

## THE INCIDENCE AND SIGNIFICANCE OF DISEASE AMONG THE AZTECS AND RELATED TRIBES

For many years students of epidemiology and sociology have recognized the importance of diseases introduced from Europe into the New World, for the profound dislocations in population and in economic life caused by smallpox, measles, and similar maladies can scarcely be overestimated. On the other hand little attempt has been made, save in a casual way by some anthropologists, to assess the importance of endemic disease to the native population prior to the advent of the white man. Yet a study of this factor should logically precede consideration of introduced pathology if the entire course of the health-disease relationship in any region is to be fully understood.

A great deal of attention has been devoted to the decline of population in Mexico subsequent to the conquest by Cortés, a decline which was caused primarily by malnutrition and violent epidemics, and which has left its mark on the country to this day. Nevertheless, very little consideration has been given to the status of public health among the Aztec and related tribes which had held the territory for centuries prior to 1520. It is true that even from the sixteenth century down to modern times several comprehensive discussions have appeared dealing with medicine and therapeutics in the pre-colonial era. Nevertheless, these works have treated in only a secondary fashion the significance of the various diseases in their relation to the welfare of the civilization at large.

The question requiring a definitive answer is specifically this: What was the intensity of incidence of the various diseases known to be present in the late pre-conquest era? There are five possible lines of approach to the solution of this problem.

1. Consideration of the prevalence of certain infections among both Spanish and Indians after the conquest.
2. Indirect evidence from the *materia medica* of the natives.
3. Direct statements by observers in the sixteenth century.
4. Archaeological evidence developed by physical anthropologists.
5. Statements and accounts of epidemics by historians and chroniclers.

1. In the sixteenth century several very severe scourges afflicted the natives of central Mexico. Of these the most notable were smallpox, measles, and *matlazahuatl*. The first two were unquestionably introduced and were unknown in the land prior to 1519. Concerning the third there is considerable controversy, particularly with respect to its identification. Many authorities have stated it to be *typhus exanthematicus*. It first appeared in virulent form in 1576 and attacked the native population with terrific force. On the contrary, no white man was ever known to suffer from it, despite extreme exposure in many cases. From this circumstance it has been argued that the disease was introduced from Europe. But *typhus exanthematicus* certainly attacks Europeans; and hence the opposite view has been advanced that it was an endemic disease that for some obscure reason suddenly acquired virulence insofar as the natives were concerned. Regardless of the merits of this controversy, it is clear that between 1519, when the Spanish first landed, and 1576, the disease was unknown. The remaining point is whether it had likewise been unknown prior to 1519.

The two principal modern writers on Aztec medicine are of the opinion that *matlazahuatl* was known before the conquest. Flores says that it was typhus and that it was represented pictographically in the codices.<sup>1</sup> Ocaranza is, however, more skeptical, saying "its existence before the conquest is founded on one codex where an Indian appears who is suffering from epistaxis, and in a passage of Hernández where . . . he mentions some fever which might be typhus exanthematicus: . . . *exantematis, et punctis quae ex sanguine sicitatas febres comitare solent.*"<sup>2</sup> With regard to the statement of Hernández it must be remembered that this author wrote at the end of the sixteenth century. He was familiar with the diseases of his time in Mexico, but he nowhere makes reference to or displays any interest in those of the natives prior to the Spanish occupancy. There is no reason, therefore, to assume that the sentence quoted by Ocaranza referred to any but Hernández'

<sup>1</sup> Francisco A. Flores, *Historia de la medicina en México desde la época de los indios hasta el presente* (3 vols., Mexico, 1886-1888), I, 150.

<sup>2</sup> Fernando Ocaranza, *Historia de la medicina en México* (Mexico, 1934). The work by Flores is less modern than that of Ocaranza, particularly with reference to those aspects of medicine which have developed during the past fifty years. However, Flores was far more profound and thorough in his scholarship, more comprehensive in his treatment, and more exhaustive in his detail. His work still remains the standard treatise in the field.

The translations from Spanish and Mexican authors are my own. The original is quoted only where it is necessary to preserve the exact meaning of the phraseology.

own time. The pictograph cited by both Flores and Ocaranza is allocated by neither to its documentary source. It may well exist, but I have been unable to find any other reference to it. One other modern opinion may be mentioned. In the *Anales de Quauhtitlán* as translated by Lehmann<sup>3</sup> the statement appears with reference to the Valley of Mexico at approximately 1320: ". . . Denn hier gedeiht 'die Krankheit' Blutdurchfall, Bluthusten, Schüttelfrost, Auszehrung."<sup>4</sup> In a parenthesis, Lehmann gives as equivalent for "die Krankheit" *Flecktyphus*, or *typhus exanthematicus*. The Nahuatl in the original text uses *yn cocolliztli*, which Lehmann properly renders into German as "die Krankheit." The difficulty lies in the meaning of the word *cocolliztli*, which can clearly be shown to imply illness, sickness, or epidemic.<sup>5</sup> Consequently Lehmann has proceeded only upon assumption in stating that the disease was typhus, and hence *matlazahuatl*. There is no internal proof whatsoever that such was the case. The evidence is consequently exceedingly tenuous that the disease which caused the great epidemic of 1576 had been recognized at all prior to that date. Even if known there is no record whatever that the *matlazahuatl* had constituted a serious menace to the health of the inhabitants.

