Consideration of severe epidemics and other disease processes in the XVI C
The unique case of the left eye of Viceroy Luis de Velasco (son) based on the study of four existing portraits and one copy of a portrait*

M.L. Calvo¹, J.M. Enoch², S.S. Choi³

¹. Departamento de Óptica, Facultad de Ciencias Físicas, Universidad Complutense de Madrid, 28040 Madrid, Phone: 91 3944684
². School of Optometry, University of California, Berkeley, USA
³. Department of Ophthalmology and Visual Sciences, University of California, Davis, USA.

Based upon earlier work done by authors on the early use of spectacles in the 16th Century, and in particular in the New Spain, the later Mexico, it is discussed the possible ocular disease who was suffering the Vice Roy Luis de Velasco (the son). The approach is done throughout the analysis of details of the painting now located at the Chapultepec Gallery in the city of Mexico. The authors introduce as well some comments on the current diseases that occurred during that historical period in New Spain.

Correspondencia
María L. Calvo
Departamento de Óptica
Facultad de Ciencias Físicas
Universidad Complutense de Madrid
28040 Madrid
Phone: 913 944 684
mlcalvo@fis.ucm.es

Este trabajo se fundamenta en otros trabajos anteriores de los autores sobre la introducción del uso de las lentes correctoras en el s. XVI. En particular, sobre su uso temprano en las colonias del Nuevo Mundo (Nueva España) más tarde México. Se estudia el posible problema ocular o enfermedad en el ojo izquierdo del Virrey Luis de Velasco (hijo), comienzando en el periodo en el que dicha enfermedad pudo afectarle. Se han analizado detalles del retrato pictórico localizado en la Galería del Castillo de Chapultepec, México, DF y otro en España. Los autores hacen una aproximación para entender las condiciones sanitarias de la época, y las importantes epidemias que ocurrieron durante el periodo en el que Luis de Velasco residió en México.

1. Introduction
In previous publications¹-³ the authors performed studies designed to elucidate the early use of spectacles in the Spanish colonies of the New World (particularly in that area which included modern Mexico (New Spain in the XVI C.) and in some of the later Southwestern United States Territories and States. These studies were principally based upon a discovery of a copy of an early painting of Viceroy Luis de Velasco (the son) at the Pecos Museum, near Santa Fe, New Mexico (USA) (fig. 1). In subsequent investigations, other related paintings of this gentleman were found in the Collegiate (Colegiata) of Saint Louis, at Villagarcía de Campos (Valladolid, Northern Castile, Spain) and at the Chapultepec Castle in Mexico D.F. (Federal District)¹.

This may have been the first pair of spectacles brought into the territories which later constituted the United States of America. They were also an early pair of spectacles used in New Spain; they were apparently originally purchased in Europe.

*Para solicitar traducción al castellano pueden contactar con el autor
most probably from Spain. Relative to early use of spectacles in the future United States, one of us (JME) found a citation referring to another pair of spectacles (dated a bit later). “In 1620 a pair of European spectacles was brought to America by Peter Brown, a Pilgrim (on the Mayflower). His was presumably the first pair in America”. Note that the date cited for the pair of spectacles worn by Luis de Velasco (son) was observed wearing glasses. Later, we learned that portraits of all Viceroyos were commissioned in Mexico, and that these several paintings were on display in modern Mexico City. De Velasco (son) was the first Viceroy portrayed wearing spectacles.

The development and establishment of artisans working glass in New Spain was initiated in the XVI C. From the studies of J.R. Peralta one can assume that at least one Spanish artisan was working in the city of Mexico as an optician dispensing spectacles in the year 1652 and was designated as “master to make spectacles and other glass things and carey”. We note that this was at least 60 years after execution of the painting of the Viceroy wearing a pair of spectacles upon the American continent (in 1589). This portrait (seen below) was painted in the future Mexico City. Broader commercial distribution of spectacles occurred in New Spain at a later time (in 1689, one full century after the execution of the painting described) and this was set in a rather public market of the city. It was only in 1786 when a graduate of a formal training program opened his place of business for the dispensing of glasses and spectacles. Certainly, before these commercial activities occurred, New Spain must have imported the necessary components for those who needed them from Europe. Since this was relatively expensive merchandise, one can argue that their use was (early on) probably restricted to a great degree to wealthy individuals such as aristocrats, clerical persons, intellectuals, and those who wanted to be recognized as having high status. That is, wearing spectacles served as a status symbol for quite some period of time. There are many examples of such status-seeking uses of spectacles at this time by individuals in Europe. Clearly, de Velasco (son) had a very real set of ocular problems affecting, in particular, his left eye.

