Prehispanic Medicine in Mesoamerica with emphasis in ophthalmology.

**Historical antecedents of the Mesoamerica Region.**

The Archeologists had named the geographical region comprised by central Mexico and part of central america as mesomerica. Is in this territory were many ancient cultures developed before to arrival of the european civilization at the end of the fifteenth century and during the following decades. Mesoamerica varies from tropical to subtropical regions; from rain forests and flat bushes to highlands in central Mexico.

There are vestiges of human settlements in central Mexico since 3,000 years before Christ (BC), but a civilization and more developed culture started to emerge in the coast of Mexico, in tropical and subtropical regions 1,200 BC. This first mother culture is known as the Olmecas.

As any other prehipanic culture, is divided in three different periods: Preclassic, Classic and postclassic, that corresponds to the level of cultural manifestations found in the culture described. Preclassic refers to the firsts, and frequently rudimentary chracateristics of the culture, Classic
period to the best expression, and postclassic to the late manifestations of the culture, frequently influenced, by other contemporary growing cultures or to a decadence of the civilization.

The preclassic period in the Olmecas started 1200 Bc. The classic period corresponds to 800 BC. and somehow, extinguished in the beginning of this era. The fact is that at the time of the Spanish conquest, the olmecas had totally disappeared.

They did not leave us pyramids as vestiges of their culture, probably due to a less degree of urbanism, but in the other hand, their stone sculptures, as colossal heads, altars and gracious human figures of the classic period show a high degree of artistic development.

It is probably that the olmecas influenced other indigenous tribes in central Mexico and in the south east of mesoamerica. The most notorious of them are the Mayans in the southern peninsula of Mexico and central America and the Toltecas in central Mexico. In both cases, their preclassic periods correspond to the Olmeca decadence.
The Maya culture can be dated from ... to.... and the classic period from 500 to 1,000 After Christ (AC). There are several vestiges of this very rich culture. Pyramids, roads between cities, paintings, palaces, astronomical observatories, dated sculptures, ideographic names and numerals are clear proofs of their achievements.

The Maya world is limited, to a certain degree, to this region, probably due to geographical circumstances that limited their influence (Altitude, mountains and rivers) and with South America (climate and jungles), but remained many archeological proofs of their cultural contacts with the Tolteca culture that emerged in central Mexico.

There are several theories trying to explain the disappearance of the Maya culture: Wars between cities (The Maya world was composed by state cities); epidemic diseases and starvation due to climate changes, are the most popular ones. But the fact is that when the Spaniérds arrived in the peninsula of Yucatan in 1517, 1518 & 1519, all the Maya ceremonial centers and ancient cities were found abandoned and the Maya culture was in complete decadence.
Contemporary to the mayans, other cultures, the Toltecas in Central Mexico, (500 AC – 1000 AC) or the Mixtecos-Zapotecs, (500 AC – 1000 AC) in the south west, appeared. They built cities and pyramids; astromic observatories and temples, Their domain had geographical distribution in the highlands and mountains of the regions occupied by them. Most of the pyramids known by the world tourism belong to them.

Over the centuries, these classic cultures were invaded from tribes coming from the north, called the nahuas tribes. They contributed to the Tolteca decadence, but at the same time these new invaders were strongly
influenced by the toltecas in their gods; constructions; urbanism; art and many others cultural manifestations, these are the cases of the Tarascos, Chichimecas, Tlaxcaltecas and many others subcultures that stablished in the template climate of central Mexico.

A very late tribe, coming from the north, settled down in early fourteenth century AC, in the middle of a large lake in central Mexico, in what is nowadays Mexico City. This group were the Aztecs. undoubtly, the best well known culture of the prehispanic world.

**The aztecs.**

According with the aztec history, they migrated from the north whith the promise to find a place where and eagle, standing over a cactus (nopal) was eating an snake. They found that place in an island in the center of the lake mentioned above. For that reason, the symbol of the flag of Mexico has, since the independence in 1821, has the representation of this mytical fact.
The aztecs founded their city (Tenochtitlan) in 1321. At the beginning they became subjugated by the tribes and nations surrounding the lake, later on, they became mercenaries of those indigenous nations. From the story of those nations, we know how fierce they were at war.

