Finding Drugs and Poisons: The Toxicology Lab

- Toxicology Part1
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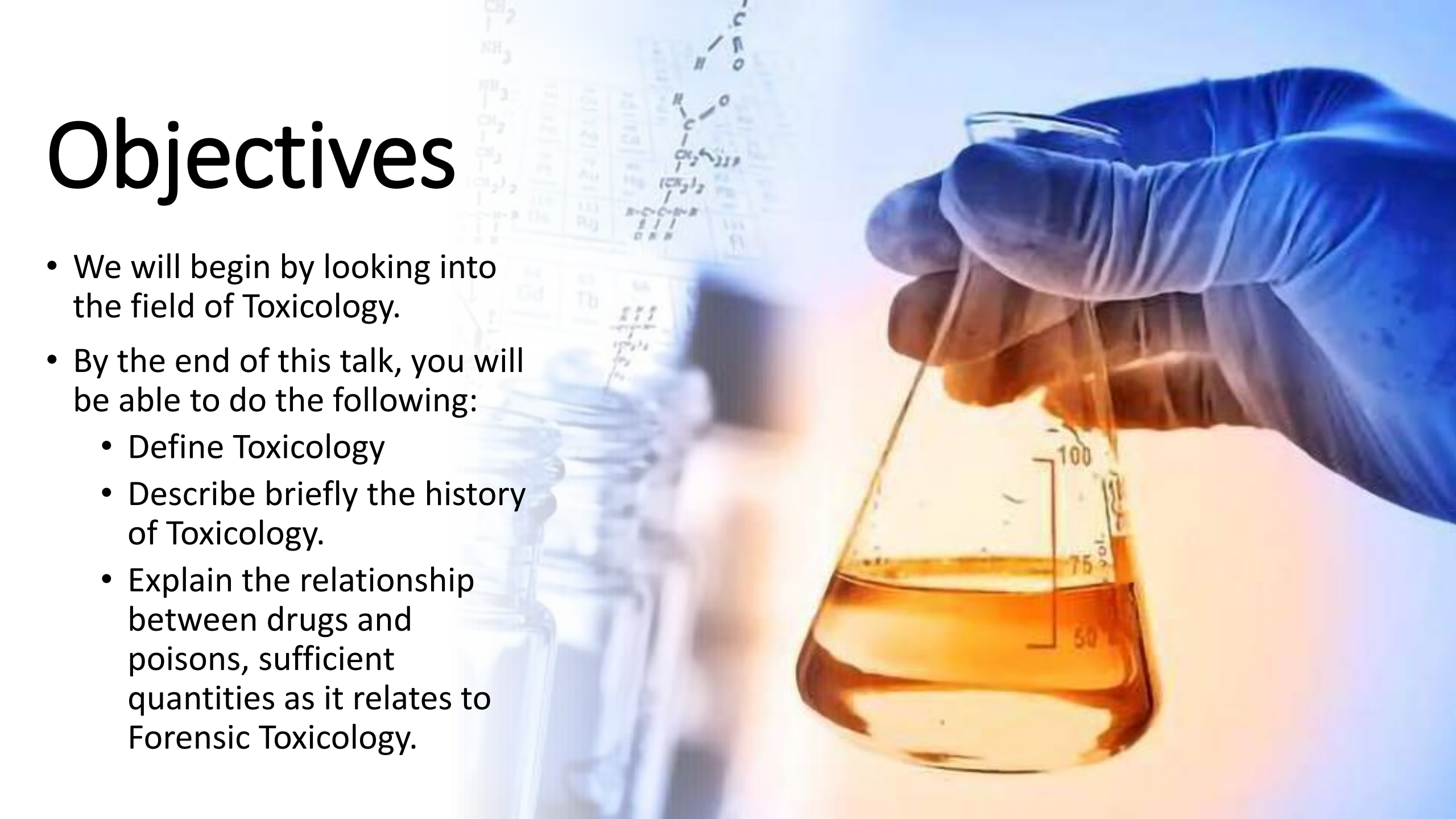
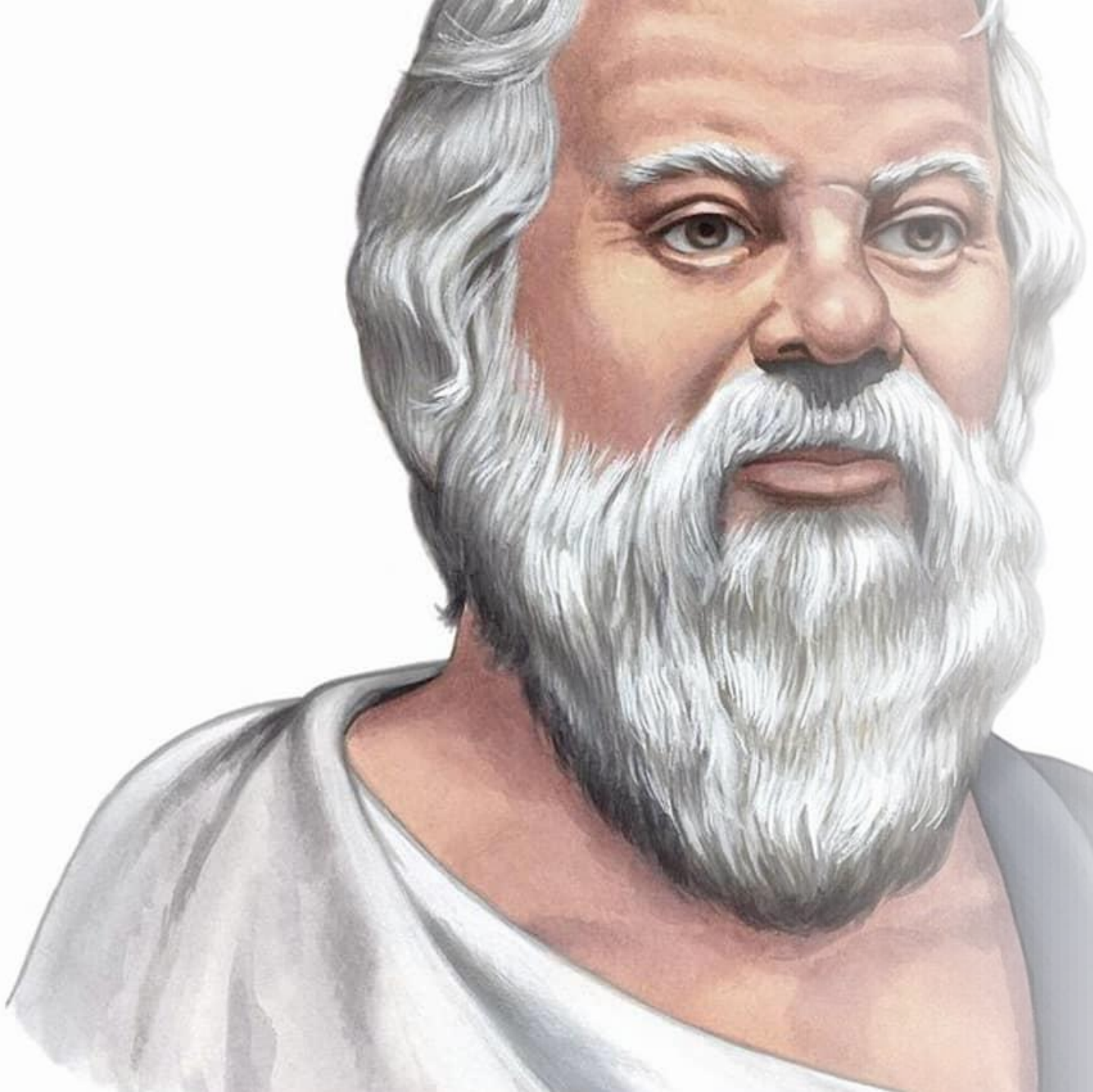
Objectives

- We will begin by looking into the field of Toxicology.
- By the end of this talk, you will be able to do the following:
  - Define Toxicology
  - Describe briefly the history of Toxicology.
  - Explain the relationship between drugs and poisons, sufficient quantities as it relates to Forensic Toxicology.



