The Birth of Modern Pharmacy

From Apothecary to Scientific Pharmacist:
A Revolution from the 19th to the 20th Century

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02 Introduction & Problem Statement

- Pharmacy was not born from nothing: it results from a millennial evolution
- Every civilization contributed to enriching this therapeutic know-how
- The chemical revolution of the 19th century as the major catalyst of this mutation
  - Transition from artisanal preparation to industrial and scientific production

Central Problem Statement

- How did pharmacy transition from craftsmanship to exact science?
- What were the legislative, scientific, and social factors of this transformation?
- What legacy does this revolution leave for contemporary pharmacy?

03 Distant Origins - Prehistory and Antiquity

- Neolithic period (~8500 BC): first decoctions based on poppy, valerian, chamomile

▸ Ancient China: Shennong and the Chinese Pharmacopoeia

- Shennong, "Father of Medicine": classification of 365 remedies
- Three categories: minerals, plants, animals — foundation of materia medica

▸ Ancient Egypt: Papyrus and Medical Knowledge

- Ebers Papyrus (~1550 BC): more than 700 medicinal formulas
- Priest-physicians: the first specialists in preparing remedies

▸ Ancient Greece: Hippocrates and Rational Medicine

- Hippocrates (460-370 BC): theory of the four humors (blood, phlegm, yellow bile, black bile)
- First experimental pharmacopoeia based on clinical observation

04 Greco-Roman Heritage — Galen, Father of Pharmacy

Claudius Galenus (Galen): Central Figure

- Physician to Marcus Aurelius and Commodus, surgeon to the gladiators of Pergamum
- Author of more than 500 treatises covering medicine, anatomy, and pharmacy
- His influence endured for over 15 centuries in both the West and the East

The Importance of Drug Manufacturing

- Galen gave paramount importance to pharmaceutical preparation
- Development of transformation techniques: decoctions, macerations, extractions
- Classification of simple and compound medicines (galenicals)

The Oath of Galen: A Living Legacy

- Still sworn by French pharmacists during their professional thesis defense
- Officially instituted in 1608 by the Order of Apothecaries of Paris
- Ethical commitment: dedication to the patient, professional secrecy, honesty

05 The Arab Golden Age- The True Inventors

▸ The First Pharmacy in History

- Sayadila opened in Baghdad by Caliph Al-Mansur in 754 AD
- First establishment dedicated exclusively to the preparation and sale of medicines

▸ Translation and Enrichment of Knowledge

- Creation of the "House of Wisdom" (Bayt al-Hikma) in Baghdad
- Encyclopedic synthesis of medical and pharmaceutical knowledge from the ancient world

▸ Avicenna (Ibn Sina): The Canon of Medicine

- Canon of Medicine (al-Qanun fi't-Tibb): the reference medical encyclopedia
- Rigorous systematization of pharmaceutical knowledge
- Classification of medicines by properties, actions, and therapeutic indications

▸ Al-Biruni: The Book of Drugs

- Kitab al-Saydalah ("The Book of Drugs"): first treatise dedicated to the pharmacist
- Precise definition of the role and competencies of the pharmacist (saydalani)
- Detailed description of more than 700 medicinal substances with their origins and effects

▸ Perfection of Pharmaceutical Techniques (Distillation, Sublimation, etc)

06 The European Middle Ages - The Apothecaries

- Official and definitive separation between physicians and apothecaries
  - Physicians forbidden from engaging in drug commerce; apothecaries forbidden from practicing medicine
  - First legal framework regulating pharmaceutical practice in Europe
- The apothecary prepared and sold remedies, without the right to medical diagnosis
  - Ambiguous status: neither fully merchant nor fully health professional

07 The Renaissance -The Scientific Awakening

Experimentation Replaces Tradition

- Return to ancient texts criticized and verified experimentally
- Medicine and pharmacy based on direct observation rather than theory
- Birth of the scientific method applied to medical sciences

