Design for Biosecurity

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Lecture 35

Insulin as Weapon of Murder

Welcome back to the fifth class of this week. Today, we are going to discuss two particularly interesting and unsettling murder cases. The first took place in the UK during the 1950s, and the second is more recent, occurring between 2001 and 2005. Our first story centers around Kenneth Barlow, who is historically recognized as the first documented murderer to use insulin as his weapon.

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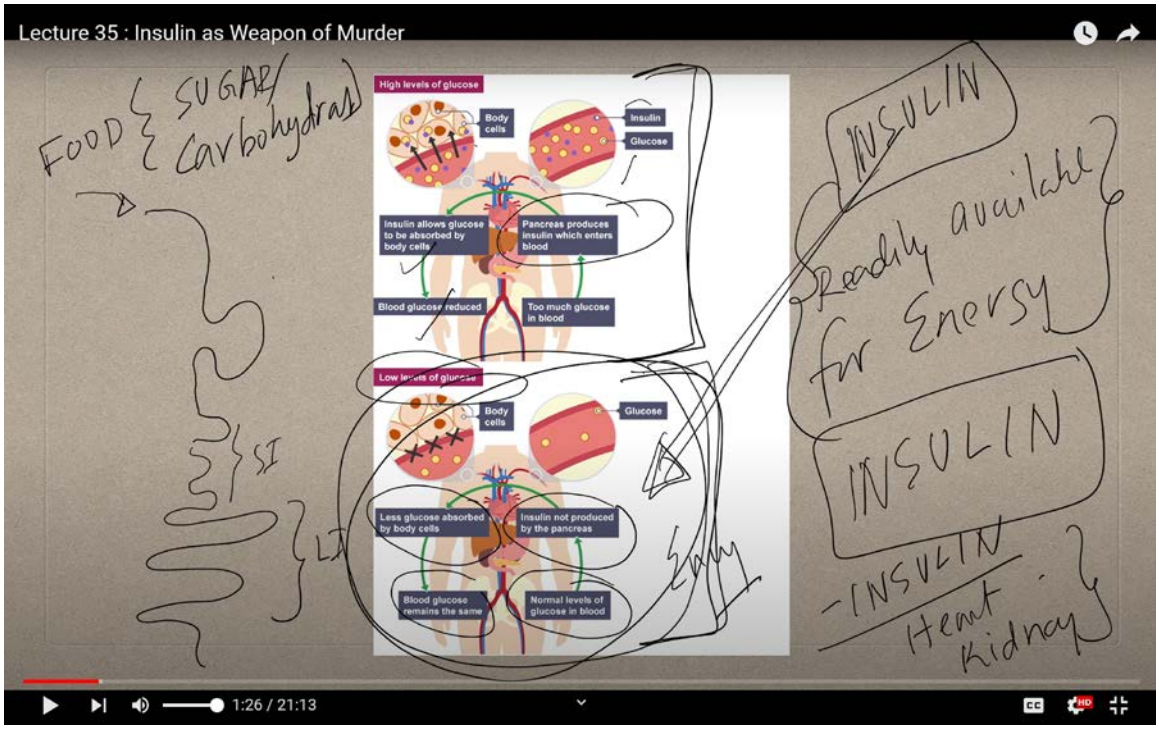

Before we delve into the details, let's take a moment to understand how insulin works in the body under normal circumstances. Imagine a situation where the body is running low on glucose, and then an excess dose of insulin is administered. What happens next?

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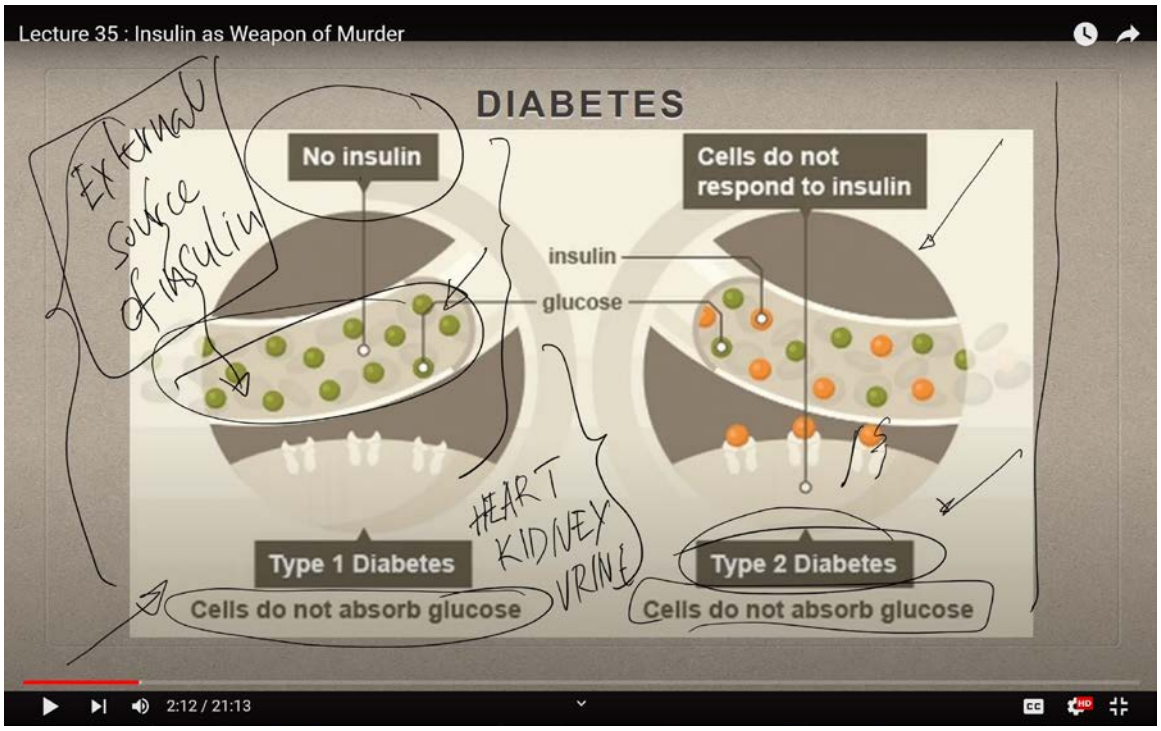

Essentially, the insulin would rapidly absorb whatever residual glucose remains in the bloodstream, effectively depriving the body of its essential glucose reserves. This could lead to a range of symptoms from extreme fatigue to loss of consciousness, and in severe cases, one could faint entirely. Without enough glucose to fuel the body, the person essentially runs out of the energy needed to function, which is a critical factor to bear in mind as we explore Kenneth Barlow's case.