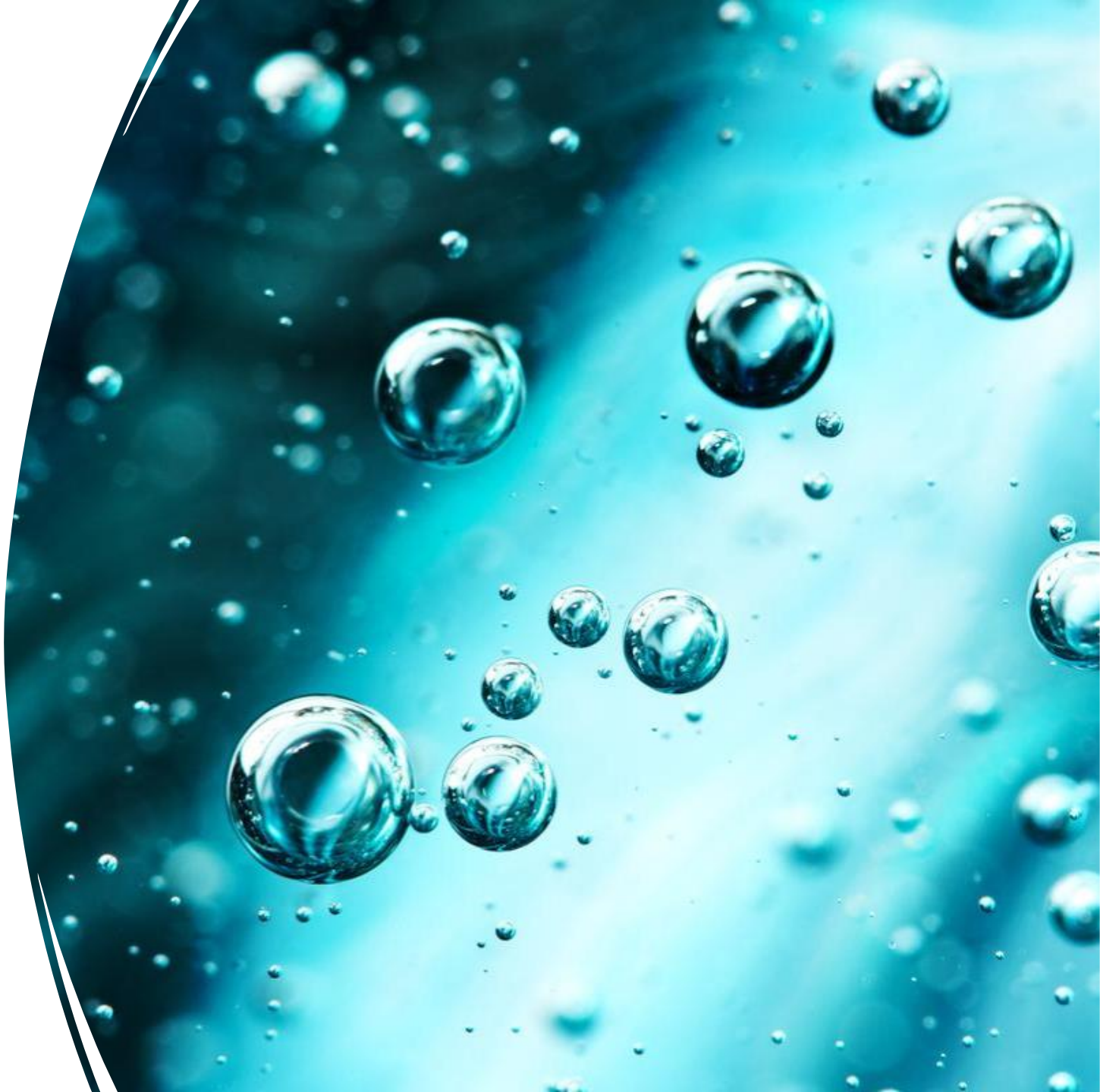


Introduction

- During the millennia since Socrates drank the hemlock that killed him, lethal use of poisons has waned a bit, in part because we now know how to trace poisons to those who use them for nefarious purposes.
- From taking arsenic to overdose on heroin to drinking to much water, poisoning deaths nowadays are the realm of the toxicologist, who becomes a critical component in the crime lab.
- Drugs and poisons of all types are involved in harmful accidents and accidental, suicidal, and homicidal deaths, and they may even be contributory factors in many natural deaths.

Understanding Poisons

- Have you ever taken a poison?
- Fact: You consume poison every day! Examples):
- Water
- Oxygen
- To name a few! ☺



Poisons Continued

- Everything can be a poison!
- The basic definition of a poison is any substance that, when taken in sufficient quantities, cause a harmful or deadly reaction.
- So, a poison basically is a substance that either harms you or kills you.
- But the key here is the phrase, “Sufficient Quantities.”
- The degree of toxicity of any substance depends on how much enters your body and over what period of time it does so.

Arsenic & Cyanide

- Arsenic is a poison, but did you know that you probably have arsenic in your body right now?
- If you're a smoker, you have more than a little bit. You also have some mercury and cyanide in you.
- These substances are in the environment, and you can't avoid them.
- But they are in such small quantities that they cause no real harm.
- Take enough of any of them and the results will not be good for you.

Water and Air

- Both water and oxygen can be toxic.
- Drinking to much water can kill you.
- In fact compulsive water drinking is a psychiatric syndrome often associated with schizophrenia.
- People with this syndrome drink gallons of water every day.
- Drinking to much water is called:
  - Water Intoxication.

