Chapter 2
Climate, Environment and Epidemic Febrile Diseases: A View from Chinese Medicine

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Abstract Chinese classics of medicine and medical records abound in reference to epidemic febrile diseases. Along with famine due to crop failures, droughts, floods and wars, they exerted a heavy burden on Chinese populations throughout the ages. The early classics of medicine (e.g. *Huang Di Nei Jing*, *Nan Jing*, *Shang Han Lun*, about 200 B.C.–220 A.D.) credited epidemic diseases to the invasion of the body by pathogenic cold and wind, classing them into the category of "cold damage disorders". With the creation of the "School of Warm Diseases" (Qing Dynasty, 1644–1911), a new conception of epidemic diseases emerged: distinction between "warm diseases" and "cold damage disorders", role of a warm "epidemic (or pestilential) *qi*" or "epidemic toxin" in their occurrence, body invasion through the mouth and nose, high contagiousness, specificity of the epidemic *qi* according to the species (human or animal) and the nature of the epidemic disease, favouring role of severe climatic and environmental conditions in their emergence, etc. This paper reviews the evolution of medical perceptions on epidemic diseases through Chinese classics of medicine. It stresses the importance of the growing awareness of variations in local and regional environments (with their climatic, epidemiological and medical specificities) in the refashioning of discourses and practices relative to epidemic diseases in Chinese medicine.

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2.1 Introduction

In the past, China was repeatedly struck by epidemic febrile diseases. Along with famine due to crop failures, droughts, floods, warfare and other social turbulences, they exerted a heavy burden on Chinese populations throughout the ages.[1] Prior to the Ming Dynasty (1638–1644), epidemic diseases (*yi* 疫 or *wen yi* 温疫, literally "warm epidemics") or also pestilence (*li* 疠) were credited to abnormal climatic conditions, in particular to excessive or unseasonable cold. In the late Ming Dynasty and early Qing Dynasty (1644–1911), a new conception of epidemic febrile diseases emerged: they are ascribed to heterogeneous pestilential *qi* (*li qi* 疠气) or to warm epidemic toxins (*wen du* 温毒) which exist in the environment and whose emergence is favoured by abnormal climatic and environmental conditions and/or social turbulences. After a brief consideration of some fundamental concepts in Chinese medicine,[2] this chapter reviews the evolution of medical perceptions on epidemic febrile diseases from the early classics of medicine to the foundation of the "School of Warm Diseases" in the nineteenth century.

2.2 *Qi*, *Yin-Yang*, *Wu Xing* ("Five Movements"), *Zang-Fu* ("Organs") and *Bing Yin* ("Aetiology")

2.2.1 Qi

In Chinese philosophy, *qi* 气[3] is the fundamental substance which, through its constant movements and changes, produces everything in the natural world. In medicine, it refers to a subtle matter with a strong vital force and in constant movement. It is the fundamental substance for the constitution of the human organism of which it maintains the vital activities. Each phase of life of the individual, from birth to decay and death, is connected to it. The *qi* of human beings originates from the congenital essence, food and water and from the inhaled air. Chinese medicine distinguishes various kinds of *qi* according to their origin, distribution and specific functions within the organism which, as a matter of fact, are different manifestations and functions of the individual *qi* once formed: *yuan qi* 元气 ("original *qi*") which is the driving force of the vital process. It derives from the congenital essence inherited from one's parents and depends for its development of the postnatal

[1] A first apprehension of the concept of warm diseases in Chinese medicine has been published in French in 2010 (see Buchillet 2010).

[2] On fundamental concepts in Chinese medicine in western languages, see Liu (1988), Zhen (1995), Marié (1997), Kaptchuk (2000) and Maciocia (1989).

[3] *Qi* has been translated in English as "vital energy", "energy", "vapour", etc. However, none of these translations are able to capture the different meanings of *qi* according to the Chinese thought. It is why I keep the original word in Chinese.

essence acquired from water and food. Its main function is to promote the growth and development of the organism, *zong qi* 宗气 ("ancestral *qi*", also translated as "*qi* of the chest" because it gathers in the chest), which results from the combination of inhaled air and nutritive essences of food and water. It is transported by the spleen to the lungs and stimulates and regulates the rhythmic movements of respiration and heartbeat, *ying qi* 营气 ("constructive/nutritive *qi*"), which derives from the nutritive substances of food and water and produces, transforms, pushes and contains the blood in the blood vessels. It is a fundamental factor for the nourishment of the body, *wei qi* 卫气 ("defensive *qi*") which circulates on the surface body, regulates sweating, warms up the organism and defends it against exogenous aggressions and *zheng qi* 正气 ("right *qi*") which is the body's healthy *qi* as opposed to the pathogenic one (*xie qi* 邪气). In Chinese medicine, the term *qi* is also used to refer to the physiological activities of body organ systems (*zang fu zhi qi* 脏腑之气, "organ *qi*") and channels and network vessels (*jing luo zhi qi* 经络之气, "channels and network vessels *qi*"), to the seasonal (*liu qi* 六气, "six *qi*" or "six climatic configurations") or abnormal (*liu yin* 六淫 or *liu xie qi* 六邪气, "six excesses" or "six climatic perversities") climatic conditions, to an external pathogen which lurks within the organism (*fu qi* 伏气, "latent *qi*") and, finally, to the second level of penetration of a warm-heat pathogen within the organism (*qi fen* 气分, "*qi* level").