The Chemical Revolution in Medicine

- • Chemical revolution: use of minerals and metals as remedies (mercury, antimony)
- Concept of "dose": "All things are poison, nothing is poison; it is the dose that makes the poison"
- Virulent critique of traditional Galenic medicine

Theophrastus and Pharmacognosy

- Theophrastus (or his Renaissance successors): systematic study of natural drugs
- Pharmacognosy: the science of medicinal substances of natural origin
- Botanical, chemical, and medical description of medicinal plants
- Foundation of modern materia medica

The First National Pharmacopoeias

- Need to standardize medicinal preparations at the scale of a kingdom
- Pharmacopoeia of Florence (1498), Cologne (1565), Paris (1638)
- Official collection of recognized medicines, their forms and dosages
- Tool for regulation and quality control by health authorities

08 The Absolute Turning Point — 1777: Birth of the "Pharmacist"

The Royal Declaration of April 25, 1777

- Royal edict enacting the definitive separation between apothecaries and grocers
- Creation of the College of Pharmacy in Paris: training and control institution
- The term "pharmacist" officially replaces "apothecary" in the French language
- First step toward recognizing the pharmacist as a full-fledged health professional

Historical Significance

- First legal recognition of a distinct and autonomous pharmaceutical profession
- Foundation of modern pharmacy regulation in France
- Legislative model that inspired other European countries in the following decades
- Foreshadowing of the foundational law of 1803 under Napoleon

09 The French Revolution & the Foundational Law

▸ The Law of 21 Germinal Year XI (April 11, 1803)

- Established the pharmaceutical monopoly: only pharmacists may prepare and sell medicines
  - Defined access conditions to the profession: examination, license, registration
  - Structured the entire medicine chain in France

▸ Creation of Pharmacy Schools

- State-supervised training: standardized programs, examinations, and diplomas
- First schools in Paris, Montpellier, Strasbourg
- Theoretical teaching (chemistry, botany, anatomy) and practical (official preparations)

▸ Institution of the National Codex

- Replacement of heterogeneous regional formularies with a single national code
- Standardization of recipes, dosages, and preparation methods
- Control tool for public health inspectors

▸ Control of Poisonous Substances

- Mandatory register of all toxic or dangerous substances
- Secure and controlled storage in pharmacies
- Traceability of sales of at-risk substances
- First framework for preventive pharmacovigilance

10 The Chemical Revolution - The 19th Century

Lavoisier: The Foundation of Modern Chemistry

- Antoine Laurent de Lavoisier (1743-1794): pneumatic chemistry and law of conservation of mass
- Table of simple elements: foundation of analytical chemistry
- Quantitative methods: weighing, gas measurement, elemental analysis
- Chemistry becomes an exact, measurable, and reproducible science

Pioneer Apothecary-Chemists

- Guillaume-François Rouelle (1703-1770): chemistry of salts, concept of base and acid
- Valmont de Bomare (1731-1807): mineralogy and chemistry applied to pharmacy
- Antoine Baumé (1728-1804): densimetry, concentration and purification techniques
- These apothecaries were the first to apply modern chemistry to medicine preparation

Chemistry as the Pivot Science

- Chemistry becomes the central discipline of pharmaceutical training
- Qualitative and quantitative analysis of medicinal substances
- Synthesis of new compounds with therapeutic properties
- Control of identity, purity, and concentration of medicines

From Complex Remedy to Pure Active Principle

- Old approach: complex remedies based on whole plants or crude extracts
- New approach: isolation of active molecules responsible for the therapeutic effect
- Major advantage: precise dosages, reproducibility, absence of side effects from excipients
- This transformation is at the heart of the birth of modern pharmacy

11 The Great Discovery - Alkaloids (1806-1820)

1806: Sertürner and Morphine

- Friedrich Wilhelm Sertürner (1783-1841), German pharmacist
- Isolation of morphine from opium poppy
- First alkaloid isolated in pure form in the history of chemistry
- Demonstration that the analgesic effect of opium is due to a single molecule