Two other diseases of colonial importance deserve mention in the present category: malaria and syphilis. With respect to the

<sup>3</sup> The *Anales de Quauhtitlán* is an important native chronicle of pre-conquest history written in Nahuatl. It exists under the title *Codex Chimalpopocatl* or *Anales de Quauhtitlán*, compiled by José F. Ramírez with two translations into Spanish, published in 1885. More recently the original Nahuatl has been done into German by the noted scholar Walther Lehmann under the title: *Die Geschichte der Königreiche von Colhuacan und Mexiko* (Stuttgart, 1938). Very lately a third edition of the work has appeared. This is the *Códice Chimalpopoca*, including the *Anales de Cuauhtitlán* and the *Leyenda de los soles*, translated into Spanish by Primo Feliciano Velásquez (Mexico, 1945).

<sup>4</sup> *Ibid.*, p. 158.

<sup>5</sup> We are confronted here with an etymological confusion which has given rise to repeated error in discussions of early Mexican medicine. (The subject is well treated by Flores, *op. cit.*, I, 113.) The word *cocolliztli*, or *cocolitzli*, originally connoted any severe or widespread illness (see Raoul de la Grasserie, *Le nahuatl, langue des azteques* [Paris, 1913], p. 127). Similarly the corresponding verb *cocoya*, meant simply to be sick. In the sixteenth century the term was transferred to the great introduced epidemics in a generic sense and perhaps to smallpox in particular. Antonio de Herrera y Tordesillas, writing at or near 1600 A.D., was perfectly explicit on the point: ". . . they gave the name *cocoliztle* to the general epidemics of smallpox and other universal fatal diseases" (*Historia general de los hechos de los castellanos* . . . [5 vols., Madrid, 1601-1615], I, 236). It was never at the time applied to *matlazahuatl*, a malady always clearly distinguished and designated as such. Worthy of note also is the fact that Velásquez renders *yn cocolliztli* as "las enfermedades" (*Códice Chimalpopoca*, p. 28, paragraph 121 and note 3).

latter, wholly apart from the perennial argument concerning origin, there is general agreement that whether or not it was present it caused no great damage. The occasional reference by native writers to "buboes" implies merely that lesions of this character were recognized, but proves nothing as to their pathogenicity. Malaria proved quite destructive to the coastal Indians in the early colonial period, and still constitutes a serious problem in public health, but how severe were its effects prior to 1520 is unknown. That the mosquito has always been present is highly probable, but the opinion is widely held that the organism—or at least *an* organism—was brought by the Spanish from the Mediterranean basin. It is extremely difficult to reconcile two facts with the pre-existence of a virulent form of malaria along the coast: (1) there was a very high native population density in these regions, and (2) of the original 1,300-odd conquistadores not a single one contracted the disease. On the other hand, this type of fever was known in general to the Nahuatl peoples. Thus Flores says: "The Mexicans were perfectly well acquainted with intermittent fevers and came to distinguish them, according to the type of onset, as quotidian, tertian, quartan, etc."<sup>6</sup> Ocaranza agrees in effect: "It is very probable that they understood malaria as a transmissible disease, distinct from the rest; but nevertheless we know the name of only the tertian fever, *vipiltatica*."<sup>7</sup>

If the natives derived their worst plagues from the white man it would be reasonable to suppose that the latter would suffer most severely from diseases to which the Indians had long been accustomed and to which during the course of many centuries they had become relatively immune. Apart from the presumptive evidence contained in the herbals of Hernández and others, we possess two very clear expositions of the pathology of the white settlers. One of these is by Agustín Farfán, written in 1579.<sup>8</sup> He lists the principal afflictions of the Spanish residents as follows:

1. *Weakness and indigestion of the stomach.* "It is very sad to see in this land the weakness and indigestion of the stomach of almost everyone. . . ."
2. Typhoid.

<sup>6</sup> *Op. cit.*, I, 152.

<sup>7</sup> *Op. cit.*, p. 43.

