



Teaching History of Pharmacy According to the AIHP Guidelines:

A. Introduction to the Study of Pharmacy History

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Lecture Objectives

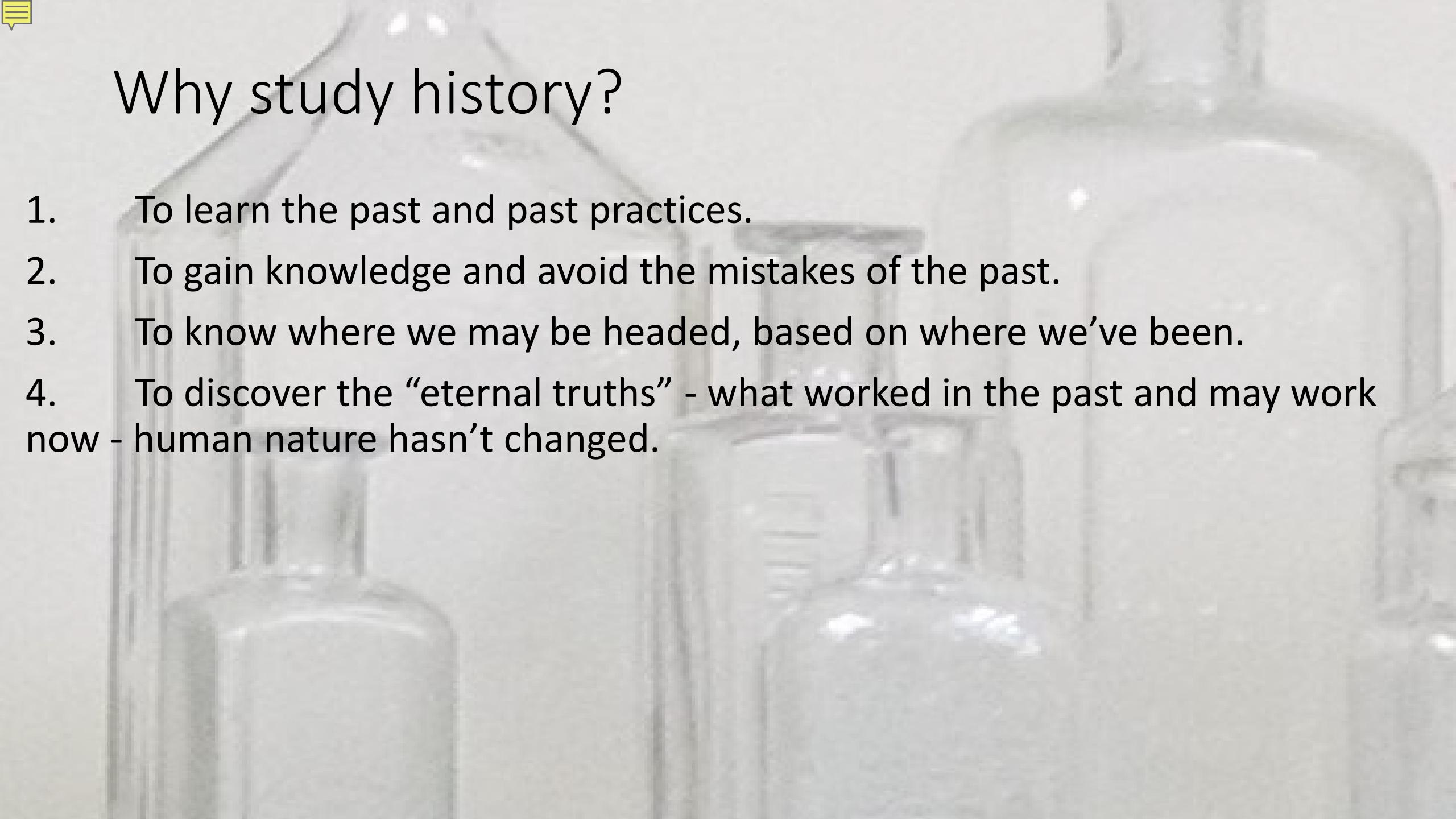
- Explain the evolution of diagnosis and treatment of disease in early civilizations
- Discuss the role of fossils in discovering disease in early man
- Describe techniques used by early Native Americans to diagnose and treat disease
- Describe the significance of artifacts left by early civilizations to medicine, treatment and society
- Explain the importance of the shaman healer in the prehistoric era and connection to modern healthcare

Lecture Objectives

- Identify contributions made by Greek and Roman Empires, especially how they influenced the standards for Western pharmacy and medicine
- Explain how the Romans built upon Greek medical and pharmacy achievements
- Recall individuals from Greek and Roman Empires who advanced pharmacy and medicine
- Describe methods used by the Greeks and Romans to diagnose and treat disease

Learning Objectives

- Describe key features of Arabian pharmacy
- Discuss the contributions of Arabian pharmacy to expanding pharmacy literature
- Discuss key elements of Ancient Chinese Medicine
- Discuss how Chinese Medicine evolved the use of the needle as a means to deliver treatment
- Describe the doctrine and different disciplines of Ayurveda Medicine



Why study history?

1. To learn the past and past practices.
2. To gain knowledge and avoid the mistakes of the past.
3. To know where we may be headed, based on where we've been.
4. To discover the “eternal truths” - what worked in the past and may work now - human nature hasn't changed.

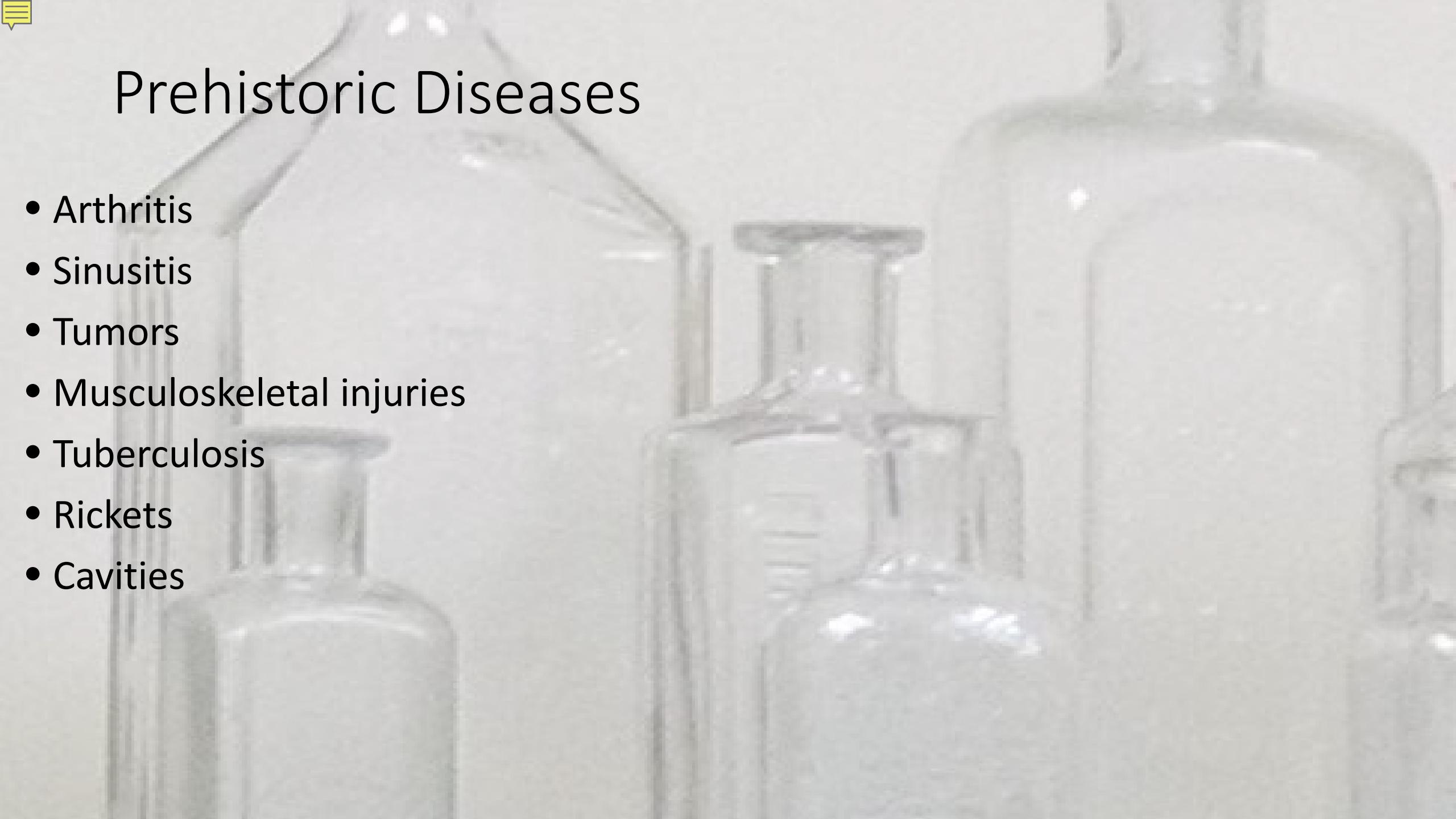
How long has pharmacy existed?

- As long as man has been in existence.
- Early man/woman learned by trial & error what effects different plants, animals and minerals had.
- Prehistoric humans believed events &/or occurrences were due to magic or spirits, and their “pharmacy” practice was a mix of mysticism and crude products.

Prehistoric Era

- 2.6 million years ago to ~15,000 B.C.
- Cave people
- Small tribes, sparsely wooded areas
- Gatherers & Hunters
- Nomadic
- Primary cause of death: disease & injury
 - Short lifespan
 - High infant mortality





Prehistoric Diseases

- Arthritis
- Sinusitis
- Tumors
- Musculoskeletal injuries
- Tuberculosis
- Rickets
- Cavities

Habits of the Paleolithic Man

- Leaves, mud, and clay
- Instinct
- Trial & error
- Learned by watching animals, neighbors
- Created gods / idols
- Emergence of tribal healers

*How does this
compare to
practices we use
today?*



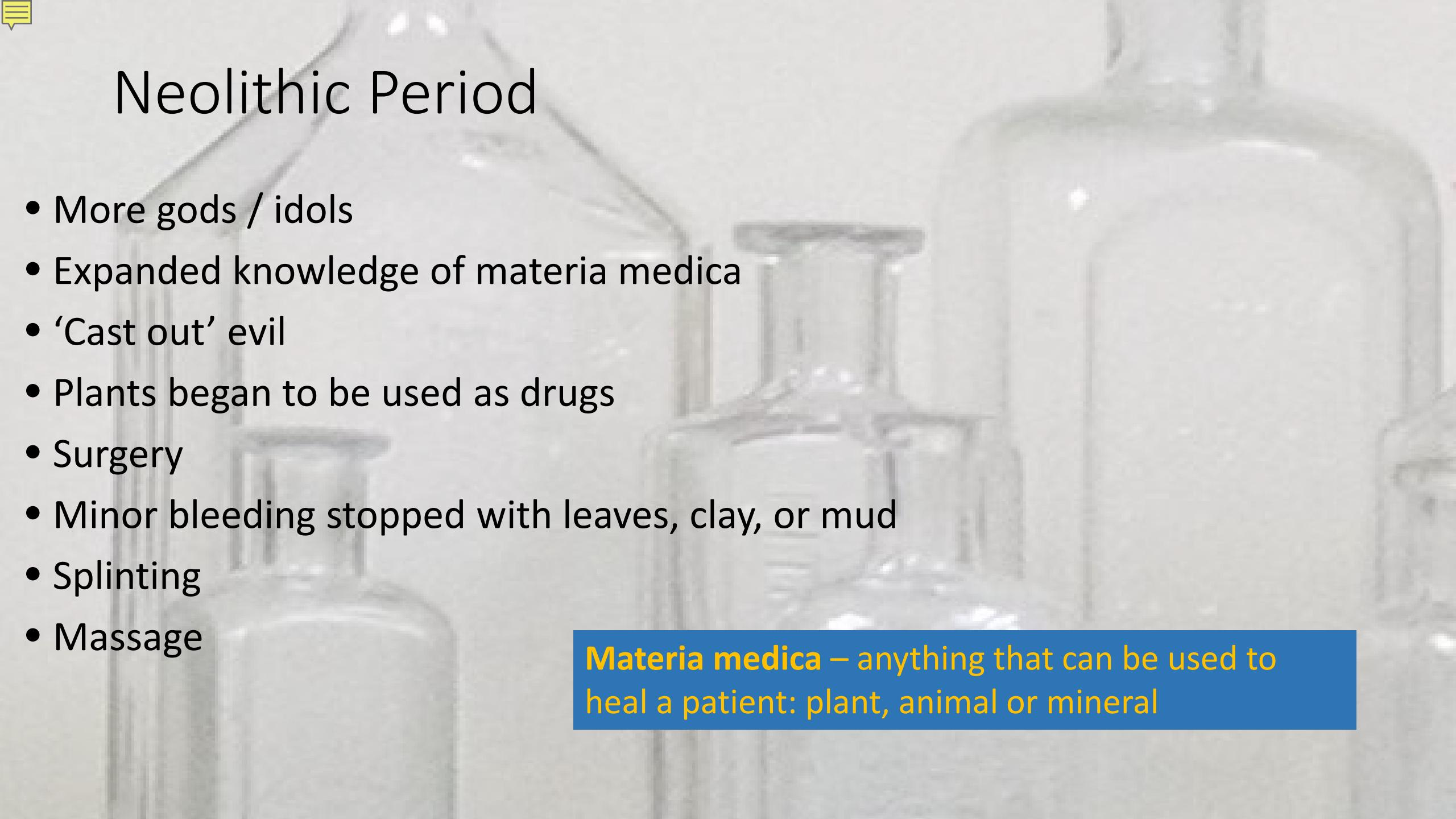


Neolithic Period

- ~10,000 to 12,000 B.C.
 - New Stone Age
- Higher density populations
- Permanent dwellings
- Agriculture
- Pottery allows for food / water storage
- Irrigation
- Farming, animal breeding
- Cloth weaving
- Art, trade



- *Advancements for humanity created negative consequences such as....*



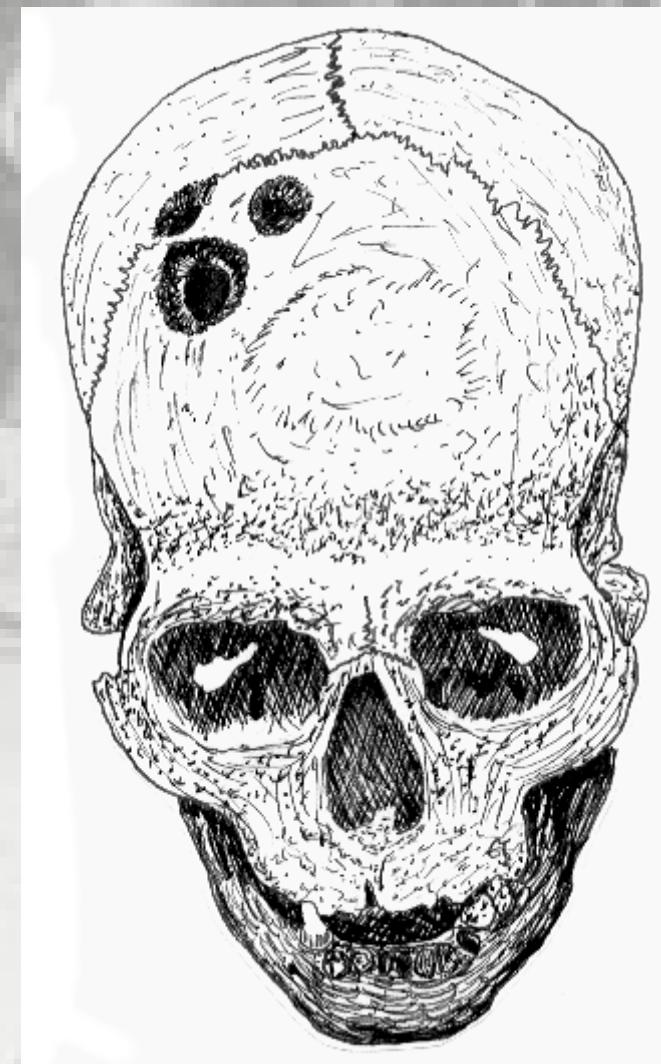
Neolithic Period

- More gods / idols
- Expanded knowledge of *materia medica*
- ‘Cast out’ evil
- Plants began to be used as drugs
- Surgery
- Minor bleeding stopped with leaves, clay, or mud
- Splinting
- Massage

Materia medica – anything that can be used to heal a patient: plant, animal or mineral

A Trephined Skull, 8,000 B.C.

Link between man and primitive societies



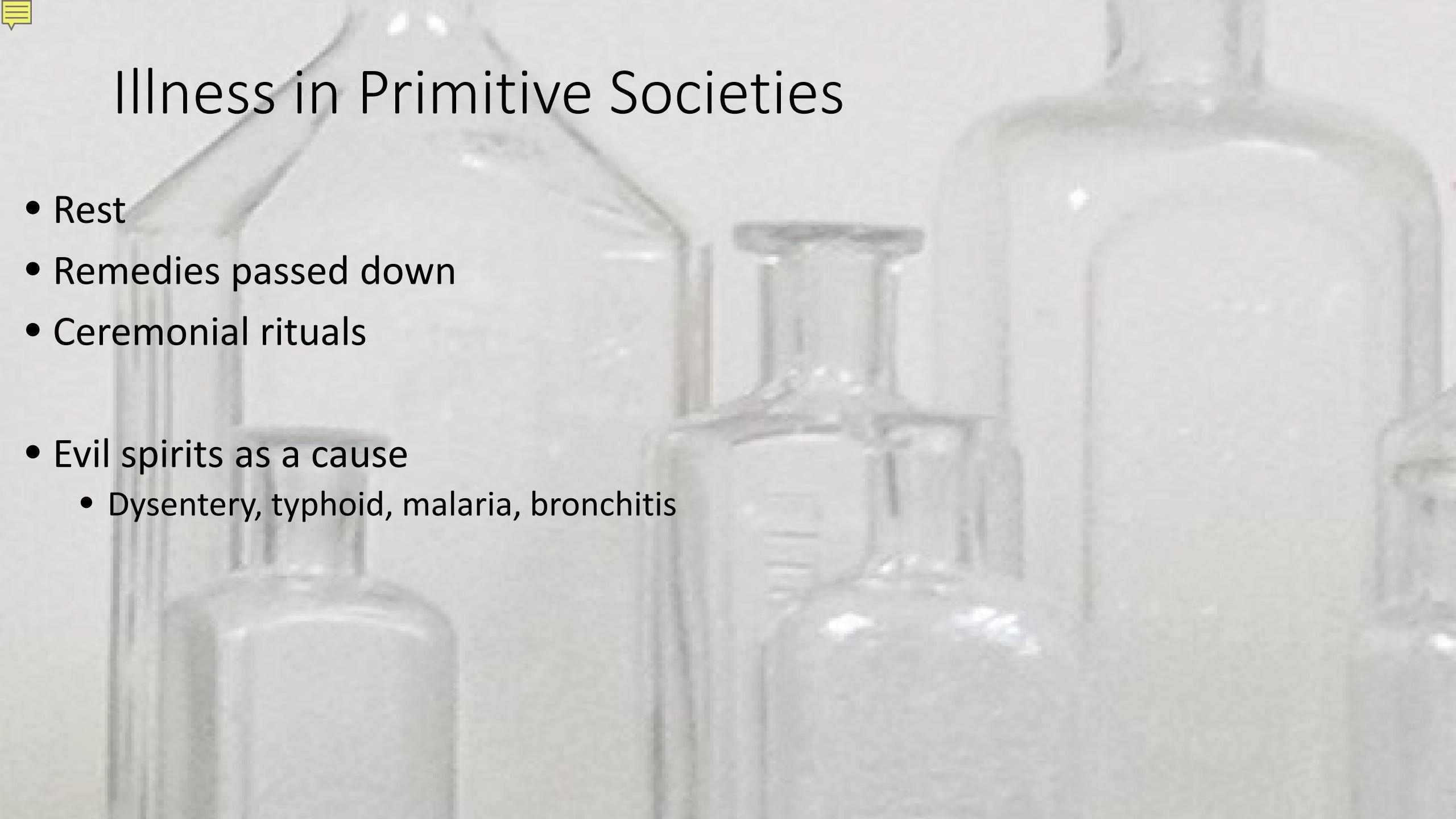


Ötzi - “Iceman” (lived around 3300 BC) - discovery yields information about prehistoric ancestors



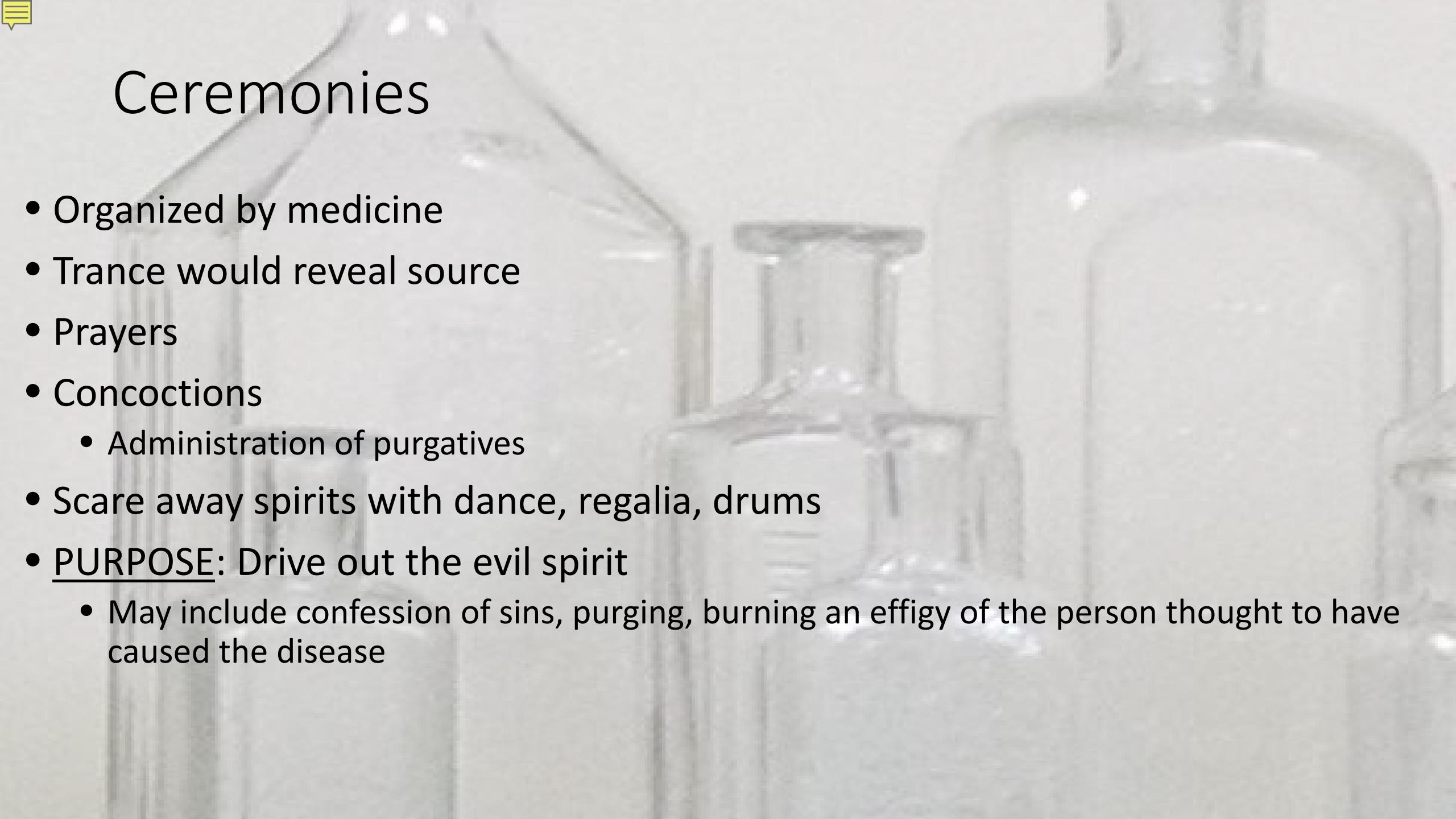
Primitive Cultures / Native American Medicine

- Link to the Neolithic Era
- No written language
- Primitive technology
- Knowledge of plant drugs without application of technology
- Tribal similarities
 - Superstitions, curses, gods, breaking a taboo caused a curse
 - Ritual chanting / dancing
 - Family presence
 - Shamans
 - Surgical skills



