Civilization as a threat to human health?

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CIVILIZATION AS A THREAT TO HUMAN HEALTH?

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SUMMARY

Civilization can be defined as the distinctly human attributes and attainments of a particular society. In general, the development of civilization is viewed as a positive step for the well-being of the human species, leading to an increased duration and quality of human life. The accelerated progress of civilization (mainly industrialization, urbanization and nutrition) has led to new possibilities for adverse effects on human health. A collection of terms referred to as "civilization diseases" has become the subject of serious concern but review of available data indicates that this concept appears to add very little to our understanding of modern environmental influences on human health. Important limitations in the continued use of this term are its non-specificity, the lack of a unifying scientific foundation, and provision of virtually no direction for remediation of these diseases or for future research. In addition, the use of this term has been localized to primarily post-socialist European countries. In view of these limitations, it seems more productive for scientists, in all parts of the world, to embrace the discipline of environmental health science and to discontinue use of the term "civilization diseases".

Key words: civilization diseases, environmental health

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Civilization can be defined as the distinctly human attributes and attainments of a particular society (1). Historically, civilizations developed around 10,000 years ago with the shift from hunting-gathering to agriculture and pasturing. Today's museums are filled with evidence of the political, social, and cultural complexities of civilizations on every continent. According to Murphy (2) historians tend to stress the possession of writing, cities, occupational specialization and a broad political structure as characteristics of civilizations, while anthropologists tend to focus rather on the possession of complex social structures and a wide variety of cultural content. In general, the development of civilization is viewed as a positive step for the well-being of the human species, leading to an increased duration and quality of human life.

But development of increasingly complex, interdependent, and crowded societies has always brought with it increased risks for the inhabitants, including health risks. Especially during the last several centuries, the accelerated progress of civilization has lead to new possibilities for adverse effects on human health. Since the onset of the Industrial Revolution, several new disciplines and specializations have emerged to deal with the newly developed and newly recognized health risks associated with changes in agriculture, industry, technology, transportation, lifestyle, etc. These new disciplines and specializations have included public health, industrial hygiene, environmental science, occupational medicine, and ergonomics, among others.

During this period of rapid industrialization and urbanization, a collection of problems referred to as "civilization diseases" or "diseases of civilization" became the subject of considerable discussion within certain medical/scientific groups (2, 3). Haffter (3) states that the term civilization diseases came into use in the 20th century, but that it is linked to earlier topics such as cultural diseases, cultural damage, and "The English Malady". Comments regarding the negative impacts of the development of industrialization including civilization diseases, can be traced to the 18th century. Examples are found in works such as J. J. Rousseau's "Discours sur les sciences et les arts" in 1750, and J. Swift's "Travels into several remote nations of the world" in 1726. The greatest attention to the concept of diseases of civilization occurred several decades ago when a number of widely read monographs and papers on this topic were published (4–13).

The purpose of this review is to stimulate discussion on the relationship between the progress of civilization/industrialization and human health. We rely on information from contemporary and historical epidemiology, palaeopathology, historical anthropology and agricultural history. We avoid wholesale criticism of the concept of civilization diseases, as has sometimes been displayed in previous literature (14, 15).

"CIVILIZATION DISEASES"

Sobra and Češka (16) describe the phenomenon of civilization diseases in the following way:

In the course of 6–8 generations, but mainly during the last 2–3 generations, an epidemic of non-infectious diseases, called "civilization diseases", "diseases of the western culture" or "metabolic diseases of massive incidence" appeared. These are tightly interconnected when searching for their origin and can be perceived as a manifestation of maladaptation to a completely new environment, created very fastly, to which the populations of the industrially developed countries were not genetically adapted.

From a genetic standpoint, humans living today are Stone Age hunter-gatherers displaced through time to a world that differs from that for which our genetic constitution was selected (17). These disease are considered to be the result of maladaptation to new environment into which the populations
of civilized societies were thrown following the industrial revolution. These populations underwent much greater changes in life style and nutritional habits during 6–8 generations than their ancestors did in the course of 10,000 years. There is concern that no living creature is able to live and survive in an environment completely different from that to which it is genetically adapted (16).

From this and other descriptions, the key elements that have been used to define diseases of civilization are that they are predominantly non-infectious; they have occurred mainly in the last 2–3 generations, although present for 6–8; and they are tightly connected and related to a society's level of industrialization. We would, therefore, expect that these diseases should be rare or unknown in today's rural (non-industrialized) communities of the third world. We would also expect that these diseases would have appeared during the last century in societies that were not economically developed at the beginning of the century but underwent rapid economic development since then.