Now, let's travel back to the year 1957. It's important to note that just a few decades earlier, in 1923, the Nobel Prize in Physiology or Medicine had been awarded to John Macleod and Frederick Banting for their discovery of insulin. Fast forward to May 4th, 1957, at approximately 2 a.m., when Dr. David Price, a forensic pathologist, was urgently called to the home of Elizabeth and Kenneth Barlow in a suburban area of Bradford, Yorkshire. Kenneth had allegedly discovered his wife, Elizabeth, unconscious in their bathtub at around 11:20 p.m. the previous night. He then called their doctor, who promptly diagnosed her as deceased.

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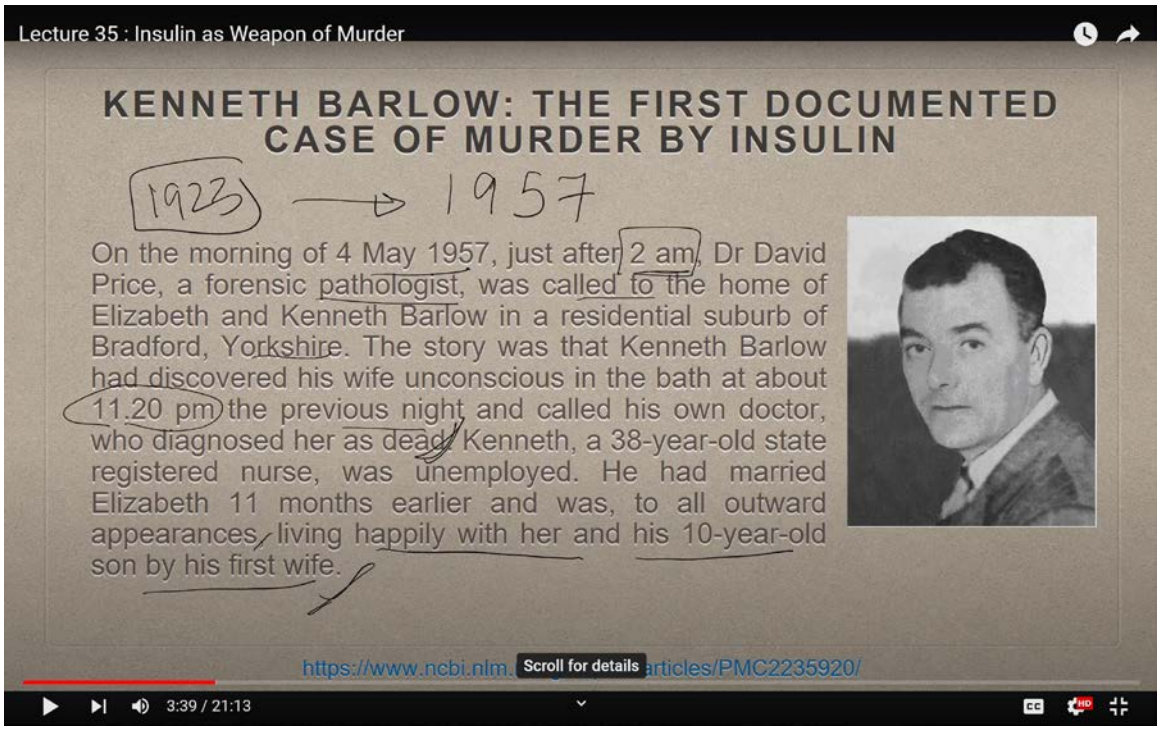

Kenneth Barlow, a 38-year-old state-registered nurse, was unemployed at the time of the incident. He had married Elizabeth just 11 months earlier, and from an outsider's perspective, they seemed to be living happily together, along with Kenneth's 10-year-old son from a previous marriage. The story Kenneth told was that Elizabeth had passed away in the bathtub, but the circumstances surrounding her death were suspicious enough for a forensic investigation. Barlow had called in a forensic expert, who arrived around 2 a.m. to assess the situation.

So, what exactly transpired that night? According to Kenneth, Elizabeth had tea around 5 p.m. on the evening of her death. Shortly after, she complained of feeling tired and went to bed. When Kenneth came to bed at around 9:30 p.m., he found that Elizabeth had vomited on the bed. Together, they changed the sheets, and she put on her pyjamas. However, she soon took them off, saying she felt too warm, and decided to take a bath. Kenneth, feeling exhausted, lay down on the bed and dozed off to the sound of the bath running.

When he awoke at 11:20 p.m., as previously mentioned, Elizabeth had not returned to bed.

He went to check on her in the bathroom and found her submerged beneath the water. Despite his efforts, he claimed he didn't have the strength to lift her out of the tub. Instead, he held her head above water until the bath drained. After that, he said he attempted to revive her by pressing on her abdomen, as he could not remove her from the bathtub on his own.

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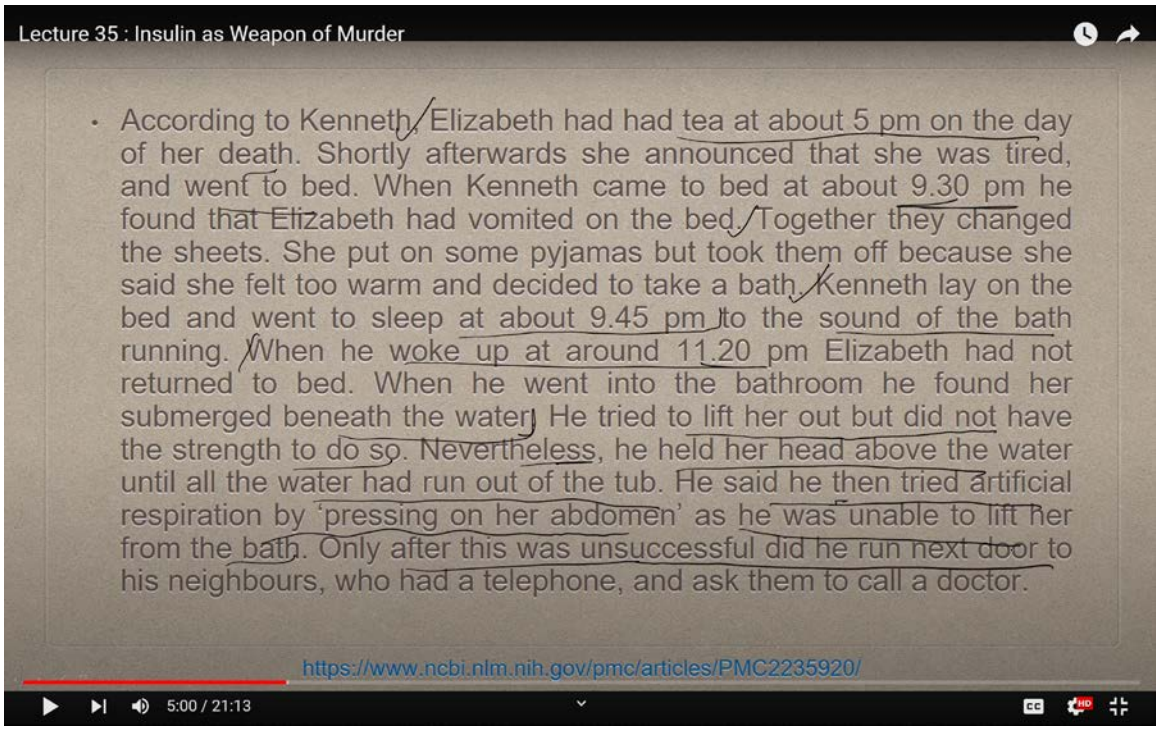