2.2.2 Yin-Yang

Yin 阴 and *yang* 阳 are two opposites but interdependent principles which reflect the inherent duality of beings and phenomena in the universe. Through their constant movements and mutations (opposition, divisibility, mutual control and balance, transformation into one another, etc.), they are the foundation of everything and every change in the universe. *Yin* and *yang* are relative (e.g. there is no absolute *yin* or *yang*) and interdependent (e.g. *yin* does not exist without *yang* and *yang* does not exist without *yin*). Furthermore, their relation is constantly changing, and, under certain circumstances, they may transform into one another. In Chinese philosophy, the theory of *yin-yang* is a way of explaining the nature and the universe. Initially, these two principles referred to the shady and sunny side of a slope. Later, the theory was applied to other domains: climate (cold/hot), season (autumn-winter/spring-summer), location (lower/upper, left/right, interior/exterior), orientation (north/south, west/east), movement of things and phenomena (passive/active, descending/ascending), gender (female/male), etc. In medicine, this theory pervades anatomy, physiology, aetiology, pathogeny and therapeutics: for example, the body surface and back are *yang*, while the interior and abdomen are *yin*; body organs are *yin* or *yang* according to their form, functions and depth within the body; a disease is *yang* when it is caused by external pathogens and *yin* when it is due to internal causes; drugs are also classified as *yin* or *yang* according to their nature, flavour and functions. Health is the balance of these two principles within the body, while pathology

results from their imbalance. In the latter case, we speak of "excess" (*shi* 实) or of "deficiency" (or "vacuity" *xu* 虚) of *yin* or *yang*.

2.2.3 Wu Xing ("Five Movements")

The theory of *wu xing* 五行 is a development of the *yin-yang* theory.[4] According to Chinese philosophy, events and phenomena within the universe result from the movement and mutation of five basic substances, namely, wood, fire, earth, metal and water. They correspond to phases of mutation of *qi* generated by the succession of *yin* and *yang*. Each movement has specific characteristics: wood (*mu* 木) bends and straights up, fire (*huo* 火) burns and rises, earth (*tu* 土) receives the seed and gives crops, metal (*jin* 金) is malleable and takes other shapes, and, finally, water (*shui* 水) moisturizes and flows downwards. These movements are interdependent and influence each other: we speak of promotion or subjugation. It is said, for example, that water promotes wood which promotes fire, etc., but water subjugates fire which subjugates metal, etc. Applied to medicine, this theory explains the physiopathological relations between body organ systems.

2.2.4 Zang-Fu ("Organs")

According to Chinese medicine, the human body is an integrated whole containing five *zang* organs 脏 (e.g. heart, lung, spleen, liver and kidney) and six *fu* organs 腑 (e.g. gallbladder, stomach, small and large intestines, urinary bladder and triple burner).[5] The *zang* organs are *yin* because they are perceived as being located deeper within the body and their common functions are to produce, transform, regulate and store fundamental substances (*qi*, blood, essence and body fluids). The *fu* organs are *yang* because of their more external location in the body. Their common functions are to receive and decompose parts of solid and liquid food that will be transformed into fundamental substances and to transport and excrete the waste. The *zang-fu* organs are interconnected by the system of channels and network vessels. They are conceived as complex and interdependent functional systems: each *zang* organ is

[4] In English, *wu xing* 五行 is often translated as "five elements" by analogy with the notion of "element" as a basic constituent of nature in the ancient Greek philosophy (Maciocia 1989). As *xing* literally means "movement" or "process" and as the theory of *wu xing* emphasizes movement and change, its translation as "five movements" appears more adequate.