Water Intoxication

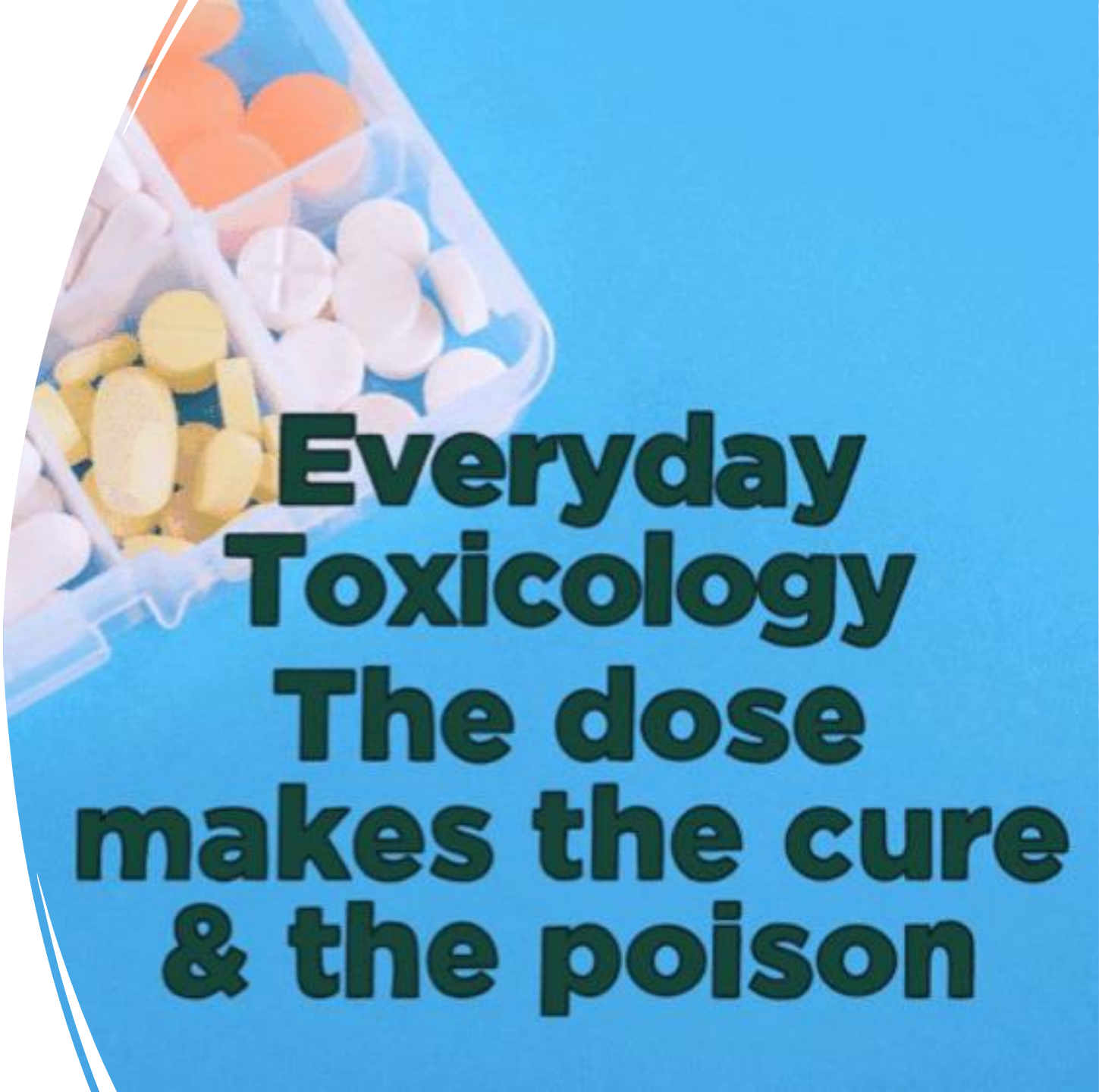
- Water Intoxication severely dilutes sodium and potassium in the blood and tissues of the body, damages the kidneys, and ultimately leads to coma and death.
- Similarly, breathing pure oxygen for too long damages your lungs and leads to death.
- In infants, high percentages of oxygen can lead to blindness, hearing loss and mental retardation.

Intoxicant Vs. Poison

- The distinction between and intoxicant and a true poison is very important.
- An intoxicant, such as alcohol or carbon monoxide, typically requires that you ingest a rather large amount to be lethal, while a true poison, such as cyanide, requires only a very small amount.

Therefore….

- Even substances that cure can poison.
- Digitalis, for example, is an extremely common cardiac medication derived from the foxglove plant, but it is also a deadly poison.
- To much leads to nausea, vomiting, and death from dangerous changes in the rhythm of the heart. How ironic that it can treat some abnormal heart rhythms but also can cause other more deadly rhythms.
- It’s all in the dose. The right dose is medication; the wrong does is a poison.



Defining Toxicology

- Toxicology is the marriage of Chemistry and Physiology that deals with drugs, poisons and other toxic substances, and how these substances alter or harm a living organism, particularly humans.
- Although toxicology is a relatively new science, the first toxicological test dates back to 1775, when the Swedish chemist Karl Wilhelm Scheele discovered a new way to prove that arsenic was the culprit in a suspicious death.

Oh, Chemistry!