In figure 1 we display a reproduction of a portrait of the Viceroy of New Spain, Luis de Velasco y Castilla, also named “The Younger” or “The Son”, in order to prevent confusion with his father, who served as an early (Second) Viceroy of New Spain. They both had the same first and family names. This painting was created during the Son’s first term as the Eighth Viceroy of New Spain (1590-1595). He also served a second time as the Eleventh Viceroy in 1607-1611.

We call the attention of the reader to some available data contained on this painting:

1. As noted, a photographic copy (B&W) was found by one of the authors (JME) at the Museum of the Pecos National Historical Monument, in Pecos, New Mexico, United States of America [1].

2. The original version of the painting seen in Figure 1 (in color) was previously located at the Viceroy Gallery, Chapultepec Castle, Mexico City, Mexico. One of the authors (MLC) visited this gallery in January 2007. There has been an important program of rehabilitation of all of these paintings. They formed an impressive historical legacy of the early history of the Spanish colonies in the New World and, of course, later Mexican history. Figure 2 reproduces in color the original painting.

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Fig. 1. This is a reproduction of a black and white portrait of Vice-Roy Luis de Velasco (the son), circa 1589, located by one of the authors (JME) at the Pecos Museum, near Santa Fe, New Mexico, United States of America (it is located in the town of Pecos, which is at the end of the “Pecos Trail”. From our studies, this was chronologically the first document encountered where Luis de Velasco (son) was observed wearing glasses. Later, we learned that portraits of all Viceroyos were commissioned in Mexico, and that these several paintings were on display in modern Mexico City. De Velasco (son) was the first Viceroy portrayed wearing spectacles.

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* Text reproduction: “Maestro de hacer antoxos y otras cosas de vidrio y carey”. The “carey” is a product from the turtle shell used in jewelry and for spectacle frames (to this day in Japan, Caribbean region, etc.).
painting of Viceroy Luis de Velasco. One is able to read the legend (in old Castellan): “D. Luis de Velasco hijo de el primer Birrey y Capitan General, año de 1589” [Luis de Velasco (as it is written today), son of the first Viceroy and Captain General, year 1589]. The painting, from an anonymous artist, was then probably painted one year before he became the Eighth Viceroy of New Spain (1590). The man is wearing glasses, with a rigid frame and supported by a soft fabric passing over and around his ears.

In order to help the reader understand the historical context of our studies, we provide in table I a list, in chronological order, of some of the most important facts/dates, from a scientific point of view, that occurred in the New Spain during the period 1550 to 1611.

We consider three separate time-periods:

Between 1558-1585 A.D., Luis de Velasco lived continuously in Mexico as a young adult, during which time he accompanied his father Luis de Velasco (the father) who was Second Viceroy of New Spain. The period between 1585-1589 corresponds to the period during which “the Son” traveled to Spain and Europe, and therefore, outside of Mexican and other “New World” territories. The second time period considered relates to his term as the Eighth Viceroy of New Spain (1590-1595), after which he traveled to Peru; during some part of that time period, he also served as Viceroy of Peru. He later returned to Mexico to serve his second term as the Eleventh Vice-Roy (1607-1611). In 1611 he traveled back to Spain where he served of President of the Council of the Indias. He died in Seville in 1617. For other relevant data one can find information on developments regarding medical treatments, intellectual activities, universities, foundations, and the introduction of the first printing atelier in the American Continent (1534-1538)

In table II we complete the information with data having a scientific interest for our study.

Table I. Chronology based on documentation from the Archivo General de Indias, Sevilla (Spain)

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1534</td>
<td>Luis de Velasco y Castilla (Son). He was born in Carrión de los Condes (Palencia, Castile, Spain).</td>
</tr>
<tr>
<td>1558</td>
<td>(He was 24 years old) Leaves Spain for Mexico accompanying his father the Second Viceroy. Note: 1545 was the date of one mega-epidemic of cocoliztli in Mexico.</td>
</tr>
<tr>
<td>1558 - 1585</td>
<td>He resided continuously in Mexico for a total of 30 years. Some travels to Spain might have take place between 1572 and 1574.</td>
</tr>
<tr>
<td>1585 - 1589</td>
<td>Traveled to Spain and Italy (largely serving as Ambassador to Florence, a major site for the manufacture of spectacles).</td>
</tr>
<tr>
<td>1589 - 1595</td>
<td>Returns to Mexico. His first period as Viceroy of New Spain.</td>
</tr>
<tr>
<td>1596 - 1604</td>
<td>Peru (Lima), where he served as Viceroy of Peru.</td>
</tr>
<tr>
<td>1604 - 1607</td>
<td>Peru? Mexico? Based upon historical Vice-regal data of Peru, he returned to Mexico.</td>
</tr>
<tr>
<td>1607 - 1611</td>
<td>Mexico, Second Period as Viceroy of New Spain.</td>
</tr>
<tr>
<td>1611</td>
<td>Leaves Mexico for Spain.</td>
</tr>
<tr>
<td>1611 - 1617</td>
<td>Served in Spain as President of the Council of the Indias.</td>
</tr>
<tr>
<td>1617</td>
<td>Died in Seville, Spain (age ca 83).</td>
</tr>
</tbody>
</table>