[5] The *san jiao* 三焦 (triple burner or three burners) refers to three areas (or burners) of the body cavity which include the different organs with their functional activities: one distinguishes the upper (e.g. heart/pericardium and lungs), middle (e.g. stomach and spleen) and lower (e.g. liver, kidneys, bladders, small and large intestines, and the womb in women) burners. It is the way of circulation of the *qi* within the organism which stimulates the physiological activities of body organs and fluids.

coupled with a *fu* organ, a sense organ, a body tissue, a body fluid, an emotion, a sound and also a specific movement, climatic factor and season. The lung, for example, which is located in the upper part of the body cavity (or upper burner, see note 5), is related to the large intestine (*fu* organ), nose (sense organ), skin and body hair (body tissue), nasal secretions (body fluid), sadness (emotion), sob (sound), metal (movement), dryness (climatic factor) and autumn (season). Therefore, when Chinese medicine speaks of the lung, it refers to the system of the lung with all its connections and functions. The human body is thus conceived as a microcosm within the macrocosm of the universe. Z*ang-fu* organs are related on physiopathological levels: their functions are interdependent, and a disease may pass from one organ system to another.

2.2.5 Bing Yin ("Aetiology")

If health is the result of the balance of *yin* and *yang* within the organism, it also depends on the harmony of human beings with the natural world. Nature provides a favourable environment to the existence of human beings, and human organism regulates and adapts to the changes that occur in the environment. All environmental events (e.g. seasonal climatic conditions, unseasonable weather, environmental alteration, etc.) affect the individual, including his health state. When the organism fails to adapt, disease may appear.

In Chinese medicine, abnormal climatic changes may invade the body, causing diseases. Usually, wind (*feng* 风), cold (*han* 寒), summer heat (*shu* 暑), dryness (*zao* 燥), dampness (*shi* 湿) and fire/heat (*huo/re* 火/热)[6] are normal climatic factors related to specific seasons according to the theories of *yin-yang* and *wu xing*. They are collectively called the "six *qi*" or "six climatic configurations" (*liu qi* 六气). Wind usually occurs in spring although it may appear in other seasons; cold is associated with winter, summer heat with summer, dryness with late summer,[7] dampness with autumn and fire/heat with any other season. The six *qi* are necessary to the life and growth of human beings and normally do not cause disease. However, when they act out of their regular temporal sequence (e.g. heat during winter), manifest excessively or change abruptly (e.g. rapid alternation of cold and heat) and when body resistance is low, they may cause a disease. Becoming the "six excesses"

[6] The terms "fire" (*huo*) and "heat" (*re*) are often used interchangeably in works about Chinese medicine. They refer however to different realities. Firstly, there is a difference of degree between them (e.g. heat is lesser than fire). Secondly, fire as a pathogenic climatic factor refers either to summer heat (*shu*), to an extreme heat that may occur at any season or to the transformation into fire of another climatic perversity within the organism (e.g. cold contracted in winter may transform into heat and extreme heat may give way to fire). Finally, one distinguishes the "lesser fire" (*shao huo* 少火), which is essential to the physiological activity, from the "vigorous fire" (*zhuang huo* 壮火) or pathogenic fire which may injure the *qi*. It becomes an internal cause of disease (Marié 1997).

[7] Late summer is a period of ten days around the summer solstice.

(*liu yin* 六淫) or "six climatic perversities" (*liu xie qi* 六邪气), they are said to enter the organism through the skin and body hair or through the nose and mouth and to work their way inwards, causing various kinds of functional disorders. Wind is usually considered as the precursor of exogenous febrile diseases. It acts as a support and vehicle for the other excesses and also reinforces their virulence. The six excesses may change in nature according to the individual constitution: for example, pathogenic cold may turn into internal heat when individual constitution is characterized by an excess of *yang*. In some cases, they may stay latent within the organism and emerge later under another nature (see *infra*). Finally, they do not affect people in a similar way. This depends on the relative force or weakness of the individual *zheng qi* as opposed to that of the *xie qi* which is influenced by constitution, physical activity, alimentation, lifestyle, emotional state, etc., of the person. Body resistance (e.g. the strength of the individual *zheng qi*) is thus the determining factor in the emergence of a disease, while the pathogenic factor is only a contributing factor.

The six excesses manifest in the patient's body with different signs and symptoms. Some are common to every disease (e.g. fever and aversion to cold which express the invasion of the body by a pathogen), while others depend on the specific nature of the excess(es) involved. For example, due to its mobile and changing nature, wind manifests in the patient's body with inconstant and moving symptoms such as erratic pains, pruritus or cutaneous eruptions which change places, spasms, trembling, etc. While cold manifests with headaches, body pains, spasms (e.g. one quality of cold is to contract), etc., heat presents with high fever, sensation of hot body, sweating (e.g. heat opens the pores), aversion to heat and search for cold, redness of the face and eyes, etc. Given its tendency to damage body fluids, it can also produce thirst, dry tongue, rare dark urines, etc. When in excess, it may transform into fire and then concentrate on a specific spot of the body, giving way to ulcers, abscesses, furuncles, etc. In this case, Chinese medicine speaks of "heat toxin" (*re du* 热毒) or "warm toxin" (*wen du* 温毒) (see *infra*).