<sup>8</sup> *Tratado breve de medicina y de todas las enfermedades* (1st ed., Mexico, 1579). This author is of interest as the first native white man in North America to publish a work on medicine. According to Joaquín García Icazbalceta (*Bibliografía mexicana del siglo XVI* [Mexico, 1886], p. 173), he was born in Mexico and was a doctor and teacher of medicine at the University of Mexico, "which faculty he exercised with much credit." In his later years he entered the Order of St. Augustine.

3. Tuberculosis (extreme pain in chest, fever, bloody sputum).
4. Dysentery.
5. Diphtheria.
6. Appendicitis—or enteritis.

The other source of data is Juan de Cárdenas, who devotes a chapter to the subject. He says regarding gastric ills: "But certainly . . . in the Indies . . . there is scarcely a man who does not go around complaining of his stomach, no matter whether he be old or young, man or woman, born in the Indies or come from Spain. . . ." <sup>9</sup> He remarks that nearly every woman of Spanish descent is afflicted with menstrual difficulties whereas the Indians escape these entirely. <sup>10</sup> In another place he states: ". . . the Spanish scarcely arrive, in their twenties, when they begin to complain of rheumatism, headache and stomachache . . . and rarely has an Indian been seen to complain of rheumatism, liver trouble, urinary difficulty, or other ills which are so ordinary and continuous among the Spanish. . . ." <sup>11</sup>

From the evidence presented up to the present point the deduction is possible that smallpox, measles, *matlazahuatl*, malaria, and syphilis were either absent completely or present in very mild form among the aboriginal tribes. Various gastro-intestinal disturbances and respiratory infections had been endemic but over a period of hundreds of years the natives had built up a high resistance to them.

2. A great many specific maladies and ailments were known to the central Mexican tribes, some possibly important, others presumably insignificant. The most complete compilation of these is that given by Flores, who apparently exhausted the original sources. His list contains well over one hundred items, all of which are recognized pathological states. <sup>12</sup> Many of them pertain to organic and nervous ailments, menstruation and parturition, wounds, and skin lesions of various sorts. Those infectious and possibly fatal diseases which could react seriously upon public health and population are fewer in number and are as follows:

pneumonia	gastro-enteritis	yellow fever <sup>13</sup>
tuberculosis	dysentery	intermittent fever
pleurisy		

<sup>9</sup> *Primera parte de los problemas y secretos maravillosos de las Indias . . .* (2nd ed., Mexico, 1913), pp. 185-186.

<sup>10</sup> *Ibid.*, p. 191.

<sup>11</sup> *Ibid.*, p. 193.

<sup>12</sup> *Op. cit.*, *passim*.

<sup>13</sup> *Vómito prieto*. Flores elsewhere (*op. cit.*, p. 151) qualifies its inclusion by the statement

A mere list, however, although it be very extensive, gives no indication of the severity of any malady beyond the mere fact of its existence. A somewhat more quantitative insight may be obtained from an examination of the therapeutics of the time. The materia medica of Europe, and hence of the Spanish, throughout the Middle Ages had been largely herbalistic, a state of affairs which persisted throughout the sixteenth century. Similarly, the treatment of diseases in aboriginal Mexico depended almost exclusively upon the use of plant preparations. On both continents over a series of generations a large number of plants had been found to possess medicinal value. Now in a general way and in spite of various disturbing factors any civilization relying upon an herbalistic rationale of medicine inevitably tends to find a preponderance of medicines for those ailments which are both most common and most lethal. If, therefore, the Mexican native materia medica differed from that of contemporary Europe with respect to the number of remedies available for specific types of disease, there would be a probability that the incidence of such types differed in parallel fashion between the two regions. In order to apply this hypothesis, three lists of plants have been compared with respect to the number of plants stated to be of curative value for various classes and for certain specific diseases. The first is that of Parkinson,<sup>14</sup> chosen as an exhaustive and a representative work applying strictly to Europe. The second is that of Hernández<sup>15</sup> who, in the latter half of the sixteenth century compiled information concerning many hundred Mexican plants of medicinal value. Hernández, nevertheless, thought in terms of the current European medical philosophy and was interested in the treatment of Europeans and their descendants. His work hence reflects the condition of the white men exposed to the New World environment. Thirdly we have the discussion and list of Sahagún<sup>16</sup> who, although European himself, wrote with reference to the aboriginal Mexican scene. His informants, whom he lists by

that "It is most probable that they did not know this disease. . . ." On the other hand fevers of various sorts were widespread and the febrile condition was well recognized.

<sup>14</sup> John Parkinson, *Theatrum Botanicum: The Theater of Plantes, or an Universall and Compleate Herball* (London, 1640).