1818-1820: Pelletier and Caventou

- • Isolation of strychnine (1818), brucine (1819), and quinine (1820)
- Quinine: effective remedy against malaria, extracted from cinchona bark
- These discoveries saved millions of lives and opened the way to therapeutic chemistry

1811: Courtois and Iodine

- Bernard Courtois , French pharmacist has discovered the iodine during the treatment of kelp ash
- First chemical element discovered by a pharmacist
- Revolutionary antiseptic applications in surgery and medicine

1826: Balard and Bromine

- Antoine Jérôme Balard (1802-1876), pharmacist from Montpellier
- Discovery of bromine in the seawaters of Montpellier
- Second halogen element discovered after chlorine
- Applications in medicinal chemistry and photography

Major Consequence: Industrial Expansion

- Pharmacies could no longer produce these purified substances on a large scale
- Need for specialized laboratories with industrial equipment
- Birth of the chemical pharmaceutical industry in Europe
- The community pharmacist gradually became a dispenser rather than a manufacturer

12 Pioneers of Modern Pharmacy

François Dorvault (1815-1879)

- Parisian pharmacist, emblematic figure of 19th-century practical pharmacy
- Publication of "L'Officine" in 1844: general and encyclopedic repertoire of pharmacy
- Reference work used by generations of pharmacists for over 50 years
- Creation of the Pharmacie Centrale de France in 1852: first pharmaceutical cooperative

Claude-Adolphe Nativelle (1812-1889)

- Pharmacist and chemist, collaborator of Pierre-Joseph Pelletier
- Discovery of pure digitaline in 1872: cardiotonic glycoside extracted from digitalis
- Digitaline: treatment for heart failure, first precision cardiac medication
- Major contribution to modern cardiovascular therapeutics

Antoine Béchamp (1816-1908)

- Professor of medicinal chemistry and pharmacy at the Faculty of Montpellier
- Father of modern biology: theory of microzymas and fermentation
- Work on the reduction of nitrobenzene salts, synthesis of aniline
- Controversial but unavoidable figure of French medicinal chemistry

Louis Pasteur (1822-1895)

- Chemist and microbiologist, deeply linked to pharmacy through his training
- Vaccines: rabies (1885), anthrax, chicken cholera - therapeutic revolution
- Pasteurization: preservation technique applicable to liquid medicines
- Foundation of modern immunology and medical microbiology

Collective Impact of These Figures

- Transformation of pharmacy from craftsmanship into rigorous and codified science
- Establishment of reproducible and quantifiable experimental methods
- Creation of training, research, and quality control institutions
- Social and scientific legitimization of the pharmaceutical profession

13 Structuring of the Profession

▸ 1803: Creation of Pharmacy Schools

- Standardized programs: chemistry, botany, materia medica, galenic pharmacy
- First university training dedicated exclusively to pharmacy

▸ 1920: From Schools to Faculties of Pharmacy

- Elevation to Faculty rank: academic and scientific recognition
- Integration into universities: fundamental research and doctoral training
- Development of specialties: pharmacology, pharmacognosy, therapeutic chemistry
- Doctorate in pharmacy: original research and contribution to scientific knowledge

▸ 1945: Creation of the Order of Pharmacists

- Professional body for discipline, counsel, and representation
- Pharmaceutical code of ethics: binding ethical and deontological rules
- Regional and national Order councils: control of practice

▸ 1946: The National Academy of Pharmacy

- The Paris Society of Pharmacy, founded in 1809, becomes the National Academy of Pharmacy
- Institutional recognition of pharmacy as a major academic science
- Publication of the Academy Bulletin: reference scientific journal

▸ Symbols of the Profession

- Caduceus: symbol registered at INPI in 1967, representing commerce and negotiation
- Green Cross: established in 1984, European symbol of the pharmacy
- Oath of Galen: professional initiation ritual perpetuated since 1608
- These symbols materialize the identity and values of the profession

14 The 20th Century — The Modern Era

The Antibiotic Revolution (post-1945)