2.3 Epidemic Febrile Diseases in Early Classics of Medicine

According to early classics of medicine, exogenous febrile diseases (including epidemic febrile diseases) are due to abnormal climatic conditions. Actually,

> [They are] understood within the traditional system of cyclical change at the basis of the Chinese agrarian calendar. (Hanson 2011)

They are ranged in the general category of *shang han* 伤寒 ("cold damage disorders") whatever the nature of the causative climatic pathogen or the clinical manifestations of the disease. In this way, diseases presenting with a rapid evolution, pronounced signs and symptoms of heat and a tendency to damage the *yin* – and hence called "warm diseases" (*wen bing* 温病) or "heat diseases" (*re bing* 热病) –

belong to this category.[8] For example, Chap. 31 (paragraph 1) of the *Huang Di Nei Jing – Su Wen* 黄帝内经-素问 ("Classic of Internal Medicine of the Yellow Emperor – Plain Questions")[9] states that warm diseases belong to the category of cold damage disorders (*shang han* 伤寒).

Moreover, *Su Wen* 3 (paragraph 13) stresses that the exposition in winter to pathogenic cold may manifest in spring as a warm disease, and *Su Wen* 31 (paragraph 8) further specifies that pathogenic cold contracted in winter may manifest as a "warm disease" in spring or as a "heat disease" in summer. Therefore, pathogenic cold may stay latent (or lurk) within the organism and give way later to a disease of another kind. In this way, the so-called warm and heat diseases result from the transformation of pathogenic cold into warmth or heat within the organism. At that time, pathogenic cold and wind were understood as the main causes of exogenous febrile diseases (including epidemic febrile diseases), and warm diseases were considered a kind of cold damage disorders.

Su Wen 72 (paragraphs 7 and 8) refers to five kinds of seasonal febrile diseases which are related to the five movements (e.g. earth, water, metal, wood and fire), "easily pass between people" and manifest with the same degree of severity regardless of the person's age. It further states that persons with a strong *zheng qi* are not affected by them (see Van Nghi 1973/1991).

The absence of a clear distinction between cold damage disorders and warm diseases is also apparent in the *Nan Jing* 难经 ("Classic of Difficult Issues") written slightly later and which discusses certain theoretical problems presented by the *Nei Jing – Su Wen*. The 58th difficult issue distinguishes five "kinds of harm caused by cold": *zhong feng* 中风 ("wind stroke"), *shang han* 伤寒 ("cold damage disorder"), *shi re* 湿热 ("damp-heat attack"), *wen bing* 温病 ("warm disease") and *re bing* 热病 ("heat disease") (Unschuld 1986). In these two early classics of medicine, *shang han* refers to the category of exogenous febrile diseases brought on by unseasonable weather and also to a specific febrile disease caused by pathogenic cold. Nowadays, it only refers to diseases resulting from a cold injury. It is also the modern term for typhoid fever.

This conception was retaken by Zhang Ji (Zhang Zhong-Jing, 150–219) in his master essay *Shang Han Lun* 伤寒论 ("Treatise on Cold Damage Disorders")[10]

[8] Warmth is an attenuated form of heat. In works devoted to Chinese medicine, the denomination "warm diseases" (*wen bing*) refers interchangeably to warm and heat diseases.

[9] The *Huang Di Nei Jing* ("Classic of Internal Medicine of the Yellow Emperor") or, in short, *Nei Jing* ("Classic of Internal Medicine"), which is ascribed to the legendary emperor Huang Di, was probably compiled by unknown authors at different periods from the Warring States Period (475–221 B.C.) to the Eastern Han Dynasty (25–220 A.D.). It is a synthesis of the different currents of thought and clinical observations and experiences of these periods. It consists of two parts: *Su Wen* 素问 ("Plain Questions") which establishes the theoretical foundations of Chinese medicine and gives the descriptions of numerous diseases and *Ling Shu* 灵枢 ("Spiritual Pivot") which is more devoted to acupuncture and moxibustion. References to the *Huang Di Nei Jing – Su Wen* were borrowed from Van Nghi (1973/1991), Liu (2001), Unschuld (2003) and Kong (2010).