<sup>15</sup> The work of Francisco Hernández has a long and bibliographically complex history, too involved for the present discussion. It, or rather parts of it, has appeared at various times under different titles. The edition consulted here is entitled *Nova plantarum, animalium et mineralium Mexicanorum historia, a Nardo Antonio Reccho in volumen digesta*, published in Rome in 1651.

<sup>16</sup> Bernardino de Sahagún, *Historia general de las cosas de Nueva España* (edition of Pedro Robredo, Mexico, 1938).

name and describes as "*médicos*," were all Indians who spoke from the purely native point of view.

In both Parkinson and Hernández there is an index or table of "virtues" in which all pathological states mentioned are listed alphabetically and under each one the plants noted which are supposed to be efficacious in the particular instance. For Sahagún it was necessary to construct such a table. The Parkinson list is the most extensive, with 8,177 items. Hernández has 2,254 and Sahagún 202. In all cases, moreover, it is necessary to delete one broad category of materials, those which were designed to induce some particular response or excite some specific function. Here would be included drugs designated only as purgatives, astringents, soporifics, diuretics, tonics, etc., without stating explicitly for what diseases they were to be employed. Deducting these there remain for Parkinson 7,373, for Hernández 1,797, and for Sahagún 162. It is impossible to get an exact cross-check on the diseases themselves, owing to language differences (Latin, Spanish, English) and to variations in medical terminology. Certain broad but reasonably distinct categories can be set up, however, which convey all essential information. These are listed in the table below, together with the per cent of the remedies shown in the three herbals as applying to each (after the deduction mentioned above):

Type of Ailment	Parkinson	Hernández	Sahagún
1. Specifics for internal and animal poisons.....	5.8	2.6	0.0
2. Animal parasites, internal and external.....	1.8	1.2	1.2
3. Wounds, burns, fractures, bruises.....	7.6	3.3	5.6
4. Female reproductive system: parturition, menstruation, lactation, uterine.....	9.1	7.1	3.7
5. Organic ailments and symptoms, primarily non-infectious.	38.4	36.9	18.5
6. Minor non-infectious ailments.	3.4	3.4	4.3
7. Tumors and cysts.....	1.7	3.6	0
8. Skin diseases: bacterial, mycotic, zootic.....	13.3	9.5	19.8
9. Infectious diseases: inflammatory, febrile, venereal.....	18.1	32.0	40.2
10. Unidentifiable diseases.....	0.6	0.4	6.8

Neglecting minor categories two important trends are apparent: the reduction in non-infectious organic ailments in Mexico, and the corresponding increase in infectious diseases. Even allowing for perhaps dubious statistical validity, it is evident, as one might expect, that the inflammatory and febrile infections assumed a relatively more important position in semi-tropical Mexico than in temperate Europe. This trend, moreover, is still pronounced when we compare Hernández and Sahagún, indicating that the native population was, or had been, very definitely subject to the effect of such diseases.

The field may be still further narrowed down if certain more specific categories are selected. For three of these in particular the data are quite clear cut:

Type of Ailment	Parkinson	Hernández	Sahagún
Respiratory infections: nose, throat, lungs . . . . .	5.7	8.5	9.3
Diarrhea and dysentery . . . . .	2.6	9.0	13.0
Fevers of all types . . . . .	3.4	7.7	13.0

It is clear that, relative to the entire pathology of the region, Mexico in general and the aboriginal tribes in particular, suffered extensively from infections of the respiratory and gastrointestinal tracts.

3. The evidence hitherto adduced can give us some picture of what diseases were present among the pre-conquest Mexicans as well as an approximate idea of their *relative* incidence. We still have to enquire concerning their *absolute* intensity: conceding their presence, what was their influence upon the condition of the whole population?

Among modern writers the prevailing opinion seems to be that the native tribes were in quite good shape insofar as their physical well-being is concerned. This view is illustrated by Bancroft,<sup>17</sup> who states that "The Nahuas were a healthy race . . .," and by Flores. The latter, referring to tuberculosis, says that ". . . this important pathological state which probably was rare among them . . . was nevertheless perfectly well known to them."<sup>18</sup> And, regarding pneumonia: "It is not possible to affirm in a final manner

<sup>17</sup> Hubert Howe Bancroft, *The Native Races of the Pacific States of North America* (5 vols., New York, 1874-1875), II, 592.

<sup>18</sup> *Op. cit.*, I, 131.



whether the pneumonias were known to them . . . but it is impossible to suppose that such an important pathological state would have passed unnoticed by them."<sup>19</sup> The implication is that neither of these diseases was of any particular consequence.