Note: Notice that even if his father was the Second Viceroy, he was the first one who lived in the Viceroy’s Palace, earlier a property of the family of Hernán Cortés. It is currently the National Palace of the Mexican nation.
2. Historical data on major epidemics which occurred during the periods 1550-1585 and 1590-1595 in the territories of then New Spain

It is important to highlight a number of important facts relative to sanitary and living conditions which existed during critical time periods in New Spain/Mexico from 1558 (or earlier) to 1589 and from 1590 to 1595.

There was an interesting study conducted by Acuña-Soto and his co-workers who sought to analyze data on the "so-called" mega-epidemics faced by the inhabitants of the early territories of New Spain in the 16th century. From existing historical archives, there is evidence that hygienic conditions were very poor in the territories of New Spain, and in particular, within the area then comprising Mexico City. In addition to natural disasters such as earthquakes, severe periods of drought (which were often followed by major floods, such as occurred in 1553), it is clear that the existing situation was not at all favorable. In addition, by 1550 the City of Mexico was very much overpopulated. There were approximately 200,000 inhabitants at that time in this city. No doubt, in the 16th century, Mexico City was the largest city of the World. The inhabitants included a great mix of peoples. That group was largely comprised of the indigenous population, the Spaniards, the slaves who recently had arrived from the African Continent and by all manner of foreigners mainly from various nations in Europe. The water supply for the population was "delicate" at best, and not very satisfactory. Politics further confounded this problem. We remind the reader, Mexico City was founded within an artificially dried-lake-area. There is no doubt that polluted water probably transmitted all manner of diseases.

In the study by Acuña et al. he calls attention to at least three "mega-death" epidemics during the 16th century! One occurred in 1520 due to smallpox. It caused an estimated 8 million deaths. A second one occurred in 1545; it resulted in 12 million deaths. A third one in 1576 caused 2 million deaths. The causes of the latter two mega-epidemics are not yet well identified from a medical point of view. We note that the later date corresponds to the period of time during which Luis de Velasco (son) was living in Mexico (see table I). These epidemics were believed to be caused by a condition called cocoliztli (this term is derived from the native-language náhuatl, meaning “sadness”, it is still used among the native Mexican population as a name for a deadly disease). The pathogenic agent causing these epidemics has not yet been identified, but it is believed that it belonged to the group of hantaviruses. It resulted in a set of very severe symptoms, as well as hemorrhagic fever!

The details of the disease cocoliztli were well recorded by Francisco Hernández, who was a medical doctor. He was the personal physician of King Phillip II, and he traveled to/in Mexico on a scientific expedition from 1570 to 1577. He also acted as the personal medical adviser of Viceroy Luis de Velasco (the father) and most certainly to his family as well. In addition, he served as the "Chief Medical Doctor" assuring correct/ethical behavior in medical activities of the time in Mexico.

It is speculative to try to link these severe epidemic periods to known ocular disorders and diseases. One serious symptom of cocoliztli...
ascribable to the eye(s) was “bleeding from the eyes.” We have no record of this symptom affecting de Velasco (the son).

In 1552, the native Mexican doctor Martin de la Cruz wrote a textbook on herbal medical remedies in the náhuatl language. It was later translated into Latin as Libellus de Medicinalibus Indorum Herbis by another native medical doctor, Juan Badiano, who studied ophthalmology at the Colegio de Santa Cruz de Tlatelolco and the University of Mexico (founded by Viceroy Luis de Velasco (the father)). In the book, more than two hundred therapeutic substances were reported (some of mineral origin). Martin de la Cruz mentioned a treatment for so called “burning eyes”, achieved by using glass of volcanic origin (i.e. obsidian) (- but for what purpose?). The use of herbal medicines by native doctors was also linked to the “disease of the spirit” causing the illness. Many ocular diseases suffered by both the native and Spanish population certainly were of infectious origin, caused by the presence of bacteria or parasites. For example, the so called “Chagas” disease caused by the Trypanosoma cruzi (a Trypanosoma is a sporozoan parasite which is found in the blood), was reported as an epidemic disease in Central and South American regions and it is still under treatment and survey. The symptoms are accompanied by conjunctivitis.