[10] The *Shang Han Lun* is part of Zhang Ji's original text entitled *Shang Han Za Bing Lun* 伤寒杂病论 ("Treatise on Cold Damage Disorders and Miscellaneous Diseases") that was lost during the

written in reaction to the series of deadly epidemics which swept out various provinces during the last decade of the Eastern Han Dynasty (25–220).[11] Zhang Ji was an official of Changsha, capital city of the Hunan province, which was then located in the "south" (nowadays, South Central China). In the preface of the *Treatise*, Zhang Ji alluded to the death of two-thirds of his clan members in less than ten years, seven out of ten from exogenous febrile diseases. This situation inspired him to study the characteristics of the epidemics which were sweeping out his province. Looking back on ancient medical texts and collecting the medicinal formulas of his contemporaries, he wrote the *Shang Han Lun* in which he provided a theoretical framework for the diagnosis and treatment of exogenous febrile diseases. Focusing on pathogenic cold and wind to which he credited these deadly epidemic diseases, Zhang Ji showed that exogenous febrile diseases may progress according to six stages within the organism, three *yang* and three *yin*, namely, the *tai yang* ("greater *yang*"), *yang ming* ("*yang* brightness"), *shao yang* ("lesser *yang*"), *tai yin* ("greater *yin*"), *shao yin* ("lesser *yin*") and *jue yin* ("attenuated *yin*") stages.[12] In the *san yang* (e.g. the three *yang* stages), the disease involves the six *fu* organs, while in the *san yin* (e.g. the three *yin* stages), it implicates the five *zang* organs. Only the *tai yang* stage (e.g. the first of the *yang* stages) is an exterior condition. Each stage is marked by specific syndromes. Syndromes (or "patterns", *zheng* 证) are specific constellations of signs (e.g. characteristics of the pulse, tongue form, colour and largeness, tongue moss characteristics, etc.) and symptoms (sensation of hot body, fever more or less high, thirst, sweating, aversion to cold or wind, headaches, agitation, fear of heat, etc.) which vary over the time during the course of the disease according to the relative strength or weakness of the pathogenic factor and to that of the individual *zheng qi*, the location of the disease within the organism and also the organ system affected. In the *san yang*, for example, the *zheng qi* is strong despite the predominance of the pathogenic factor, hence the symptoms of excess and heat; in the *san yin*, there is a gradual weakening of the *zheng qi*, hence the symptoms of cold and deficiency. Syndromes usually appear in an isolated way. In some cases, two or more syndromes may appear simultaneously. In addition, one syndrome may transform into another. Warm diseases are referred to in the *tai yang* stage where

numerous wars of the late Eastern Han Dynasty. Fragments of the original treatise have been found some decades later. The section devoted to cold damage disorders was arranged and edited by Wang Xi (Wang Shu-He, 210–285), a palace physician of the Western Jin Dynasty (220–265), into the book we know now as *Shang Han Lun* ("Treatise on Cold Damage Disorders"). The sections of the original manuscript devoted to the study of different types of diseases (including digestive, gynaecological and paediatric disorders) were rearranged later into the book entitled *Jin Kui Yao Lue* 金匮要略 ("Synopsis of Prescriptions of the Golden Chamber"). The citations in this article are borrowed from the translation of the *Shang Han Lun* by Mitchell et al. (see Shāng Hán Lùn 1999).

[11] 119 disasters including epidemic diseases have been reported during the late Eastern Han Dynasty (see Qu et al. 1994).

[12] It should be noted that *tai yang*, *yang ming*, *shao yang*, *tai yin*, *shao yin* and *jue yin* are the names of the six pairs of major channels to which one refers to in acupuncture and moxibustion. In the *Shang Han Lun*, they are referring to different stages of penetration of the exogenous pathogens within the organism and not to the channels.

Zhang Ji differentiated four syndromes: *zhong feng* 中风 (“wind stroke”), *shang han* 伤寒 (“cold damage disorder”), *wen bing* 温病 (“warm disease”) and *feng wen* 风温 (“wind warmth”). *Wen bing* and *feng wen* are defined as follows:

> When in greater *yang* disease [there is] heat effusion and thirst, without aversion to cold, [this] is a warm disease. If, after sweating has been promoted, there is generalized scorching heat [e.g., sensation of hot body], this is called wind-warmth. (line 6; see Shāng Hán Lùn 1999)

As it can be seen, warm diseases and wind warmth are specific syndromes into the category of cold damage disorders. Zhang Ji developed a system of diagnosis and treatment of syndromes based on the six stages of progression of the disease within the organism. As he did not suggest any specific medicinal formulas for warm diseases, the latter have been treated during centuries according to the general principles established for cold damage disorders, e.g. mainly by warm and acrid substances.[13]