A literature search in the database MEDLINE using IN-FO TRIEVE for a query using civilization-ADI-diseases listed 45 publications since 1966. (ADI is a Boolean search operator for records in which the query word that follows it appears immediately after the word preceding it.) It should be noted that a high percentage (77.78%) of papers located in this search was published in languages other than English, reflecting a European, and mainly post-socialist country, preference for this concept. It is also interesting that several foundations for prevention of civilization diseases are active in this region of world. Despite this relatively small number of papers, the list of non-infectious diseases identified as civilization diseases is quite long. These papers commonly identify the primary conditions in this group as: ischemic heart disease, diabetes mellitus, obesity, stroke, ischemic disease of the lower extremities, cholecystolithiasis, appendicitis, hemorrhoids, colorectal and lung cancer, mammary gland cancer; and prostate cancer, but also include other civilization diseases identified as being related to life-style changes. Table 1 contains a complete list of these diseases as identified in the papers from the literature and from an Internet search. As can be seen from the table, pathologies affecting nearly every organ system in the body have been classified as civilization diseases, indicating that this term seems to have low specificity.

CIVILIZATION DISEASES AND INDUSTRIALIZATION

The period preceding the Second Agricultural Revolution in Europe can be characterized as follows (18):

- A majority of the population routinely lived on the verge of starvation.
- There was an over dependency on a single food source.
- Food supplies were vulnerable to the devastating effects of weather and disease.

- Famine occurred sporadically.
- There was a high incidence of deficiency diseases: beriberi (pellagra), scurvy, rickets, iron deficiency.
- There was a high incidence of infectious diseases: plague, malaria, tuberculosis; respiratory transmitted diseases; alimentary (faecal) oral transmissions; skin-skin transmissions: leprosy, syphilis, lice.

Ergotism and scurvy, particularly, sometimes decimated whole populations in rural areas or at sea (19).

An important milestone in alleviating many of these conditions was the introduction of some native-American plants into European agriculture. Maize and potatoes rapidly occupied a large sector of the European markets and, because of their easier cultivation and higher calorie content, were substituted for grains such as wheat and rye. In the 16th and 17th century, new diseases were described that were directly related to dietary intake (19).

Since the Second Agricultural Revolution, which occurred about 300 years ago, a decline in mortality has occurred in many European nations and in America (20). Nearly all specialists agree that improved nutrition is a significant factor responsible for this recent demographic changes in world population (20, 24, 25). Average daily calorie intake around 17th in Britain and France was 2700 and 2410 kcal per consuming unit, respectively. This implies that mature adults of the late 18th century must have been very small by current standards. The bottom 10% of the labor force lacked the energy for regular work and the next 10% had enough energy for less than three hours of light work daily. Poor body builds increased vulnerability to both contagious and chronic diseases (26–28).

Comparisons of the prevalence of chronic diseases among Union Army men ages 65 and older in 1919 (BMI = 22.8) with surveys of veterans of the same ages in the 1980s (BMI = 26.4) indicate heart disease was 2.9 times more prevalent, musculoskeletal and respiratory diseases were 1.6 times more prevalent, and digestive diseases were 4.7 times more prevalent among veterans aged 65 or older in 1910 than in the period 1985–1988 (28). Further statistical treatment of these data showed that the average decline in chronic respiratory problems, valvular heart disease, arteriosclerosis, and joint and back problems was about 66%. Occupational shifts account for 29% of the decline; the decreased prevalence of infectious disease accounted for 18%; the remainder are unexplained (29). It follows that the young adults born between 1822 and 1845 who survived the deadly infectious diseases of childhood and adolescence were not, as some have suggested, freer of degenerative diseases than persons of the same ages today; rather they were more afflicted (28).

According to Fogel and Costa (28) "...during the last 300 years, particularly during the last century, humans have gained an unprecedented degree of control over their environment – a degree of control so great that it sets them apart not only from all other species, but also from all previous generation of Homo sapiens. This new degree of control has enabled Homo sapiens

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<tr>
<th>Table 1. Conditions identified as &quot;Civilization Diseases&quot;</th>
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<tr>
<td>Ischemic heart disease</td>
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<td>Stroke</td>
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<td>Insomnia</td>
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<td>Arterial hypertension</td>
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<td>Deep vein thrombosis</td>
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<td>High level of cholesterol</td>
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<td>Obesity</td>
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<td>Ischemic disease of the lower extremities</td>
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<td>Diabetes mellitus</td>
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<td>Ischemic disease of the lower extremities</td>
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to increase its average body size by over 30%, to increase its average longevity by more than 100%, and to improve greatly the robustness and capacity of vital organ systems. The trend towards decreasing prevalence of chronic diseases is continuing since, in many countries, death rates from ischemic heart disease have declined by approximately 50% since mid-1960s (20) and WHO is optimistic that countries can still make considerable progress in lowering mortality rates from heart disease.

