

CHLORPROMAZINE: PAVING THE WAY FOR A BETTER UNDERSTANDING OF SCHIZOPHRENIA

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YOUNG REVIEWER:



ERIC

AGE: 12

Schizophrenia is a brain disorder that impacts quality of life and can require hospital treatment. Schizophrenia is thought to have affected humans throughout history; however, it was first described as a form of mental illness in 1887. Notably, doctors did not effectively treat schizophrenia until 1951, when Dr. Heinz Lehmann discovered that a drug called chlorpromazine could be used to relieve the symptoms of this disorder. Although chlorpromazine was initially used to keep patients asleep during surgery, researchers learned that it was also helpful for mental illnesses. While the causes of mental illness are still not completely understood, the discovery of chlorpromazine taught us a lot about how the brain communicates, and we learned that issues with communication between the brain and the body can lead to some of the symptoms of mental illness. Overall, chlorpromazine paved the way for future drugs and improved the lives of millions!

SCHIZOPHRENIA

A brain disorder that affects thinking, perception, emotions, or behavior.

DELUSIONS

False thoughts and scenarios.

HALLUCINATIONS

Perceiving things that are not there.

AGITATION

Restlessness and increased sensitivity to events.

WHAT IS SCHIZOPHRENIA?

Schizophrenia is a serious mental health condition with symptoms including false beliefs (**delusions**), seeing or hearing things that are not real (**hallucinations**), and difficulty speaking. Schizophrenia has likely affected people for all of human history; however, it was not until 1887 that it was classified as a type of mental illness by Dr. Emile Kraepelin. In the past, people with schizophrenia often received mental health care only in special live-in hospitals, which meant patients were isolated from their families and friends. Early treatments were often dangerous, poorly researched, and would not be seen as responsible or safe by today's standards [1, 2]. These methods used chemicals or electricity to shock the brain and cause changes that could improve symptoms over time. Unfortunately, these treatments sometimes had severe side effects, like causing patient to go into comas. These extreme treatment methods were the only options, since medications were not yet available.

In 1951, the way we treat people with schizophrenia was forever changed. This was the year that scientists discovered the benefits of a drug called chlorpromazine for treating schizophrenia. Chlorpromazine was not only the first drug treatment for schizophrenia, but it was also the first medicine used to treat *any* mental health disorder! In this article, we will tell the story of how chlorpromazine was discovered, how it came to be used for mental health disorders, and how it paved the way for the medical field of psychiatry.

DISCOVERY AND TESTING OF CHLORPROMAZINE

Dr. Paul Charpentier always wanted to make surgery safer for his patients. In December of 1951, he helped create a new drug, named chlorpromazine (Figure 1). He gave chlorpromazine to a colleague, Dr. Henri Laborit, to test whether this drug could keep his patients asleep during surgery [3]. During Dr. Laborit's first time using the drug in surgery, he noticed it did not keep patients asleep longer, but it did make them calmer. Dr. Laborit reported this finding to one of his colleagues, Dr. Heinz Lehmann. This led Dr. Lehmann to wonder if chlorpromazine might be useful for patients with schizophrenia, since this condition causes irritation and restlessness [1]. The first person to receive chlorpromazine was a 24-year-old who suffered from many symptoms of schizophrenia, including hallucinations, delusions, and **agitation** [3]. The drug was injected into the patient daily. After 20 days, the patient's symptoms got better, and he was released from the hospital [3]! In 1952, news of these results spread rapidly and reached a hospital in Paris, where Drs. Pierre Deniker and Jean Delay decided to see these effects for themselves. By studying chlorpromazine in more people with schizophrenia, Drs. Delay and Deniker found that this drug *could* help reduce symptoms of schizophrenia [1]. Eventually, the

Figure 1

Chlorpromazine was given to patients as an injection, to treat the symptoms of schizophrenia. The chlorpromazine molecule is comprised of many atoms: one sulfur (yellow), one chlorine (green), two nitrogens (purple), 17 carbons (black), and 19 hydrogens (blue).