In the *Zhu Bing Yuan Hou Zong Lun* 诸病源候论 (“Treatise on Causes and Symptoms of Various Diseases”, 610), the first Chinese medical encyclopaedia compiled by Chao Yuan-Fang (550?–630?) and collaborators, unseasonable or excessive weather is still seen as the cause of epidemic febrile diseases:

> Epidemic diseases belong to the same category as diseases due to an influence contrary to the season, and as diseases due to a hot influence or a warm influence, for they all originate from the fact that, in the course of one year, the influences of the solar periods have not been in harmony, that cold and hot are out of order, that violent wind and heavy rain suddenly occur, or that fog and dew take too long to dissipate. Most of the time this causes epidemic diseases among the people, the manifestations of which are the same for the young and for adults alike and evoke the ferocity of demons. That is why they are also called pestilential diseases (*yi li bing* 疫疠病). (fascicle 10; translated in Despeux 2001)

2.4 First Critics to the Cold Damage Theory

It was during the Song-Jin-Yuan Dynasties (960–1368) that the approach developed by Zhang Ji for the diagnosis and treatment of exogenous febrile diseases began to be challenged. During the Northern Song Dynasty (960–1279), a wave of deadly epidemic diseases, “mostly southern in origin” (Goldschmidt 2009), swept out Chinese provinces. They were possibly favoured by the ongoing movements of migration from the north to the south, the growth of the volume of trade, the expansion of trade routes and the growing urbanization (Goldschmidt 2009). Anxious to find a cure for them, the imperial government distributed remedies to the people and, in 1057, instituted a “Bureau for Revising and Printing Medical Treatises” which was charged to collect, revise, edit and publish old and contemporary

[13] Such as *ma huang* (*Herba ephedrae*) ou *gui zhi* (*Ramulus cinnamon cassiae*). Acrid substances have the property to “clear the surface [of the body]”. In warm diseases, however, they may damage body fluids and favour the progression of the disease within the organism (Liu 2001).

treatises of medicine. Consequently, earlier medical treatises (including the *Shang Han Lun* of Zhang Ji) enjoyed a greater divulgation among scholarly physicians and became the objects of annotated and critical editions. It was during these periods of recurring epidemic diseases that physicians began to point out the inadequacy of the conventional theory on epidemic diseases and the inefficiency of traditional remedies in the context of contemporary diseases. In the early twelfth century, the invasion of northern China by Jurchen people coming from Manchuria which culminated with the foundation of the Jin Dynasty (1115–1271) led the Song Imperial Court to flee to the Yangzi Delta and to set up the Southern Song Dynasty (1127–1279) in Hangzhou, Zhejiang province. The boundaries of China now extended to the Lingnan ("south of the Ling ranges") region (modern-day Guangdong and Guangxi provinces). This shift of the Han civilization towards the south

> fostered regional awareness among physicians […] who began to identify differences in climates, environments, bodily constitutions and medical conditions between northern and southern regions and populations of China. (Hanson 2011)[14]

That is why some scholarly physicians from Northern and Southern China began to condemn their contemporaries for their exaggerated observance of old canons of medicine, for their indiscriminate use of ancient therapeutic approaches that were not tailored to the nature of contemporary diseases and/or to the different climates and regions of China and also for paying little attention to the symptoms of warm diseases which, according to them, lead them to confuse cold damage disorders with warm diseases. It is also during the Jin-Yuan Period that the term *wen bing* began to take the meaning of "epidemic febrile diseases". These, however, were still linked to abnormal climatic conditions (Obringer 2010).

Pang An-Shi (1042–1099) emphasized the need to adapt traditional medicinal formulas to the different climates and bodily constitutions of China. He alluded, for example, to the fact that *gui zhi tang*, the warm acrid Cinnamon Twig Decoction prescribed in the Treatise on Cold Damage Disorders, should be adjusted to suit the climate and location of the patient: e.g. it could be administered in any season to patients living in the north or west of China but only in winter or spring to those living in South Central China where the weather was warmer (Warm Disease Theory – Wēn Bìng Xué 2000; Liu 2001). In the *Shang Han Zong Bing Lun* 伤寒总病论 ("General Treatise on Cold Damage Disorders," 1093), he advanced another aetiology for seasonal febrile diseases. These are not the result of abnormal climatic conditions but are caused by an extremely virulent *qi* (*yi qi* 异气) (Obringer 2010). The concept of "pestilential *qi*" (*li qi*) advanced by Wu You-Xing during the late Ming Dynasty shows some relationship with this notion of an abnormally "virulent *qi*" (Obringer 2010).