The Aztecs were a unique tribe. In two hundred years, from a subjugated they became the rulers of Mexico. By the end of that century they started to became powerful and conquered territories until the aztec empire expanded to all the prehispanic mesoamerican world; Sem anahuac tenochca tlalpan, as they used to say in aztec, meaning that all the world is aztec territory. They conquered every surrounding cultures and expanded their empire to almost all cities and indigenous nations from coast to coast; from the desserts in the north to the jungles in the south.

The aztecs were a tribe of warriors, all the aspects of their society were centered around conquers, tributes, and slaves and prisoners to be
sacrificed. Their main god *Huitilopochtli*, was also the god of war. His temple was the religious center of the aztec capital and the place where human sacrifices took place to satisfy the hunger for blood that *huitzilopochtli* demanded from the aztec people.

As a consequence of the influence of previous cultures settled in the valleys of mexico and the conquest of indigenous nations in the mesoamerican territory, the aztecs adopted many other cultural aspects of the prehispanic world. *Tenochtitlan*, their capital, was highly urbanized; Four large stone avenues conected the central city with the land sourrounding the lake.

To improve agriculture they developed floating agricultural lands called *Chinampas*; they inhereted and practiced astronomical observations and
measurements; laws to rule social daylife and commerce; colleges for the youth to be instructed in war and in different labors, named *calmecas*, and a complex system to collect tributes from the subjugated nations.

La hoja de tributos

By the time of the Spanish conquest, in 1521 *Tenochtitlan* and the allied cities that grew *en los litorales del lago*, had more than 250,000 people. One of the soldiers, Bernal Díaz del Castillo, when he saw tenochtitlan, and the intense activity in all aspects of the daily Aztec life, described and compare it as *Venice* in terms of their urbanistic organization and social activity.

The conquest of the capital of the Aztecs and the fall of the Aztec empire by a reduce number of Spanish soldiers, just can be explained by the rebellion of many of the tributary states and Indian nations subjugated by the Aztecs that offered their military services and many Indian soldiers to defeat the Aztec empire.

La union de indios y españoles

When the conquest war was completed and the rulers of Mexico were the Spaniards, the government of the colony started to rebuild the capital city and preserve some of traditions traditions instituted by the Aztecs; many Indian governors were left in place and the different strata of the Indian society were almost left intact. In fact, in some instances, cultural traditions were carefully studied by the misioners.
This is the case of Medicine.

**The bibliographical Sources**

Our knowledge on how Prehispanic medicine was practiced come from three main different historical sources:

The Codex of De la Cruz- Badiano
The prehispanic customs by Fray Bernardino de Sahagun and
The book report by Francisco Hernandez.

They differ one from each other by the nature and orientation of the author. The first one is by an indian doctor, the second book was written by a Priest and the third one by an spanish doctor who was sent to the new world to study indian medicine.

The Codex de la Cruz- Badiano is a manuscript with one hundred and fifty one drawings and its uses written in aztec by an Indian Physician.
Martinus de la Cruz and translated in the same codex into latin by an other indian: Juan Badiano, 31 years after de conquest of Mexico in the college of Santa Cruz de tlaltelolco.

The second book is a very large volume, written by the misioner, Fray Bernardino de Sahagun. Dean of the College of Santa Cruz de tlaltelolco, who wrote a description of the costumes of the indian people. Within the book, one chapter is dedicated to cures; remedies and medical practice of the aztecs.

These two sources have something in common: they were written at the college of Tlaltelolco. During the aztec empire, the aztecs, had colleges to train their youth in war or special labors. they used to call these colleges: Calmecac. The spaniards kept this tradition and created, after the conquest, the college of Tlaltelolco in order to teach the indians: Latin, Philosophy, Mathematics, Music and Medicine.

As it can be easily understood, this was place for cultural interchange.
It is not surprising then, that these two important books in how medicine was practiced, were written there in the sixteenth century.

The third significant source is a book intitled *Nova Plantarum animalium et mineralium mexicanorum historia*. Written in the second half of the same century.

The news of the rich medical lore of the Mexicans brought to Spain from numerous people, aroused the interest of the emperor Philip the second of Spain, about the commercial and medical value of native remedies.

To study and report his findings he selected his own court physician, Francisco Hernandez to go to Mexico.

Hernandez collected and studied native plants and minerals in many places in Mexico. He tried extracts of plants upon patients in several places in New Spain, and not infrequently, upon himself.