Childhood environment may be even more important in determining disease patterns throughout life than was previously thought. For instance, part of what is regarded as the genetic contribution to ischemic heart disease may in fact be the effect of the early postnatal or even intrauterine environment (30). Many reports have been published (31–37) on possible links between early-life conditions, including the mother's (mal)nutrition, and anthropometric measures and major chronic diseases. There is a detectable increased risk of morbidity and mortality associated with short stature. Since the childhood environment is an important determinant of adult stature it is also important for adult health (38).

Examination of the evidence seems to support the contention that human physiology has been significantly altered during the period of increasing industrialization over the past 8–10 generations (28, 29). However, these technological developments have been associated with a decline, rather than an increase, in the prevalence of many chronic degenerative diseases which have often been included as civilization diseases.

UNIFYING FACTOR(S) FOR CIVILIZATION DISEASES

There have been numerous attempts to find one or more unifying causative factors to support the concept of civilization diseases. Among various etiopathogenic factors, free oxygen radicals have been regarded as providing universal validity for chronic degenerative diseases. Indeed, the results of numerous studies have formed the basis of many preventive protocols aimed at cardiovascular diseases and cancer. Some other pathogenetic factors suggested as a common denominator to civilization diseases are listed in Table 2.

Several authors (16, 39, 40) suggest that in order to elucidate relationships among many of these diseases it is necessary to consider the geographic, socioeconomic and temporal distribution of all of these diseases rather than to look for a particular factor(s) increasing risk for a single disease. This is important with respect to the working hypothesis for directing further research and the intervention approach in health care targeted mainly to chronic degenerative diseases but also to many other pathologies.

A concept somewhat related to civilization diseases is the issue of "environmental illness”. This term has been characterized as, "A polysymptomatic condition believed by clinical ecologists to result from immune dysregulation induced by common foods, allergens, and chemicals, resulting in various physical and mental disorders". The medical community has remained largely skeptical of the existence of this "disease", given the plethora of symptoms attributed to environmental illness, the lack of reproducible laboratory abnormalities, and the use of unproven therapies to treat the condition (41).

In view of the heterogeneous character of civilization diseases and the discordant views on their pathogenesis, it is not surprising that the concept of civilization diseases provides little information regarding preventive measures nor does it lead to the formulation of working hypotheses for further research. The imprecision of this classification is reflected in the broad spectrum of recommended measures for their prevention found in the scientific literature or on the Internet. Table 3 contains a partial listing of proposed treatments.

ENVIRONMENTAL RISK ASSESSMENT

In contrast to the concept of civilization diseases, and the search for a common causative factor or set of factors to explain a collection of pathological conditions, environmental health is the science of controlling or modifying those conditions, influences, or forces surrounding humans that relate to promoting, establishing, and maintaining health (42). These conditions include also those associated with the "Western lifestyle": little physical activity, obesity, smoking, alcohol use, etc. Compared to the MEDLINE database search for civilization diseases, a similar search using INFOTRIEVE for the query environmental-ADJ-health since 1966 yielded 17,103 references with 81.47% of these papers published in English. The focus of environmental health is to identify health risk factors but it is not the task of this research discipline to establish a causal relationship between a certain risk factor and a particular disease in an individual case. Establishing such an individual diagnosis is the responsibility of occupational medicine. Even in the case of an exposure of large populations to a particular risk factor it may be very difficult to establish a causal relationship to a particular pathology. The discipline of environmental health recognizes the increasing complexity of today's highly industrialized and rapidly changing environments and uses modern analytical techniques to answer questions regarding the interactions of environmental, inclusive nutritional, factors and human health.

As indicated by the above review, the concept of "civilization diseases" appears to add very little to our understanding of modern environmental influences on human health. Important limitations in the continued use of this term are:

- It is highly non-specific.

<table>
<thead>
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<th>Table 3. Examples of treatments and products for &quot;Civilization Diseases&quot;</th>
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<td><strong>Treatments</strong></td>
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<td>Sports</td>
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<td>Spa therapy</td>
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<td>Breast-feeding</td>
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<td>Stress management</td>
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<td>Reading book</td>
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<tr>
<td>Cervical massage</td>
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<td>Specialized hospital stay</td>
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It lacks a unifying scientific foundation.
It provides virtually no direction for remediation of these diseases or for future research.
Its use has been localized to primarily post-socialist European countries.

In view of these limitations, it seems more productive for scientists, in all parts of the world, to embrace the discipline of environment health science and to discontinue use of the term "civilization diseases".

REFERENCES


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