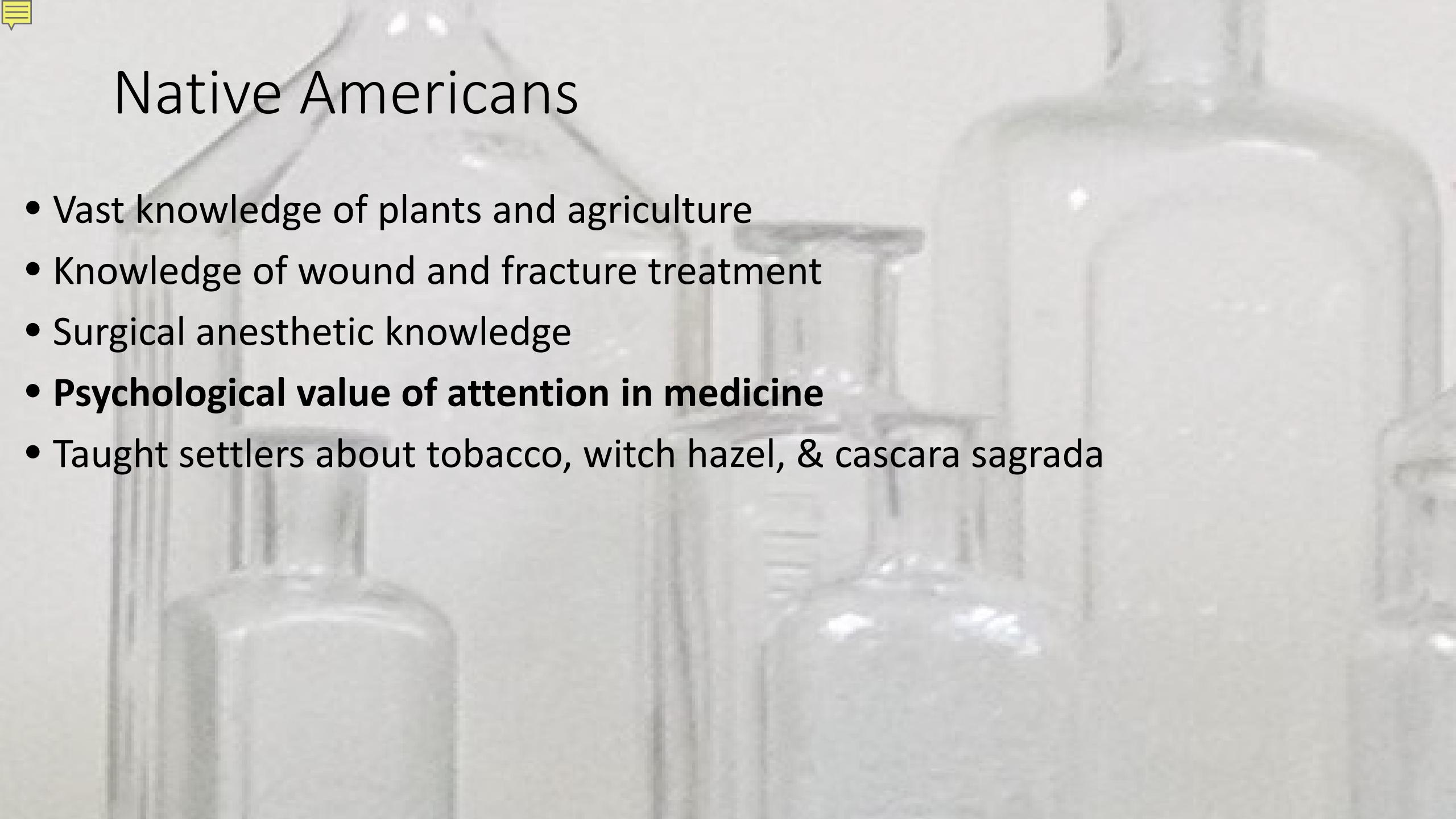
Illness in Primitive Societies

- Rest
- Remedies passed down
- Ceremonial rituals
- Evil spirits as a cause
 - Dysentery, typhoid, malaria, bronchitis



Ceremonies

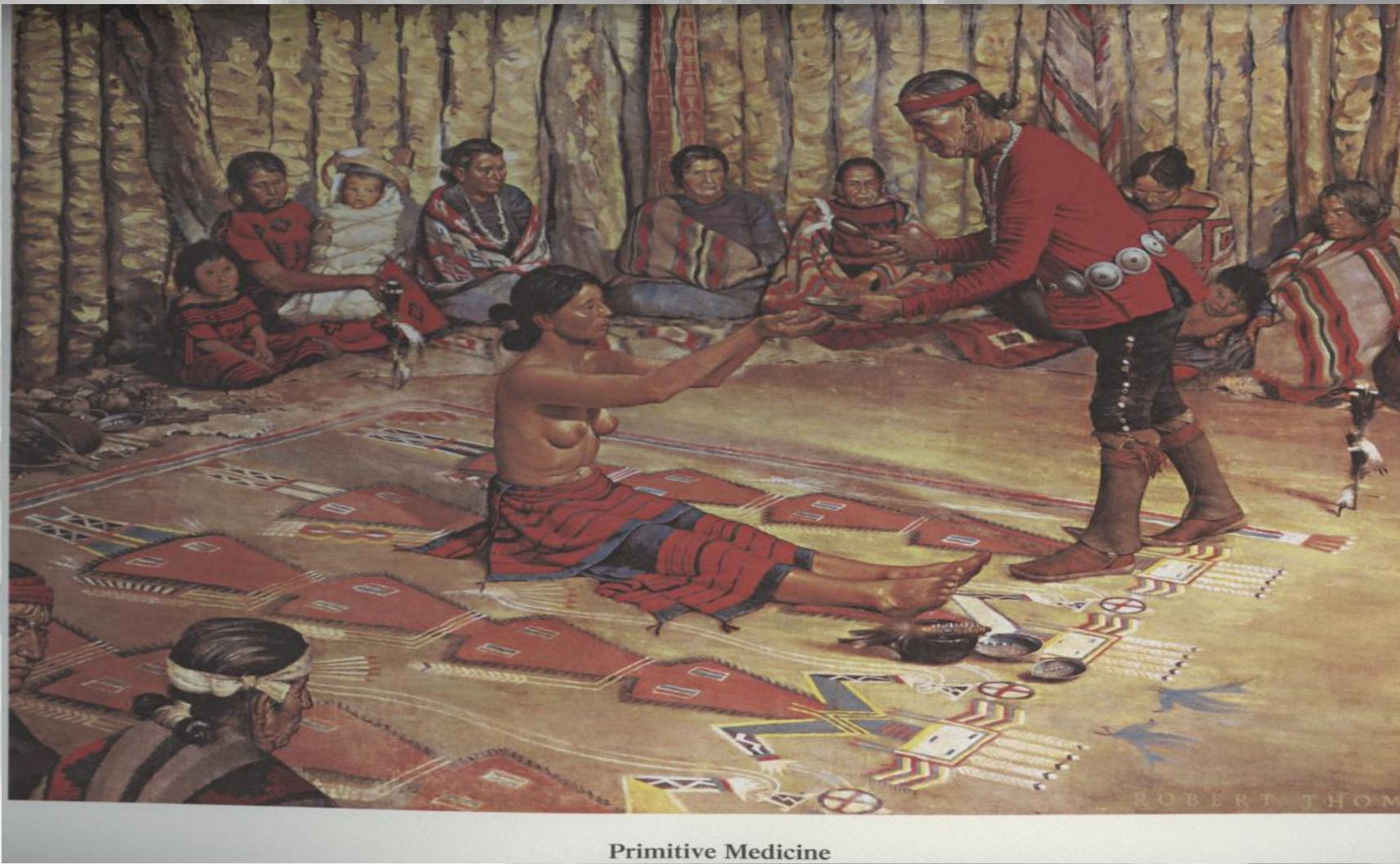
- Organized by medicine
- Trance would reveal source
- Prayers
- Concoctions
 - Administration of purgatives
- Scare away spirits with dance, regalia, drums
- PURPOSE: Drive out the evil spirit
 - May include confession of sins, purging, burning an effigy of the person thought to have caused the disease



Native Americans

- Vast knowledge of plants and agriculture
- Knowledge of wound and fracture treatment
- Surgical anesthetic knowledge
- **Psychological value of attention in medicine**
- Taught settlers about tobacco, witch hazel, & cascara sagrada

Native American Ritual Medicine



Primitive Medicine

Navajo Sand Painting

- Painted elaborate designs in the sand
- Spirits could act to cure sickness
- Destroyed after 24 hours so they could not be used maliciously
- Over 600 documented, each with a specific disease or prevention ceremony

Ancient World: Growth of Civilization

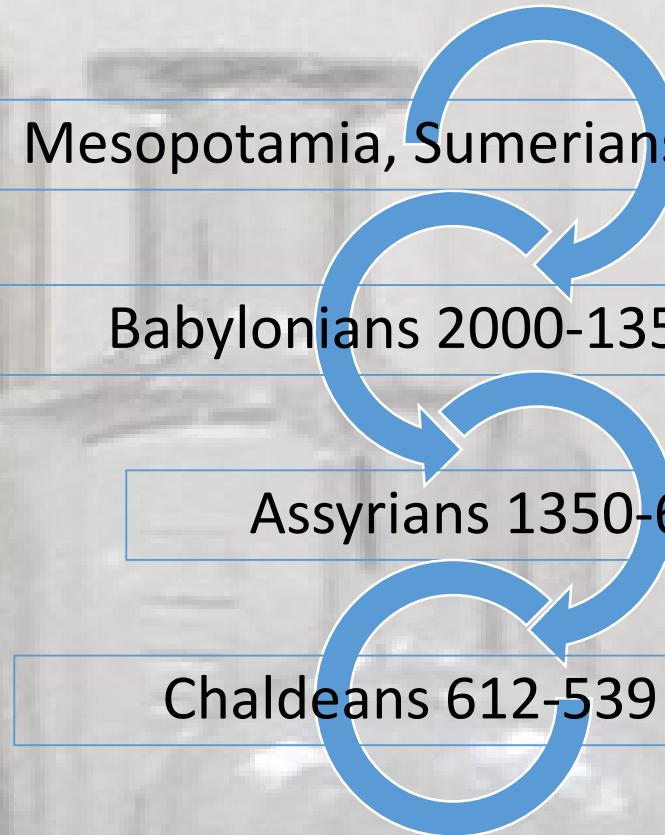
- Village populations grew
- River civilizations grew

Mesopotamia, Sumerians 4000-2000 BC

Babylonians 2000-1350 BC

Assyrians 1350-612 BC

Chaldeans 612-539 BC



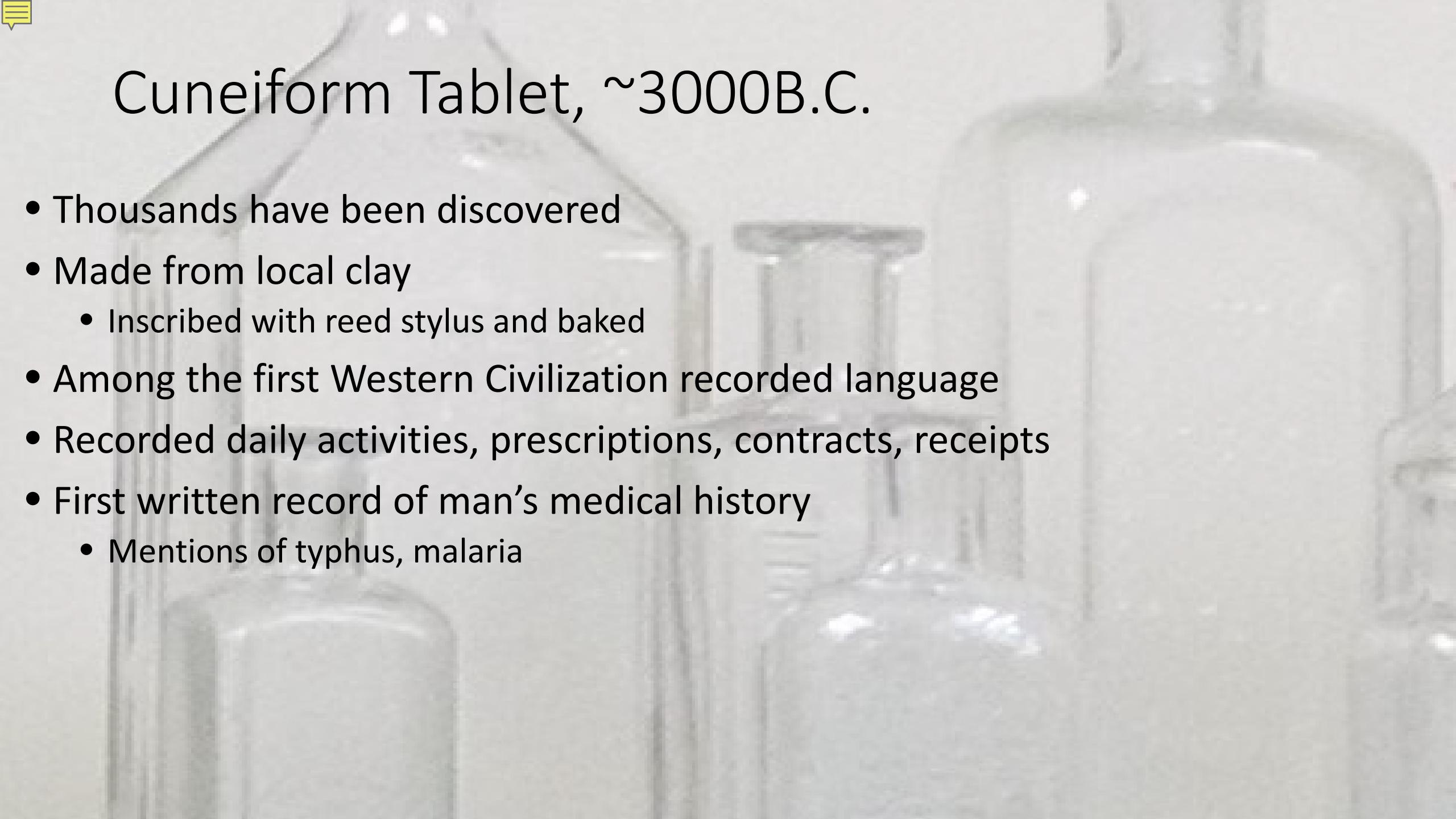


Sumerians

- Pictograms
- Cuneiform
- Basic arithmetic
- Standard system of weights and measurements
- Astrology
- Omens
- Liver is the central organ and seat of life

Sumerian “Pharmacy”

- About 250 vegetable and 120 mineral drugs
- Formulas were not quantitative
- “pasisu” = remedy/cosmetic preparers - plied their trade on a particular street

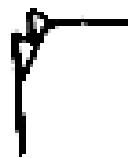
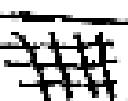


Cuneiform Tablet, ~3000B.C.

- Thousands have been discovered
- Made from local clay
 - Inscribed with reed stylus and baked
- Among the first Western Civilization recorded language
- Recorded daily activities, prescriptions, contracts, receipts
- First written record of man's medical history
 - Mentions of typhus, malaria

Pictograph Translations

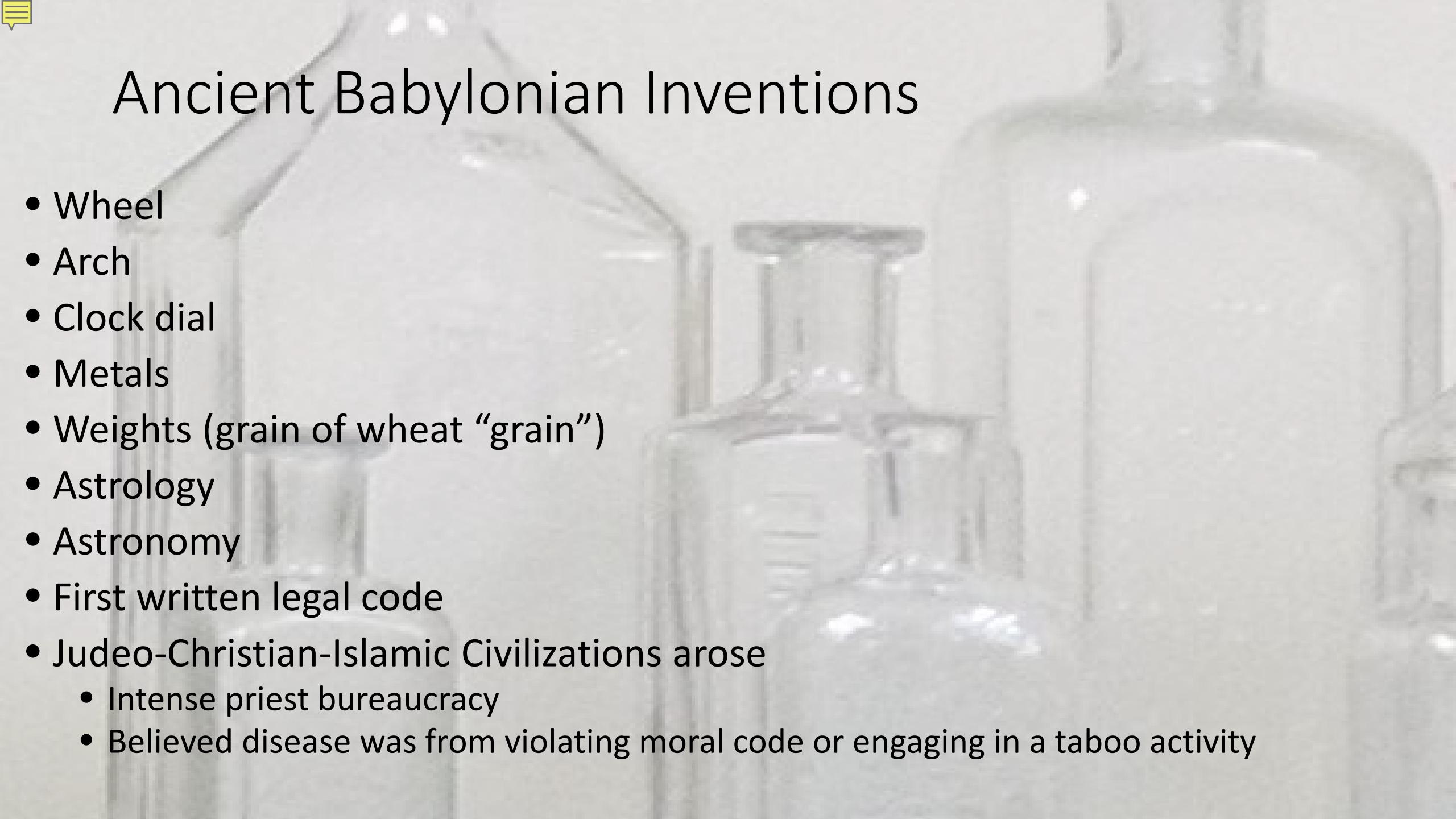
IV. SUMERIAN MEDICAL TERMS IN THE WORLD'S OLDEST PHARMACOPEIA

- a.  "plant"
- b.  "oil" (a vessel in which oil was kept)
- c.  "branches"
- d.  "to drink" (head with mouth plus water)
- d.  "to drink" (head with mouth plus water)
- e.  "fasten"
- f.  "wine"
- g.  "bread" (perhaps a vessel in bread was kneaded)
- g.  "bread" (perhaps a vessel in bread was kneaded)
- h.  "wool"

World's Oldest prescription



*Sumerian
Cuneiform
Prescription,
2100B.C.*



Ancient Babylonian Inventions

- Wheel
- Arch
- Clock dial
- Metals
- Weights (grain of wheat “grain”)
- Astrology
- Astronomy
- First written legal code
- Judeo-Christian-Islamic Civilizations arose
 - Intense priest bureaucracy
 - Believed disease was from violating moral code or engaging in a taboo activity

King Hammurabi, 1792-1750 B.C.

- Wrote first law code, medical ethics and justice
- Innocent until proven guilty
- Eye for an eye
- Regulated surgery, penalties for failed operations
- Dictated physician fees
- Genesis of current concepts of healthcare
- Managed Care sliding fee scale services based on social status



Examples of plant / mineral drugs

Mesopotamian tablet library - *materia medica*

- Mandrake
- Poppy (opium)
- Hellebore
- Pine turpentine
- Licorice root
- Myrrh
- Asafoetida
- Cannabis
- Crocus

- Mentha
- Mustard
- Turmeric
- Thymus
- Honey
- Cedar
- Willow
- Salt
- Styrax

Chemical substances: Alum,
Arsenic, Sulfur



Babylonians added:

- Senna
- Saffron
- Coriander
- Cinnamon
- Garlic

Vehicles to administer drugs:

- Alcohol
- Beer
- Wine
- Oil
- Fats (milk)
- Wax

Distillation process discovered

Poly-pharmaceuticals / Compounding

- Beer and wine used as vehicles, along with honey, milk, oils, wax, bouillon
- Preparations were ground, strained and filtered
- Decoctions (boil down, concentrate, extract flavor)
- Electuaries (mix herbs in sugar water or honey)
- Embrocations (liniments)
- Examples:

Salt + beer = Antiseptic

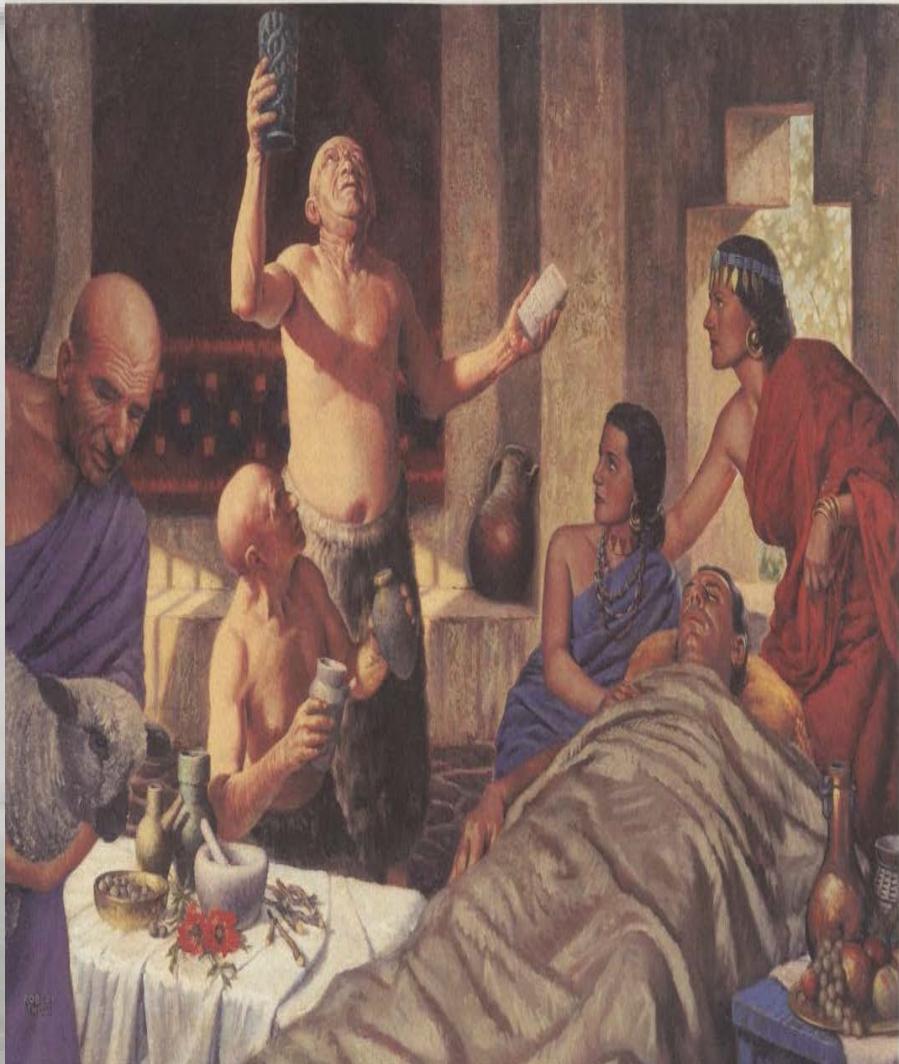
Glycyrrhiza (licorice root) + honey = Sooth sore throat

Pine turpentine oil + sulfur = Antimicrobial/analgesic for skin irritation & nerve pain

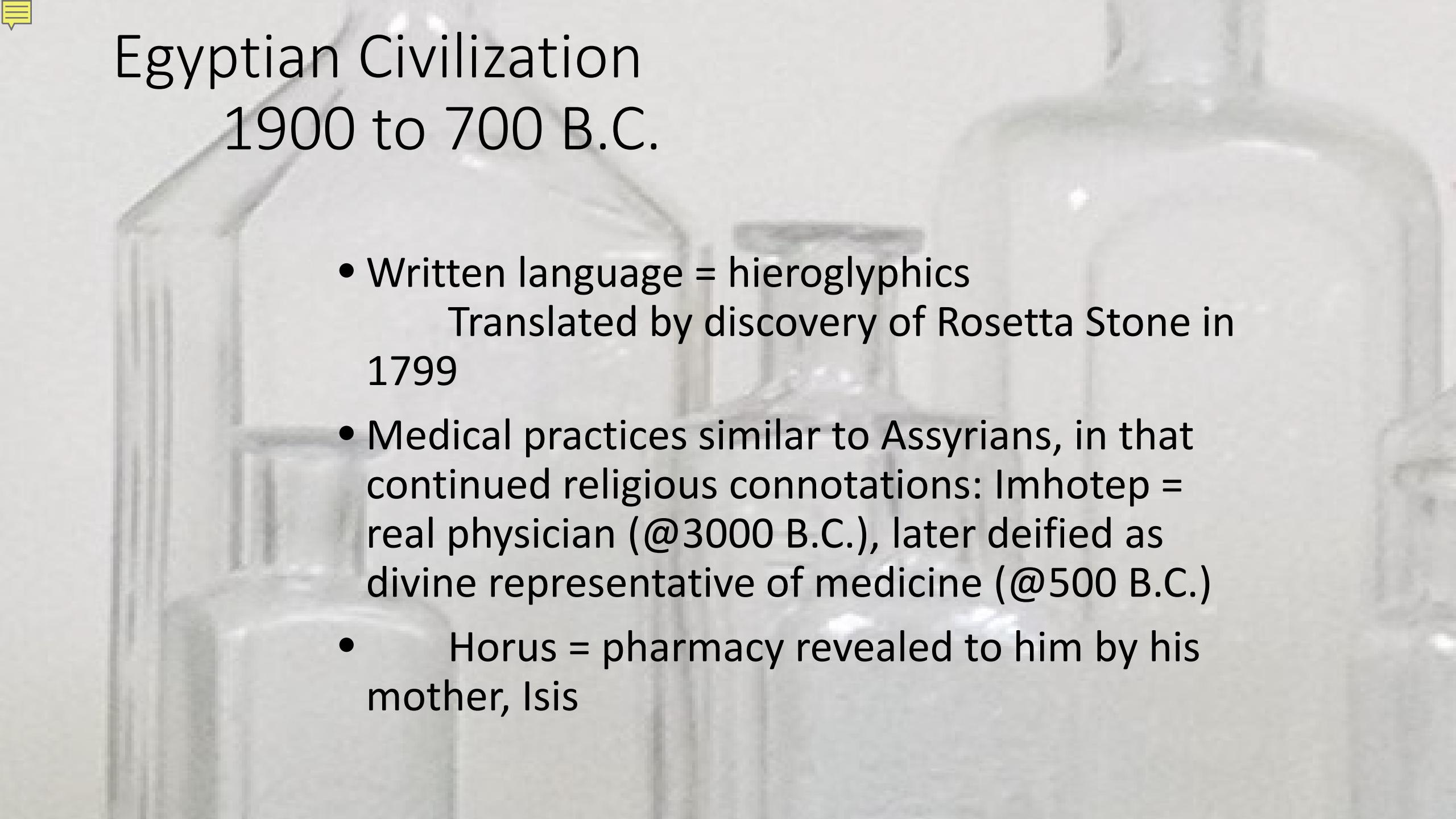
Dosage forms used in Ancient Babylonia

- Poultices and plasters
- Ointments and salves
- Lotions
- Tablets
- Powders
- Enemas
- Suppositories
- Pessaries
- Inhalations / fumigations