After six years of work, he considered his task completed, went back to Spain and left his manuscript at the imperial library of the Escorial.
Gradually, the medical remedies from the new world were highly appreciated, and soon, they saturated the European market. Plants for the Tiphus; Syphilis; and herbs with hormones; hipotensors and diuretics enriched the European pharmacy. *Monardes, an spanish doctor working in Sevilla in the seventeenth century, in his treatise in medicine refers how valuable and expensive were some of the herbal treatments and ointments coming from the New Spain (Named given to Mexico in the colonial period after the conquest)*

But at the same time, with this success, the books, as reference to study Prehispanic medicine, were almost forgotten and left in the shelves of libraries for a long period of time.

The Codex De la Cruz-Badiano, somehow reached the Vatican library. It remained there, unopened for centuries, with the title of *Libellus de Medicinalibus indorum herbis*, and rediscovered in 1931 by an American researcher: Charles U Clark.

John Hopkins Press, in 1938, made a beautiful facsimile edition, in full color, of this historical book. The book, after several years, is finally in
Mexico as a gift of the Pope John Paul the Second to the Mexican government.

La historia de la edición del libro de Fray Bernardino por Carlos Viesca
The History of the costumes of New Spain by Fray Bernardino remained as manuscript until the early nineteenth century when the book finally was edited after a large and interrupted period of paleography.

The book report of Francisco Henandez after been deposited in the imperial library, stayed there for some years, until the late sixteenth century when a fire occurred in the Escorial and the original work was almost destroyed.

Many efforts were made to complete the initial manuscript with the copies left in Mexico, and finally - almost one hundred years later- , in 1651, the first edition was published in Rome. The book became a medical best seller of that time, and several posterior editions were published.

The Practice of Medicine in prehispanic times.

Most of the things that we know from Prehispanic Medicine come from the Aztec period. At the same time, the Aztecs probably inhereted their
medical knowledge from all those other indian nations conquered by them, who had been in the territory, for at least, two thousand years. The art of the aztec medicine is the heritage of many others previous indigenous groups settled in Mesoamerica.

The prehispanic society was very religious. Therefore, medicine was strongly influenced by gods. Gods were responsible for health and illness. In order to succeed in medicine, prayers and exorcisms were mandatory and religious offerings and oblations had to be done in addition to medical treatments.

From several historical sources we know that the prehispanic people strongly believed that their mission in life was to sustain the willness of their gods and, if for any reason, they did not follow the strict religious habits and rituals imposed, then, their gods could send them, as punishment, some kind of disease, or cocoliztli, as they called it.
For them, the main causes of illness were:

- To disobey the indications of god willness as expressed by their kings and priests;
- To forget their religious rituals habits,
- And to have sexual relations in forbidden days.

In the prehispanic world common people had somekind of rudimentary medical knowledge used to distinguish some curative plants as self medication to heal minor problems.

But if they have more serious problem, the sick people have to use the medical competences of the Indian doctors,

*The titcies* as they called them, must then apply their religious knowledge according with of the god responsible for the illness; the proper exorcism and the therapeutic tools.

*Ejemplo de algun exorcismo*
We also know, from the sources cited above, that medical knowledge, as some other labors, was transmitted from fathers to sons and required a large period of training and mentoring.

According with Sahagun, the main skills to be acquired were:

- A wide knowledge on the effects of medical and toxic plants;
- Skills needed to reduce bone fractures,
- The art of bleeding and its applications
- And abilities for suturing wounds.
The titcies had an special social stratus. They used to live in the neighborhood, close to each other, and wear special dresses that represented their relation with certain gods. Therefore, there were some kind of specialities in the aztec medicine. We know, for example, of some titcies specialized in massage treatments, others in healing by suctioning with the mouth, or in water treatments; there were also specialists for diseases of the mouth or the ears, and of course, since those ancient times, the eye indian doctors.
The ophthalmologists of prehispanic times were called *titci Teizpatiani* and their main surgical skills were treatments for pterigion, cataract and surgical procedures of the conjunctiva - (perhaps tracoma or vernal conjunctivitis-.)

*Habrá que agregar algo sobre Xipe*

*Xipe Totec* was the god of the spring and also responsible for the diseases the skin, the eye and the ocular adnexa. In order to be easily identified, the ophthalmologists used some kind of dresses that resembled the God Xipe Tótec.

