlinear regression modeling in DynaFit 4.0 and proprietary Python-based tools. Our results demonstrate that the same catechol-derived molecule can function as an activator at lower concentrations and as an inhibitor at higher concentrations. Furthermore, we successfully modeled the kinetic behavior of multiple catechol derivatives in both the absence and presence of calcium ions. These findings provide insight into the concentration-dependent dual functionality of catechol-based MMP modulators and

highlight the importance of calcium in influencing their activity.

Oil-Based Cream Formulations: How Oil Type and EDTA Affect Viscosity and What That Means for Skin Health

Hassan Farooq, Ish Kumar (mentor), Department of Chemistry, Biochemistry and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

This study looked at how the type of oil used in cream formulation, as well as the addition of a chelating agent called EDTA, affects the cream's viscosity (thickness). Five cream formulations were made: one mineral oil-based cream with EDTA, one without EDTA, and three creams made with botanical oils - mustard oil, coconut oil, and canola oil. Oil formulations were created using identical formulation ratios while varying only the oil type. Viscosity was measured at different speeds using a Brookfield DV-II+ viscometer. All five creams showed shear thinning behavior, meaning they became less thick when a force was applied to them, which is exactly what you want in a skin cream so it spreads easily but stays in place when at rest. The cream containing EDTA was noticeably thicker than the same cream without it. Among the botanical oil creams, coconut oil produced the thickest cream (983,000 cP at 0.5 RPM), followed by canola oil (673,000 cP) and mustard oil (323,000 cP). These differences matter clinically because a

thicker cream creates a stronger physical barrier on the skin, which helps reduce moisture loss, something especially important for people with eczema or dry skin. Each oil also carries natural antioxidants and fatty acids that may provide additional biological benefits to the skin beyond just physical protection.

The Effects of Dopamine on Crayfish

Camila Saunders, Brielle Schilling, Danielle Levy, Jayla Clark, Nya Blades, Jayden Mabry, Justin Cruz, Noemi Vasquez, Hara Rahman, Roslyn Zometa, Josh Stout (mentor), Department of Biological Sciences, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

This study examined the effects of dopamine and food filtrate on juvenile crayfish activity. The hypothesis stated that dopamine has an inhibitory effect on crayfish movement rather than acting as a stimulant. Crayfish were exposed to four treatment conditions: deionized water (DI), dopamine, food filtrate, and dopamine plus food filtrate, with movement recorded over 20 minutes. Activity varied across treatments, with food filtrate increasing movement and dopamine, alone or combined with food filtrate, decreasing activity. Food filtrate ($N = 420$) compared to dopamine plus food filtrate ($N = 160$) showed a significant difference ($p = 0.0003$), while deionized water ($N = 340$) compared to dopamine plus food filtrate ($N = 160$) was not significant (p

= 0.7393). Results support dopamine as an inhibitory modulator of crayfish activity.

Investigating the role of PMK-1 in cell migration during *C. elegans* development.

Johnna Mainhart, Dr. Andre Wallace (mentor), Department of Biological Sciences, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

Cell migration is a critical process in mammalian organisms. It regulates processes like development, wound healing, immune response and others. Metastatic cancer is one of numerous disorders linked to abnormal cell migration. Actin polarization is key during cell migration. In *C. elegans*, actin is nucleated via the WAVE pathway to trigger cell movement. The WAVE complex is activated in response to signals from axonal guidance receptors SAX-3/robo, VAB-1/ephrin and UNC-40/netrin. Mutating any WAVE pathway gene prevents proper actin nucleation and leads to failed epidermal closure, ultimately causing death. During the epidermal ventral enclosure step of morphogenesis, actin becomes enriched at the leading edge of the migrating cells and promotes enclosure. Previously, we identified the Mitogen-Activating Protein kinase, PMK-1, gene as a potential WAVE pathway regulator. Loss of *pmk-1* resulted in embryos with *wve*-like phenotypes and double mutants of *pmk-1* with one of the axonal guidance receptors rescued embryonic death. Here, we examined actin levels in *pmk-1*

and *wve* pathway mutants using the LifeAct actin reporter. Loss of PMK-1 increased actin in ventral epidermal cells. Double mutants of *vab-1* and *pmk-1* shows slightly increased actin levels. These results align with the increased embryonic lethality seen in *vab-1* mutants when *pmk-1* is mutated. We will further investigate PMK-1's role during actin nucleation in embryogenesis. Our data strongly suggests that PMK-1 has a role, likely in response to stimuli from one or more of the axonal receptors.