After Kenneth Barlow's attempts to revive his wife were unsuccessful, he ran to his neighbor's house, as they had a telephone, and asked them to call a doctor. The family doctor arrived about 10 minutes later and found Elizabeth lying in an empty bathtub in a position that resembled natural sleep. He did not touch her, beyond confirming that she was deceased. Given the unexpected nature of Elizabeth's death, the doctor felt it necessary to contact the police, who in turn called Dr. David Price, a forensic pathologist affiliated with the Home Office. Dr. Price was also a consultant pathologist at the nearby Beckett Hospital in Barnsley.

From the very beginning, Dr. Price suspected that Elizabeth's death was not from natural

causes, for two key reasons. First, death by drowning in a domestic bathtub is exceedingly rare, especially in the case of a healthy 32-year-old woman. Second, and more crucially, there was a small amount of water, about 110 ml, that remained in the cavity where Elizabeth's arm had rested against the side of the tub. This detail cast doubt on Kenneth's claim that he had tried to resuscitate her, making his account suspicious.

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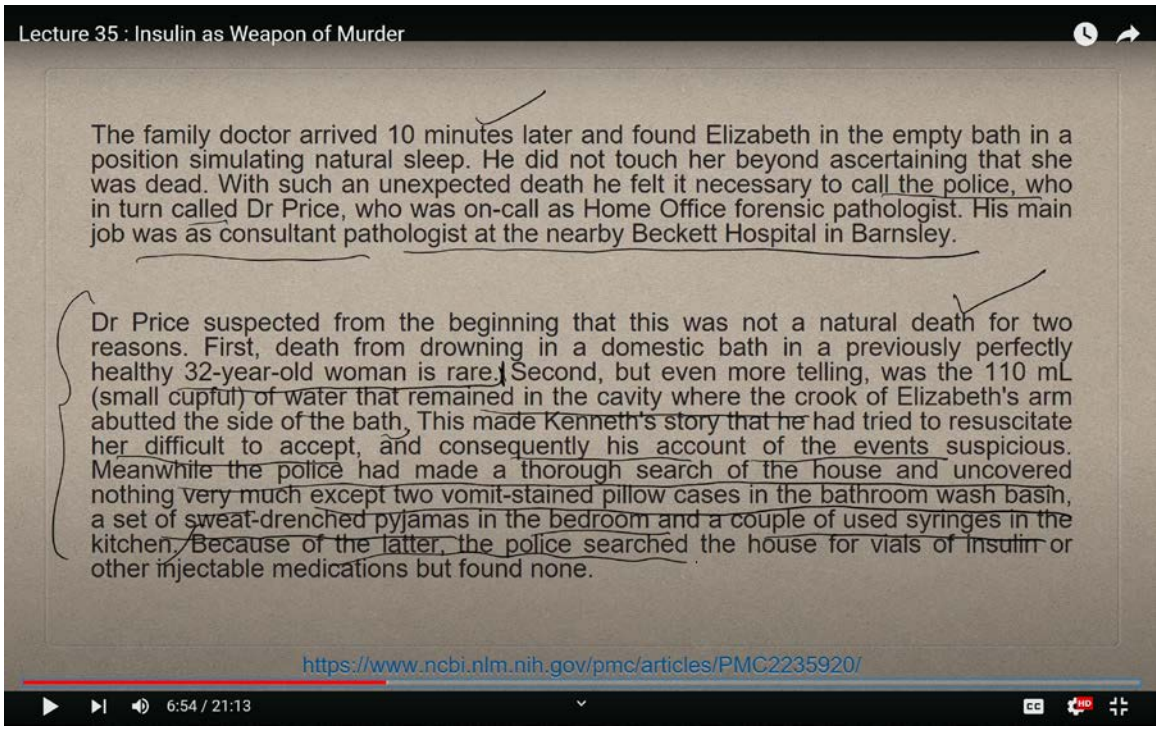

Meanwhile, the police conducted a thorough search of the house. They didn't uncover much except for a few curious items: two vomit-stained pillowcases in the bathroom's washbasin, sweat-drenched pyjamas in the bedroom, and a couple of used syringes found in the kitchen. The presence of these syringes prompted the police to search for insulin or any other injectable substances, but none were found.

At 5:45 a.m., about three and a half hours after he was initially called, Dr. Price began the post-mortem examination of Elizabeth's body at the local mortuary. Timing was critical in this investigation, as the deterioration of compounds in a deceased body can make it difficult to establish a definitive cause of death. When Elizabeth's body was examined, six

hours after her death, her pupils were found to be widely dilated, and there was blood-stained froth in her nose, mouth, and throat. Under microscopic examination, her lungs appeared swollen, congested, and wet, and small hemorrhages confirmed that she had drowned.