Pharmacy in Ancient Mesopotamia



- Temple priests determined which god or demon caused disease
 - › **BARU** diagnosis and prognosis
 - › **ASHIPU** performed rites, prescribed medicine, also acted as a nurse by applying treatments
 - › **ASU** prepared healing preparations (including drugs), performed surgery as physician/priest (Could be held accountable in Hammurabi's code. BARU AND ASHIPU were exempt.)
- Used incantations, amulets, prayers, sacrifice and drugs



Egyptian Civilization

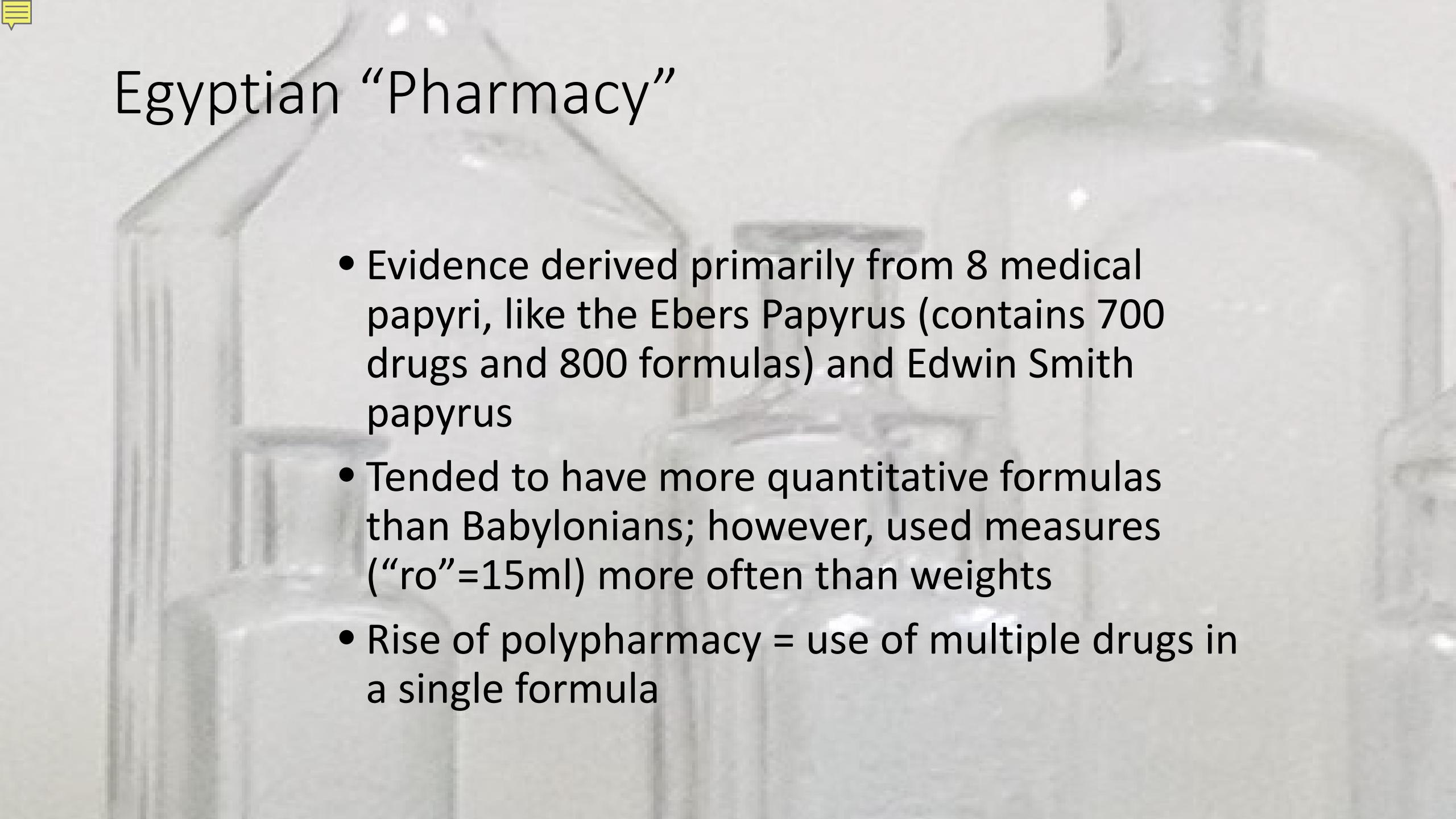
1900 to 700 B.C.

- Written language = hieroglyphics
Translated by discovery of Rosetta Stone in 1799
- Medical practices similar to Assyrians, in that continued religious connotations: Imhotep = real physician (@3000 B.C.), later deified as divine representative of medicine (@500 B.C.)
- Horus = pharmacy revealed to him by his mother, Isis

Ancient Egypt 3000BC



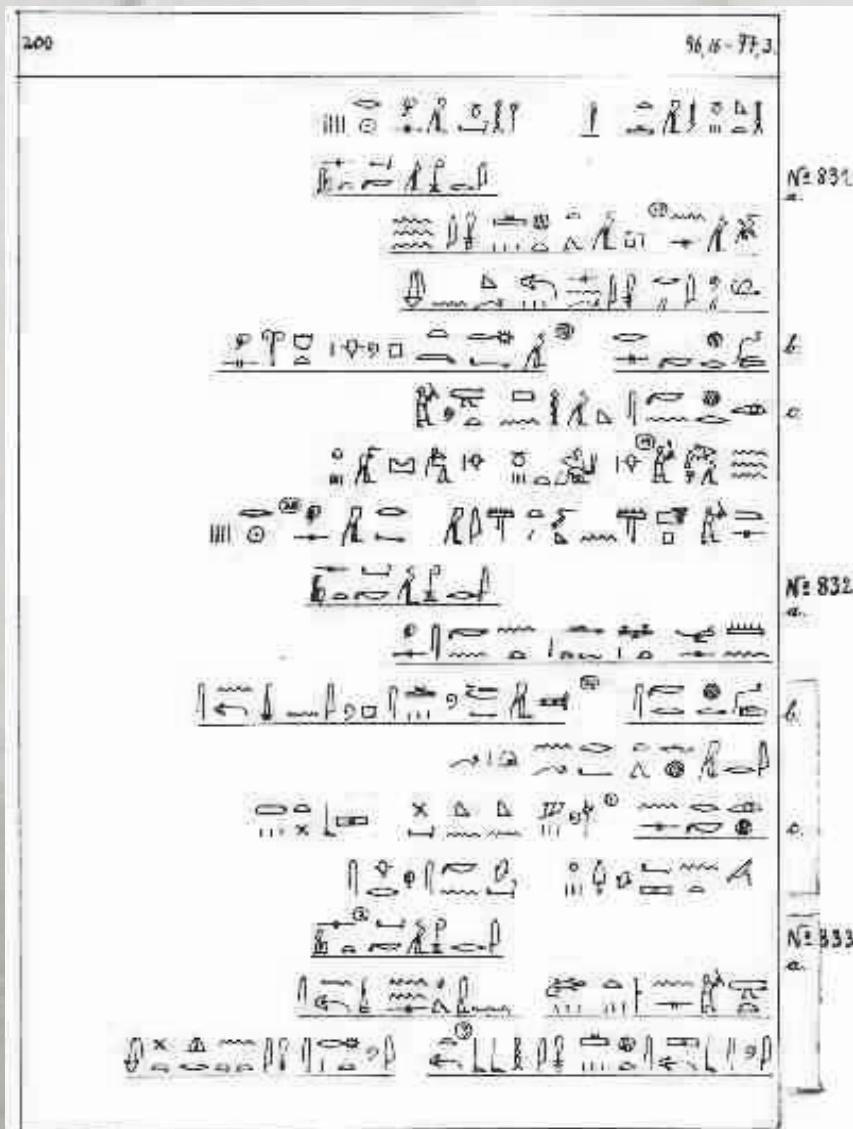
- Egypt means “Gift of the Nile”
- Wrote on papyrus reed
- Life guided by mythology
- Goddess Isis, knowledge of herbs
- Thoth, physician/god
- Priest bureaucracy controlled day to day lives, Pharaohs were considered Gods
- Pharmacy separated from medicine, drugs play key role in medical system
- Anubis apothecary to the gods

A grayscale photograph of an ancient Egyptian jar with a lid. The jar is made of a light-colored material, possibly stone or ceramic, and has a rounded body with a flared base. A matching lid sits on top. The surface of the jar shows signs of age and wear, with some darker spots and a slightly irregular texture. The background is a plain, light color.

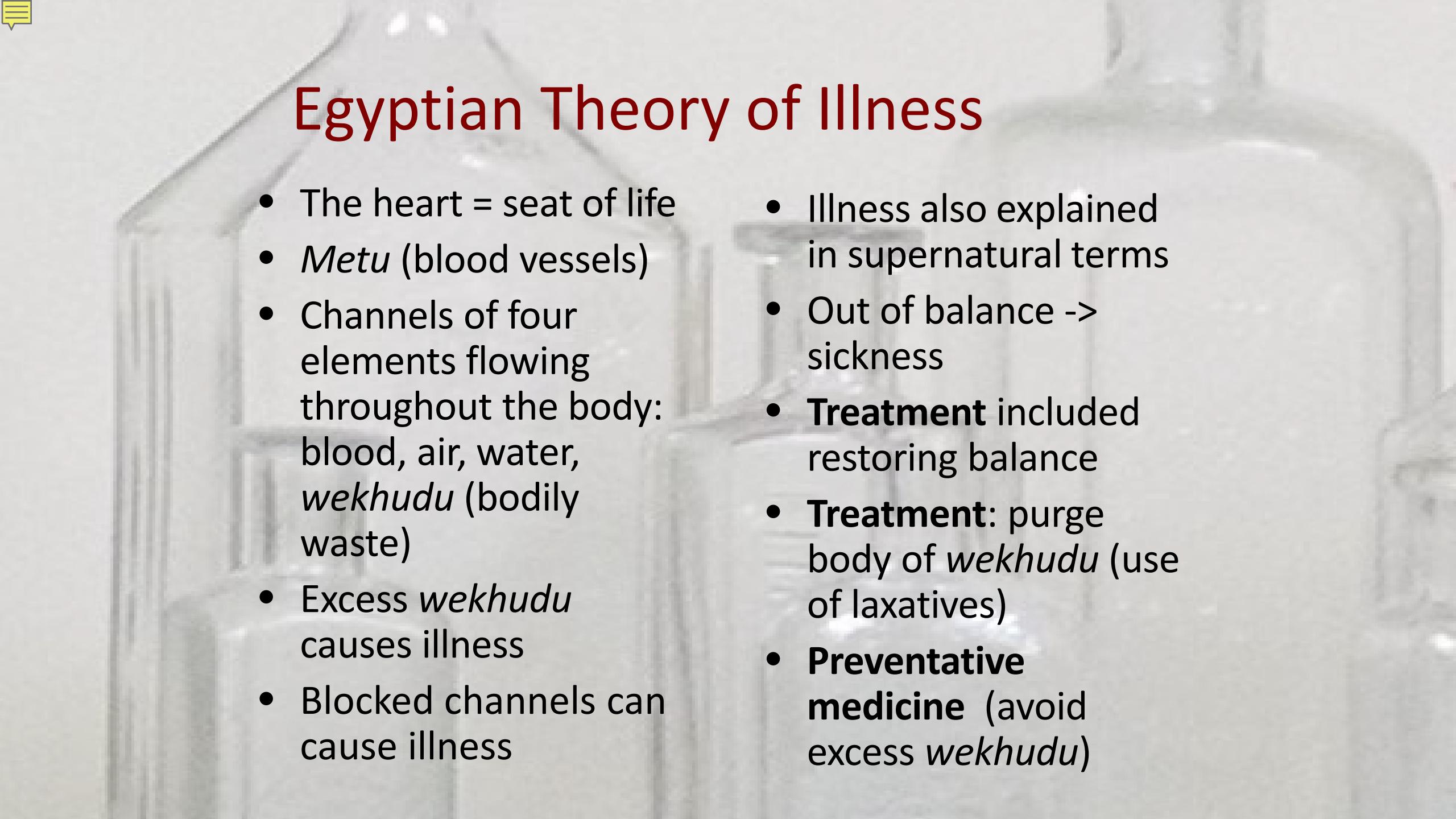
Egyptian “Pharmacy”

- Evidence derived primarily from 8 medical papyri, like the Ebers Papyrus (contains 700 drugs and 800 formulas) and Edwin Smith papyrus
- Tended to have more quantitative formulas than Babylonians; however, used measures (“ro”=15ml) more often than weights
- Rise of polypharmacy = use of multiple drugs in a single formula

Ebers Papyrus, ca 1500 B.C.



- 22 yards long
- 800 RXs and 700 drugs, describes diseases
- Very detailed, describes diseases and drugs
- Directions for treating ophthalmic, dermatologic and gynecological ailments
- Notes quantities, denotes poisonous or expensive drugs as well as appropriate incantations



Egyptian Theory of Illness

- The heart = seat of life
- *Metu* (blood vessels)
- Channels of four elements flowing throughout the body: blood, air, water, *wekhudu* (bodily waste)
- Excess *wekhudu* causes illness
- Blocked channels can cause illness
- Illness also explained in supernatural terms
- Out of balance -> sickness
- **Treatment** included restoring balance
- **Treatment:** purge body of *wekhudu* (use of laxatives)
- **Preventative medicine** (avoid excess *wekhudu*)



What the Egyptians Knew

- Extensive working pharmacopeia, as early as 3700 B.C
- Renowned for their learned physician/healers
- Embalming and mummification, some knowledge of human anatomy
- Invented paper from papyrus
- Role of cleanliness and food contamination
- Fevers
- Eye ailments
- Parasites
- Small Pox, Leprosy, Arthritis, Pneumonia, Appendicitis
- More details in medicine in Ancient Babylon, but still highly spiritual and superstitious

Egyptian “Pharmacy”

- Two class system of drug preparers:
 - 1) Chief preparer of drugs, Conservator of drugs or priest-herbalist
 - 2) Collectors of drug product and laboratory aides
- However, practitioners of drug collection and preparation may have been assistants to physician, and not a distinct entity. May even have been the same person.

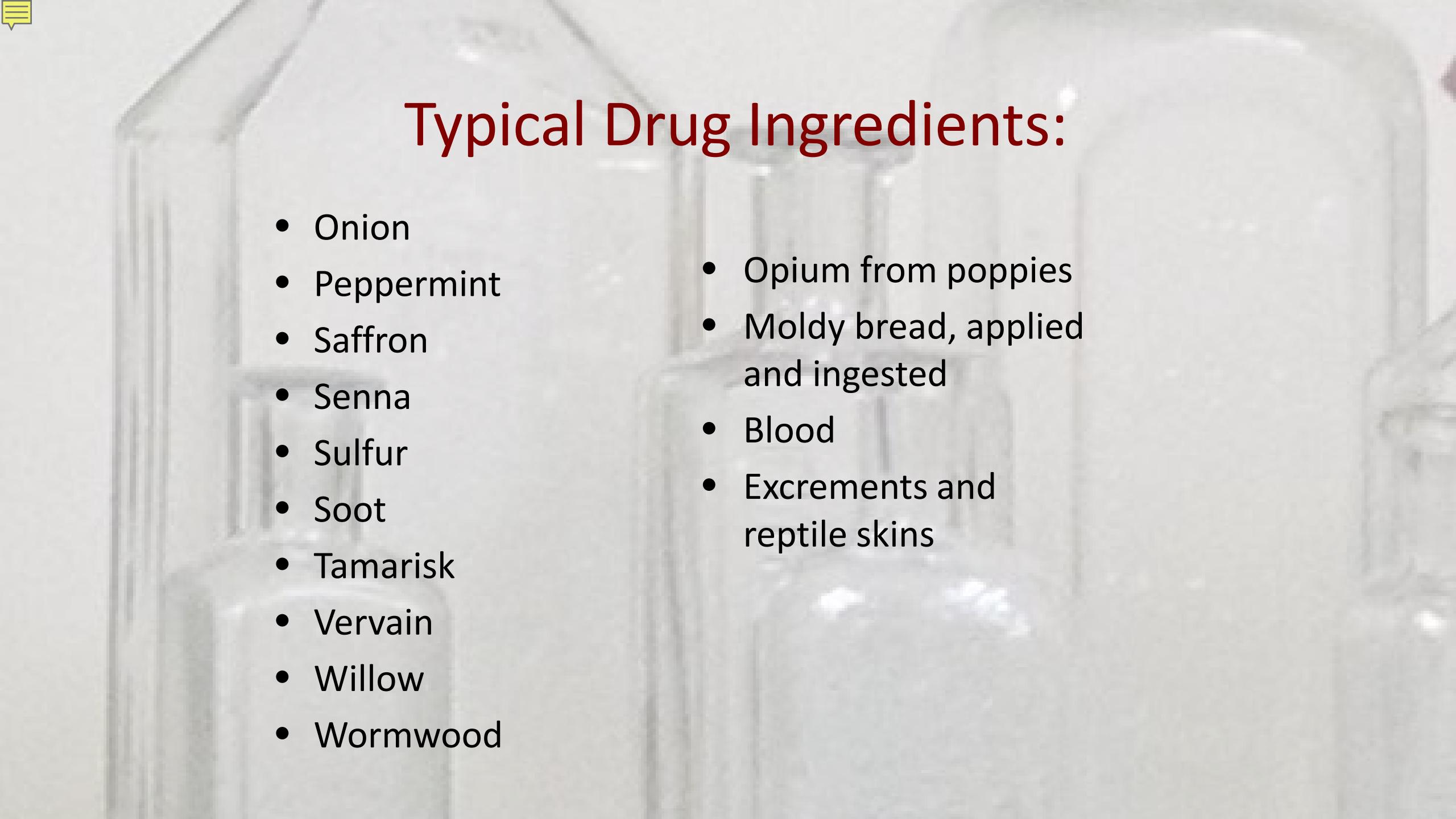
Drugs and Therapeutics

- Fractures easy to treat
- Diseases of internal organs more difficult to treat – used supernatural methods of prayer, chants, magical incantations to expel and appease demons
- Amulets of garlic, honey, fish tail, castor oil worn to drive out evil spirits that caused disease
- Drugs - animal, vegetable or mineral origin, mainly alleviated symptoms
- Opium well known for use in pain
- Moldy bread used on wounds (penicillin?)

Extensive Working Pharmacopeia

Typical Drug Ingredients:

- Acacia
- Almond
- Aloe
- Alum
- Anise
- Arsenic
- Castor Bean
- Celery
- Cinnamon
- Charcoal
- Dill
- Fennel
- Fig
- Garlic
- Hemp dogbane
- Henbane
- Juniper
- Lotus
- Mandragora
- Myrrh



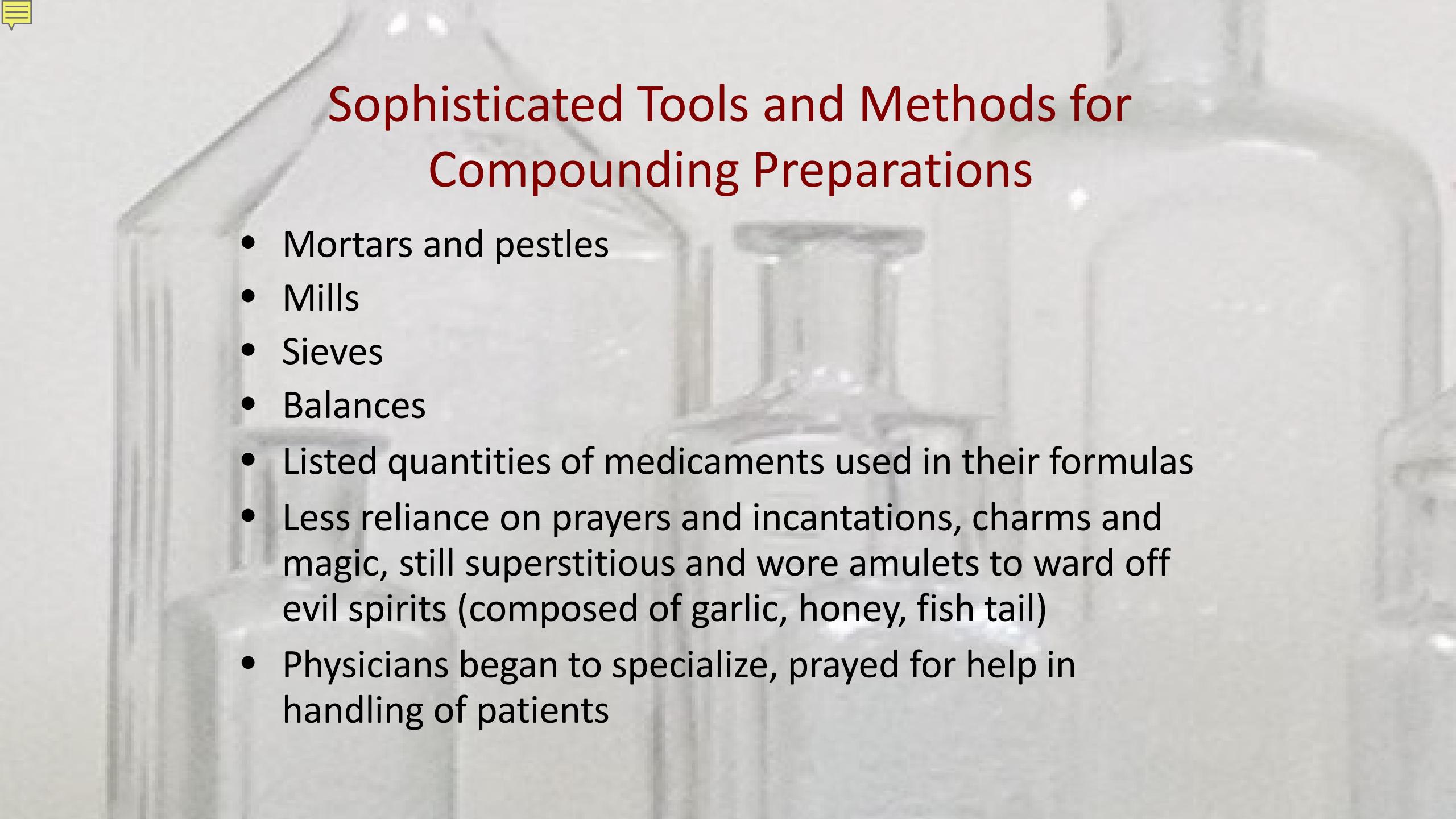
Typical Drug Ingredients:

- Onion
- Peppermint
- Saffron
- Senna
- Sulfur
- Soot
- Tamarisk
- Vervain
- Willow
- Wormwood
- Opium from poppies
- Moldy bread, applied and ingested
- Blood
- Excrements and reptile skins

Dosage Forms

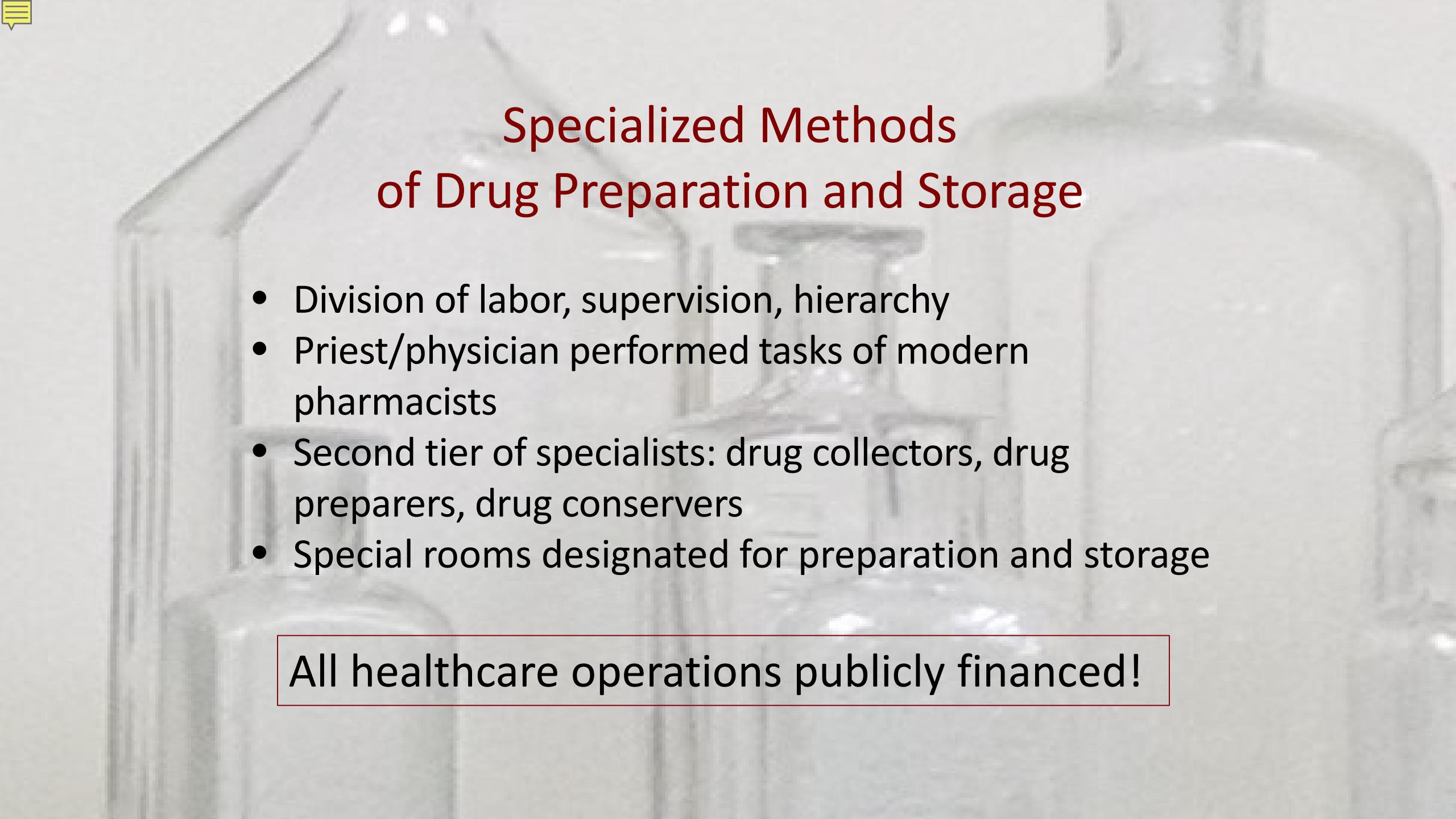
- Gargles
- Suppositories
- Enemas
- Troches (lozenges)
- Poultices
- Pills
- Lotions
- Snuffs, inhalations, fumigations
- Infusions
- Ointments
- Plasters