Very few of the sixteenth-century chroniclers make any positive assertions respecting epidemiology among the Aztecs and their neighbors. There is, however, an interesting passage by Cárdenas in connection with a discussion of the savage northern tribes known collectively as Chichimecas. These people, he says, are very healthy in their natural habitat, but when captured they rapidly sicken and die: ". . . the stronger and fiercer and healthier they are in their own land, the worse food they eat, . . . the fewer clothes they wear, the more miserably wasted and sick they become on falling into our hands . . . and scarcely do they become afflicted with a bit of a pain or a slight dysentery than they immediately die. . . ."<sup>20</sup> More positive are the assertions of Pomar, one of the native Nahua writers: "It is stated . . . that in the time of their heathendom they lived very healthy without ever knowing what a pestilence was . . . and it is not found that their fathers or ancestors left any word of ever having had plagues and mortality, as they have had since their conversion."<sup>21</sup>

Of the opposite opinion was Herrera, writing in approximately 1600 A.D. He says: "No se guardavan de malos contagiosos y enfermedades y bestialmente se dexaban morir."<sup>22</sup> Also, referring to the Popoloca of Tepeaca province, he says: "The principal illnesses which ran through these people were an abundance of *colera*, *flema*, and other *malos humores*, caused by bad food and lack of protection in their clothing."<sup>23</sup> It is probable, on the other hand that Herrera, who never saw Mexico, did not clearly distinguish the pre-conquest natives from their descendants, who certainly were in a miserable condition subsequent to 1520.

Although the weight of published opinion, for what it is worth, holds that the pre-colonial inhabitants were relatively free from severe epidemics we must go to such primary sources as are available for more concrete evidence.

4. One type of data which might prove of value is the findings of the archaeologists and the physical anthropologists who have disinterred hundreds of skeletons. The results to date which

<sup>19</sup> *Ibid.*, p. 130.

<sup>20</sup> *Op. cit.*, p. 180.

<sup>21</sup> Juan Bautista Pomar, "Relación de Tezcoco" (1582), in García Icazbalceta, ed., *Nueva colección de documentos para la historia de México* (5 vols., Mexico, 1886-1892), III, 53.

<sup>22</sup> Herrera, *op. cit.*, Dec. II, Lib. VI, p. 208.

<sup>23</sup> *Ibid.*, Dec. X, Lib. X, p. 366.

have been published are surprisingly meager, although several highly competent persons have pursued this line of investigation. Two specific items have come to my attention. The first is the observation of Rubín de la Borbolla on dental caries in skulls found at Tzintzuntzán in Michoacan. Rubín states: "Las caries dentarias son en exceso abundantes al grado de llamar la atención por el numero en comparación con las piezas completas."<sup>24</sup> He ascribes this condition to faulty diet. The second is an isolated case of "exostasis osea" in one skeleton which "might indicate osseous tuberculosis or syphilis" found by Caso and Rubín at Mitla in Oaxaca.<sup>25</sup>

George C. Vaillant tabulated several score burials with respect to age. His final conclusion was that "Disease has left no trace but over a quarter of the dead were children and few individuals reached old age."<sup>26</sup> Some years previously, he had published a table showing the age of 138 skeletons disinterred at three different sites.<sup>27</sup> Of these, thirty-three are listed as children, twenty-four as "young," fifty-eight as "middle age," and twenty-three as "old." Aside from the obvious smallness of the sample, it is doubtful whether this type of age distribution shows any evidence of unduly high infant mortality or whether the relative scarcity of very old persons is not wholly to be expected in a primitive population. Vaillant furthermore contradicts his implication of abnormal mortality by his introductory statement that "Disease has left no trace."

A reasonable conclusion to be drawn from the relative lack of archaeological data is that there were few if any really critical epidemics or any unusual incidence of internal organic pathology among the peoples whose osseous remains have been discovered.

5. There still remains to examine the written record of the central Mexican tribes before the conquest and their immediate descendants thereafter. This source of information should be of crucial significance because wars, famines, natural disasters, and decimating pestilences are the four categories of material events which invariably leave their mark upon the social consciousness and which therefore find expression in oral and written tradition.

<sup>24</sup> Daniel F. Rubín de la Borbolla, "Antropología Tzintzuntzán-Ihuatzio, temporadas I y II," *Revista mexicana de estudios antropológicos*, III (1939), 99-121.

<sup>25</sup> Alfonso Caso, and Rubín de la Borbolla, *Exploraciones en Mitla 1934-1935* (Instituto Panamericano de Geografía e Historia, Publication No. 21, Mexico, 1936).

<sup>26</sup> *The Aztecs of Mexico* (New York, 1941), p. 37.

<sup>27</sup> "Excavations at El Arbolillo," in *Anthropological Papers of the American Museum of Natural History*, XXXV, Part 2 (1935), 187-188.