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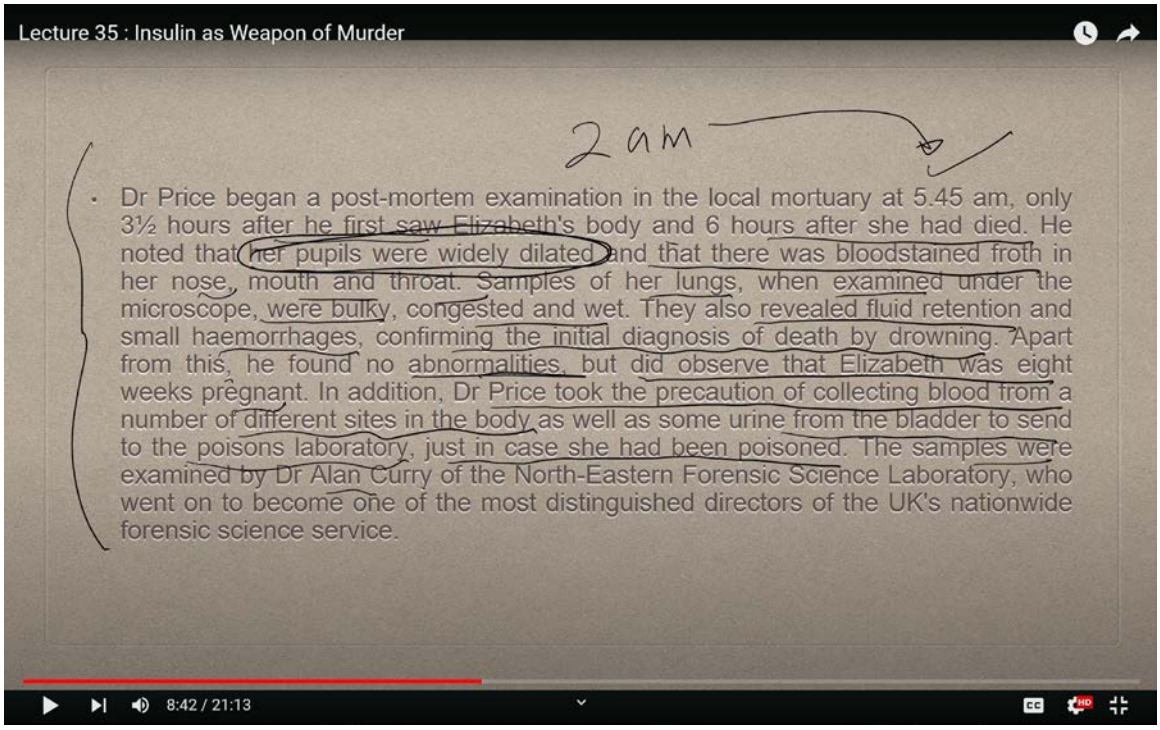

Aside from these findings, there were no significant abnormalities in Elizabeth’s body, except for one major revelation: she was eight weeks pregnant. Dr. Price also took the precaution of collecting blood samples from various parts of the body, as well as urine from the bladder, to be sent to a laboratory for toxicological analysis, suspecting the possibility of poisoning. These samples were sent to Dr. Alan Curry at the Northeastern Forensic Science Laboratory. Dr. Curry, who would later become one of the UK’s most prominent forensic science directors, found no traces of common poisons or abortifacients in the samples he tested.

Despite this, Dr. Price and senior police officers remained convinced that Elizabeth had been rendered unconscious before she drowned. They began to consider the possibility that

she had been injected with insulin.

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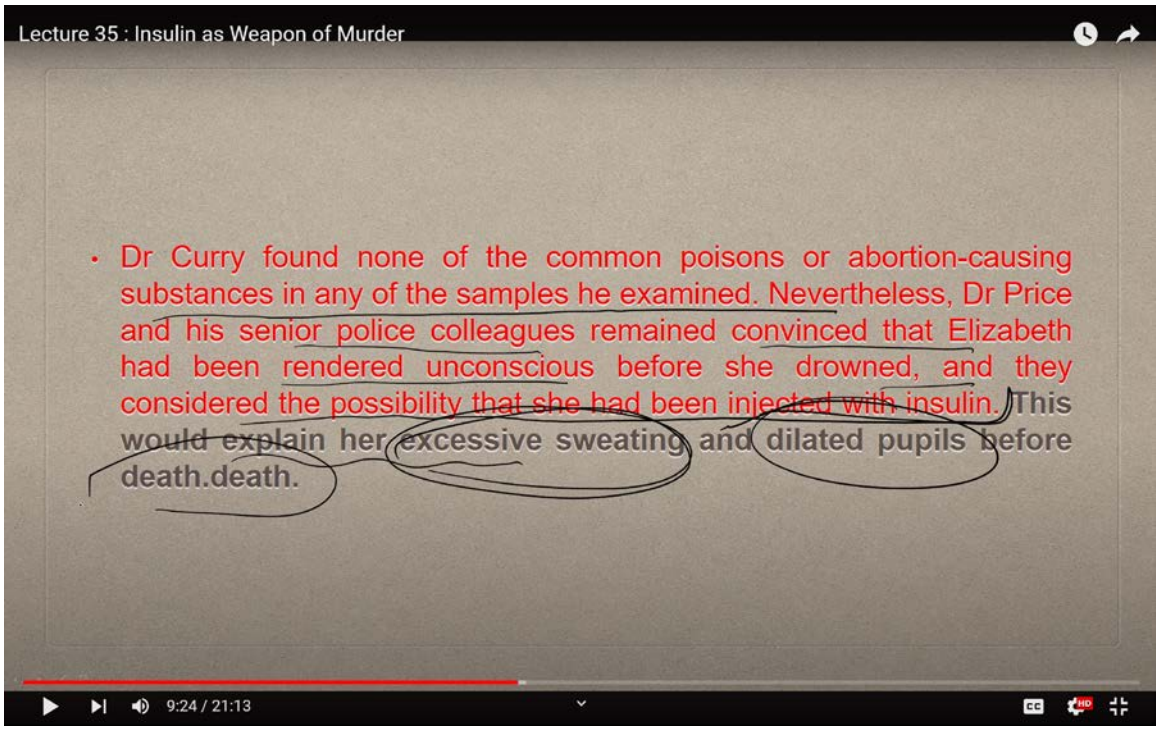

This could explain her excessive sweating, dilated pupils, and other symptoms prior to her death. Four days after the initial examination, on May 8th, Elizabeth's body was re-examined more thoroughly under brighter light. During this examination, with the help of a magnifying glass, two hypodermic injection sites were discovered on each of Elizabeth's buttocks. Dr. Price carefully excised the surrounding tissue and stored it in a refrigerator until he could find a scientist equipped with the expertise and facilities to perform an insulin test.

It's important to note that this was 1957, and the techniques available for detecting insulin were rudimentary compared to today's standards. Only a few specialized laboratories had the capability to perform such tests. The method commonly used at the time involved injecting the tissue samples into mice and observing whether they experienced hypoglycemic convulsions, which occur when the body is entirely depleted of glucose due to insulin. This method was originally used to measure the strength of pharmaceutical

insulin extracted from animal pancreases before it was released for medical use.