- *Eye Drops, to be added with a vulture's feather*
- *Beer and Wine were used as vehicles*
- *Blood was ingested as a tonic for vitality*



Sophisticated Tools and Methods for Compounding Preparations

- Mortars and pestles
- Mills
- Sieves
- Balances
- Listed quantities of medicaments used in their formulas
- Less reliance on prayers and incantations, charms and magic, still superstitious and wore amulets to ward off evil spirits (composed of garlic, honey, fish tail)
- Physicians began to specialize, prayed for help in handling of patients

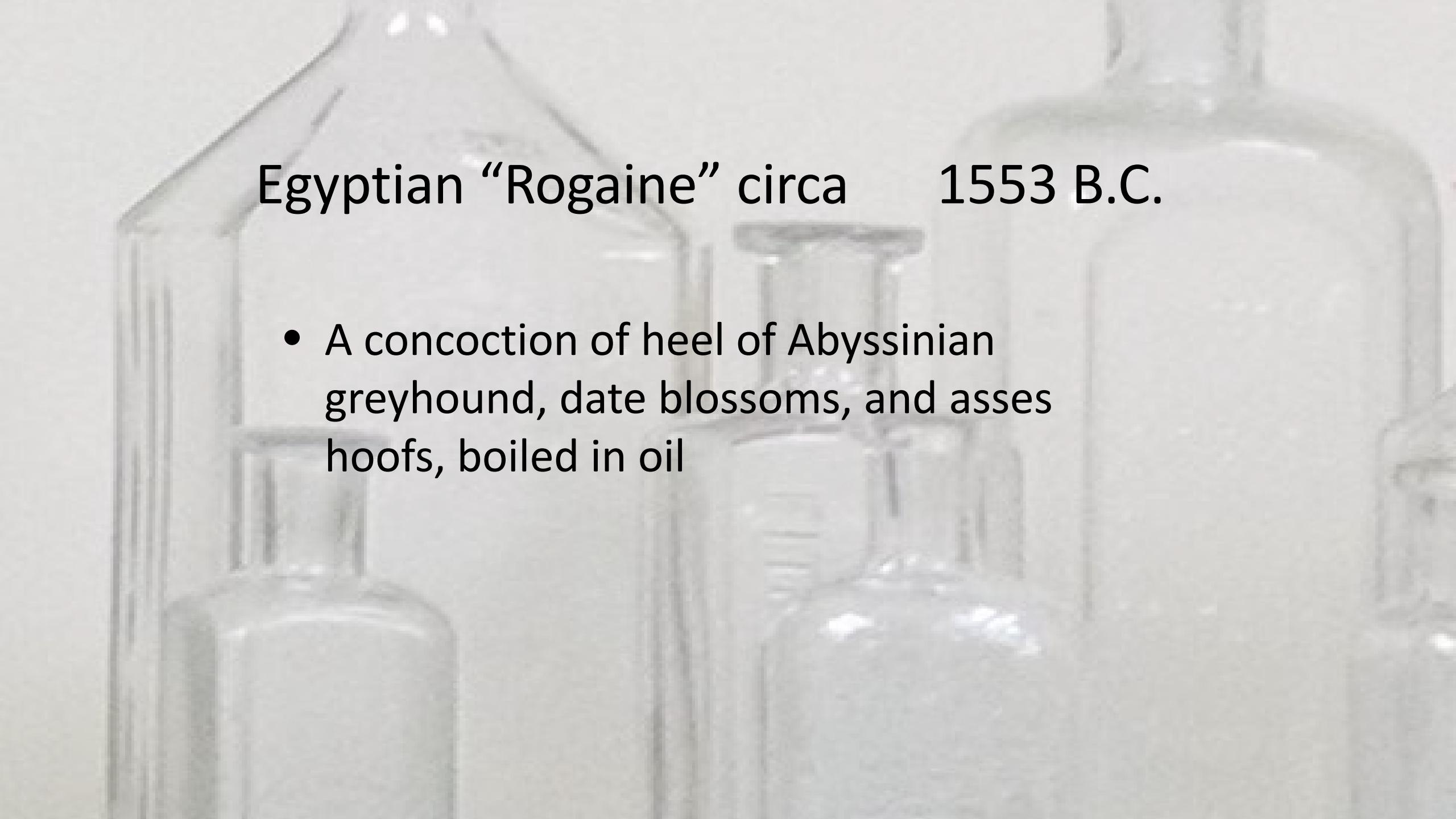


Specialized Methods of Drug Preparation and Storage

- Division of labor, supervision, hierarchy
- Priest/physician performed tasks of modern pharmacists
- Second tier of specialists: drug collectors, drug preparers, drug conservers
- Special rooms designated for preparation and storage

All healthcare operations publicly financed!





Egyptian “Rogaine” circa 1553 B.C.

- A concoction of heel of Abyssinian greyhound, date blossoms, and asses hoofs, boiled in oil

Horus, Son of Isis



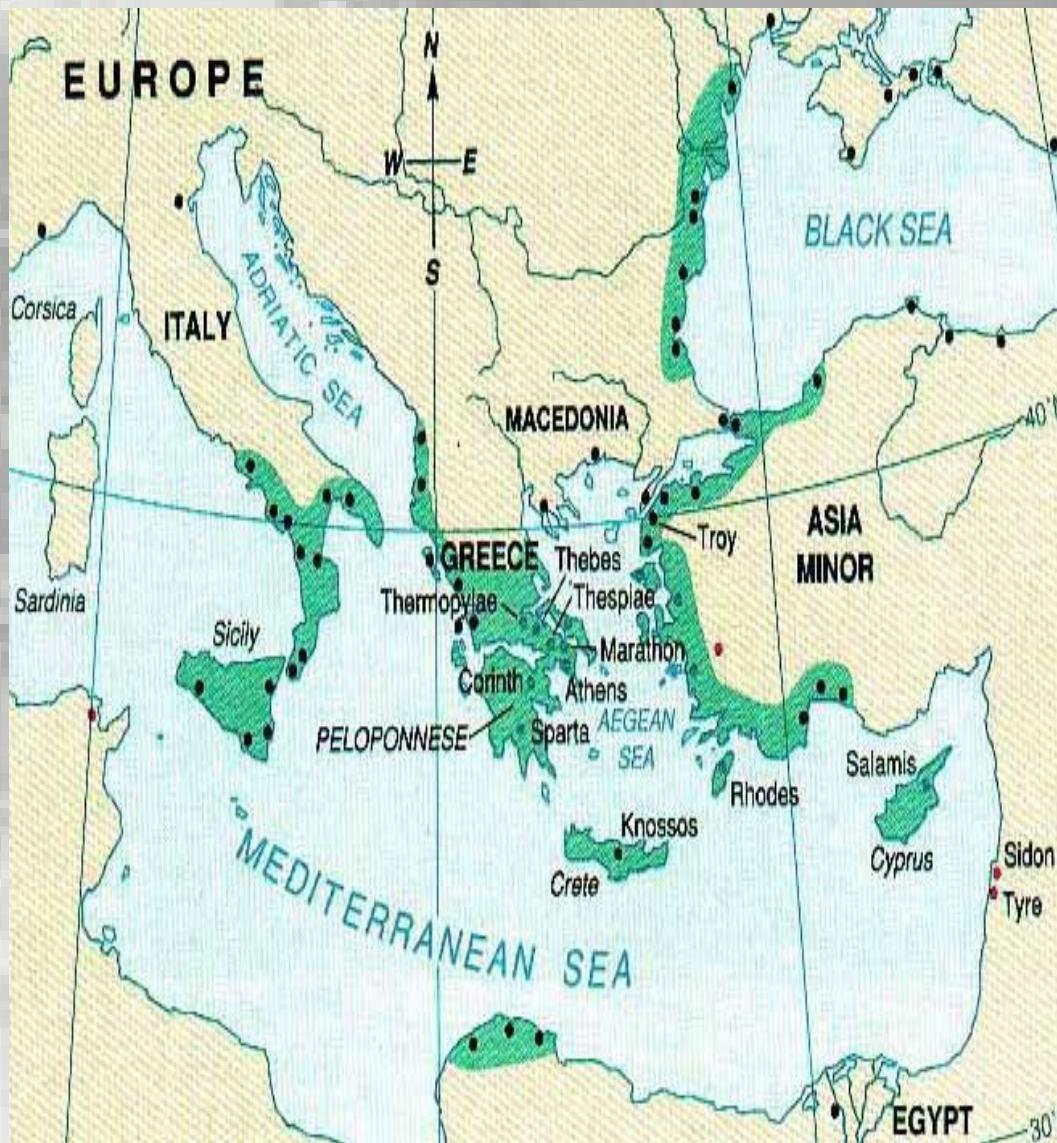
Steles used against
snake bites and
scorpion stings

Patient would touch
face and hope to
be cured by the
Stele's magical
powers

Epigrams covering are
to guard against
venemous bites

Ancient Greek Medicine 800BC – 300AD

Greek Colonies, 500B.C.



- Islands: navigation and math to assist
- Temperate climate, irrigation and cooperation for survival not as critical
- Decentralized, priest bureaucracy was ineffective
- Interacted with many other civilizations/ cultures

Peripatetic School founded by Aristotole ASKED THE QUESTION WHY?



- Mystic and supernatural:
rational, observational thought
- Birth of free thought
- Ideas presented/defended in public forums: debated and analyzed
- Individual began to be celebrated for the first time



The Ancient Greeks

Philosophy

Democracy

Psychology

Ethics

Government

Medicine as a science

Mathematics

Physics

Architecture

Science

- Greek physicians were influenced by science, led to the idea of diagnosis and prognosis – based in nature
- Empedocles: 4 elements, body diseased if these elements were out of balance in the body

Ancient Greek Civilization 800 B.C.- 200 A.D.

The word “Pharmacy” derived from:

Greek “pharmakon” (drug or poison, also: a vegetable substance with magic powers that brought relief from pain)

Egyptian “pharmagia” or magic

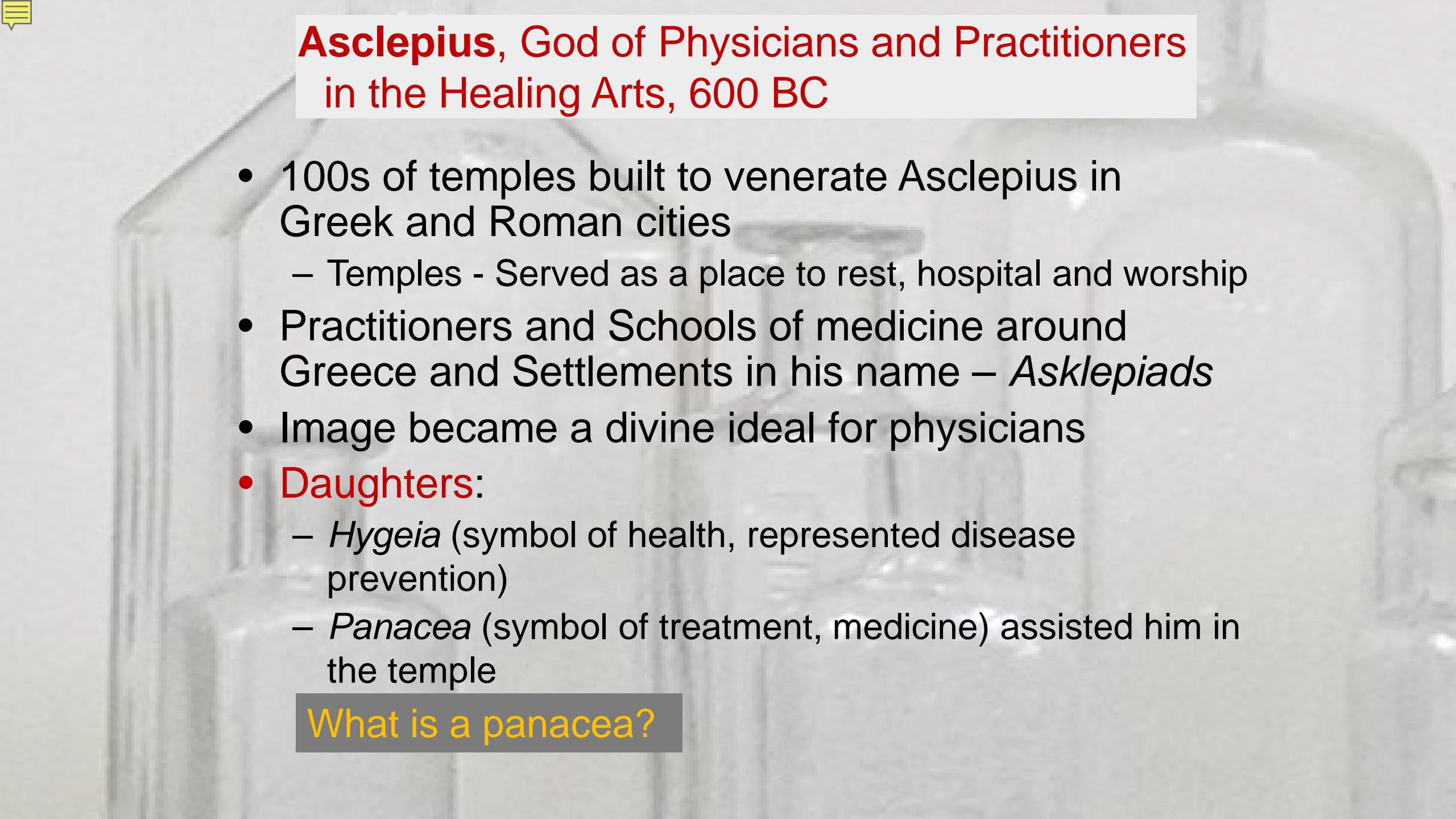
Apothecary - Greek or Latin “**apothecarius**” or storekeeper

Apotheca - drug store house

Greek Temple Medicine, Apollo – All Purpose God



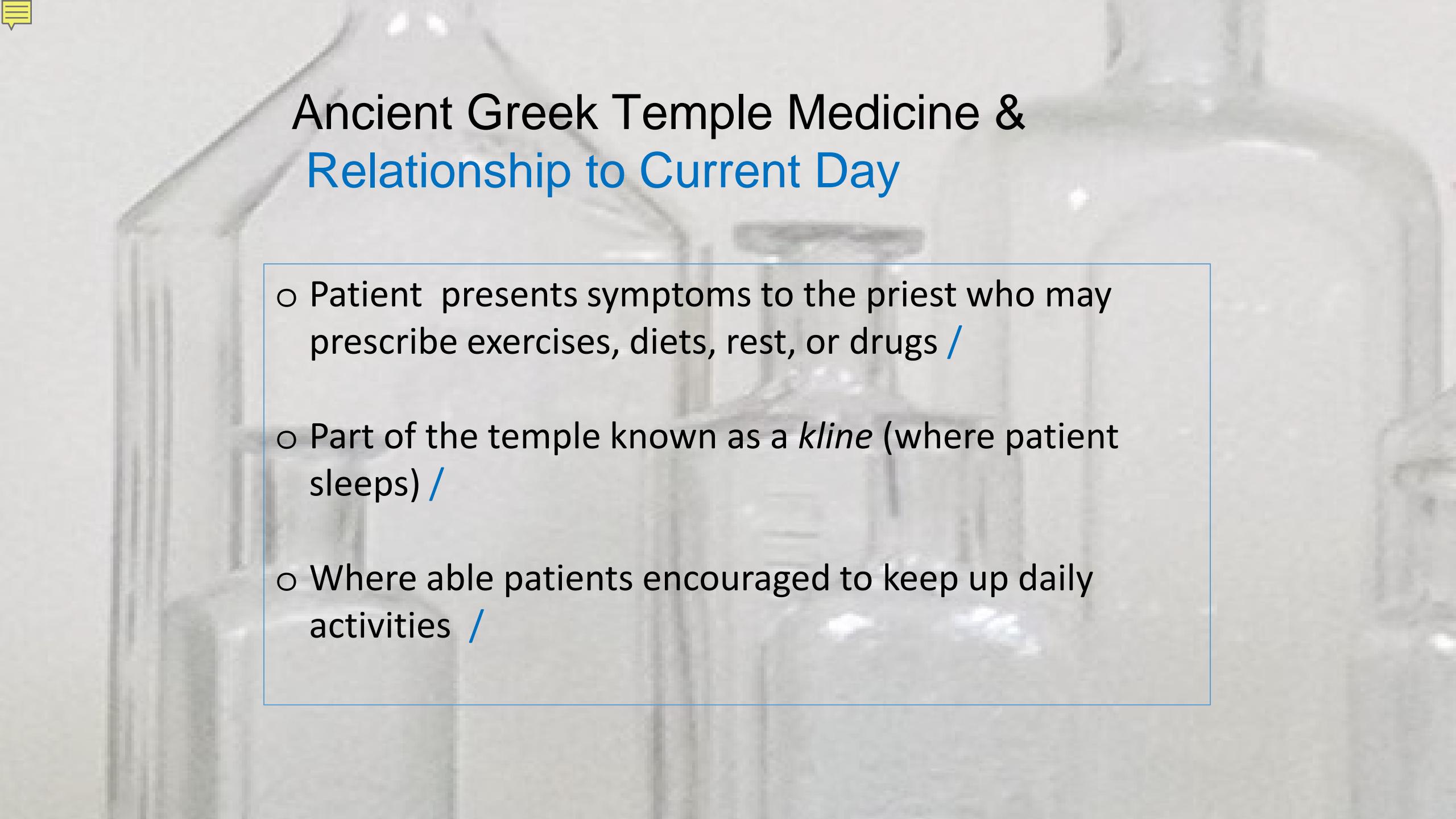
- God of sun, medicine, truth, and the arts- could bring and prevent disease
- Greeks prayed to him for health
- Mythology held a place to explain certain phenomena, morals and dilemmas
- Didn't believe that disease was a punishment for sin



Asclepius, God of Physicians and Practitioners in the Healing Arts, 600 BC

- 100s of temples built to venerate Asclepius in Greek and Roman cities
 - Temples - Served as a place to rest, hospital and worship
- Practitioners and Schools of medicine around Greece and Settlements in his name – *Asklepiads*
- Image became a divine ideal for physicians
- **Daughters:**
 - *Hygeia* (symbol of health, represented disease prevention)
 - *Panacea* (symbol of treatment, medicine) assisted him in the temple

What is a panacea?



Ancient Greek Temple Medicine & Relationship to Current Day

- Patient presents symptoms to the priest who may prescribe exercises, diets, rest, or drugs /
- Part of the temple known as a *kline* (where patient sleeps) /
- Where able patients encouraged to keep up daily activities /



Ancient Greek Temple Medicine & Relationship to Current Day

- Patient presents symptoms to the priest who may prescribe exercises, diets, rest, or drugs / **Healthcare providers do same today**
- Part of the temple known as a *kline* (where patient sleeps) / “clinic” of today
- Where able patients encouraged to keep up daily activities / **occupational therapy of today**



Caduceus, Mistaken Symbol of Medicine



- US military adopted, 1902, represents medical profession- Hermes (Mercury) staff
- Staff of Asclepius , which has always represented medicine, one snake no wings
- Shape familiar from biology?

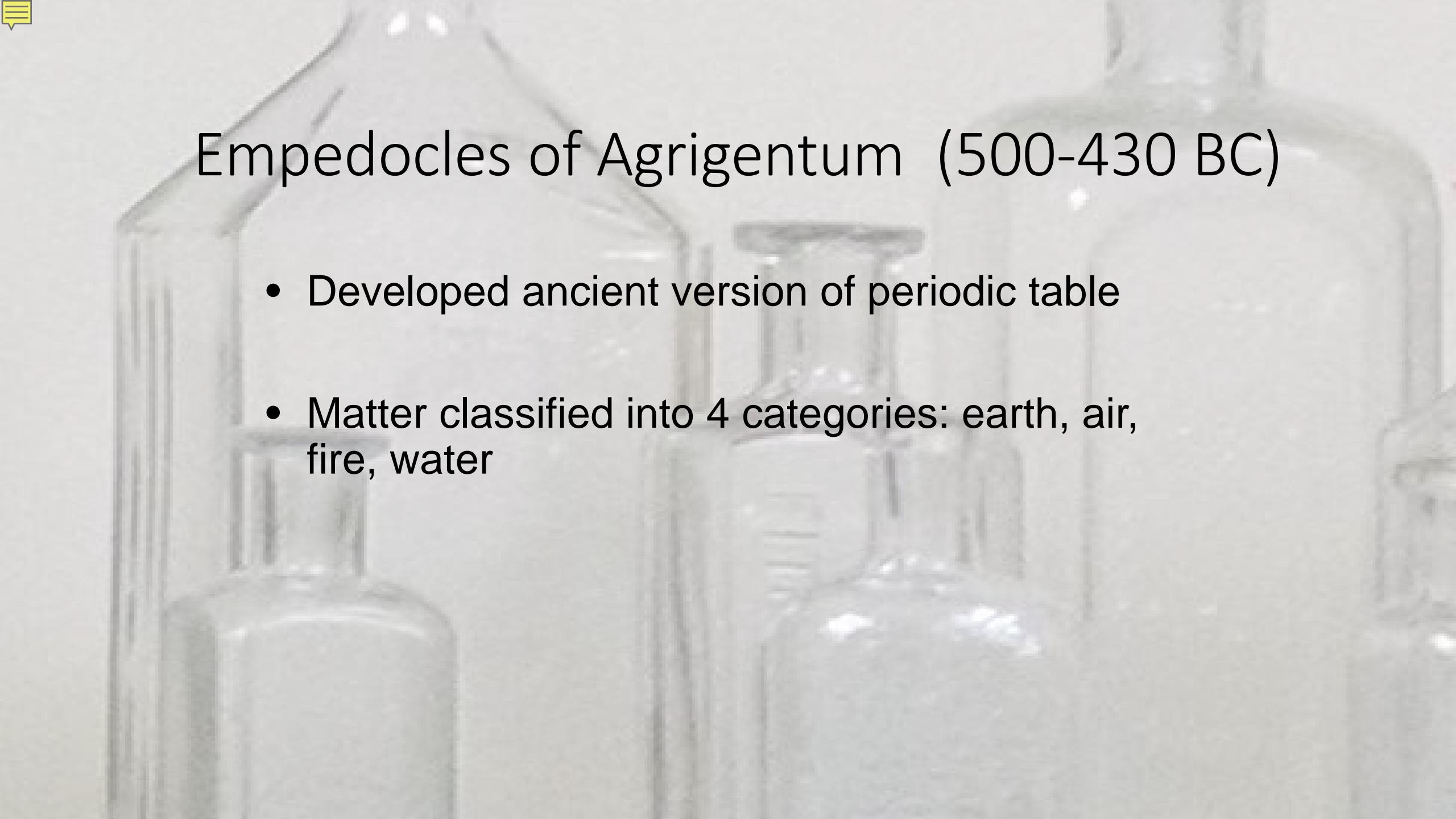
Hygeia, International Symbol of Pharmacy



- Bowl in hand: medicine and the snake, representing regeneration and health
- 1795 ,INTL symbol of pharmacy, French commemorated a coin with her picture

BOWL OF HYGEIA AWARD





Empedocles of Agrigentum (500-430 BC)

- Developed ancient version of periodic table
- Matter classified into 4 categories: earth, air, fire, water

Hippocrates (460-379BC), Father of Medicine



Hippocratic Humors

4 elements: water fire earth and air, replaced by “humors”

Hippocrates stated body is composed of 4 humors, when healthy they are in balance (**homeostasis**)