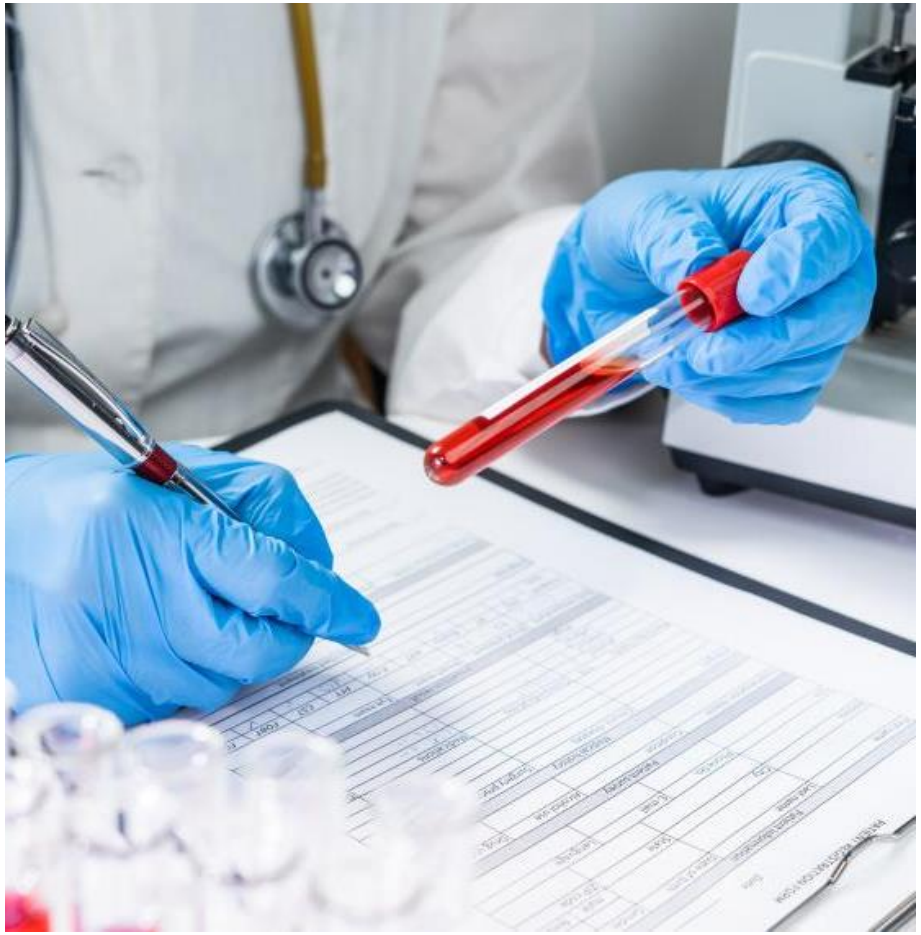
- Scheele found that chlorinated water converts arsenic to arsenous acid and that adding Zn metal and heating the acid mixture releases arsine gas.
- When the gas cones in contact with a cold vessel, arsenic collects on the vessel.
- In 1821, scientists first used this technique to find arsenic in the stomach and urine of poisoned individuals, and the field of Forensic Toxicology was born.

Back To The Future!!!

- Today, the forensic toxicologist's job is to find a toxin and determine its likely effect on the individual who ingested or otherwise came in contact with it.
- For Example, the forensic toxicologist may:
- Assess the state of inebriation of an automobile or industrial accident victim.
- Determine whether someone died from poison or from natural causes.
- Assess whether drugs played a role in a perpetrator’s action or in someone's seizure or coma.

On The Other Hand…

- Not finding a drug may be just as important.
- Suppose for example, that the toxicologist finds no drugs in someone who's exhibiting erratic or bizarre behavior.
- Such a situation may lead to psychiatric evaluation and ultimately to a diagnosis and appropriate treatment.
- Similarly, if the toxicologist finds that the level of a seizure medication in the blood was too low for the driver or a vehicle involved in the accident, he or she may conclude that a seizure was the cause of the accident



Thank You For Your Attention!