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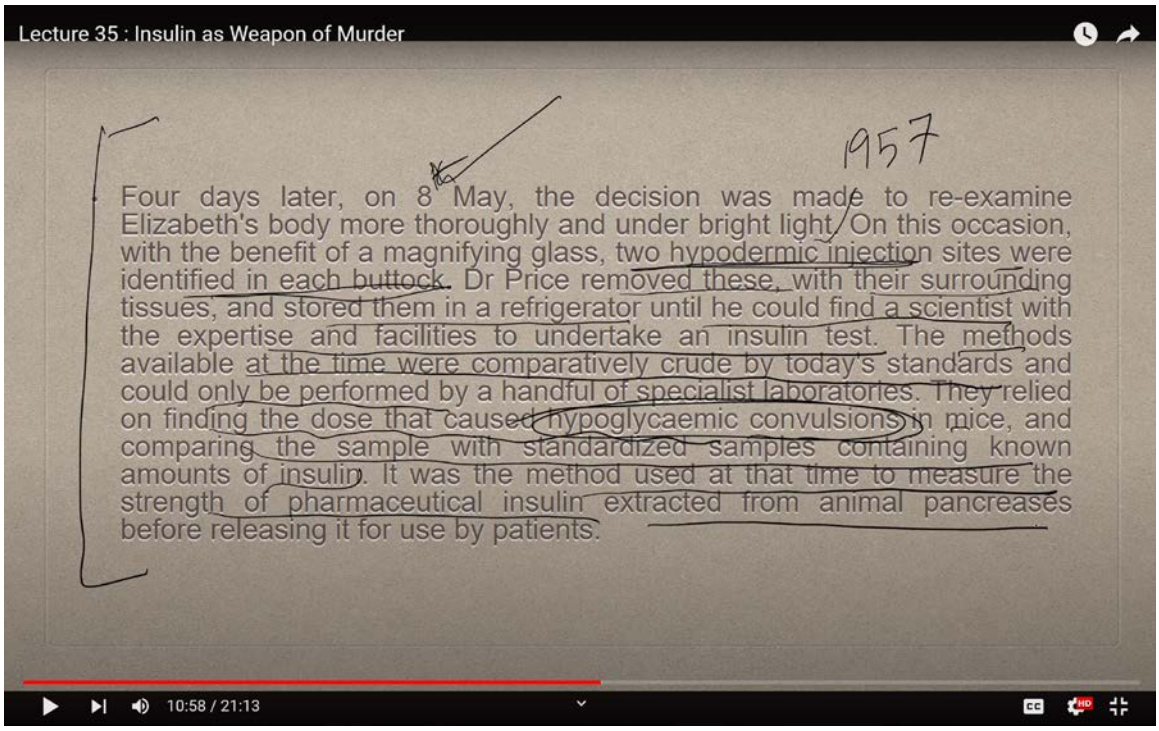

Dr. Amar Gard, from the research laboratory of Boots Drug Company, one of the three British manufacturers of insulin at the time, agreed to conduct the test. However, Dr. Gard was not optimistic. Given the tissue's degradation post-mortem, he doubted whether the technique would be sensitive enough to detect the remaining insulin. Despite his skepticism, Dr. Gard managed to extract measurable quantities of insulin from the tissues taken from Elizabeth’s buttocks. For comparison, Dr. Price had also removed tissues from other bodies that were handled similarly. As expected, no traces of insulin were found in those samples.

The findings from Elizabeth’s tissues were both abnormal and highly suspicious. Although newer techniques like ELISA and RIA would later be developed, at the time, this was the evidence that investigators had to rely on. On July 5th, two months after Elizabeth’s death, Dr. Gard reported that he had successfully recovered a total of 84 units of insulin from three separate samples taken from Elizabeth's buttocks. This was enough insulin to keep

two insulin-dependent diabetic patients alive for an entire day, confirming the suspicions that Elizabeth had indeed been injected with a fatal dose of insulin.

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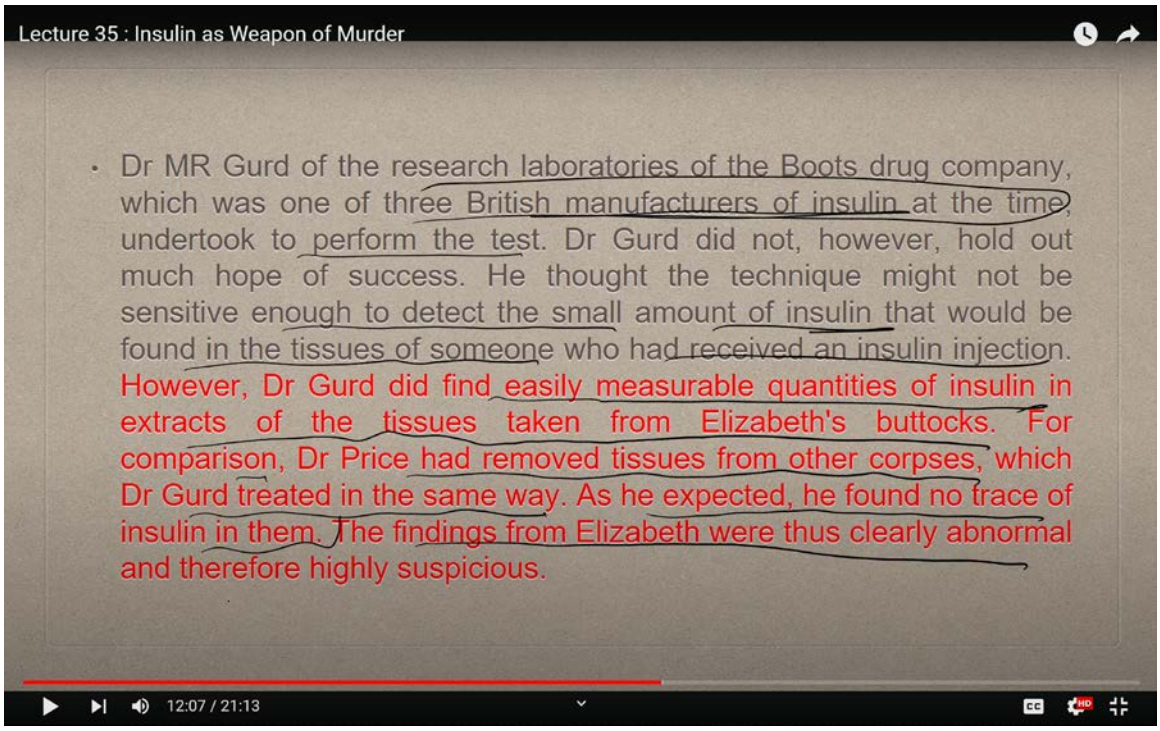

Elizabeth Barlow was neither diabetic nor on any prescribed insulin treatment. She was indeed pregnant, but she did not suffer from diabetes. So, how was it that 84 units of insulin were found in her body? Specifically, this insulin was detected at the site where puncture marks were visible, indicative of an injection. Tissue samples from this site confirmed the presence of insulin in her system. This discovery alone provided enough reason at the time for suspicion.

Based on this evidence, Kenneth Barlow was confronted by the police on July 26. During questioning, he admitted to injecting Elizabeth but claimed it was not with insulin. He said that with Elizabeth’s consent and participation, he had injected her with ergometrine, a drug commonly used in obstetrics to manage postpartum bleeding. However, he also acknowledged that some individuals obtained ergometrine illicitly to induce abortion, which was illegal. Kenneth was unaware, however, that the possibility of ergometrine had

already been ruled out by the toxicological analysis performed by Dr. Curry soon after Elizabeth's death. Moreover, the syringes and needles found in the kitchen had been examined and ruled out as related to ergometrine.