The Europeans, who arrived in the Territory of Mexico, also brought other health problems with them. For example, it is well known from recent studies that Christopher Columbus was suffering from a particular type of arthritis (this is dated from 1476 when he was 25 years old). This form of arthritis (the so-called Reiter syndrome) caused muscular pain and ocular hemorrhages. At that time, this condition was wrongly attributed to uric acid deposited in the articulations.

We have been searching for possible plausible/appropriate scenarios in order to help deduce/understand certain aspects of the ocular disorder(s) observed in the left eye of the Viceroy Luis de Velasco (son). He seemed to have a chronic condition that lasted throughout much/most of his life. Clearly, in his left eye, he suffered from chronic irritation of the conjunctiva, an exotropia (and possibly?) there was also from some downward displacement of the left eye), as well as drooping of his left lid (figs 1-2, 4-5). While difficult to judge(), there is some evidence for changes which might have already occurred in his teens (fig. 3). The painting in Figure 3 was hung high up upon the church walls in the Collegiata.

3. The eye disorder of Vice-Roy Luis de Velasco (the son)

We deal with limited information here! We have no alternative but to assume the artists provided a true view of the left eye of de Velasco (son). So saying, artists often seek to favor the person who is being painted. Thus, it is possible that the situation in his left eye was understated to some degree. The second portrait of de Velasco obtained during his second term as Viceroy looks remarkably like the first one with very modest differences noted, mainly the white hair (fig. 4). Was the latter painting simply a modified copy of the first one? We have no simple way of knowing how to judge the accuracy of these records. So saying, it is clear that he had visual problems, and required spectacles to optimize his vision, particularly in his right eye. He also may have had to do a great deal of reading and writing in his roles as Viceroy, etc. Otherwise he might have simply patched his left eye. Of course, presbyopia (changes in vision associated with aging) must have complicated vision in his right eye in his later adult life. We assume his vision was much

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*Chagas disease is taken from the name of the Brazilian doctor Carlos Justiniano Riveiro Chagas (1879-1934) who discovered this ocular infectious disease*. 

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Fig. 3. The painting, by the artist Juan Dualde (date unknown), is located at the Collegiata de San Luis, Villagarcía de Campos (Valladolid). The Second Viceroy, Luis de Velasco (the father), is the gentleman to the upper left of the picture with the dark beard. The young man leaning over next to him is Luis de Velasco (the son). Here the son is much younger than seen in figs. 1, 2, 4, 5 and he is not wearing a visual correction, but the left eye seems a bit puffy. Is there tropia (eye turn)? Is the left lid drooping a bit? The image portrayed is Our Lady of Guadalupe.
Is the left lid drooping a bit? The image portrayed is Our Lady of Guadeloupe. He is not wearing a visual correction, but the left eye seems a bit puffy. Is there tropia (eye turn) to him is Luis de Velasco (the son). Here the son is much younger than seen in figs. 1, 2, 4, 5 and Fig. 3. The painting, by the artist Juan Dualde (date unknown), is located at the Collegiata de San Campos (Valladolid). The Collegiata, a small cathedral, is a renaissance monument built by the Jesuits in the XVI C. After viewing this painting (this site was visited by two of the authors: JME and MLC), we agreed, the left eye had a chronic conjunctival flush. In most all versions shown there was a darkened nasal conjunctiva. We cannot state if this existed immediately circum-corneally (this is useful in diagnostic localization of the source of irritation of the conjunctiva). We don’t know if the palpebral (lid) muscle was paralyzed or simply exhibited a chronic droop.

This comment becomes important owing to the fact that the only other painting of the Son was made when he was an adolescent. His father has the beard in figure 3, and Luis is the lad leaning over the cloth painted with an image of the Saint. The painting is located at the Collegiata de San Luis, in Villagarcia de Campos (Valladolid). The Collegiata, a small cathedral, is a renaissance monument built by the Jesuits in the XVI C. After viewing this painting (this site was visited by two of the authors: JME and MLC), we agreed, the left eye of the young Luis de Velasco was not quite normal; the left lid looks somewhat “puffy”, and there might some left lid droop. It is really hard to make an unambiguous statement! The real question we sought to answer is whether this was a congenital disorder, that is, an early acquired disorder of ocular and lid motility, or a disorder acquired in later life? In this painting, the eye does not look quite right, but assuming an anomaly is present, it is less noticeable than that which we observed in portraits made of this gentleman at a later age. Is there a slight left exotropia (and a bit downward displacement of the strabismic eye), it is hard to say? As noted, this painting is located (?) twenty feet or more above the ground, and we had to view it in none too bright light from a distance. The kind Jesuit Fathers loaned us their quite ancient binoculars. Unfortunately, the optics of this set of binoculars did not add much here.