Liu Wansu (Liu Shou-Zhen, 1110–1200), the founder of the "Cold and Cooling School of Medicine" (*Han Liang Xue Pai* 寒凉学派), recommended the use of

[14] Differences in climates, environments, bodily constitutions and nature of diseases, foods and therapies were first alluded to in *Su Wen* 12 which divided China into five directions (*wu fang* 五方, e.g. east, west, north, south and centre). On the theory of *wu fang* and the resulting regionalist perspective in medicine, see Hanson (2011).

bitter, acrid and cold herbs in the treatment of exogenous febrile diseases. He also stressed that exogenous pathogenic factors may transform into fire within the organism and that emotional disturbances (e.g. the internal causes of diseases) also lead to the formation of fire/heat within the body (Liu 2001).

Zhang Yuan-Su (Zhang Jie-Gu), a physician of the twelfth century, advanced the view that, given the changing conditions between ancient and modern times, physicians should discard traditional medicinal formulas in the treatment of the new diseases and also devise a system of their own:

> In the ordinary course of events, when one is treating [a new] disease, one does not use the old remedies… The movements of the internal ethers are not the same. The past and the present follow different tracks, and to use the old remedies for the new illnesses is ineffective. (Cited by Elvin 1973)

A further example of the scepticism towards the *Shang Han Lun* is illustrated by Wang Lu (Wang An-Dao, 1332–1391) who denounced the confusion made by his contemporaries between cold damage disorders and warm diseases to which he credited the therapeutic inefficiency of cold damage formulas and he proposed specific therapeutic formulas for these two categories of diseases. Contending that old remedies were ineffective for present-day diseases, he also advocated the need to go against the tide of the classics of medicine (Hoizey 1988; Liu 2001).

2.5 From Cold Damage Disorders to Warm Diseases

The late Ming Dynasty (1368–1644) and early Qing Dynasty (1644–1911) mark a decisive turning point into the conceptual and medical approach of exogenous febrile diseases. These periods were marked by a series of natural disasters, famines and widespread deadly epidemic diseases (*da yi* 大疫 "great epidemic disease"). For example, about 19 major epidemic outbreaks with countless deaths have been registered between 1408 and 1643, in especial during the years 1639–1643 (Wang et al. 1999). In 1641, the worst year of the period, 79 localities from ten provinces were affected. There were epidemic diseases at all seasons of that year, the worst being in spring and summer (Elvin 1973; Dunstan 1975). Mortality rates varied between 20 % and 90 % according to the localities (Elvin 1973). The nature of these epidemic diseases is uncertain. Various aetiologies have been proposed: pneumonic and septicaemic plague, haemorrhagic influenza, anthrax, cerebrospinal fever and bubonic plague.[15]

[15] According to Dunstan (1975) and Benedict (1986), the aetiology of bubonic plague is improbable given the absence in contemporary local gazetteers and medical works of any clear mention of buboes (the most characteristic symptom of the disease) and of widespread death of rats prior to the outbreak of the disease in humans. Actually, rat epizootics and buboes or enlarged lymph glands are the criteria used by medical historians to establish a retrospective diagnosis of bubonic plague through historical sources.

In 1641, the physician Wu You-Ke (Wu You-Xing, 1580–1660), a native of Suzhou (present-day Jiangsu province, Jiangnan region, South China), observed the rapid progression of the epidemic diseases in each village and family. He also noted the therapeutic inefficiency of cold damage formulas which he explained by the wrong appraisal, by his contemporaries, of the aetio-pathogeny and clinical manifestations of the epidemic diseases. After an extensive research, he concluded on the distinct nature of epidemic febrile diseases and cold damage disorders. In the *Wen Yi Lun* 温疫论 ("Treatise on Warm Epidemic Diseases") written in 1642, e.g. one year after the 1641 deadly epidemics, he proposed a new aetiology and natural history for epidemic febrile diseases which can be summarized as follows[16]:

1. Epidemic febrile diseases are not directly caused by climatic factors acting out of their proper time or when in excess (e.g. the six excesses). They are instead caused by a great variety (*za* 杂 "miscellaneous")[17] of "pestilential *qi*" (*li qi* 疠气) which reside in the nature (lit. between "Heaven and Earth", *tian di* 天地). Therefore, the nature of epidemic diseases varies according to the specific nature of the pestilential *qi* ("One [epidemic] disease, one [pestilential] *qi*").
2. Pestilential *qi* are shapeless and invisible to the naked eye, and they are only perceived through their effects within the body.
3. They have a warm or hot nature and attack people at their will (e.g. at any season).
4. They may be contracted from the contaminated atmosphere (*tian shou* 天受, lit. "received from heaven") or via personal contact (*chuan ran* 传染). In both cases, the disease is the same.
5. Pestilential *qi* enter the body through the nose and mouth rather than through the skin and body hair as it was postulated before.
6. Once in the organism, pestilential *qi* lodge into the "membrane source" (*mo yuan* 膜原)[18] located in the chest where conventional therapies could not get at them.
7. Human beings and animals are afflicted by specific pestilential *qi*; moreover, pestilential *qi* differ according to animal species (e.g. diseases in oxen, sheep, chickens or ducks are caused by specific pestilential *qi*).
8. Pestilential *qi* manifest in the body with the same signs and symptoms of the six excesses. They differ however from them by their greater virulence and contagious power. They pass from one person to another and diffuse widely and quickly between people. They may invade the healthiest organisms and afflict everyone in the same way regardless of the age and physical constitution of the person.