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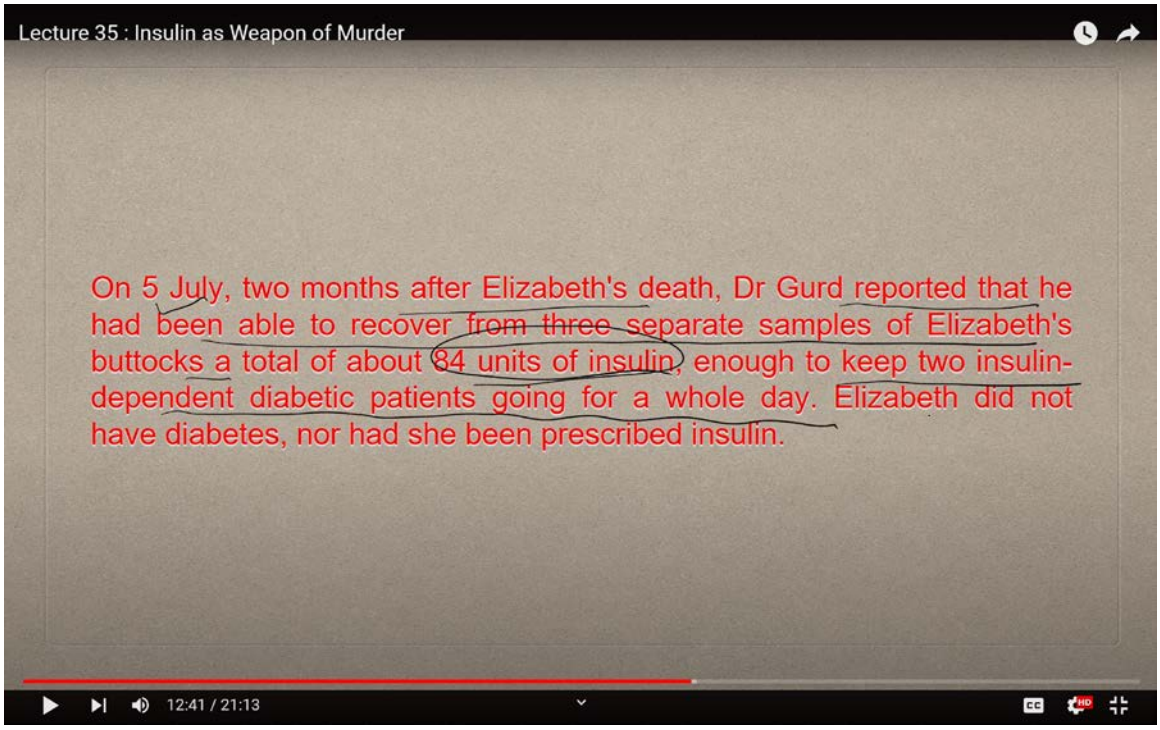

Despite Kenneth's claims, the jury convicted him based on the evidence presented, and in December 1957, Mr. Justice Diplock sentenced him to life imprisonment, which amounted to 13 years. Kenneth was released from prison 26 years later, in 1984, and continued to maintain his innocence. While many details may forever remain unknown, one thing is certain: although this case is often referred to as the first conviction for murder using insulin, Elizabeth Barlow did not technically die from an insulin overdose. While the insulin injected into her body played a crucial role in her death by rendering her unconscious due to a lack of glucose, it is unclear if she would have died had Kenneth left her to succumb to the effects of insulin alone. It is likely that Kenneth expected her to die more quickly than she did and, when that didn't happen, decided to drown her.

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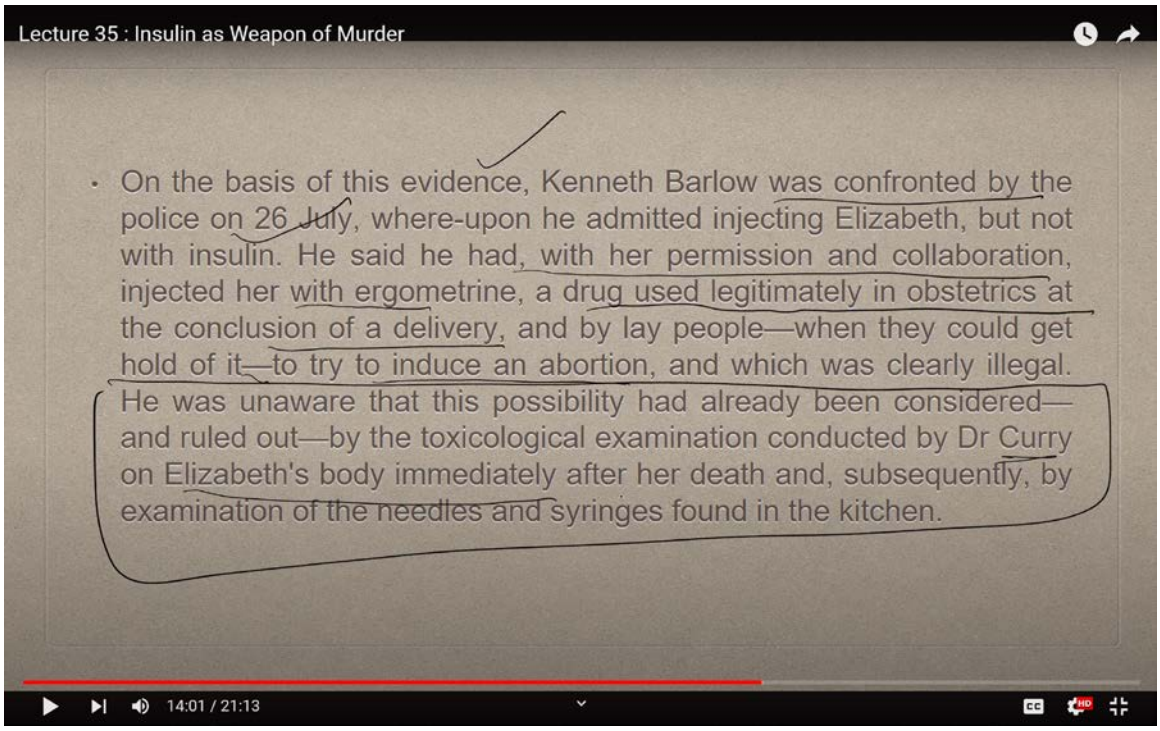