On the basis of this painting, the decision as to whether this was a congenital disorder or disease, cannot be resolved at this time. We prefer to leave that possibility open at this time. Also, the modest redness of the conjunctiva observed in the painting dated 1589 might also be the result of his rubbing his eye and irritating it over the course of a day. The enlarged image of the head in figure 2, seen in figure 5, has been modestly digitally enhanced in the red by manipulating the tone curve of the picture (green and blue channels).

While inspecting in detail the face on the painting (fig. 5) one may argue that it is possible that more than one process may be at work. If the blink reflex was abnormal (palpebral muscle [3rd cortical nerve affected?]), or the tear formation apparatus was not normal [multiple possibilities, the eye would become “red” (referred to as hyperemic”) as well, etc. Exotropia can be the result of overactive sixth cortical nerve acting on the lateral rectus muscle, and or an underactive medial rectus muscle (3rd cortical nerve) or other combination of abnormal extraocular nerve responses [there are some more complex versions of this argument.]

Usually, red eye refers to conjunctival inflammation. The location of the red appearing vascular distribution allows one to determine if it was intraocular or extraocular inflammation. Redness of the conjunctiva just about the rim of the cornea (perhaps 1.0-1.5 mm wide) speaks to intraocular inflammation (generally a more serious case). Inflammation further removed from the cornea suggests extraocular irritation. There is also deeper episcleral injection, and one can often differentiate this form of inflammatory process from superficial inflammation. Both also can occur simultaneously.

The only ocular complication reported as being associated with the eye(s) in cocolitzli was bleeding from the eye itself (from where?)....from the cited discussion, one assumes this was an acute symptom, although it is possible that it could be or become chronic(?), but would this be the only obvious residual effect of such an violent and complex hemorrhagic-disease-process? The eye presented does not quite fit the picture of this complex and devastating disease. The authors have never seen such an eye except in trauma. Once again, it is not totally possible to rule out such a possibility, but the likelihood...
Conclusions

Based upon our previous studies of the two unique paintings representing Viceroy Luis de Velasco, wearing spectacles, the authors have taken a dual historical and clinical approach to develop initial insights as to the type of ocular disease(s)/disorders this gentleman might have developed or encountered. The lack of additional pictorial documents prevents more complete or conclusive resolution of the problem. We cannot rule out many possibilities. This is clearly a chronic disorder, and it troubled him for some considerable number of years. We sense it was already present to a lesser degree during his adolescent years. And we sense the epidemics occurring in Mexico during his life did not affect him. The smallpox would have left him with local scarring; and cocoliztli was apparently a very violent disease. Wouldn’t one expect there to have been some other signs as well?

The initial insult or disorder could have had many causes. It is possible the irritability of the eye varied throughout the day. Photophobia from that eye (assuming he had some residual vision in the eye) may also have contributed to his visual discomforts. There is evidence of strabismic exotropic eye-turn and lid/palpebral droop which cannot be overlooked. Use of spectacles may well have been required in order to optimize vision in the right eye, or might have also served to shield/or protect, in part, the left eye.

Clearly, the left eye was not a normal, there was apparent chronic irritation (conjunctival redness) associated with the condition, and there is rather obvious evidence of strabismus. Binocularity was no-doubt compromised, and it is possible/probable he needed visual correction for a refractive error present in the right eye, and this problem would have become exacerbated as he aged. He probably purchased multiple pairs of spectacles for distance and reading purposes in Europe, as there was no known service for that purpose at the time he lived in Mexico. Saying, there might have been someone who was able to adjust/maintain his spectacles over years of use. We can only assume that his position as Viceroy allowed him the use of spectacles to diminish or relieve his visual problems, but...
other serious ocular clinical problems clearly were not resolved. Until an earlier pair of spectacles is located, this may well be the first pair of spectacles recorded in New Spain, and/or used in the territories of the future United States of America. De Velasco is known to have traveled in the future Southwestern States of the United States, and also in Florida2.

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