*the Vatican Codex*
Cadaver dissections were not a scientific practice, therefore, prehispanic medicine showed a rudimentary knowledge of human anatomy, however, human sacrifices were common in the aztec world, and probably, from there, that the prehispanic doctors had knowledge of the different parts of the body. There was also a strong correlation of parts of the body with gods and animals that represented areas of the astronomic calendar.

Human sacrifice, bending the prisoner, and extracting the living heart with an stone knife, besides being cruel, shouldn't be easy, and required a very skilled indian priest.

There is no evidence that human sacrifices were performed by Titcies, in fact, it was reserved to very high religious status. But most probably from the observation of the rest of the body, is that the aztecs were able to learn about the human parts and their functions.

Thanks to the careful descriptions of Fray Bernardino de Sahagun, it is known the aztec names of the different parts of the body and specific pathological entities related to them. For example: The eye was called:
Ixtelolotli; The pupil: *toteuh*; *The conjunctiva: Totztacauh*; *The eyelids: ixquatolli*; *The nasolagrimal ducts: Tixcuilchil*

According to the same source there is a large list of well identified clinical pictures, described by their name, and in many cases, with their proper herbal treatment. In the case of ophthalmology, we know of some the most common ones: *Conjunctivitis: Ixcocolixtli*; *Blefaritis: Ixtempipiquiliztli*; *Chalazio: Ixtomoniztli*; *Strabismus ixneuciltic*; *Leucomas: ixayapachiuhqui*; *Cataract: ixtotoliculiztli*; *Blind people: Ixpopoyoti*; *Blindnees due to cataract: Ixtepeta*

In a society of warriors, wounds and fractures were common. Therefore, medicine and surgery were practice together.

By different historical sources we know that some of these *titcies* were very skilled: When Hernando Cortes, the captain general of the spaniards, was severely injured during one of the battles, instead of calling the spanish doctors, he asked for the *Titcies* to be sutured and healed.
For suturing they used clean and delicate human or animal hairs, and as needle, the spines of the cactus

**Some ocular Prehispanic treatments**

The *Codex De la Cruz- Badiano* is composed by illustration of the plants and herbs used to heal certain problems, following each drawing the specific prescription in aztec is described and followed by the latin translation.

In the case of eye treatments some of the prescriptions are:

For the treatment of painful eyes: it was recommended:

The potion of

*Ashes from dead people,* just as the Egyptians did,* and then mixed with blood of snake or iguana and an egg.*

For inflamed eyes:

![Image of plants from Codex De la Cruz-Badiano]
The potion of: The juice of a root of the plant showed in the drawing and mixed with womans milk to used for topical application.

Or if, for any reason the root could not be found, the alternative was a mixture of:

Macerated fox eyes,
Blood of goose,
and human milk

Since diseases were associated with missbehaviours of religious rituals and habits, the codex imposes certain preventive and sanitary precautions as: To avoid sunshine and not have sexual intercourses during the disease.

For corneal ulcers and opacities the prescription indicated was:

Dust of human excrement
mixed with the pulverized shell of a fresh egg and
mixed with water to be used for topical application
The term *Glaucoma* was probably used by the Latin translation of the Codex for a variety of diseases and not for the pathological condition that we know as *glaucoma*.

Most probably, it refers to all opacities, perhaps cataract, perigion, and leucomas. For all those pathological entities described as *Glaucoma*, the prescription was:

To use a spine as a needle, and draw them out;
Add pulverized human excrement, salt, and sundried grounded roots of the native plant illustrated in the codex.

**Conclusion.**

500 hundred years had passed since all these remedies and rituals were used, and obviously, they sound to us as something completely out of place, however, they were considered effective for that time, valid for the prehispanic people and somehow useful for the Aztec doctors.
It is also important to compare all these treatments of Prehispanic times with those of the roman and medieval medical text books, and is interesting to observe that both have something in common: the use of plants, minerals and animals to solve health problems. Of course, herbal treatments are different, but the patients, in separate continents, were treated on the same line of terapeutic tools.

What is important to identify, is that the indian doctors were trained to for recognize entities and prescribe the already known remedies. Just as, in many instances, is the actual practice of medicine—

we do nowadays.