The earliest reference to anything approaching an epidemic which I have been able to find is a pictograph from the *Codex Boturini*, Plate, or *Lámina* 8.<sup>28</sup> According to Orozco y Berra this plate represents the period of approximately 780 A.D. during the early migrations of the Aztecs, before their settlement in the Valley of Mexico. "The naked figure with closed eyes and exhausted appearance near the day sign 6 *acatl* signifies that a plague swept over the land during this period." The general interpretation of illness may be accepted but the use of the word "plague" in the modern medical sense may be questioned, as also the assertion that it "swept over the land." The *Codex* was composed probably in the middle of the fifteenth century and could represent only the haziest tradition of what happened seven or eight hundred years previously. Moreover the Nahua tribes in the eighth century were small groups of wandering nomads. A much more conservative statement of the probable meaning of the picture would be that at a remote period the Aztecs had been afflicted with some kind of sickness sufficiently severe to leave a trace in the memory of subsequent annalists.

The next mention of disease is derived from the *Codex Aubin*.<sup>29</sup> During the late thirteenth century while the Aztecs were still migrating and reached Pantitlán, ". . . allí les sobrevino una epidemia de rajarseles todas las carnes (grietas)." <sup>30</sup> Literally this means "splitting or cracking of all the flesh," evidently referring to some type of severe skin infection. The exact nature cannot be determined, nor is there any evidence of high mortality. Had the latter occurred the *Codex* would very probably have so indicated.

At or near the year 1330, after the Aztecs had settled finally in their home on Lake Tezcoco the valley seems to have been subject to some kind of debilitating illness. This localized in at least two points: at the northern end of the valley and at the southern end at Coyoacán. It was to this period that the *Anales de Quautititlán* ascribed the list of diseases to which reference has already been

<sup>28</sup> This *Codex* was published by Manuel Orozco y Berra in his *Historia antigua y de la conquista de México* (4 vols., Mexico, 1880), III, 67-87. His descriptions of the plates were translated by Paul Radin in the University of California *Publications in American Archaeology and Ethnology*, XVII (1920), p. 33. I have used Radin's translations wherever available.

<sup>29</sup> The *Codex Aubin* (said to have been written in 1576), comprises Cuaderno IV of the *Colección de documentos para la historia mexicana*, by Antonio Peñafiel (6 cuadernos, Mexico, 1901-1904).

<sup>30</sup> *Ibid.*, p. 92.

made. Apparently there was a widespread incidence of dysentery and respiratory diseases at least among the Tepanecs. At the same time occurred the fabulous epidemic at Coyoacán. According to later accounts—and it is noteworthy that only the later accounts carry the story in full detail—the Aztecs on the lake cooked large amounts of fish. The smell of this cookery, carried by the wind a few miles to the shore at Coyoacán, caused a violent reaction. Tezózomoc says that the Aztecs had previously tried to starve out the people at Coyoacán by withholding the supply of fish, hence the profound effect of the odor: “Little by little the old men and women, the boys and girls began to feel ill and suffer from swelling of the eyelids. The small boys and girls began to die, after them the old men and women. And the young men and women began to show bloody diarrhea, with no remedy whatever to cure them. . . .”<sup>31</sup> Durán says “. . . and such was the smoke that entered the streets of Coyoacán that it made the women miscarry from desire to eat what the Mexicans were cooking and made the children cry for it; it gave diarrhea to the old people from desire to eat; it made the faces of the women and feet of the children swell, from which many suffered and died. . . .”<sup>32</sup> Torquemada adds that “many died” and that the symptoms included “enfermedad de garganta” and “pujamento de sangre.”<sup>33</sup>

Summing the symptoms and accepting the statements that there was a high mortality, it is clear that in 1320 to 1330 there was unusually severe illness in central Mexico. On the other hand there is evidence that the fundamental cause was nutritional. From the multiplicity of symptoms it may be inferred that several distinct diseases were rampant: certainly dysenteries and acute respiratory infections. The fanciful account of the fish smell has all the appearance of an attempt upon the part of later historians to interpret an otherwise mysterious malady. On the other hand it is quite possible that there was a food shortage. If so the intensity of disease onset is quite logically explained by assuming a reduced resistance on the part of the general population to the normal endemic disease pattern. Furthermore the eye inflammation, the diarrhea, and the tendency toward edema could very easily have resulted from an acute avitaminosis accompanying a

<sup>31</sup> Hernando Alvarado Tezózomoc, *Chronica mexicana* (ed. by José M. Vigil, Mexico, 1878), p. 261.

<sup>32</sup> Diego Durán, *Historia de las Indias de Nueva-España y islas de Tierra Firme* (ed. by José F. Ramírez, 2 vols., Mexico, 1867-1880), I, 91.