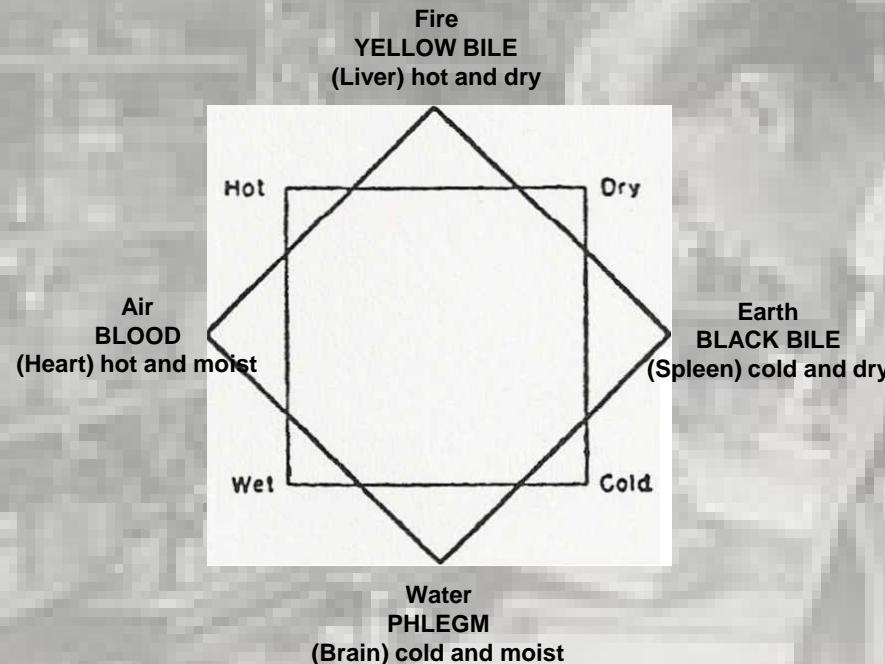
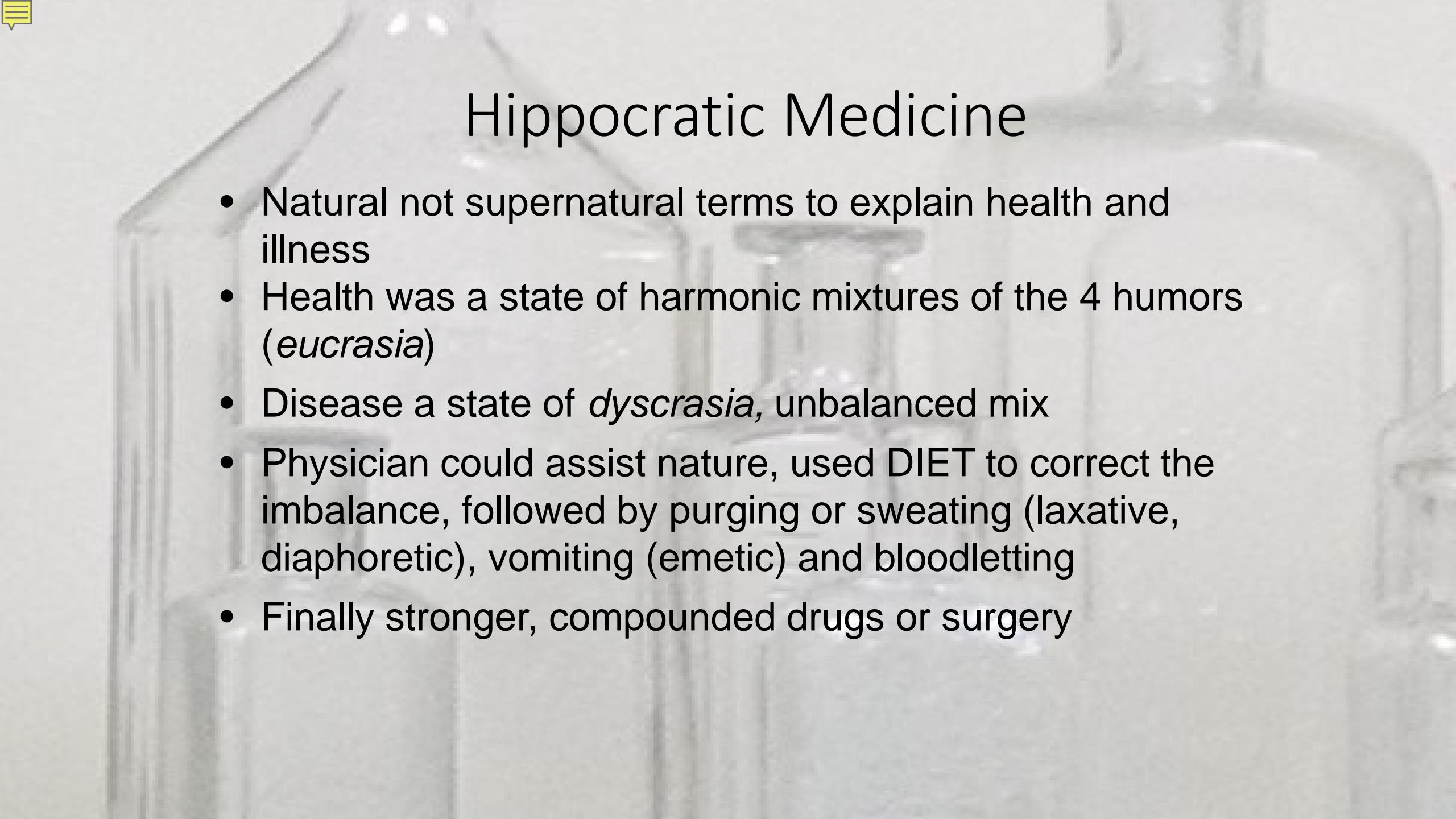


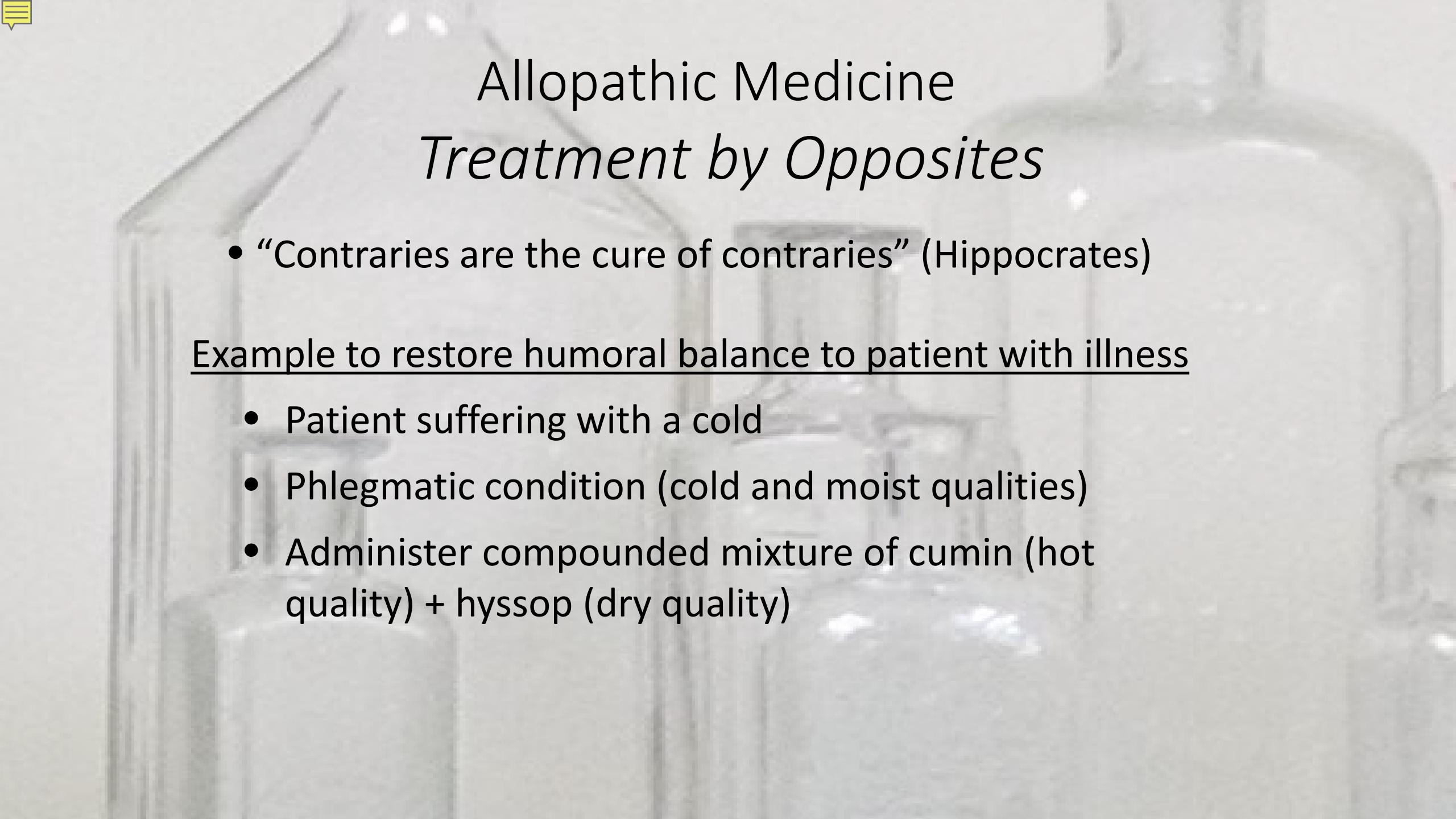
Diagram of the Four Humors

- Changed constantly due to the diet and environment
- Imbalances could be compensated by drugs or bleeding
- Theory lasted into the 20th century



Hippocratic Medicine

- Natural not supernatural terms to explain health and illness
- Health was a state of harmonic mixtures of the 4 humors (*eucrasia*)
- Disease a state of *dyscrasia*, unbalanced mix
- Physician could assist nature, used DIET to correct the imbalance, followed by purging or sweating (laxative, diaphoretic), vomiting (emetic) and bloodletting
- Finally stronger, compounded drugs or surgery



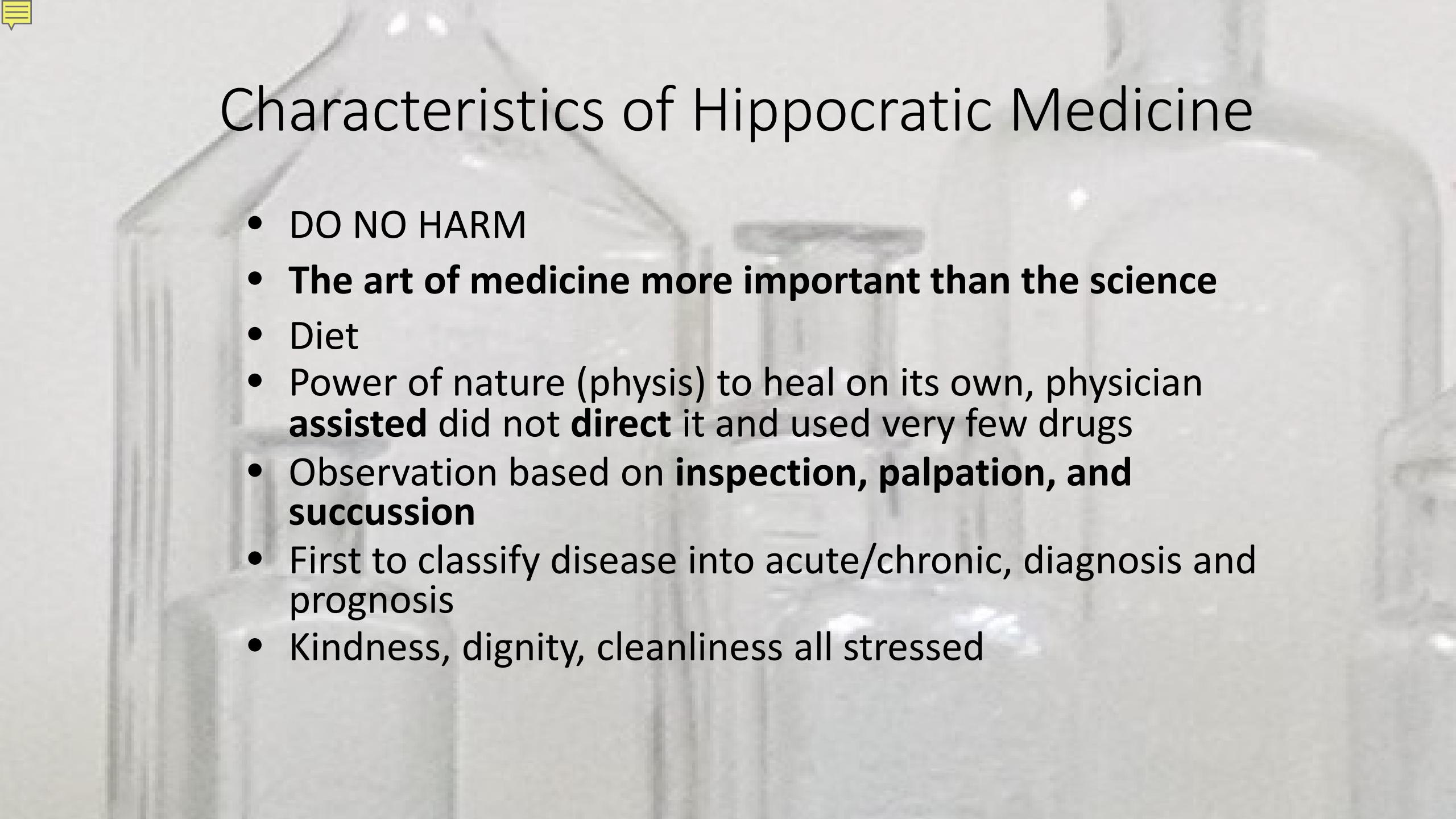
Allopathic Medicine

Treatment by Opposites

- “Contraries are the cure of contraries” (Hippocrates)

Example to restore humoral balance to patient with illness

- Patient suffering with a cold
- Phlegmatic condition (cold and moist qualities)
- Administer compounded mixture of cumin (hot quality) + hyssop (dry quality)



Characteristics of Hippocratic Medicine

- DO NO HARM
- **The art of medicine more important than the science**
- Diet
- Power of nature (physis) to heal on its own, physician assisted did not **direct** it and used very few drugs
- Observation based on **inspection, palpation, and succussion**
- First to classify disease into acute/chronic, diagnosis and prognosis
- Kindness, dignity, cleanliness all stressed

Hippocratic Drug Response

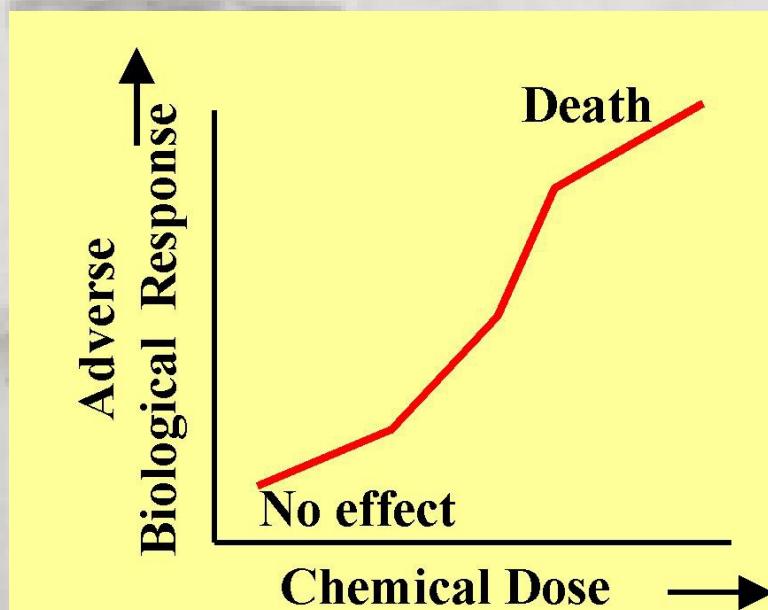
Drugs could be simple or compounded. The compounded blend had a dominant property or its quality was the sum of individual ingredients. This was their way of saying strength.

1st degree- effect produced only after repeated doses

2nd degree – effect after first dose

3rd degree – toxic after first dose

4th degree – lethal after first dose



Biological Response Graph in Pharmacology

Corpus Hippocraticum, 300 B.C.

- Not written by Hippocrates
 - Summary of various “schools” compilation of all medical knowledge known at the time, at the School of Alexandria
- Naturalistic approach, not divine or supernatural
- Detailed documentations of diseases, surgery and conservative treatments
- Dissection was illegal
- Humoral Theory
- Hippocratic Oath
- Ethical to refuse treatment if physician felt there could not be a positive outcome

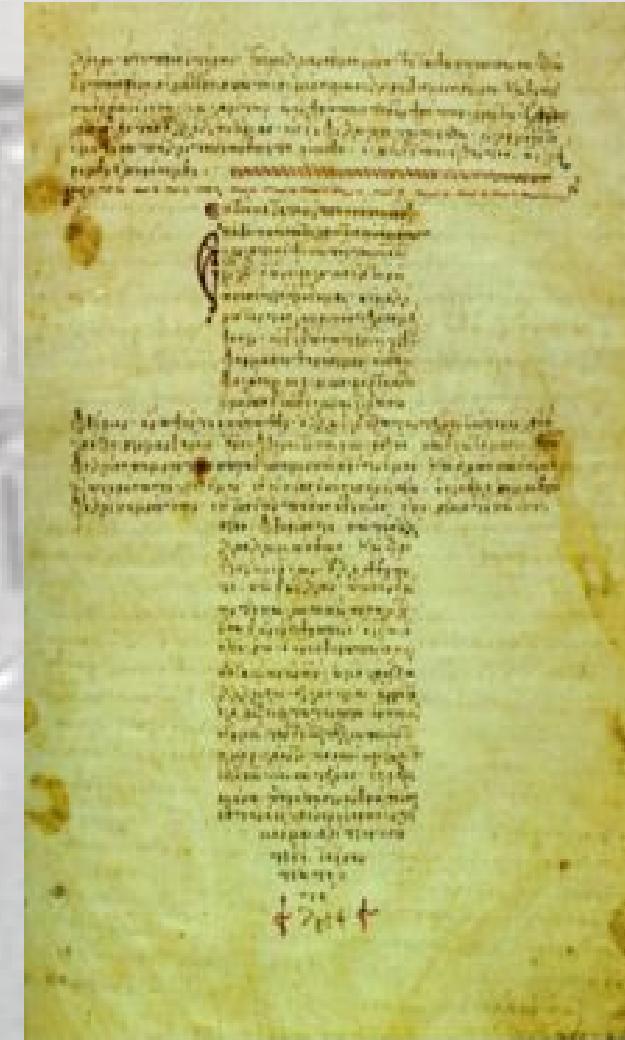
CORPUS HIPPOCRATICUM

- Pills
- Ointments
- Oils
- Troches
- Inhalations
- Emetics
- Narcotics
- Cerates
- Poultices
- Gargles
- Suppositories
- Purgatives

Mention of more than 300 different herbal remedies.

Hippocratic Oath

- The oath is still taken today by physicians of some medical schools
- Use dietetic measures
- No deadly drugs or drugs that will assist in suicide
- No pessaries for abortions
- Delegate to surgeons and specialists don't try to do it yourself
- Do not seduce male or female patients
- Keep consultation confidential
- Pharmacy the Oath of Maimonides, Spanish
- APhA Code of Ethics



Alexander the Great and the Library at Alexandria, 330BC



Alexander the Great, 330 B.C.

- Alexandria became the center of Greek civilization
- Most sophisticated library in the known world
- Science and math, experimentation, increased and flourished
- Dissection was legalized briefly, descriptions of blood vessels, pathology and polypharmacy were recorded
- *Corpus Hippocratum* was catalogued at the Library of Alexandria.

Medical “Schools” after Hippocrates (**Humoralists**)

(1st peak of Greek Medicine)

- **Dogmatists** – still followed the Humoral theory of Hippocrates (Balance) fairly closely, and treated via purging and bleeding

Herophilus (300BC), was a dogmatist that studied anatomy and surgery, used poly-pharmacy and the humoral theory



Medical “Schools” after Hippocrates

(1st peak of Greek Medicine)

Rationalists

- Use of reason in formulating and adopting a theory concerning structure &/or body function
- Every disease has cause(s), observable or hidden
- Treatment/remedies based on logical deduction & observation
- Made advances by dissecting humans



Schools of thought after Hippocrates

(2nd peak of Greek medicine, 300BC -100AD)

NON-HUMORALISTS

- **Empiricists**-felt scientific experiments and speculations were irrelevant in medicine, used more drugs than Hippocrates, just do what works. Healing based on and used experience. Believed in the healing power of nature. Physician should help nature to heal. Performed surgery. Believed to have written most of the “Corpus Hippocraticum”
- Heraclides – an empiricist who wrote extensively on symptoms, surgery and drug therapy .

Schools of thought after Hippocrates

(2nd peak of Greek medicine, 300BC -100AD)

NON- HUMORALISTS, continued

- **Methodists** – (Themison) Disease caused pores to constrict or relax depending on degree of fever, evacuations or secretions.
 - Constricted pores, then light diet, warm bath, humidity and laxatives. Liked gymnastics and exercise.
 - Open pores, cold bath, fresh air, exercise, more food, astringent or astyptic drug, to close up pores.
- Opposed to blood letting and purging
- Treat slaves, minimal effort

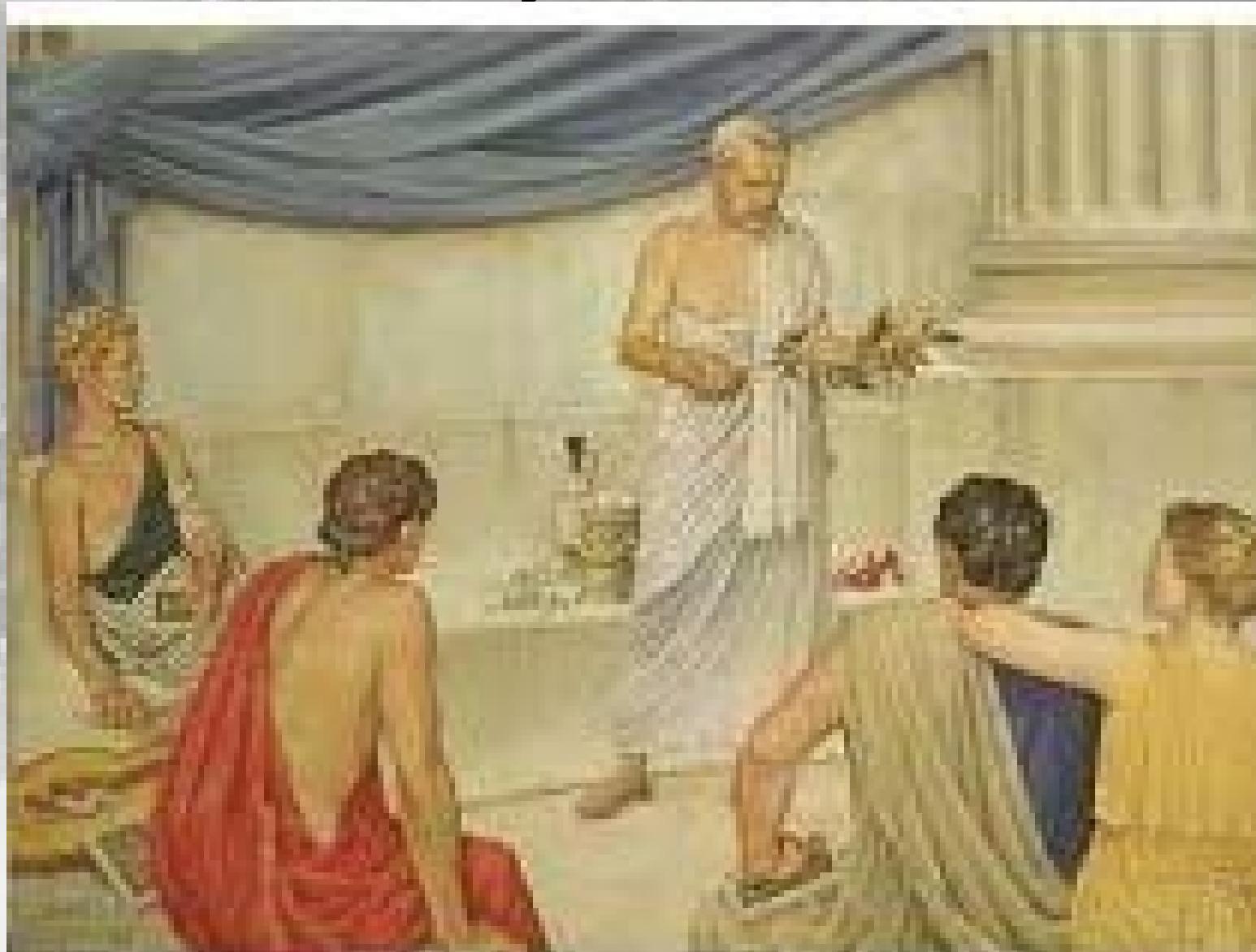
Schools of thought after Hippocrates

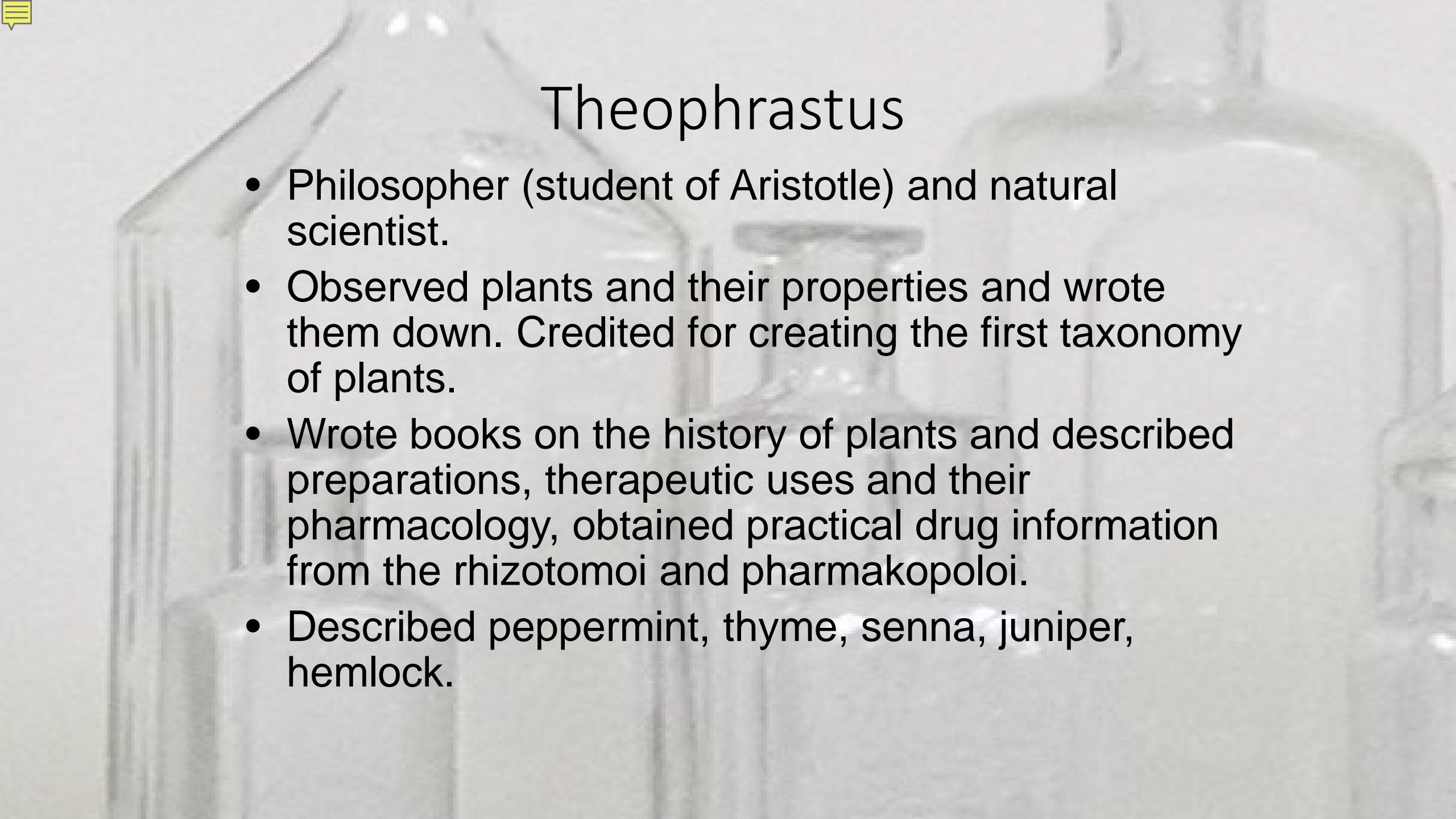
(2nd peak of Greek medicine, 300BC -100AD)

NON-HUMORALISTS, continued

- **Pneumatists (Athenaeus)** opposed other theories. Believed air (*pneuma*) went to heart and reacted with atoms in the arteries.
 - Disease – interference of air circulation or not in sync with climate and moisture of the body. Good living conditions and fresh water for treatment.
- **Eclectics** – used whatever philosophy or theory worked

Theophrastus, Father of Pharmacognosy and Botany 370-286B.C.