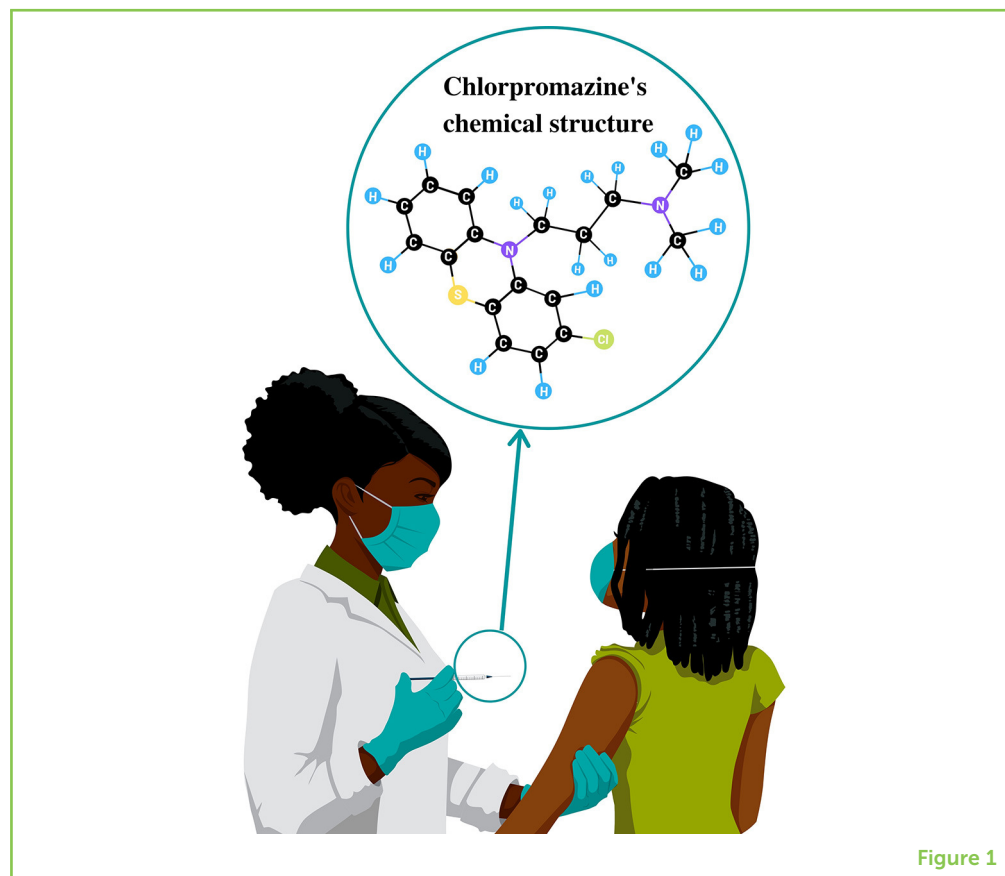


Figure 1

evidence was so strong that chlorpromazine was declared a worldwide success. Key events related to the development, testing, and success of chlorpromazine are summarized in Figure 2.

SIGNAL TRANSMISSION

The process by which the brain communicates with the rest of the body.

DOPAMINE

A chemical messenger used in brain cell communication that is elevated in people with schizophrenia.