- Alexander Fleming discovered penicillin in 1928; industrial production from 1942
- Streptomycin (Selman Waksman, 1943): first effective antibiotic against tuberculosis
- Chloramphenicol, tetracyclines, macrolides: antibacterial therapeutic arsenal
- Penicillin has saved more than 200 million lives since its discovery

Appearance of Pharmaceutical Specialties

- Ready-to-use industrial medicines, manufactured in series and controlled
- Pharmaceutical specialty: patented, dosed, packaged, and industrially labeled medicine
- Progressive replacement of magistral preparations by specialties

Birth of Pharmacovigilance

- Creation of regional pharmacovigilance centers in France (1973)
- Systematic surveillance of adverse effects: nonexistent in the 19th century

New Constraints and New Challenges

- Ever-stricter regulation: MA, GMP, good dispensing practices
- Globalization of the pharmaceutical industry and international competition
- Emergence of biological medicines and gene therapies
- Treatment personalization: precision medicine and pharmacogenomics

15 Contemporary Changes

Pharmaceutical Interviews

- Educational role: explaining treatment, promoting adherence
- Preventive role: screening risk factors, vaccination, hygiene-dietetic advice
- Legal recognition of the pharmacist as a public health prevention actor

Return to Natural and Organic

- Paradox of modernity: return to plants and "gentle" methods
- Dietary supplements, phytotherapy, aromatherapy: strongly growing market
- Patient demand for more natural and less chemical care
- New pharmacist role: advice in phytotherapy and alternative medicines

The Pharmacist, Full-Fledged Health Professional

- Evolution of legal status: recognition as a health professional
- Expanded competencies: vaccination, prescription renewal, generic substitution
- Interprofessional collaboration: care team with physicians, nurses, physiotherapists
- Central place in the care pathway of the chronic patient

E-Health and Digital Pharmacy

- Telemedicine and telepharmacy: remote consultation, dematerialized dispensing
- Mobile applications: medication intake reminder, treatment information
- Artificial intelligence: aid in pharmaceutical diagnosis, detection of prescription errors
- Blockchain and traceability: securing the medicine chain against counterfeiting

16 Synthesis - The 5 Pillars of Modern Pharmacy

Pillar	Key Date	Founding Event	Significance
Scientific	1806	Isolation of morphine (Sertürner)	Birth of therapeutic chemistry and pure active principles
Legislative	1803	Law of 21 Germinal Year XI	Pharmaceutical monopoly, pharmacy schools, National Codex
Educational	1803-1920	Schools → Faculties of Pharmacy	Scientification of training, university research
Industrial	1827-1852	E. Merck, Pharmacie Centrale de France	Industrial production, pharmaceutical specialties
Ethical	1608-1945	Oath of Galen, Order of Pharmacists	Professional deontology, individual responsibility

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18 Conclusion

A Millennial Heritage

- From Shennong to Galen, from Arab apothecaries to 19th-century chemists
- Every civilization enriched pharmaceutical knowledge through its discoveries and techniques
- Modern pharmacy is the fruit of a secular accumulation of knowledge

The Napoleonic Turning Point

- The Law of 21 Germinal Year XI: legal birth certificate of modern pharmacy
- Structuring of the profession, pharmaceutical monopoly, university training
- Legislative model that inspired all of Europe and persists in France today

The Chemical Revolution

- Isolation of active principles: scientific birth certificate of modern pharmacy
- Radical transformation: from empirical craftsmanship to exact and quantifiable science
- Foundation of the pharmaceutical industry and modern therapeutics

The Permanent Challenge

- Reconciling scientific progress, universal access to care, and cost control
- Fragile balance between therapeutic innovation and viability of health systems
- New challenges: antibiotic resistance, personalized medicine, e-health

The Pharmacist of Today and Tomorrow

- Heir to a rich history and a millennial know-how
- Central actor in a public health system in permanent transformation
- Health professional advisor, educator, and guarantor of drug safety

"Today's pharmacy owes its heritage to centuries of research, experimentation, and evolution."