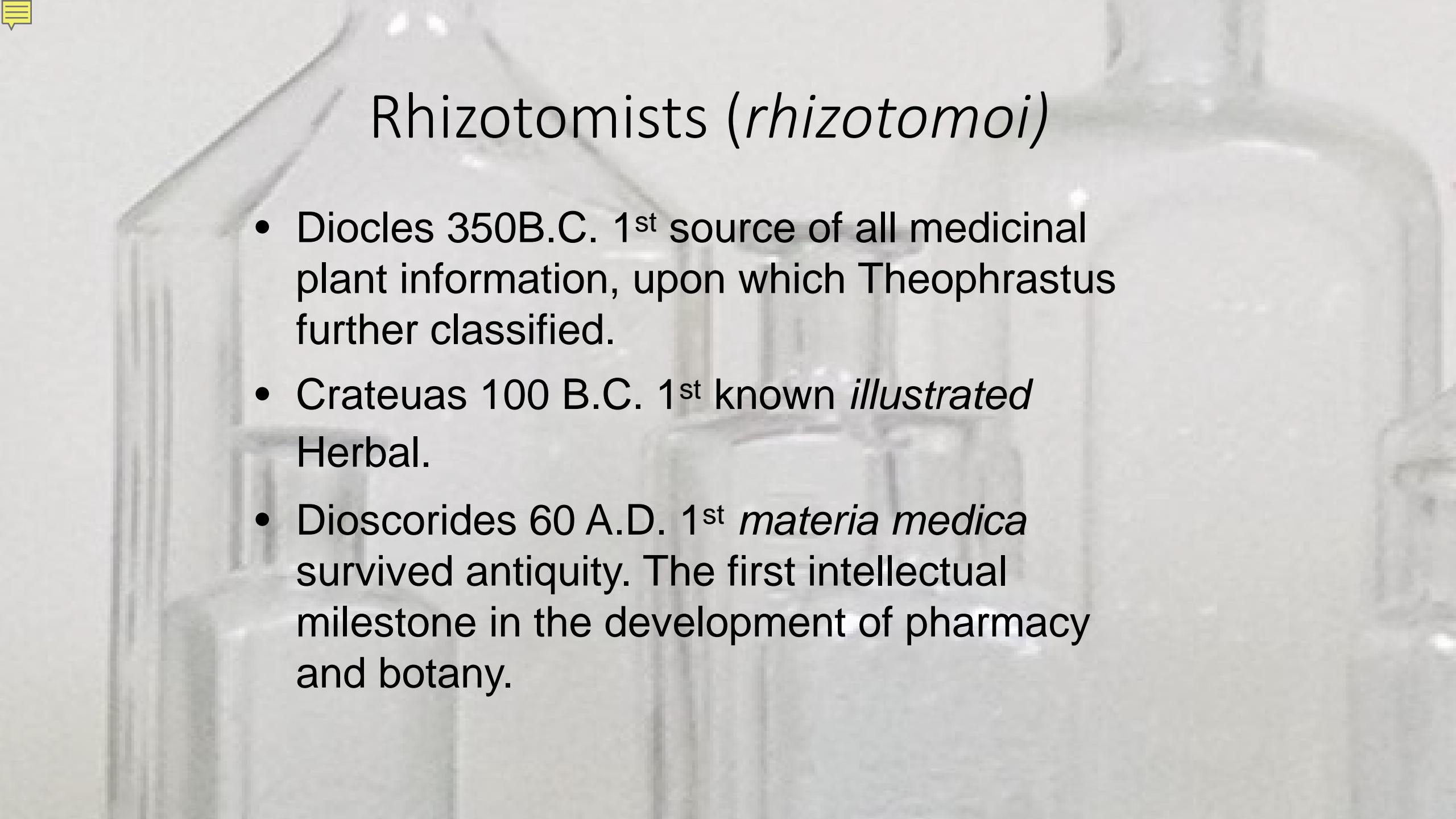


Theophrastus

- Philosopher (student of Aristotle) and natural scientist.
- Observed plants and their properties and wrote them down. Credited for creating the first taxonomy of plants.
- Wrote books on the history of plants and described preparations, therapeutic uses and their pharmacology, obtained practical drug information from the *rhizotomoi* and *pharmakopoloi*.
- Described peppermint, thyme, senna, juniper, hemlock.

Plant Classification

- **Pharmacognosy** study of active pharmacological ingredient or ingredients in plants. Identification, origin, the potency of its active ingredients (*alkaloids*) and the concentration in different parts of the plant.
- About 70% of prescription and OTC drugs are derived in some form from original natural products.
- Pharmacobotanists or the plant collectors of antiquity -*Rhizotomoi*, “root collectors” and the *pharmakopolai* – or drug sellers and apothecaries were experts on medicinal plants and their uses.



Rhizotomists (*rhizotomoi*)

- Diocles 350B.C. 1st source of all medicinal plant information, upon which Theophrastus further classified.
- Crateuas 100 B.C. 1st known *illustrated* Herbal.
- Dioscorides 60 A.D. 1st *materia medica* survived antiquity. The first intellectual milestone in the development of pharmacy and botany.

Belladonna (*Atropa Belladonna*) and Mandrake (*Mandragora*) Solanaceae



PLATE XVII.—*Atropa belladonna* (Deadly nightshade). (From Jackson: *Experimental Pharmacology and Materia Medica*.)

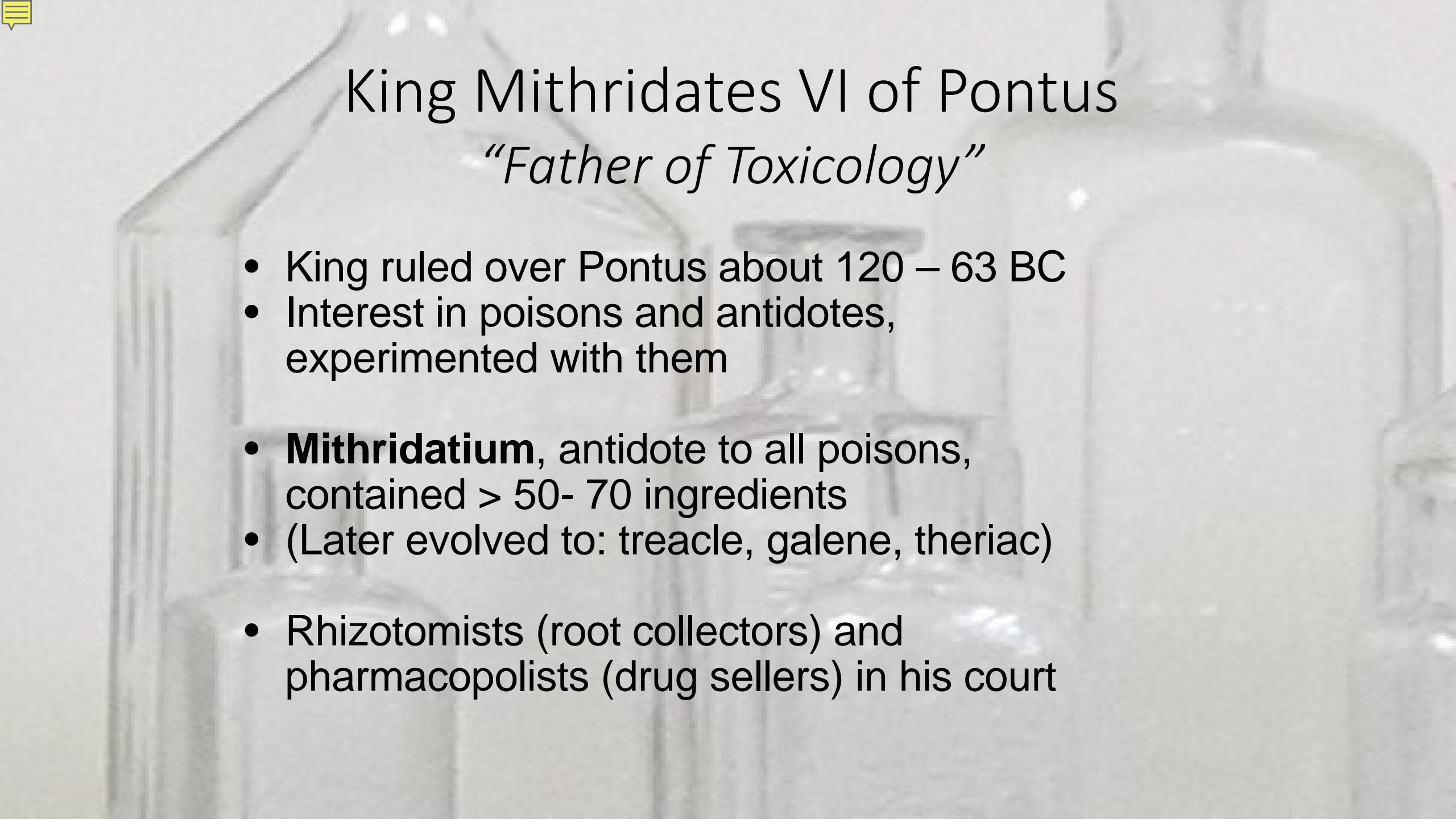


Belladonna and Mandrake

- Mandrake, highly prized by Egyptians and Babylonians knew of its narcotic effect.
- Active Ingredients: Atropine, hyoscamine, scopolamine (anti-cholinergic), highly toxic.
- Used by ancient Greeks and Romans as a poison, aphrodisiac, stomach ailments, attained cult status in middle ages.
- Today, found in Isopto-Homatropine, Donnatal tablets, Donnagel, Trans-Derm Scopolamine, tx of heart block and bradycardia.
- Smoked, suppositories, liquid, tablets, drops, ointments
- “Hot as a hare, blind as a bat, dry as a bone, red as a beet, and mad as a hatter”.

Mithridates, King of Pontus (100 B.C.), The “Royal Toxicologist”





King Mithridates VI of Pontus

“Father of Toxicology”

- King ruled over Pontus about 120 – 63 BC
- Interest in poisons and antidotes, experimented with them
- **Mithridatium**, antidote to all poisons, contained > 50- 70 ingredients
- (Later evolved to: treacle, galene, theriac)
- Rhizotomists (root collectors) and pharmacopolists (drug sellers) in his court



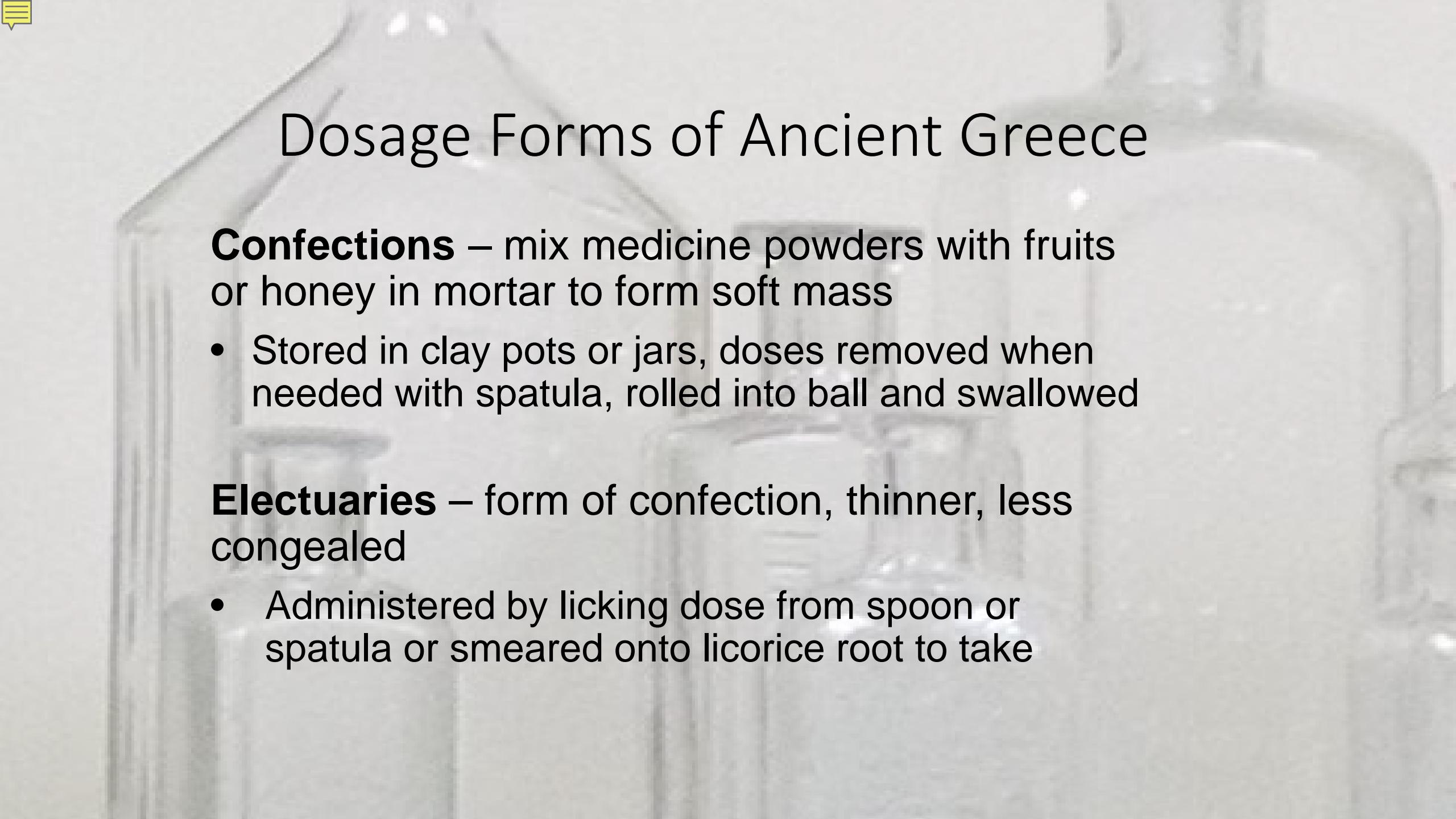
Terra Sigillata (sealed earth) 500 B.C.

- Combination of greasy clay, silica, aluminum, magnesium and calcium salts, plus iron oxide
- Antidote for poisons, treat dysentery, ulcers, hemorrhages, fevers, infections, animal & insect bites
- Still used today – Kao-Pectate, antacids
- Elaborate ritual was performed, with dignitaries, to commemorate the creation of *terra sigillata*. The stamped pastilles were distributed around the known world.

How important is the trademark?

Hiera Picra (Holy Bitter)

- *HIERA PICRA* – an **electuary** employed in the temple of Aesclepius. The Asclepiads brought to Rome as they came in to the city claiming a “temple formula”.
- Principle ingredients- aloe and canella bark.
- 99% had aloe, with a complement of other ingredients, changed through centuries and by maker. A panacea that cured everything -Always called Hiera....
- Major ingredient is Aloe -Dioscorides is the first to identify aloe and record its “gentle purge” effect –Give $\frac{1}{2}$ to 3 drachms (drachm is about 1/8 of an ounce) depending on degree of “laxation”.
- Used for centuries, modified depending on maker and town.



Dosage Forms of Ancient Greece

Confections – mix medicine powders with fruits or honey in mortar to form soft mass

- Stored in clay pots or jars, doses removed when needed with spatula, rolled into ball and swallowed

Electuaries – form of confection, thinner, less congealed

- Administered by licking dose from spoon or spatula or smeared onto licorice root to take

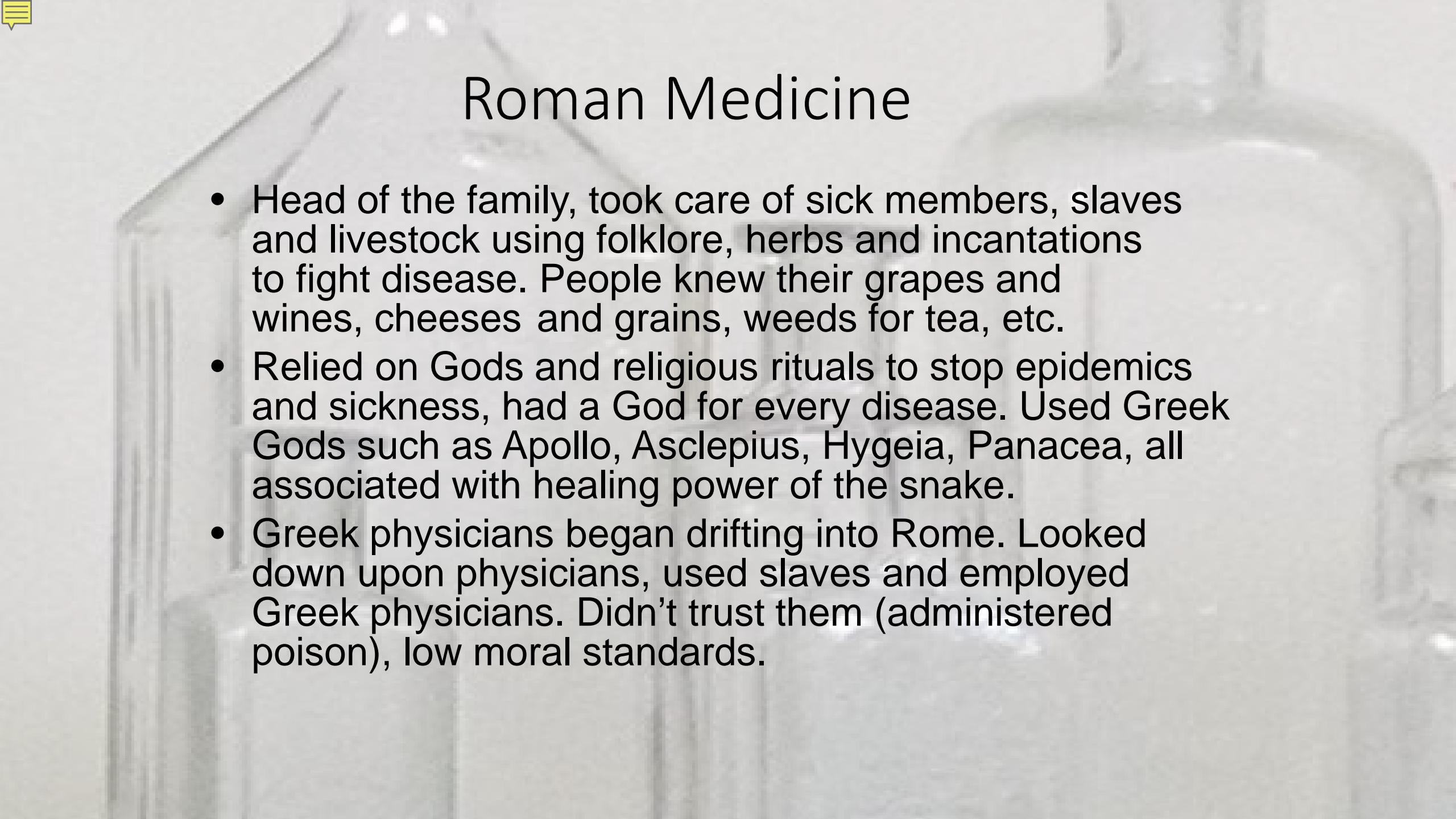
Greek Marble Mortar and Pestle, 1st Century AD



Roman Empire, about 100 A.D.



- Huge army – became adept at surgery, applied medicine
- Infrastructure, bridges, arches, architecture
- Alleviated public health diseases-major advances water purification, sewage systems



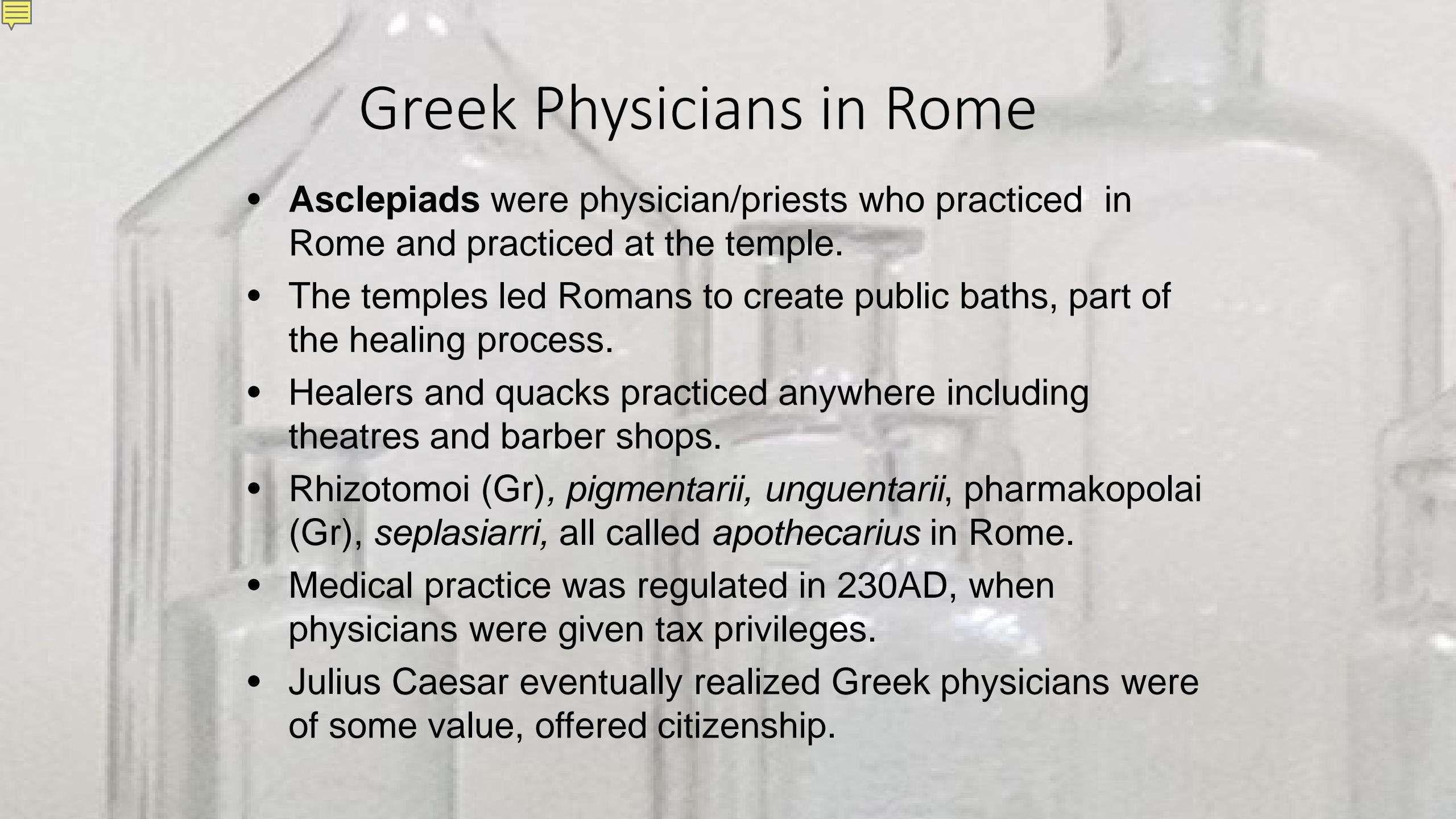
Roman Medicine

- Head of the family, took care of sick members, slaves and livestock using folklore, herbs and incantations to fight disease. People knew their grapes and wines, cheeses and grains, weeds for tea, etc.
- Relied on Gods and religious rituals to stop epidemics and sickness, had a God for every disease. Used Greek Gods such as Apollo, Asclepius, Hygeia, Panacea, all associated with healing power of the snake.
- Greek physicians began drifting into Rome. Looked down upon physicians, used slaves and employed Greek physicians. Didn't trust them (administered poison), low moral standards.

