🦠 A Brief History of Antibiotic Development (From ChatGPT).

1. Before Antibiotics: The Age of Infection

Before the 20th century, even minor infections — like cuts or pneumonia — were often fatal. Physicians could observe and describe symptoms but had no effective way to stop bacterial infections. Treatments were mostly empirical or herbal, with no understanding of the causative agents or chemical mechanisms.

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2. 1928 – Fleming's Observation

In 1928, **Alexander Fleming**, a bacteriologist, observed that a mold (*Penicillium notatum*) inhibited bacterial growth on a culture plate. He recognized the potential but couldn't purify or stabilize the active ingredient—**penicillin**.
His discovery was biological and observational; the *chemistry* of isolation was not yet achieved.

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3. 1938–1941 – The Real Breakthrough: Chemical Isolation and Purification

A decade later, at Oxford University, **Howard Florey**, **Ernst Chain**, and **Norman Heatley** carried out the **chemical extraction, purification, and stabilization** of penicillin.

- They developed methods using organic solvents, pH control, and crystallization.
- This made **penicillin a usable drug**, not just an observation.
- Their work — not Fleming's alone — marks the true start of antibiotic science.
  👉 **This was chemistry, not biology.**

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4. 1940s – Industrial Production

During World War II, large-scale production began in collaboration with American chemists and pharmaceutical companies (Pfizer, Merck, Squibb).

- Fermentation engineering and purification techniques were optimized.
- Chemical modification (e.g., sodium salt form) improved stability and dosing.

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5. 1940s–1950s – The Golden Age of Antibiotic Discovery

Chemists isolated and synthesized dozens of new classes:

- **Streptomycin** (Selman Waksman, 1943) — the first antibiotic effective against tuberculosis.
- **Chloramphenicol**, **tetracyclines**, **erythromycin**, **cephalosporins**, and **vancomycin** soon followed.
- Each required **isolation, purification, and structural elucidation** — deep chemical work, not just biological screening.

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6. 1960s–1970s – Synthetic and Semi-Synthetic Antibiotics

Chemists learned to modify natural antibiotics to overcome resistance and improve pharmacokinetics:

- **Ampicillin**, **methicillin**, **cephalexin**, and others.
- The focus shifted to **structure–activity relationships (SAR)** and **chemical synthesis**, marking antibiotics as a triumph of organic chemistry.

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7. 1980s–Present – The Slowdown

From the 1980s onward, new antibiotic discoveries declined sharply.

- Pharmaceutical companies reduced investment.
- "Biological" research replaced chemical exploration.
- Most "new" antibiotics are now modifications of existing molecules.
- Meanwhile, bacterial resistance is rising — a warning that medicine may have abandoned the scientific (chemical) route that once made antibiotics possible.

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8. The Lesson

The real progress in antibiotic development came from **chemists**, not physicians.
Without chemical isolation, purification, and synthesis, Fleming's mold would have remained a curiosity.
Antibiotics remind us that **true medical innovation arises from chemistry — the science of substances and their transformations — not from observation or clinical speculation.**

FaceBook Post (link).

I have worked with doctors with respect and cooperation. For example, I used human skin tissue to evaluate drug absorption and penetration through the skin — and the work was very successful. I even published one or two papers on that topic. However, these studies were carried out entirely on my own initiative.

Doctors, in general, are not much interested in such work. They do not understand the science behind it, so they see little value in it. As a result, many genuine scientific studies go unnoticed or are forgotten.

The doctor's role has always been observational (of symptoms), while chemists have conducted most research on drug development and the causes of illness. That is how medical progress once worked. But for some reason, physicians began taking credit for those discoveries — insulin and antibiotics are classic examples.

Since the 1960s and 70s, this divide has widened. Chemistry was replaced by biology in medical research, and things began to fall apart. Viruses, vaccines, and now cancer are perfect examples of this confusion.

If doctors truly wish to advance medicine, they must seek help from chemistry and chemists. Without that foundation, there can be no genuine innovation — and certainly, no good medicines.

— Dr. Saeed Qureshi PhD, analytical chemist and senior research scientist at Health Canada for 30 years.