Dopamine Deception: Exploring The Inhibitory Effect of Dopamine Models

Adrianna Argenziano, Talia Baptiste, Cassandra Brown, Jayla Clark, Danielle Levy, MaryJane Limon, Daniel Mack, Andrea Ougaard, Irthu Pillai, Kenya Rodriguez, Brielle Schilling, Josh Stout (mentor), Department of Biological Sciences, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

This study examines dopamine mediated inhibition and motivation utilizing crawfish as an animal model. Dopamine is an essential neurotransmitter involved in pathways related to desire and reward. Crawfish are good model organisms becaus of their highly permeable circulatory system. Crayfish were exposed to 2ml of dopamine in a tank dosed with food filtrate and observed for 20 minutes. Crawfish movement was quantified with one movement noted each time the head crossed a line of a grid. Crawfish unexposed to dopamine had a higher mean movement per minute. This

indicated dopamine was stimulatory. To test why dopamine was stimulatory in the classroom when previous experiments had shown it to be inhibitory in a quiet laboratory, the experimental setting was varied as a new treatment. Dopamine treated crawfish were placed in a "quiet" and a "loud" room. Preliminary results indicated the quiet room was inhibitory, while the loud room was stimulatory. This may indicate that dopamine's role allows for different results depending on the setting. Dopamine appears to make experimental organisms extremely susceptible to outside disturbance.

Functional Comparison of Octopamine and Dopamine in Modulating Crayfish Locomotor Behavior

Danielle Levy, Brielle Schilling, Jayla Clark, Nya Blades, Jayden Mabry, Camila Saunders, Justin Cruz, Noemi Vasquez, Hara Rahman, Roslyn Zometa, Josh Stout (mentor), Department of Biological Sciences, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

Octopamine's role in invertebrate physiology remains debated, with some proposing it functions analogously to epinephrine and others suggesting it is more comparable to dopamine. This study examined crayfish locomotion following exposure to dopamine (DA) and octopamine (OA) in combination with food filtrate after a 20-minute acclimation period. Both treatments produced similar behavioral effects, characterized by reduced movement and

comparable locomotor patterns. Although differences between groups were statistically significant, the overall behavioral outcomes were highly similar. These findings support the conclusion that octopamine functions more similarly to dopamine in crayfish, rather than serving as an invertebrate analog of epinephrine.

Chemical Synthesis, Purification, and Characterization of S-Glycoside Derivative of 2-Acetamido-2-deoxyl-1-thio-β-D-glucopyranoside (GlcNAcβSG)

Mukti Parmar, Ish Kumar (mentor), Department of Biochemistry, Chemistry and Physics, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

Synthetic S- glycoside derivatives of N-acetylglucosamine are being explored for various cancer therapies. These are potential candidates for N-O-glycan biosynthesis for cancer cells. Here we are exploring their potential against various cancer target enzymes, including matrix metalloproteinases (MMPs). In the synthetic scheme, urea salt was prepared from commercially purchased 2-Acetamido-3,4,6-O-triacetyl-2-deoxyglucopyranosyl chloride by refluxing with thiourea. The thiourea salt was isolated and further derivatized to the desired product S-glycoside derivative (GLcNSG) by nucleophilic substitution with geranyl bromide. The product was isolated and purified by silica gel column chromatography using a hexane-ethyl acetate mixture.

The Role of FSHR Gene Polymorphism in the Etiology of Recurrent Miscarriage: An Investigative Study

Rutvi Lad, Marion McClary (mentor), Department of Biological Sciences, Olsen College of Engineering and Science, Fairleigh Dickinson University, Teaneck, NJ

This investigative study, presented by Rutvi Lad at Akanksha Hospital, explores the relationship between Single Nucleotide Polymorphisms (SNPs) in the Follicle Stimulating Hormone Receptor (FSHR) gene and Recurrent Miscarriage (RM), defined as three or more consecutive pregnancy losses before 20 weeks. The research specifically focuses on the Ser680Asn polymorphism, where the amino acid Asparagine (Asn) is replaced by Serine (Ser) at position 680, potentially disrupting hormonal signaling and follicular development essential for healthy oocytes. Using DNA isolated from whole blood, the study employed Polymerase Chain Reaction (PCR) and Restriction Fragment Length Polymorphism (RFLP) with the BseNI enzyme to categorize participants as normal (wild-type AA, Asn-Asn), carriers (GG, Ser-Ser), or mutants (AG, Asn-Ser) based on distinct DNA fragment patterns. The findings identified various degrees of polymorphism among RM patients, suggesting that mutated FSHR genes can lead to underdeveloped oocytes and low-potential embryos that result in early pregnancy loss. Consequently, this pilot study concludes that FSHR polymorphism may serve as a vital biomarker for

screening at-risk females and guiding preventative therapies to improve reproductive outcomes.