ROMAN SURGICAL TOOL, 100 A.D.

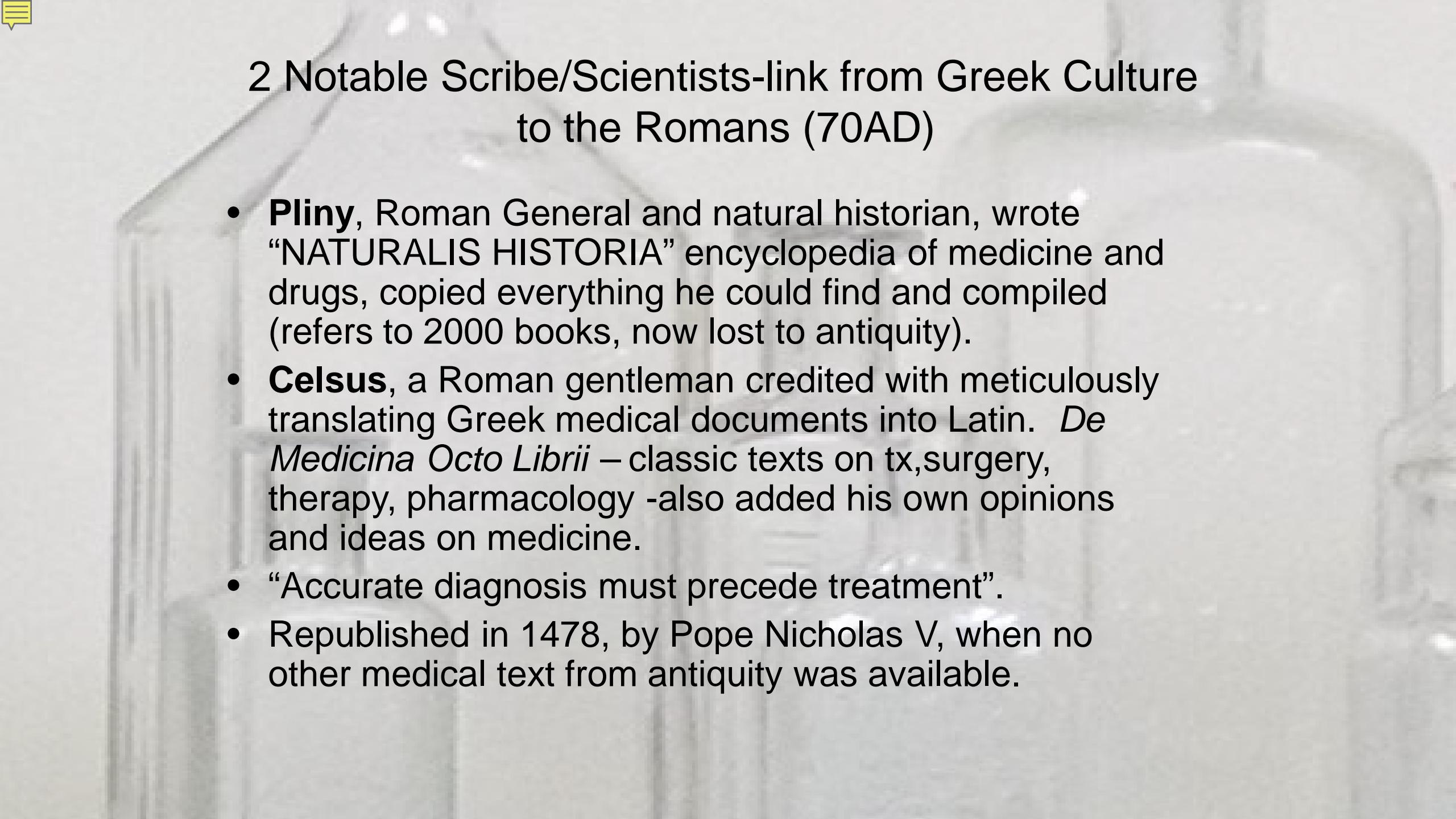


107. Below: Roman bronze scalpel
(ca. 200 B.C.)
108. Surgical instruments in *Alfaraby*
(thirteenth-century Latin translation)
by Albucais



Greek Physicians in Rome

- **Asclepiads** were physician/priests who practiced in Rome and practiced at the temple.
- The temples led Romans to create public baths, part of the healing process.
- Healers and quacks practiced anywhere including theatres and barber shops.
- Rhizotomoi (Gr), *pigmentarii*, *unguentarii*, pharmakopolai (Gr), *seplasiarri*, all called *apothecarius* in Rome.
- Medical practice was regulated in 230AD, when physicians were given tax privileges.
- Julius Caesar eventually realized Greek physicians were of some value, offered citizenship.



2 Notable Scribe/Scientists-link from Greek Culture to the Romans (70AD)

- **Pliny**, Roman General and natural historian, wrote “**NATURALIS HISTORIA**” encyclopedia of medicine and drugs, copied everything he could find and compiled (refers to 2000 books, now lost to antiquity).
- **Celsus**, a Roman gentleman credited with meticulously translating Greek medical documents into Latin. *De Medicina Octo Librii* – classic texts on tx, surgery, therapy, pharmacology -also added his own opinions and ideas on medicine.
- “Accurate diagnosis must precede treatment”.
- Republished in 1478, by Pope Nicholas V, when no other medical text from antiquity was available.

Dioscorides (100 A.D.) *MATERIA MEDICA*

Botanist and Plant Collector; categorized **medicinal properties**, animals, plants and minerals





Dioscorides

- ***Materia Medica***, a series of 5 books ,sum of all therapeutic knowledge, properties of any substance used for healing. Well organized, medical uses. Storage and collection.
- I- aromatics, oils, ointments, trees
- II- living creatures, milk and dairy, cereals and sharp herbs
- III- roots, juices, herbs
- IV- herbs and roots
- V- vines, wines and metallic ores
 - **Greek later translated to Latin**, most important source of drug information used by the ancients and for centuries afterward
- Described 600 plants, 90 of which were still used during WWI
- Gives instructions for the detection of fake drugs, quite common especially with opium

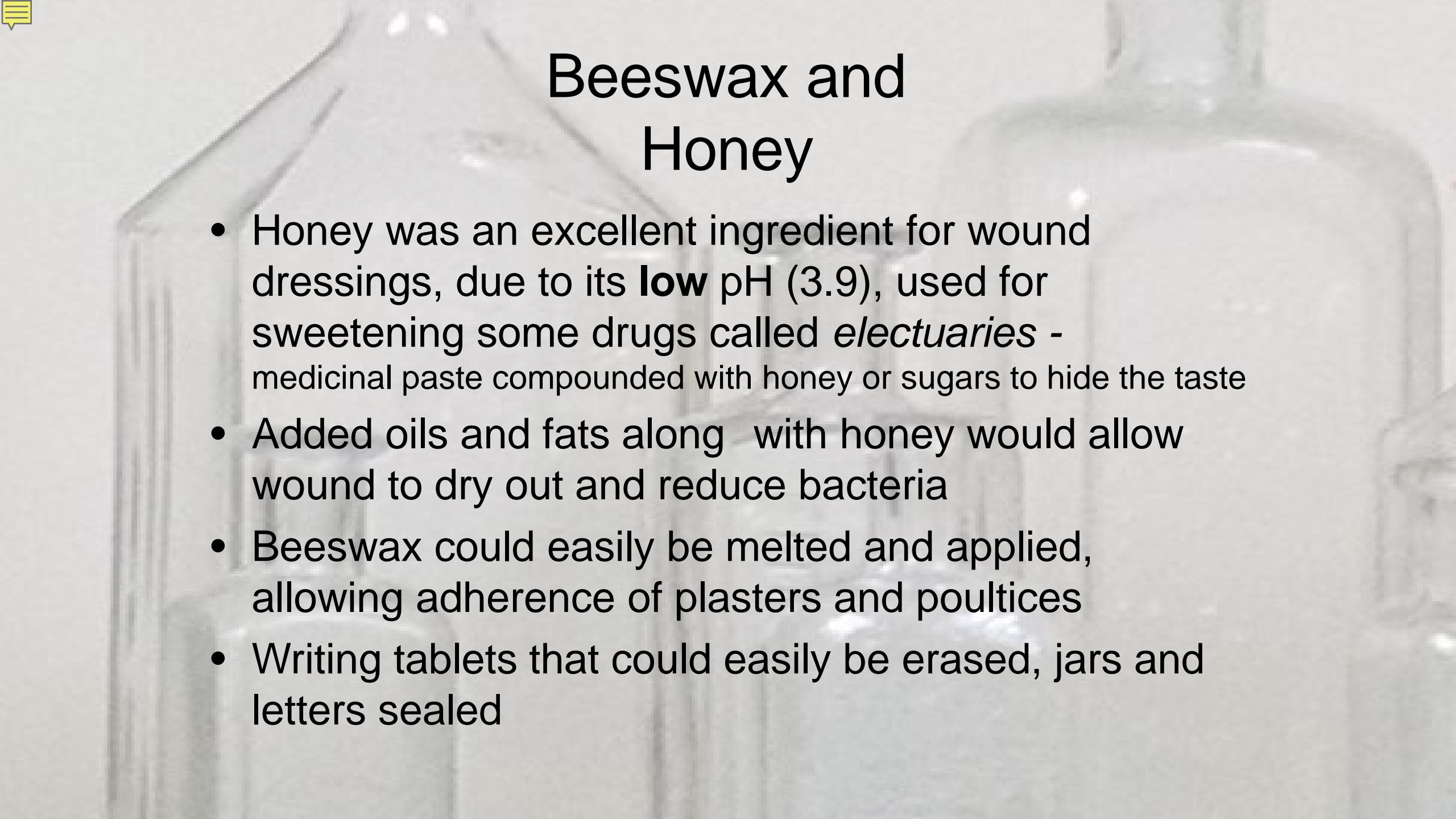
Dioscorides *Materia Medica*, 512 AD,
translated by Byzantine monk.
English translation -1655



3 Notable Plants -Roman Empire:

- Opium Poppy (*opos*)- common latex of the opium poppy, available in the marketplace – Romans would use for a painless death – its purgative and narcotic power well known
 - heroin, morphine, codeine, papaverine
- Frankincense (*libanotos*)- expensive, reserved the wealthy, used in ceremonies and as an antidote to hemlock poisoning
- Pennyroyal (*glechon*)- used as a contraceptive tea, or burned in birthing chambers. Prostitutes and used pennyroyal to control all aspects of their menstrual cycles. Used as an emmenagogue, carminative and aromatic stimulant.





Beeswax and Honey

- Honey was an excellent ingredient for wound dressings, due to its **low** pH (3.9), used for sweetening some drugs called *electuaries* - medicinal paste compounded with honey or sugars to hide the taste
- Added oils and fats along with honey would allow wound to dry out and reduce bacteria
- Beeswax could easily be melted and applied, allowing adherence of plasters and poultices
- Writing tablets that could easily be erased, jars and letters sealed



Mithridatum

- The antidote ascribed to King Mithridates
- Said to be effective against poisonous venom and other poisons like belladonna (atropine)
- Composed of opium, myrrh, castor, ginger, cinnamon, saffron, duck blood, contained over 50 substances
- After he was dispatched, his recipe was found. Eventually Andromachus (Nero's physician) added vipers flesh- used for over 1000 years as a poison antidote and “cure-all” eventually became known as ***theriac or treacle (Br).***

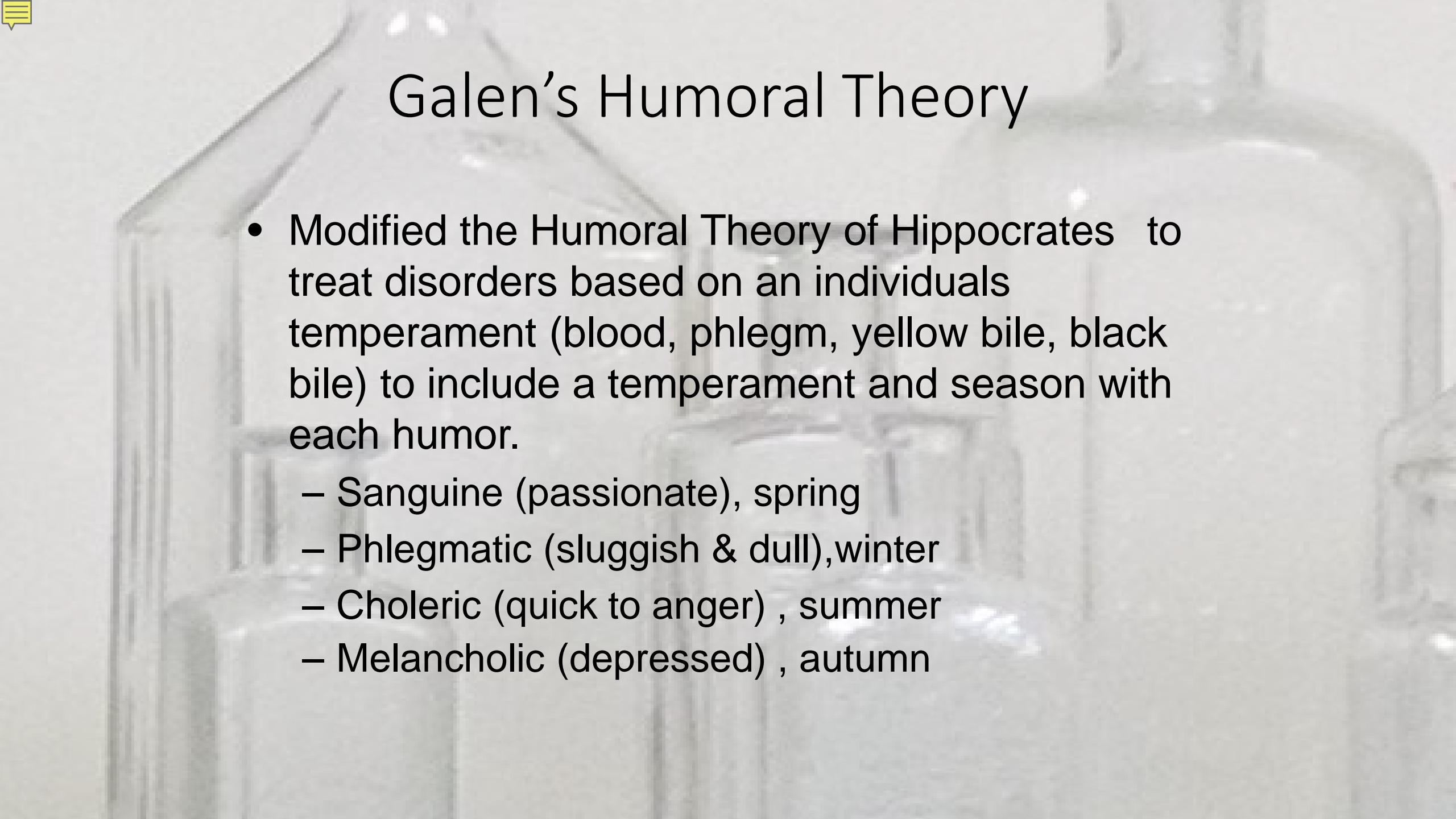
Galen A.D. 131-200 A.D., Physician to Emperors and Gladiators, Marks the End of Greek Medicine





Galen's Attributes

- Excellent clinical observer , philosopher and teacher
 - 1st to take a pulse
 - Wrote on blood, brain, nervous system, spine
- Tried to systemize medical theories of the time (Dogmatism, Methodism, Empiricism, Pneumatism) in some of his over 1400 treatises, link between ancient Greek medicine and the Middle Ages
- Criticized for fleeing Rome during a plague epidemic
- First anatomic descriptions, of animals he dissected
 - Extrapolated to humans
- Addicted to polypharmacy, sometimes 25 drugs in one rx
 - compounded rxs were henceforth called “galenics”
- Used bleeding and evacuation
- Theory of “laudable pus” meant wound is healing
- Ruled medicine into the 17th century

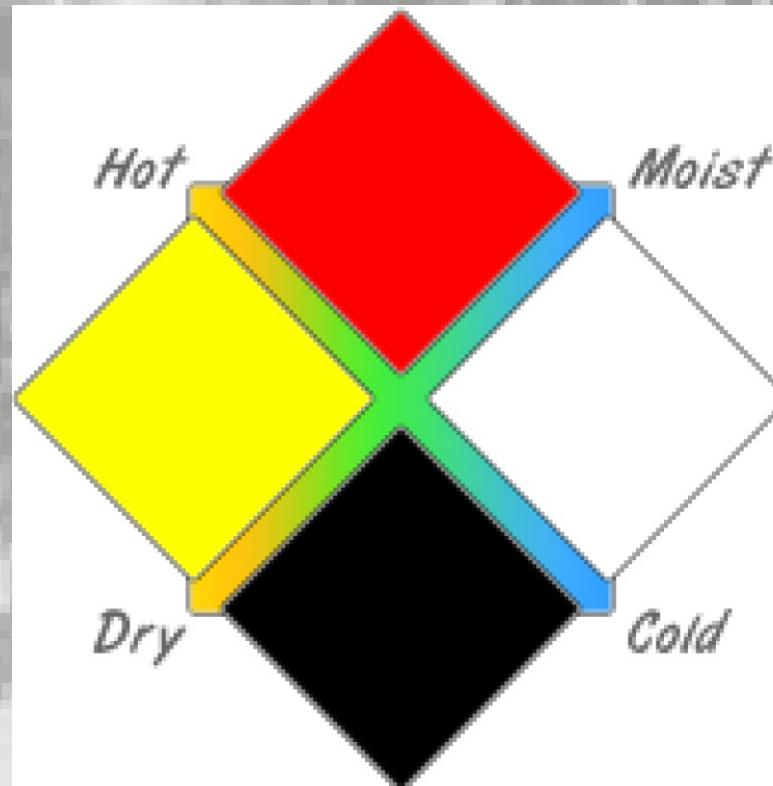


Galen's Humoral Theory

- Modified the Humoral Theory of Hippocrates to treat disorders based on an individuals temperament (blood, phlegm, yellow bile, black bile) to include a temperament and season with each humor.
 - Sanguine (passionate), spring
 - Phlegmatic (sluggish & dull), winter
 - Choleric (quick to anger) , summer
 - Melancholic (depressed) , autumn



Sanguineus
BLOOD - AIR- SPRING



Cholericus
*YELLOW BILE -
FIRE - SUMMER*

Phlegmaticus
*PHLEGM - WATER -
WINTER*

Melancholicus
BLACK BILE - EARTH - AUTUMN

4 Humors of Galen, 13th century manuscript



Sanguine: sanguine or passionate



Phlegm: sluggish and dull



Choler: choleric or quick to anger

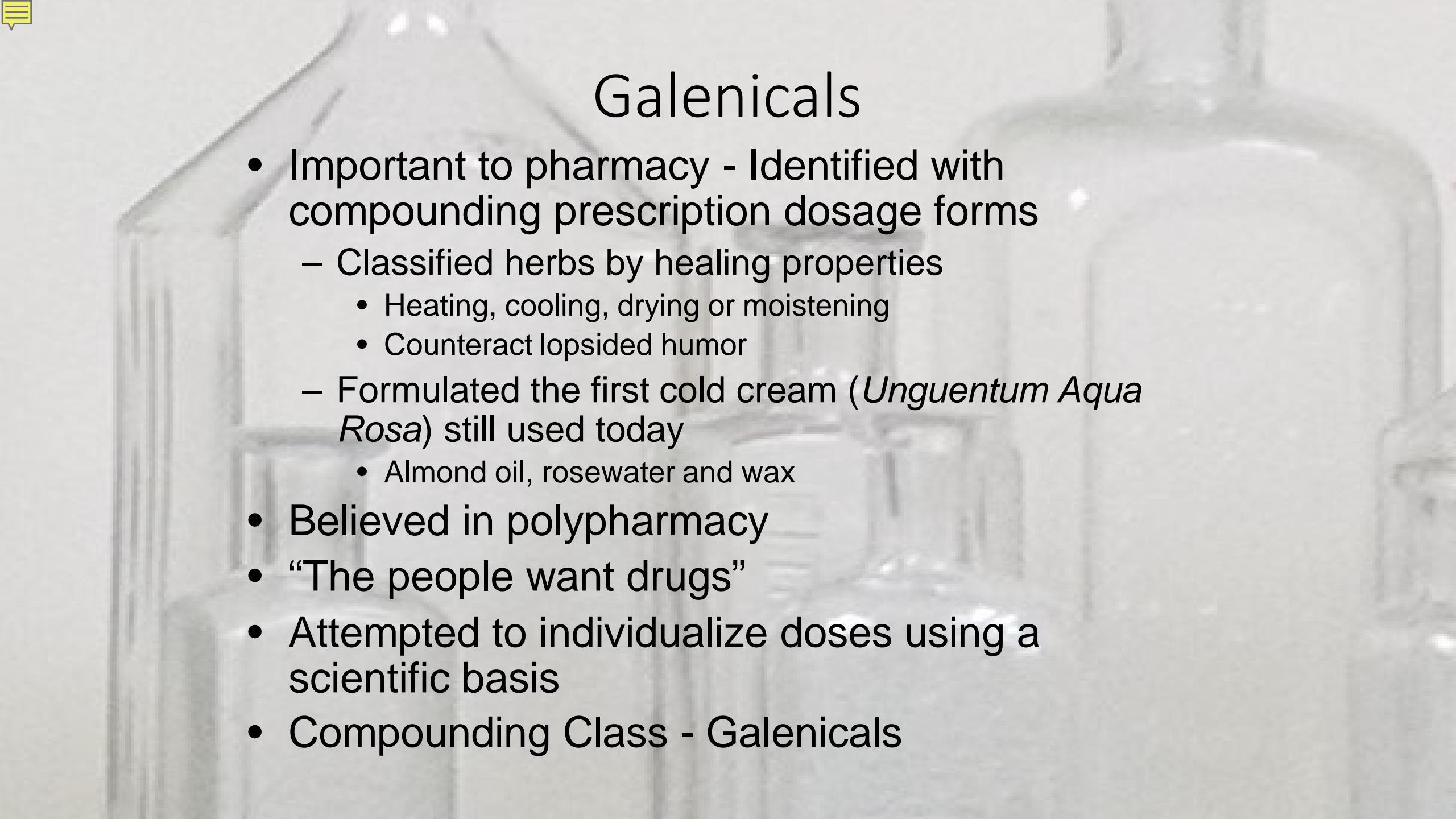


Black bile: melancholic or depressed

The four humors of Galen in a thirteenth-century manuscript

BLOODLETTING

- Discovered by Egyptians
- Central to Galen's Four Humors Theory, excess blood caused a fever
- Patients, in many cases, improved. Loss of blood induces vasopressin which in turn, reduces fever
- Used until the mid 19th century

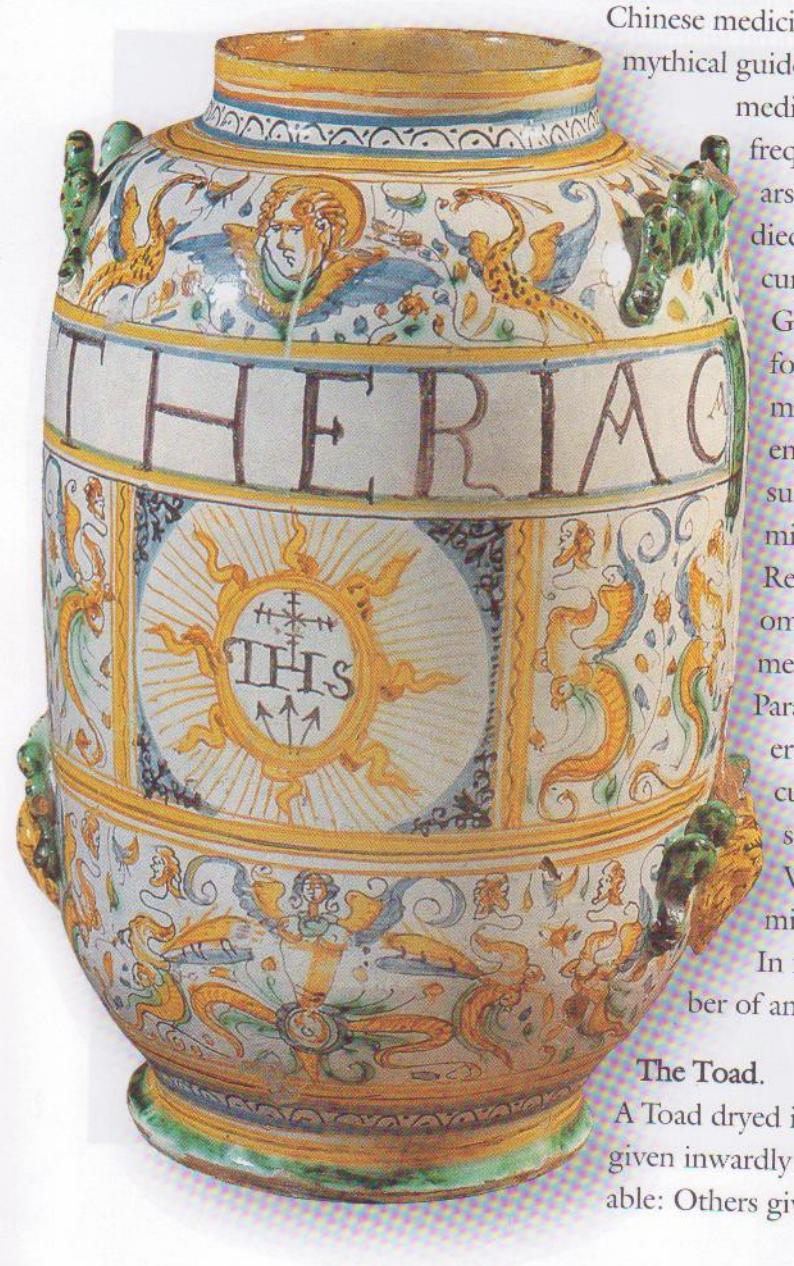


Galenicals

- Important to pharmacy - Identified with compounding prescription dosage forms
 - Classified herbs by healing properties
 - Heating, cooling, drying or moistening
 - Counteract lopsided humor
 - Formulated the first cold cream (*Unguentum Aqua Rosa*) still used today
 - Almond oil, rosewater and wax
- Believed in polypharmacy
- “The people want drugs”
- Attempted to individualize doses using a scientific basis
- Compounding Class - Galenicals