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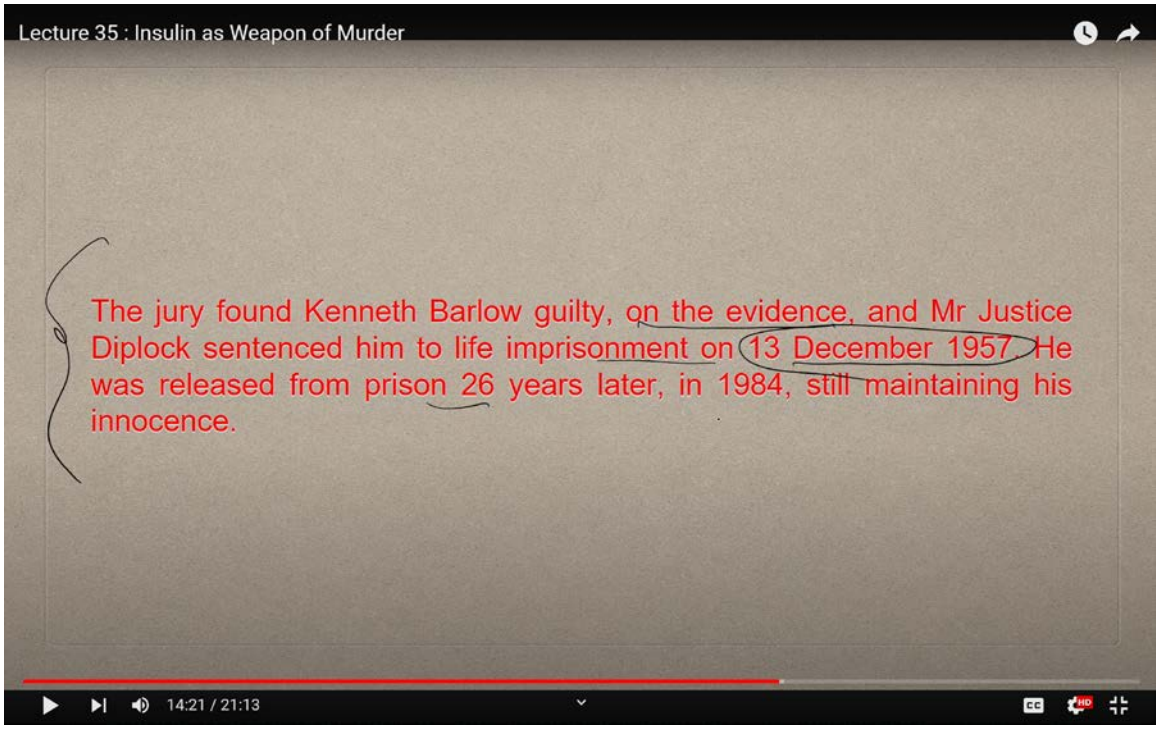

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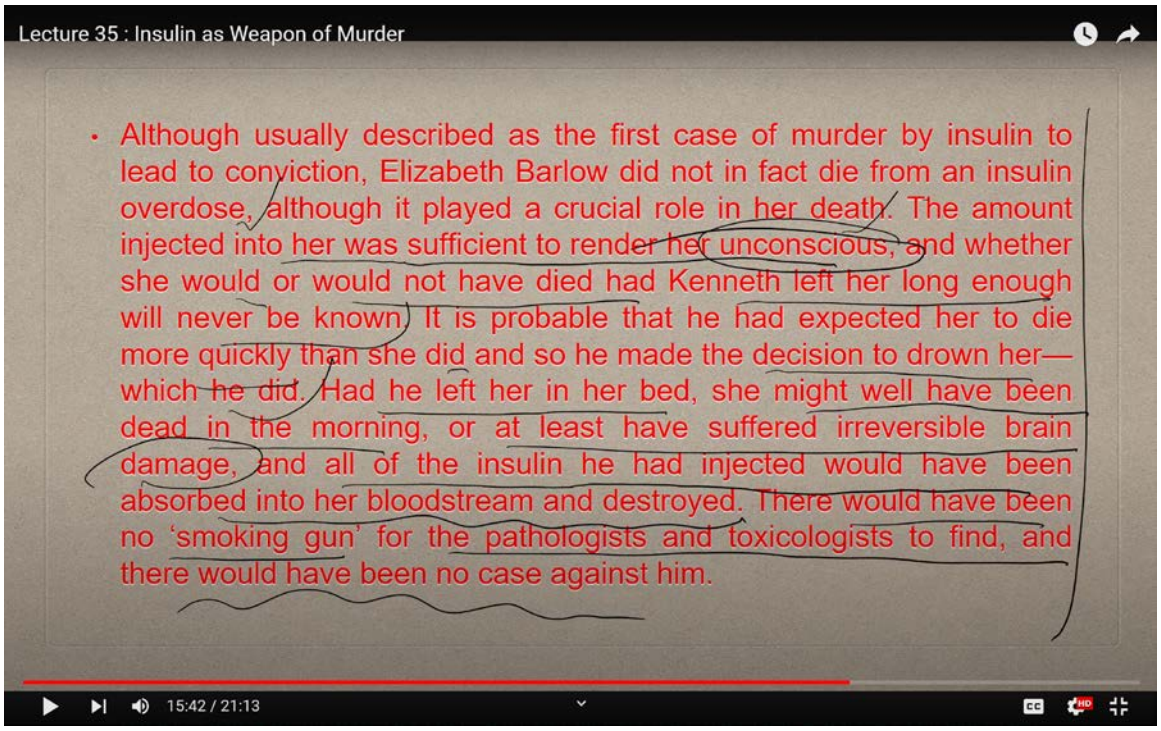

Had Kenneth left Elizabeth in the bed, it is possible she would have died overnight or suffered irreversible brain damage. In such a scenario, all the insulin would have been absorbed into her bloodstream and metabolized by the time of her death, leaving no trace behind for pathologists to detect. In such a case, there would have been no "smoking gun" for forensic experts to find, and no evidence against Kenneth. Thus, the discovery of 84 units of insulin in her body became the vital clue that led to his conviction. This was a disturbing case of insulin misuse, and it led investigators to wonder: why did Kenneth Barlow do it? There are many potential psychological factors, but we may never truly know the full story.

What we do know is that this case became the first recorded instance in history where insulin was used as a murder weapon that led to a conviction. The next high-profile case involving insulin misuse as a murder weapon was that of Colin Norris, a serial killer whose crimes spanned from 2001 to 2008. Norris is currently believed to have overdosed several elderly and frail patients with insulin, causing spontaneous hypoglycemia, irreversible brain damage, and ultimately death. Investigations into Norris's case revealed that insulin

C-peptide levels in the plasma serve as key biomarkers for insulin overdose.

