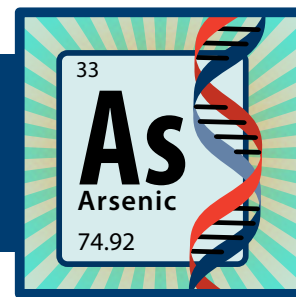


Teacher Background

UNIT: DNA

LESSON 1: ARSENIC AND EPIGENETICS: A DNA STORY

Activity 1D: Walking in the Steps of an Epigeneticist



TEXAS BIOMEDICAL
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Objectives

The Student Will Be Able To:

1. Compare the occurrence of T2D from various regions in the US.
2. Graph T2D data in selected regions of the US.
3. Evaluate possible epigenetic factors related to T2D data.
4. Present T2D data analysis.

Overview

BACKGROUND

From research studies, such as the Strong Heart Study (SHS), a connection between maternal DNA methylation caused by exposure to arsenic during pregnancy increases the occurrence of Type 2 Diabetes (T2D) in offspring later in life. At a national level, T2D has an economic burden, a health burden, and mortality burden.

Economic Burden

According to the Centers for Disease Control (CDC), the annual cost at a national level related to T2D is over \$4,000,000, with over \$3,000,000 of that total attributed to people ages 19-64. These costs include direct medical expenses for annual treatments amounting to over \$7,000/person with T2D. There are also indirect costs which include work absenteeism (over \$7,000/person, lost household productivity (over \$6,000/household), and inability to work due to T2D complications (over \$74,000/year/person).



Health Burden

Using self-reported data gathered through surveys, the CDC estimates nearly 25,000 new cases of T2D will be diagnosed each year in adults 18 years old and older. Most of these new cases (over 11,000) will be in the age range of 45-64 years old. Risk factors for T2D include high blood pressure and high cholesterol which can lead to increased risk of heart disease. Complications from T2D include vision impairment or blindness (over 2,800 cases annually) and limitations to activities of daily living (ADL) such as loss of mobility due to poor circulation in toes, legs, fingers, and arms. Poor circulation can lead to amputation of these extremities.



MIDDLE & HIGH SCHOOL LEVEL

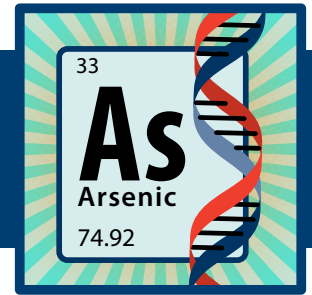
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NIH SEPA Project #1R25GM142021-01A1

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Mortality Burden

Annually, the number of deaths directly attributed to T2D is nearly 75,000. In addition to the emotional toll taken by these deaths, there is a reduction in lifespan caused by T2D. This reduction is called Estimated Years of Life Lost (YLL). This value is calculated by comparing the lifespan of individuals with T2D and individuals without T2D. On average, an individual with T2D will have an YLL of 4.4 years. When considering nearly 25,000 new cases of T2D are diagnosed annually, the total YLL for these new cases is 109,707!

There is another consideration for individuals with T2D beyond YLL. There is also impact on quality of life, which is called Quality Adjusted Life Years (QALYs). This estimates the years in which individuals with T2D will experience a diminished quality of life due to the disease. On average, the QALY is 5.4 years. In other words, an individual with T2D will experience declining quality of life during their final 5 years of life. For the estimated 25,000 new cases of T2D/year, they will experience a combined diminished QALY of 133,054 years.