Theriac (Treacle)

- Galen wrote an entire book about *Theriac (theriaka)* and gave it regularly to his patient, Emperor Marcus Aurelius
- He continued to expand the formula of the original *mithridatum*
 - Added venom of vipers and other ingredients until it contained over 70 substances. Also recommended *Terra Sigillata* and *Hiera Picra*
- Considered a universal antidote and a panacea, used until the 1880's. Used for plague
- Eaten in chunks or spread on the body, expensive
- Many cities and towns compounded a *theriac* preparation with great pomp and circumstance, public ceremony
- *Theriac* translates to opium in several languages
- Idea of a universal antidote still elusive



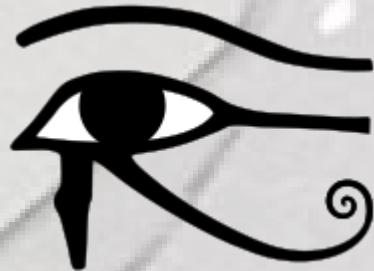
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Pharmacy in Ancient Rome

- Dioscorides and Galen introduced **apothecaries' system of weights and measures** in drug preparation
- Most physicians prepared medications themselves
- Writings indicate others preparing drugs, specializing:
 - ***Seplasia*** = a pharmacy
 - ***Selluarii*** = street stall, drug vendor shop
 - ***Medicina (drugs)*** prepared by ***medicamentarii, pharmacopoei, pharmacotritae, confectionarii***
 - ***Medicamentarius*** = person who administers poison
 - ***Ungentarii*** = maker of ointments
 - ***Seplasarii*** = seller of ointments



Symbol of Pharmacy RX – 2 Theories

- Egyptian, Eye of Horus (Udjat), measure
- Began during Emperor Nero's reign
 - R “*Recipio*” To take (now Latin root *recipere*)
 - Sign of Jupiter, allegiance to God Jupiter not Christianity-combined to form RX

24



Mortar and Pestle



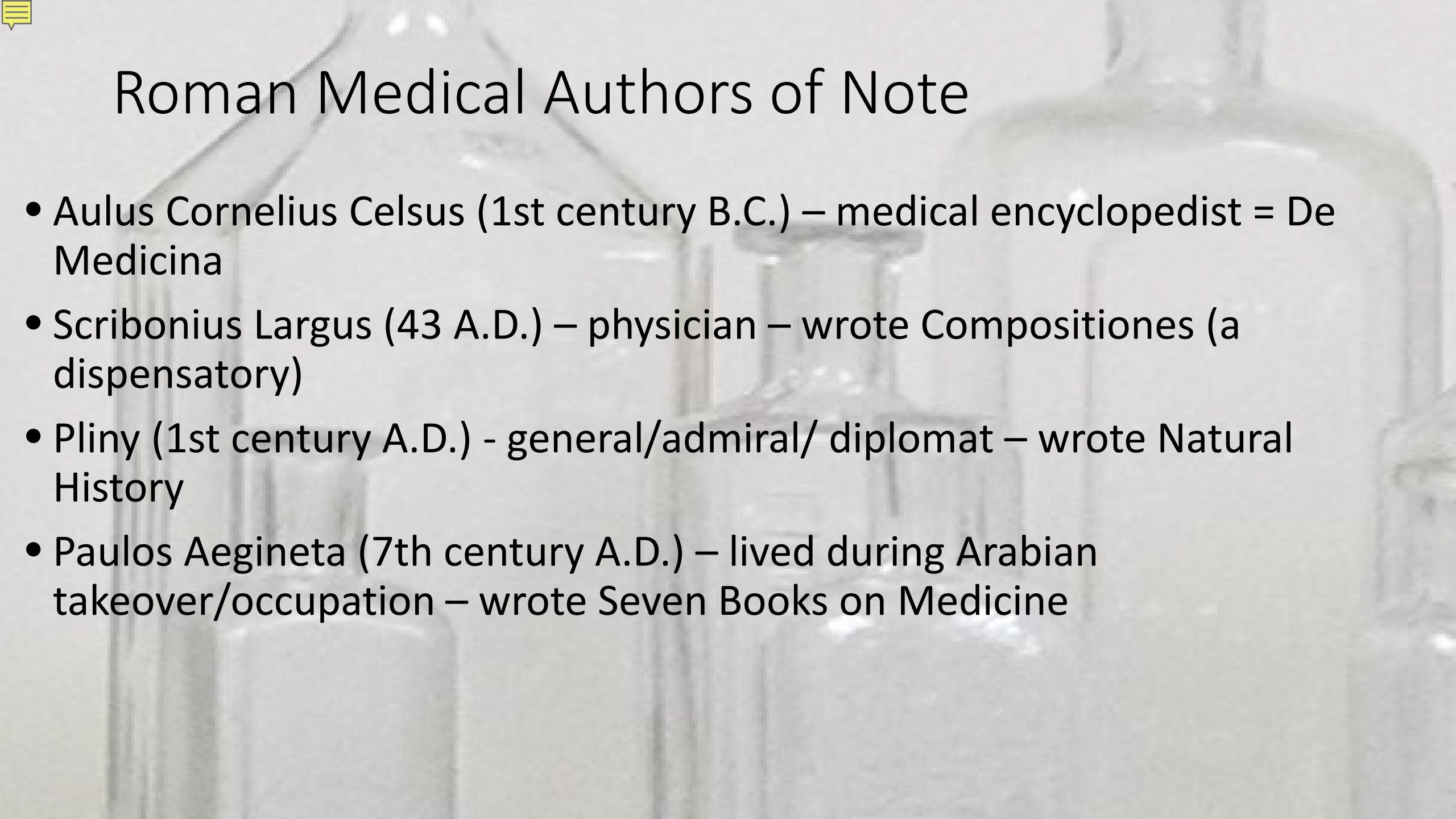
Date back to Egyptians,
Romans named

Mortarium (Latin) ->
Mortar (English) =
receptacle for grinding

Pestillum (Latin) ->
Pestle (English)

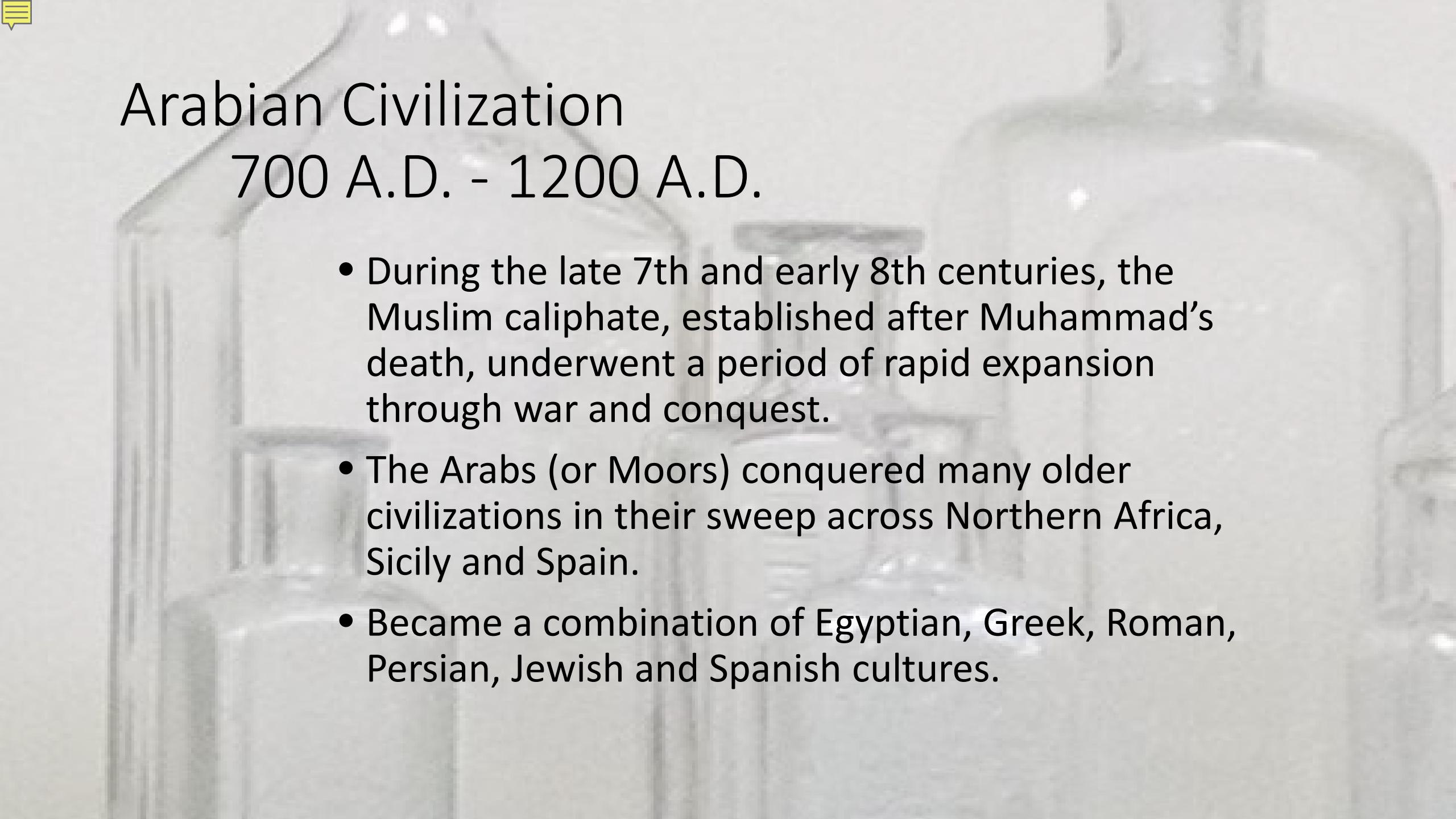
Fall of Roman Empire

- Germanic Tribes took over, malaria epidemic destabilized country, conquered Rome – some say lead vessels lead to decline, busy defending the empire in other countries
- Catholic church saw the opportunity to translate Greek works into Latin
- Church took over practice of medicine and plant cultivation for drugs
- Church converted Roman Gods of Disease into Saints to pray to for particular diseases
- As Roman Empire declined, so did progress in medicine and surgery and continued to decline through part of the Middle Ages



Roman Medical Authors of Note

- Aulus Cornelius Celsus (1st century B.C.) – medical encyclopedist = *De Medicina*
- Scribonius Largus (43 A.D.) – physician – wrote *Compositiones* (a dispensatory)
- Pliny (1st century A.D.) - general/admiral/ diplomat – wrote *Natural History*
- Paulos Aegineta (7th century A.D.) – lived during Arabian takeover/occupation – wrote *Seven Books on Medicine*



Arabian Civilization

700 A.D. - 1200 A.D.

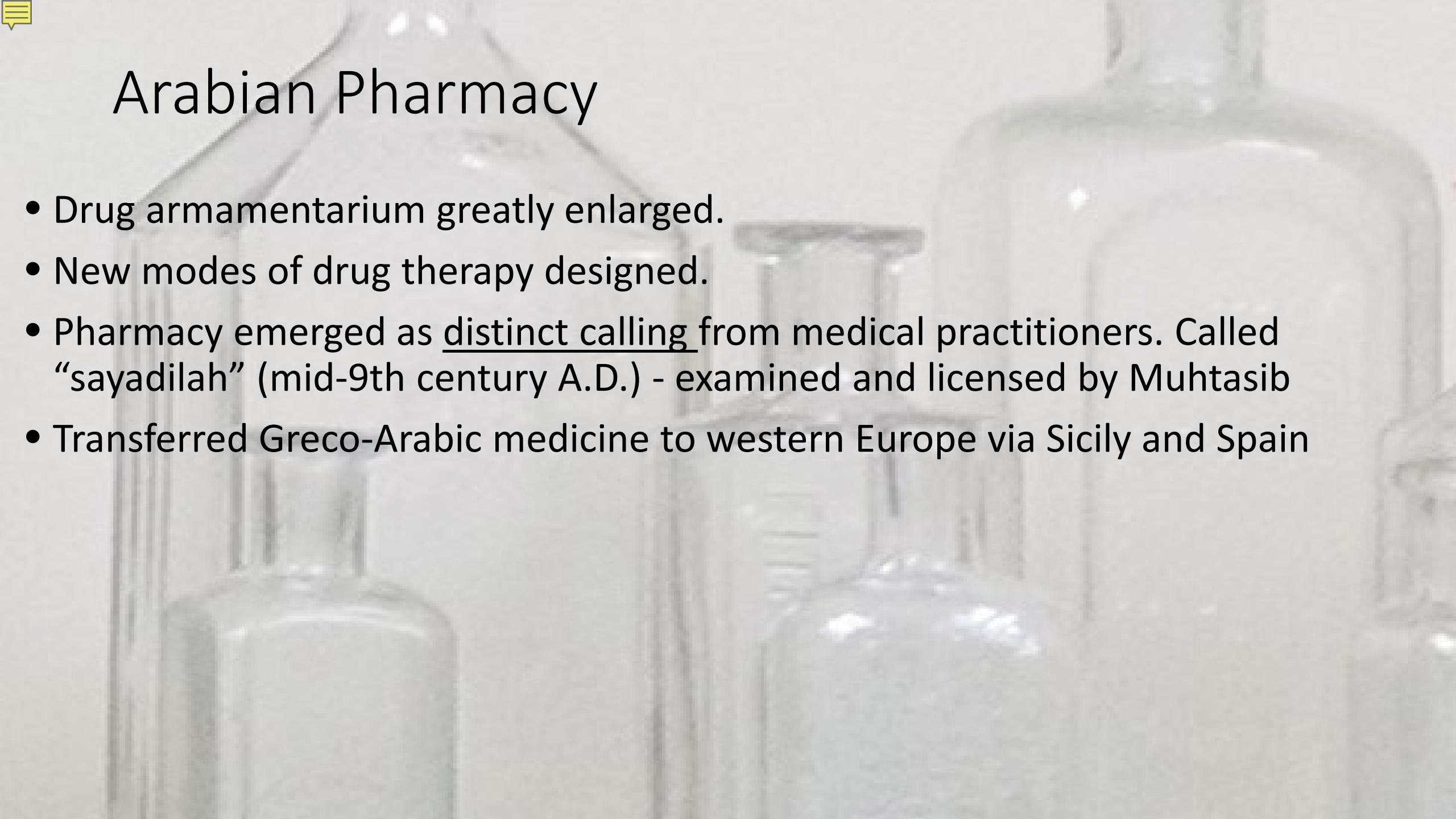
- During the late 7th and early 8th centuries, the Muslim caliphate, established after Muhammad's death, underwent a period of rapid expansion through war and conquest.
- The Arabs (or Moors) conquered many older civilizations in their sweep across Northern Africa, Sicily and Spain.
- Became a combination of Egyptian, Greek, Roman, Persian, Jewish and Spanish cultures.

Arabian Pharmacy Literature - Greatly Expanded

- Four types of Arabic drug-oriented contributions:
 - 1) Formularies and compendiums – Theodoq, a court physician (709 A.D.)
 - 2) Books on herbals and the *materia medica* - Ibn Masawaih (857 A.D.) – physician & son of a pharmacist
 - 3) Toxicology treatises
 - 4) Diet and drug therapy in relation to human ecology

Arabian Pharmacy Literature - Greatly Expanded

- Like the Romans, Arab writers tried to systematize medical knowledge and create encyclopedic works. Writer examples:
 - al-Razi – physician – scientific chemistry
 - Ali Ibn Abbas – the Royal Book - ethics
 - Ibn Sina – 5-part Canon – about 760 drugs
 - Abu-l-Qasim al-Zahrawi – medical encyclopedia w/ pharmaceutical concerns



Arabian Pharmacy

- Drug armamentarium greatly enlarged.
- New modes of drug therapy designed.
- Pharmacy emerged as distinct calling from medical practitioners. Called “sayadilah” (mid-9th century A.D.) - examined and licensed by Muhtasib
- Transferred Greco-Arabic medicine to western Europe via Sicily and Spain

Ancient Chinese Medicine

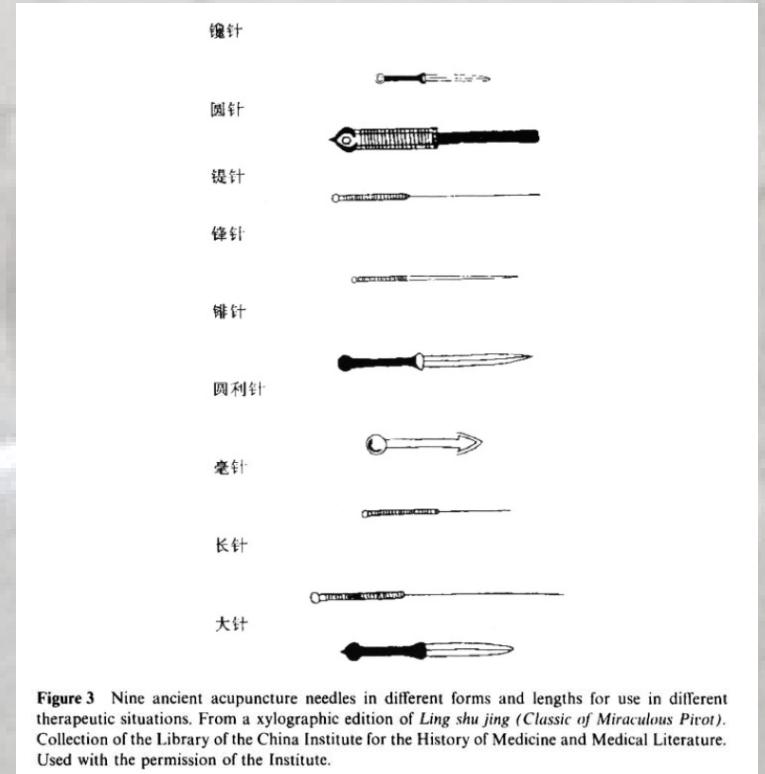
- Theoretical basis found in
 - *Huang di nei jing (Huang di' Inner Canon of Medicine)*
 - Zhang Zhongjing's *Shang han za bing lun* (*Essays on Cold and Miscellaneous Diseases*)
- System includes
 - Yin-yang
 - Five evolutionary channels
 - Other theories including channel collaterals, viscera, pathogenesis, etiology, treating principles

Ancient Chinese Medicine

- Yin-yang
 - Two opposites in constant motion
 - Disease is the result of yin or yang being in a state of excess or deficiency for an extended period of time
- Five element theory (wuxing)
 - Universe and everything in it, our health included, is controlled by the natural elements
 - Wood: Associated with spring, the liver, and the gall bladder
 - Fire: Associated with early summer, the heart, and the small intestines
 - Earth: Associated with late summer, the stomach and spleen
 - Metal: Associated with fall, the lungs and large intestine
 - Water: Associated with winter, the kidneys and bladder
 - Underscores belief that humans are interwoven with nature

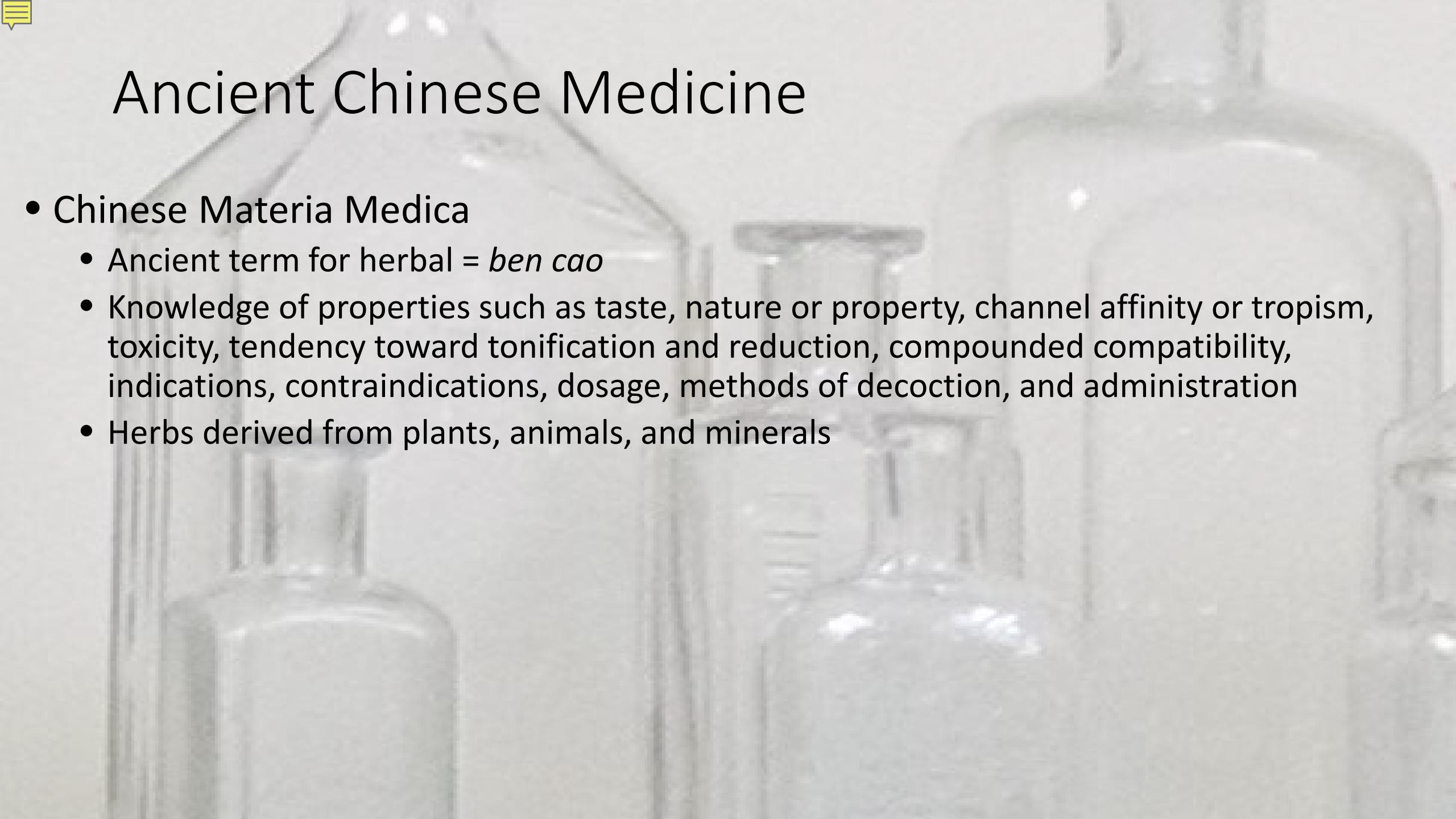
Ancient Chinese Medicine

- During end of Western Han dynasty, liquor was viewed as most significant medicine
- Knives as stone needles, later evolved to using bronze to make needles
 - Nine needle types for different types of treatments



Ancient Chinese Medicine

- Bone and tortoise shell inscriptions show presence of:
 - Headache
 - Abdominal pain
 - Dizziness
 - Common cold
 - Tinnitus, deafness
 - Infectious diseases
- Recognized relationship between seasons and occurrence of diseases



Ancient Chinese Medicine

- Chinese Materia Medica

- Ancient term for herbal = *ben cao*
- Knowledge of properties such as taste, nature or property, channel affinity or tropism, toxicity, tendency toward tonification and reduction, compounded compatibility, indications, contraindications, dosage, methods of decoction, and administration
- Herbs derived from plants, animals, and minerals

Ayurveda Medicine

- Indigenous living medical tradition on the Indian continent
- Purpose is to “protect the health of the healthy and pacify the disease of the diseased”
- The five elements (earth, water, fire, air, and space) are central to Ayurveda
- Humans made of three pillars: imperishable self (atma), mind (sattva), and body (sarira)
- Doctrine of three dosas or ‘vitiator’
 - Vata (wind): regulates respiration, intestinal peristalsis, excretion
 - Pitta (bile): responsible for digestion, metabolism, and psychic processes
 - Kapha (phlegm): gives firmness to the body, regulates stabilizing functions, and refreshes the sense organs

Ayurveda Medicine

- Eight disciplines
 - Salyam (surgery)
 - Salakyam (dealing with diseases above the clavicle)
 - Kayacikitsa (medicine)
 - Bhutavidya (science of dealing with spiritual possession)
 - Kaumarabhrtyam (pediatrics)
 - Agadatantram (toxicology)
 - Rasayanam (preventive and strengthening measures)
 - Vajikaranam (aphrodisiacs)

Unani Medicine

- Entered India during Muslim invasions during the 1st half of the 6th century
- Form of Greco-Islamic medicine

Shamanism

- Thought to have existed since the Stone Age
- Early form of polytheism with the following key beliefs:
 - World is inhabited by spirits that can influence people
 - Interconnections in nature that includes humans
 - Humans are equal to other forms of life
 - Human society is closely connected with the cosmos
 - A human has the ability to acquire spiritual qualities and visit other worlds
 - The aim of religious activity is to defend and make prosperous a small group of kinsmen
- Illness contributed to evil spirits
 - Illness is an expression of activities in the spiritual realm

Shamanism

- Shaman
 - One who connected directly with the spiritual world through a state of ecstasy
 - Center of healing efforts
 - May also be called a 'medicine man' but not all medicine men are shamans
 - Two manners of healing
 - Seeking up the fleeing soul
 - Dislodging the disease object or spirit that has taken a person's body in possession