<sup>33</sup> Juan de Torquemada, *Primera [segunda, tercera] parte de . . . monarchia indiana* (3 vols., Madrid, 1723), I, 93.

critical shortage of food, particularly of certain types of food. If this concept of the situation may be accepted, then what was observed was not an epidemic in the sense of the decimation of an otherwise healthy population by an invading organism, but merely the sequelae of semi-starvation.

This close association in Mexico of famine and epidemic is seen even more clearly in the famous mortality of 1454-1457 which, it will be noted, was the first severe experience of the sort suffered by the Nahuatl peoples subsequent to 1330, or in a period of 120 years. The natural disasters occurring at this time have been fully described in histories of pre-colonial Mexico and need not be discussed at length here. They began apparently with an unprecedented freeze and snowfall in the winter of 1453-1454 which caught the inhabitants totally unprepared. This was followed by utter drouth throughout 1454, 1455, and 1456, such that food production was completely prevented and the food reserves utterly exhausted. In the resulting famine thousands perished from acute starvation. The pertinent question in connection with the present discussion concerns the possibility of an epidemic which caused mortality apart from starvation.

The local sources and in general the earlier speak only of famine. In the *Atlas* of Durán,<sup>34</sup> *Lámina* 17, there is shown "the terrible famine that raged over the land for a period of three years . . ." The *Codex Telleriano-Remensis* states simply that "there was so much snow that the people died" and "there was such a famine that the people died."<sup>35</sup> Two illustrations are given in Plate 7, one showing or representing snow, the other hunger. The *Codex Aubin* describes the famine and then says "The people scattered through the mountains to secure the flesh of animals or birds . . . nor did they have hunting nets; they wandered among the valleys, the birds of prey ate them, for there was no one to bury them."<sup>36</sup> In *Historia de los mexicanos por sus pinturas* there is merely the statement: "In the year one hundred and thirty-two there was an intense frost and a famine."<sup>37</sup> The *Anales de Chimalpahin* says that "there were many deaths. The people died of

<sup>34</sup> The *Atlas* of Durán was published by José F. Ramírez in his edition of Durán's *Historia*. The descriptions of the plates have been translated by Paul Radin (see note 28).

<sup>35</sup> The explanations of the plates of the *Codex Telleriano-Remensis* are given in Edward K. Kingsborough's *Antiquities of Mexico* (9 vols., London, 1830-1848), VI. They also have been translated by Radin (*loc. cit.*, p. 46).

<sup>36</sup> *Loc. cit.*, p. 96.

<sup>37</sup> To be found in García Icazbalceta, *Nueva colección de documentos para la historia de México*, III. It has also been translated by Radin (*loc. cit.*, p. 65).

thirst. . . ."<sup>38</sup> The *Codex Ramírez* gives a circumstantial account of the famine. Regarding mortality there is only the statement that ". . . the people began to grow thin and weak from the hunger which they suffered and many died, and others fled. . . ."<sup>39</sup> The *Anales de Quauhtlán* states there was a "fearful famine, in which many people perished."<sup>40</sup>

Disease comes to be mentioned in conjunction with the famine only by the chroniclers of the sixteenth century. The most important references of this type are as follows. Diego Durán says that "the people began to weaken and grow thin with the hunger they suffered; some began to fall ill eating things contrary to health. . . ."<sup>41</sup> Ixtlilxóchitl in the *Historia chichimeca* is rather detailed to his account. In the great cold winter of 1454 "there was a pestilential catarrh from which many people died especially the older persons, and in the three following years all the crops and fruits of the earth were lost such that the greater part of the people perished . . . and soon the sickness increased and so many people died that it seemed as if not a single person would survive. . . ."<sup>42</sup> Tezózomoc mentions no disease until he comes to the end of his description where he uses the terms "hambre, pestilencia y mortandad." He then proceeds: ". . . the old Mexicans called this famine and mortality *Nezetochohuiloc*, others applied the name *Netotonacahuiloc*, the pest of the coasts of Cuextlan."<sup>43</sup> These terms are illuminating in themselves. The first is derived from *Ne* (from), *ce* (one) *toch* (rabbit) and *huiloc* (illness), that is: from the illness of (the year) 1 rabbit. The other is derived from *Ne* (from) *tonaca* (the Totonacs) and *huiloc* (illness), or from the illness of the Totonacs. The first expression therefore refers to some illness or debilitating condition which occurred at a certain date. The other ascribes this condition to the Totonacs, a tribe living on the Gulf Coast in the present state of Veracruz. Neither defines or qualifies the illness in the pathological sense. One other citation may be mentioned. There is a statement in the "Anales mexicanos: Mexico-Azcapotzalco" that ". . . there was much hunger and for that reason it was said that they suffered much *fuego* (skin

<sup>38</sup> Translation by Radin (*loc. cit.*, p. 128).