DOPAMINE RECEPTOR

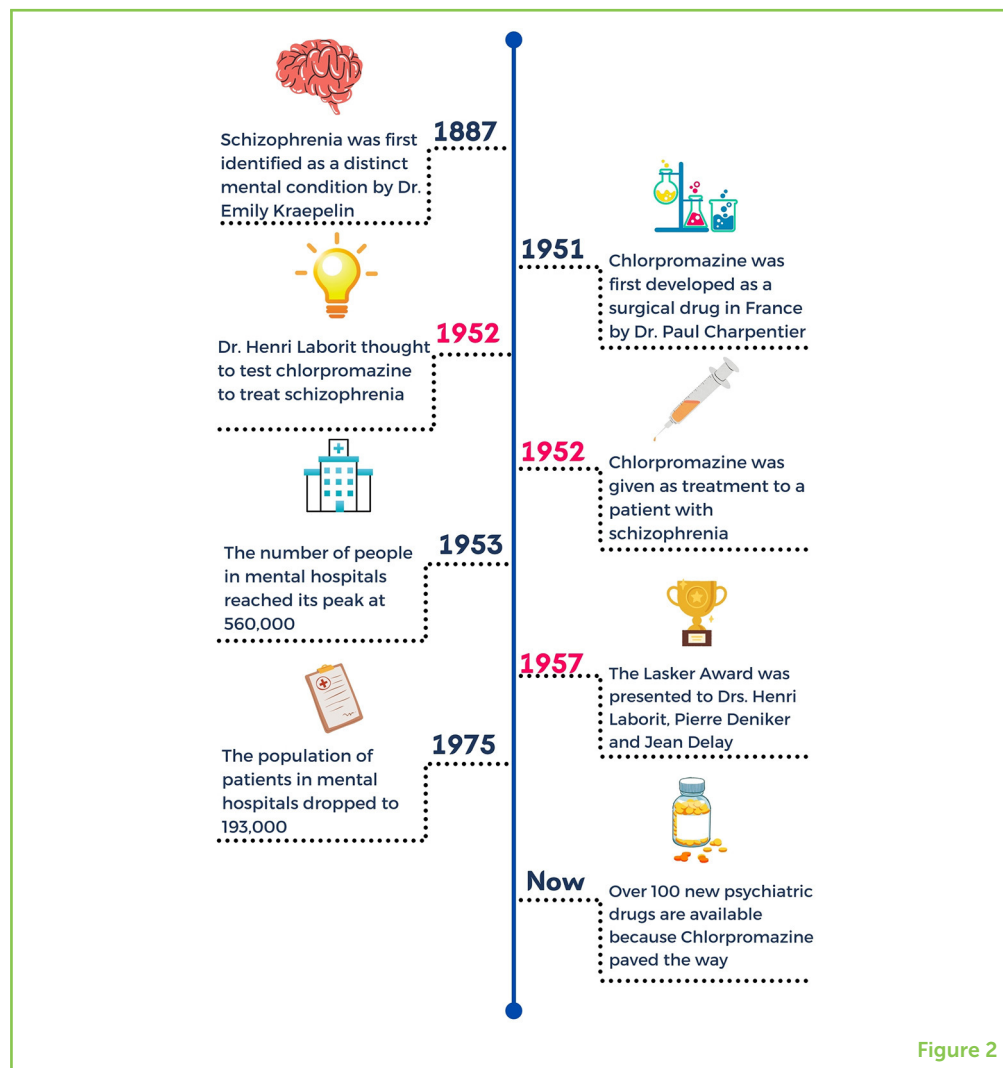
The location where dopamine binds normally and that chlorpromazine binds to lower dopamine signal transduction.

HOW DOES CHLORPROMAZINE WORK?

To understand how chlorpromazine works, we need to understand how this medication affects the brain and the signals that connect the brain to the body. Have you ever touched a hot surface? How did your body react? This is a perfect example of how the brain communicates with the body to help keep you safe. When you touch something hot, the cells of your hand sense the heat on your skin and communicate this to your brain. Your brain then sends a signal back to your hand, to pull it away quickly. This is an example of a process called **signal transmission**, which is the technical term for how the body and brain communicate. Some mental health disorders, including schizophrenia, are caused by too much signaling along important pathways. Specifically, people with schizophrenia have higher amounts of a substance called **dopamine** than the average person. Dopamine binds to proteins within the brain called **dopamine receptors**, which cause cells to communicate with each other through signal transmission. Increased dopamine signaling causes parts of the brain to become overactive, leading to the symptoms of

Figure 2

Historical events leading to the development and success of chlorpromazine.



schizophrenia. Drugs like chlorpromazine bind to dopamine receptors, which blocks dopamine from binding and sending signals. Lower dopamine signaling reduces hallucinations, delusions, and other symptoms of schizophrenia. When chlorpromazine is taken for a while, it is very effective at reducing schizophrenia's symptoms. Each patient's symptoms are unique, so the amount of chlorpromazine needed and the amount of time patients must take the drug before seeing results can vary. Chlorpromazine helped scientists understand brain-to-body communication, which led to the discovery of many additional new drugs to treat other mental health conditions.

