

2024 年 12 月 23 日

## サイエンス・ダイアログ 実施報告書

1. 学校名・実施責任者氏名: 愛知県立明和高等学校
2. 講師氏名: Dr. Ahmed Mohamed Rashwan
3. 講義補助者氏名: 藤井佳穂 様
4. 実施日時: 2024 年 12 月 17 日 (火) 13:00~15:00
5. 参加生徒: 1 年生 10 人、 2 年生 7 人、 3 年生 0 人 (合計 17 人)  
備考: (例: 理数科の生徒)
6. 講義題目: ヒト IPS 細胞を用いたインスリン遺伝子異常糖尿病の病態解明と治療戦略
7. 講義概要: Our presentation will cover three types of diabetes—type 1, type 2, and monogenic diabetes—with a focus on monogenic diabetes, a rare form caused by single gene mutations. Our research aims to elucidate the underlying mechanisms of monogenic diabetes and to identify a promising drug candidate for its treatment. We are specifically investigating an insulin gene mutation (INS C.188-31G>A) recently identified in Japan and linked to early-onset diabetes. To study this condition, we used human iPS cells to create a disease model, known as an "iPS disease model," that mimics the human disease phenotype. We introduced the INS C.188-31G>A insulin gene mutation into human iPSCs using CRISPR/Cas9 gene editing. After differentiating these cells into insulinproducing beta cells in vitro (in a culture dish), we compared the phenotypes of healthy and mutant cells to understand the pathophysiological mechanisms of the disease. Furthermore, we will share our findings on a potential drug that restores insulin function in mutated cells, along with our in vivo (mouse model) test results showing promising therapeutic effects. I am looking forward to discussing the future of regenerative medicine using iPS cells.
8. 講義形式:  
☒ 対面 ・ ☐ オンライン (どちらか選択ください。)  
1) 講義時間 90 分 質疑応答時間 30 分  
2) 講義方法 (例: プロジェクター使用による講義、実験・実習の有無など)  
プロジェクター使用による講義、実験有  
3) 事前学習  
有 ・ ☒ (どちらかに○をしてください。)  
使用教材
9. その他特筆すべき事項:

Form B-2  
(FY2024)  
Must be typed

Date (日付)  
18/12/2024  
(Date/Month/Year : 日/月/年)

**Activity Report -Science Dialogue Program-**  
(サイエンス・ダイアログ 実施報告書)

- Fellow's name (講師氏名) : Ahmed Mohamed El Sayed Rashwan \_\_\_\_\_  
(ID No. P23413)

- Name and title of the lecture assistant (講義補助者の職・氏名)  
Kaho Fujii sensei

- Participating school (学校名) : Meiwa Senior High School, Aichi Prefecture

- \_\_\_\_\_ Date (実施日時) : 17/12/2024  
(Date/Month/Year: 日/月/年)

- Lecture title (講義題目) :  
**Mechanistic Insight and Therapeutic Strategy for Diabetes with Insulin Mutation using Human iPSCs**

- Lecture format (講義形式) :

◆☒ Onsite ・ ☐ Online (Please choose one.) (対面 ・  
オンライン) ( (どちらか選択ください。 ) )

◆Lecture time (講義時間) 90 min (分), Q&A time (質疑応答時間) 30  
min (分)

◆Lecture style (ex.: used projector, conducted experiments)

(講義方法 (例: プロジェクター使用による講義、実験・実習の有無など) )

A projector was utilized to display the PowerPoint slides.

- Lecture summary (講義概要) : Please summarize your lecture within 200-500 words.

The lecture began with a self-introduction, during which I shared details about myself, my country, and my educational and scientific background. This opening helped establish rapport with the students and set a welcoming tone for the presentation. I then transitioned into the scientific portion by discussing iPSCs, providing an overview of their significance in modern scientific research and their potential applications in regenerative treatments.

Building on this foundation, I elaborated on the various applications of iPSCs before introducing the topic of diabetes, with a particular focus on monogenic diabetes. I explained the aim of my study: to uncover the mechanisms underlying this disease and

identify effective drugs for its treatment. I highlighted how human iPS cells serve as a valuable model for investigating disease mechanisms and developing therapeutic interventions. To engage the students further, I encouraged them to adopt a scientific mindset by first identifying a problem and then systematically working toward its solution. To illustrate this approach, I demonstrated the process of generating insulin-producing cells from normal and mutant iPS cells through differentiation, comparing the two to better understand the disease mechanisms.

To ensure the content was accessible and engaging, I used a variety of visual aids, including figures, schematic drawings, animations, and videos. These tools helped simplify complex concepts and enabled the students to better understand the mechanisms and causes of diabetes. I also shared findings from my research on a potential drug that restores insulin function in mutated cells. Additionally, I presented in vivo results from mouse model experiments, which showed promising therapeutic effects of the drug.

I concluded the presentation by summarizing the key points of my talk and emphasizing that science is a universal language that transcends differences in language, religion, culture, race, and gender. I highlighted the critical role of international collaboration in advancing science and improving our shared planet. Finally, I encouraged the students to study diligently, set ambitious goals, and pursue their dreams in science. I reminded them that while the journey may present challenges, the process itself is immensely rewarding. To inspire them further, I shared insights on becoming a successful scientist, offering practical advice to help them in their future endeavors and careers.

◆Other noteworthy information (その他特筆すべき事項) :

Students were highly engaged and eager to learn about the applications of iPS cells in regenerative medicine and the mechanisms behind diabetes. They demonstrated great interest in understanding how scientific research contributes to the discovery of potential drugs. I strongly recommend that lecturers adopt simple English, incorporate visual tools, and emphasize key points through repetition, as these methods enhance accessibility and effectiveness. Furthermore, I encourage lecturers to inspire students to work hard, identify their goals, and pursue their dreams. Motivating students to refine their skills and delve deeper into scientific topics is essential. I am genuinely pleased with the positive feedback I received from the students about the lecture.

- Impressions and comments from the lecture assistant (講義補助者の方から、本プログラムに対する意見・感想等がありましたら、お願いいたします。) :

She had a very positive impression of the lecture and expressed how much she enjoyed the experience of assisting. She found it rewarding to be part of a session that engaged the students so effectively. She appreciated the opportunity to contribute and was truly inspired by the students' enthusiasm and curiosity throughout the event.





### Differentiation of wild and mutant iPS cells into beta cells

- Generation of INSULIN+ cells by stepwise differentiation protocol