<sup>39</sup> The *Codex Ramírez* is included in Vigil's edition of Tezózomoc (see note 31.) It has also been translated by Radin (*loc. cit.*, pp. 67 ff).

<sup>40</sup> (Ramírez ed.), p. 77.

<sup>41</sup> *Op. cit.*, I, 248.

<sup>42</sup> Fernando de Alva Ixtlilxóchitl, "Historia chichimeca," in Kingsborough, *op. cit.*, IX.

<sup>43</sup> *Op. cit.*, pp. 364-368.

eruption, rash)."<sup>44</sup> Since later writers merely repeated the ideas set forth immediately above, nothing further would be gained by citing them in detail.<sup>45</sup>

Tezózomoc's account indicates that there was severe illness among the starved and dying Mexicans. But such illness is an inevitable accompaniment of any acute famine. There is no evidence of any epidemic beyond that directly caused by starvation, or one which affected persons in a nutritionally good condition, or one which carried beyond the borders of the stricken region. In fact many famine sufferers migrated to or were sold into slavery among the surrounding tribes, particularly the Totonacs, but there is no record of any spread of illness to these groups. Such would inevitably have happened if the Mexicans had been afflicted with a serious contagion. Durán's statement is no more specific than that of Tezózomoc. He merely accounts for the general debility by referring it to the very inferior food eaten by the desperate sufferers. Ixtlilxóchitl's claim of an epidemic of respiratory disease may well carry weight, although he is the first writer to mention it. He, however, distinctly ascribes the condition to the cold weather. It is entirely reasonable to assume that the extreme exposure suffered by the inhabitants wearing few clothes and living in unheated houses would result in a much increased incidence of the normally occurring respiratory infections such as pneumonia, bronchitis, laryngitis, colds, and the like. The *fuego*, or skin eruptions, rashes or lesions referred to in the fourth citation are more difficult to place but could easily have arisen as a result of acute dietary deficiencies plus generally lowered resistance to ordinary skin infections.

If we sum up the testimony concerning the misfortunes of 1454-1457 we find two points clearly emerging: (1) None of several primary documentary sources mention any disease at all (unless pure hunger is a disease). (2) The maladies mentioned in four other sources, somewhat later in origin, can all be regarded as secondary to exposure and famine, either in the form of acute avitaminosis or in the form of normally occurring infectious dis-

<sup>44</sup> In *Anales del Museo Nacional de Mexico*, Series II, VII (1903), 49-74. The introduction states that this document was probably derived in the sixteenth century from pictorial records by some native, at present unknown, but probably a contemporary of the well-known Nahuatl writers such as Tezózomoc and Ixtlilxóchitl.

<sup>45</sup> Some of these stories have carried down to modern times. Thus Flores (*op. cit.*, I, 46) refers to the cold winter and says there was an epidemic of "*pulmontas*." This is clearly derived directly from Ixtlilxóchitl.

eases operating on subjects badly weakened by starvation. There is no presumption whatever of a true epidemic.

In the years 1504-1506, there was another famine in which on a smaller scale the events of fifty years previously were repeated. All authorities agree upon the facts, insofar as the crop failures and consequent hunger are concerned. There is no reference in any of the annals, codices, or chronicles to death by any agency but simple starvation, no direct or oblique claim of an epidemic, or even abnormal illness. Yet this famine occurred only fifteen years before the Spaniards arrived and was well within the memory of such persons as Tezózomoc, Ixtlilxóchitl, and the informants of Sahagún. Had a pestilence of noticeable magnitude afflicted the country some record of it would unquestionably have been preserved.

Certain final conclusions are now possible. From the accounts of both whites and Indians after the conquest, as well as from the *materia medica* of both races, it is clear that the pathology expected in a semitropical region was present in central Mexico, probably for centuries before 1520. The natives were subject to these diseases but over a long period of occupancy had probably developed a high level of immunity and resistance. This is demonstrated in part by the susceptibility shown by the incoming white men. The archaeological and historical record indicates a race which was remarkably free from devastating epidemics and from generalized chronic endemic ailments. There are few cases of serious or widespread illness in historic times and within at least two hundred years of the conquest; all of these can be classified as secondary to physical exposure and starvation.

The biological and demographic implications of this surprisingly high level of public health were profound, for one of the most important factors commonly limiting population increase was absent or substantially inoperative. As a consequence the aboriginal population increased notably prior to 1520 until it pressed close upon the food supply. Furthermore, the terrible epidemics following the conquest were all the more fearful, particularly in their psychological effects, since the social group which suffered them was intellectually and emotionally unprepared to meet them.

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