HOW DID CHLORPROMAZINE REVOLUTIONIZE PSYCHIATRY?

Ultimately, the effectiveness of chlorpromazine allowed patients with schizophrenia to be cared for in their homes, instead of in special hospitals. In 1953, around 560,000 patients lived in mental health hospitals, but by 1975, the number had decreased to 193,000 [2]. As

PSYCHIATRY

The study and treatment of mental, behavioral, and emotional disorders.

the first drug used to treat any mental health disorder, chlorpromazine played a huge role in establishing the field of **psychiatry**. Today, psychiatry is a special form of science and medicine used to study and treat mental health conditions. Building off what was learned from chlorpromazine, doctors of psychiatry now have over 100 different drugs to treat patients with mental health conditions [4]. Newer drugs have more benefits and lower risks than chlorpromazine, so today chlorpromazine is no longer the most common medication for schizophrenia.

By improving scientists' research on brain-to-body communication, chlorpromazine led to a better understanding of the brain, signal transmission, and a variety of mental health conditions, including depression and anxiety. Today, doctors and healthcare providers can choose the right treatments for patients based on their unique mental health conditions! This is wonderful because we now know that drugs work differently for each person. The goal is to treat all people safely, without any of them having bad side effects. Ultimately, because chlorpromazine brought so much awareness to the field of psychiatry, the American Public Health Association gave an award known as the Lasker Prize for Medicine to Drs. Henri Laborit, Pierre Deniker, and Heinz Lehmann [3]. Although it is not used as frequently to treat schizophrenia, 67 years after its first use, chlorpromazine is still considered an essential drug by the World Health Organization.

SUMMARY

In the past, mental health was not well-understood. Schizophrenia was first described as a form of mental illness in 1887 but, until the discovery of chlorpromazine, there were no medications available to treat this brain disorder. The discovery of chlorpromazine was a turning point in history, as it was the first drug treatment for a mental illness. This discovery helped the field of psychiatry to get started, as it showed that psychiatric illnesses can be treated with medication. Although it is not commonly used today, the discovery of chlorpromazine and its use for schizophrenia led to major improvements in the options available for treating mental health disorders.

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SUBMITTED: 04 March 2021; **ACCEPTED:** 10 February 2022;
PUBLISHED ONLINE: 09 March 2022.

EDITOR: Pasquale Maffia, University of Glasgow, United Kingdom

SCIENCE MENTOR: Hui Sun

CITATION: Sushilkumar S, Allen AC and Osier NS (2022) Chlorpromazine: Paving the Way for a Better Understanding of Schizophrenia. *Front. Young Minds* 10:676273. doi: 10.3389/frym.2022.676273

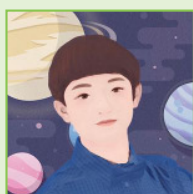
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YOUNG REVIEWER

ERIC, AGE: 12

I am a seventh grader. I am a keen and passionate STEM student. I am also a music enthusiast who enjoys playing the piano and viola. I live with my parents, my younger sister and my pets. I like biology, physics, chemistry, and computer science. As a young reviewer, I feel deeply that scientists are the driving force behind human progress through *Frontiers for Young Minds*. I hope to become a scientist and help find cures to diseases.



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I am currently an undergraduate student at The University of Texas at Austin. I am pursuing a Bachelor of Science and Arts in Biology, a minor in Iberian and Latin American Cultures and Health Professions certificate. After I graduate, I plan to obtain a Masters in Business Administration and attend dental school the following year. My favorite activities are dancing, yoga and cooking.



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I am a graduate from University of Texas at Austin with a degree in public health. Since I was a child, I have had an interest in how science can be used to improve



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