A Case of Severe Insulin Resistance

Introduction

Jade and Megan have been best friends since second grade. While they usually spar a lot of time in each other’s homes, Jade’s older sister, Joanna, was their favorite go-to person – for help with school projects, personal advice, teenage troubles, and so much more. Currently the three of them live in different cities. Megan is in Boston College, minoring in Biochemistry; Jade is in Los Angeles studying to become a nurse, and Joanna is a nurse practitioner in Texas. A few years ago, Joanna got married and now lives with her husband and little girl. Last month, Jade called Megan on a Sunday and said she had a surprise for her. Jade told the story of her little girl’s diabetes. Joanna was recently diagnosed with Diabetes! “She is not alone, you know, and it is a very particular about what she eats and stuff.” Megan sensed that Jade was worried. She knew Jade’s mom and grandma had been diagnosed with diabetes in their thirties too, so she wondered if Jade was worrying about developing diabetes herself. That day they talked on the phone for an hour about family history, food, obesity, and diabetes. By the time Jade hung up, Megan was seriously thinking about all of the different reasons of getting diabetes, and for that matter, a family’s diabetes storia.

The next Monday, when Megan started searching online to see if it could learn about diabetes running in families. She wanted to understand if diabetes could indeed be inherited. Searching through PubMed Megan read about Mutations in Diabetes of the Young (MODY) but brushed it aside because she believed that since Joanna is in the healthcare field, she must have thought about this and gotten tested. The other jokes that kept coming up in her exploration was insulin resistance. One particular paper that really caught her attention titled “A family with autoimmunity at the heart of diabetes.” She became curious and opened the paper – the family tree shown in the paper seemed very much like Jade’s family, so she wanted to learn more.

Let us join Megan in understanding what the paper described.

Getting to Structure

Identify mutation and role in signaling pathway

Molecular Explorations

compare structures of active and inactive forms of Akt2

Assessment

how to bypass the block in signaling

Citations


Piwi Matters

How do plants make caffeine?

How can small molecule drugs and gene therapy help treat SCD?

What causes SCD pain crisis?

Why do plants make caffeine?

How do plants make caffeine?

examples of Molecular Case Studies

• Nichols’ Story – based on Sickle Cell Disease addresses
  • What causes SCD pain crisis?
  • How does the treatment with hydroxyurea work?
  • How can small molecule drugs and gene therapy help treat SCD?

• Happy Blue Baby – discusses a mutation in HBF
• Waking Up Anna – discusses GABA-A receptor agonist
• Evolution of Caffeine – explores Allelopathy, Convergent Evolution
  • Why do plants make caffeine?

• Piwi Matters – discusses fruit fly egg production
• A Case of Severe Insulin Resistance – discusses Cell signaling

Learning Objectives

Discipline specific:

• Cell Biology - explain how cellular structure impacts its function – e.g. communication of signals between outside and inside of cells.
• Biochemistry and Molecular Biology - describe how 3D structure of a protein impacts its function, including ability to interact with other molecules.

Competencies:

• Apply the process of science; use modeling; interdisciplinary explorations (using data from various bioinformatics resources); communicate; understand the relationship between science and society

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An Invitation

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