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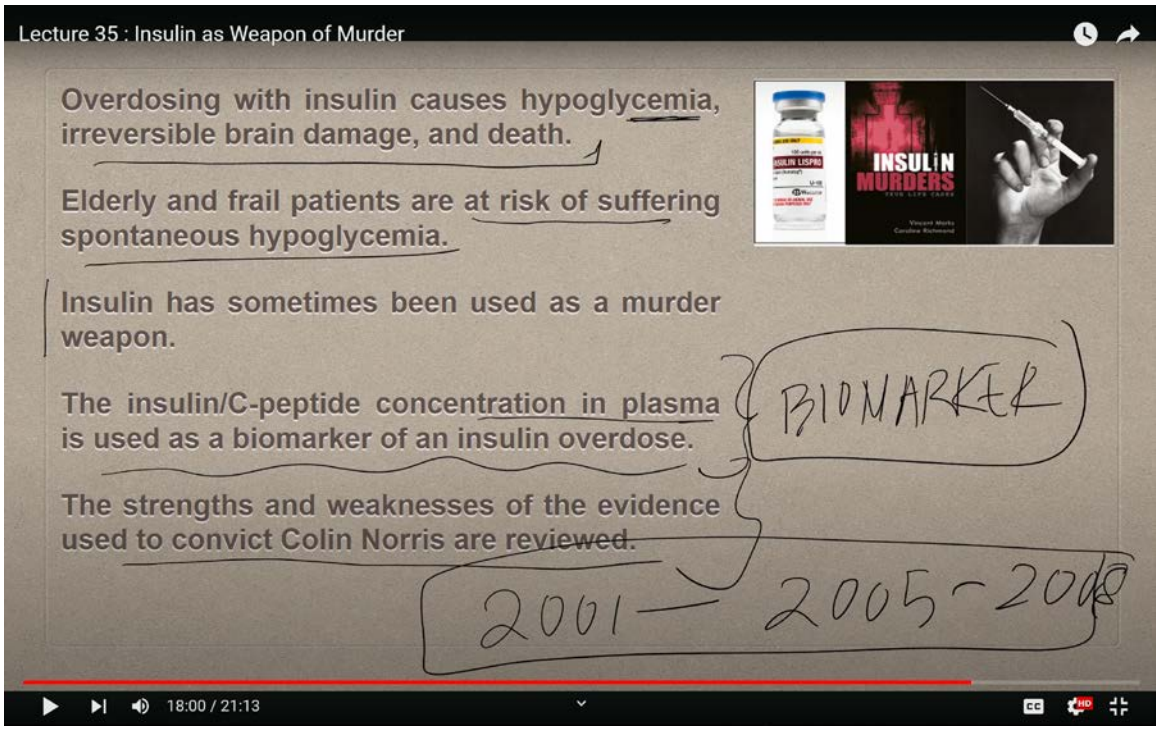

We'll discuss the implications of insulin C-peptide as a biomarker and its relevance to sensor development in future sessions.

Looking back at the evolution of insulin's story, from its discovery in the 1880s to its clinical use in the 1920s and now as a forensic tool in modern criminal cases, this molecule has had a dramatic and, at times, tragic impact on human history. In the realm of forensics, insulin has sparked greater understanding of biochemical markers, while also raising profound ethical and medical questions about its role as a potential agent of death. This is why I chose to focus on insulin today. We often think of biological agents like microbes, viruses, or bacteria as potential dangers, but this case reminds us that even molecules we produce for therapeutic purposes, like insulin, can have devastating consequences in the wrong hands.

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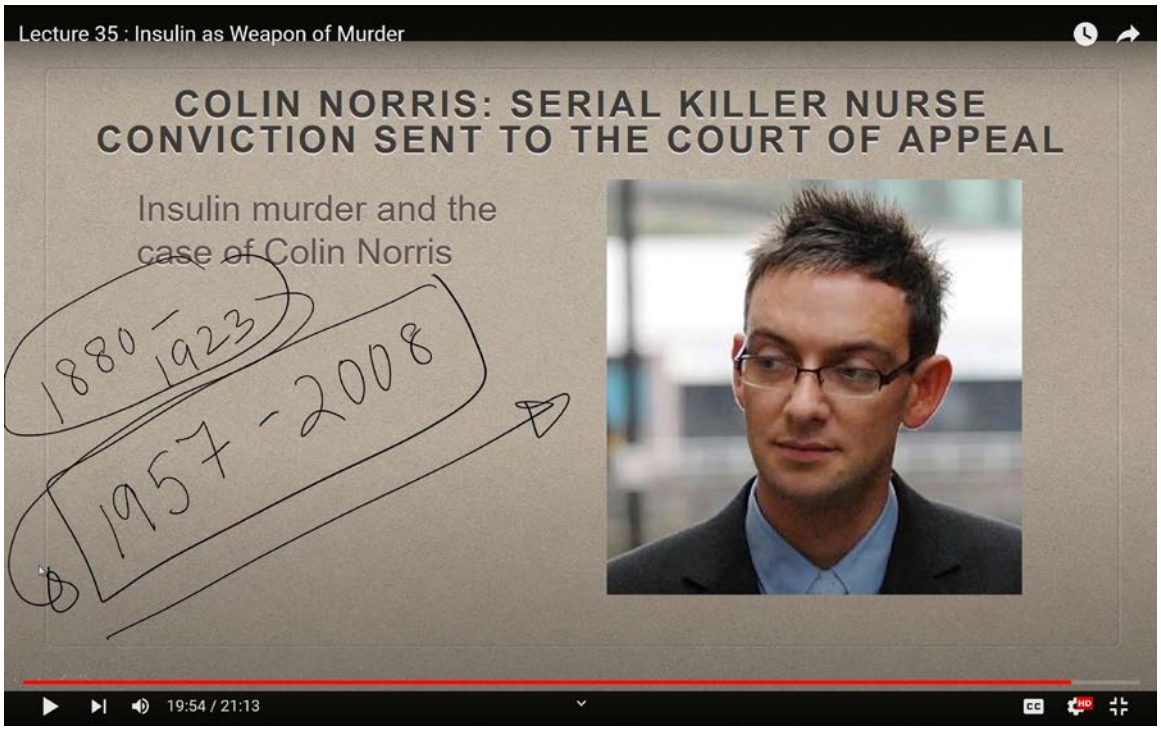

In the future, we will explore advances in miniaturized sensors for diabetic patients, particularly those that monitor insulin levels in real time. These innovations will allow us to better understand how molecules like insulin play critical roles in the human body and how sensors can be designed to detect such compounds with higher precision. With this, I conclude today's class, encouraging you all to continue exploring the fascinating and sometimes sobering intersection of biochemistry and forensic science. There are many real-life stories like this that have forever altered how we think about the power of different compounds and their impact on biosecurity. Thank you.