[16] On the *Wen Yi Lun*, see Dunstan (1975), Hoizey (1988), Liu (2001), Obringer (2010), and Hanson (2011).

[17] The term *za* ("miscellaneous") alludes to the existence of various types of pestilential *qi* which produce different kinds of epidemic diseases of varying virulence (Obringer 2010; Hanson 2011).

[18] The "membrane source" (*mo yuan* 膜原) is located between the stomach and the muscle layer at mid-distance from the inner and outer parts of the body. Wu You-Xing elaborated a special formula (the decoction *da yuan yin*) to reach this area, diminish the heat, dry the dampness and favour the circulation of the *qi* within the organism in order to expel the pestilential *qi* (Liu 2001; Hanson 2011).

Pestilential *qi* are, therefore, not directly brought on by abnormal seasonal conditions. Their emergence is also unpredictable. The views expressed in the *Wen Yi Lun* in response to the great epidemics of the period 1639–1644 (as the *Shang Han Lun* was written in reaction to the epidemics of the late Eastern Han Dynasty) were radically different from the conventional seasonal explanation of epidemic diseases derived from the conception of the harmony between the body microcosm and the universe macrocosm. The *Wen Yi Lun* inspired studies on diseases caused by warm and heat factors which led to the foundation of the "School of Warm Diseases" (*Wen Bing Xue Pai* 温病学派) during the Qing Dynasty.

During the Qing Dynasty, a wave of severe epidemic diseases swept out again various regions and provinces, in especial the Jiangnan region. The four main theoreticians of the School of Warm Diseases are native of this region. They differentiated warm diseases from cold damage disorders and proposed new systems of diagnosis and treatment.

In *Wen Re Lun* 温热论 ("Treatise on Warm-Heat Diseases"), the Suzhou physician Ye Tian-Shi (Ye Gui, 1667–1746) distinguished four levels (*si fen* 四分) in the progression of a warm disease within the body, each one presenting with specific syndromes: "defensive level" (*wei fen* 卫分), "*qi* level" (*qi fen* 气分), "constructive/nutritive level" (*ying fen* 营分) and "blood level" (*xue fen* 血分). Usually, warm-heat pathogens attack first the body surface (e.g. the defensive level), impairing the body defence functions which are linked to the lung system, skin and body hair. The most important symptoms at this level are fever, slight aversion to cold and small increased thirst. Other potential signs and symptoms are sneezing, nasal congestion, sore throat and cough, headache, red-tipped tongue, floating and rapid pulse, etc. At this level, the disease is considered as mild. In cases it is left untreated or improperly treated, the warm-heat pathogen will progress to the *qi* level or directly to the other levels, causing different syndromes. When it reaches the last level (e.g. the blood level), it leads to a loss of blood, hence blood vomiting, nosebleed, haemoptysis, bloody stools and urines, purple or black skin eruptions, deep-red tongue, etc. Other potential symptoms are fever, restlessness or delirium, coma, etc. Ye Tian-Shi designed a system of differentiation of syndromes based on the progression of the disease according to the four levels. With this system, the physician may anticipate and follow the progression, transformation and worsening of a warm disease from the beginning to the end, judge its severity and also differentiate the syndromes over the course of the disease.[19]

Ye Tian-Shi also clarified the notion of latent *qi* or lurking pathogen (*fu qi* 伏气 or *fu xie qi* 伏邪气). As seen above, the possibility for a pathogen to lurk for a while within the organism was first alluded to in the *Nei Jing – Su Wen*. However, the concept of latent or lurking pathogen was only developed by the School of Warm Diseases. A lurking pathogen is a pathogen which invades the body at a specific season and incubates within the organism where it changes its nature and emerges later either by itself or stimulated by the attack of another pathogen. Ye Tian-Shi

[19] On differentiation of syndromes in warm diseases according to the four levels, see Warm Disease Theory – Wēn Bìng Xué (2000) and Liu (2001).

distinguished two kinds of diseases caused by a lurking pathogen: *chun wen* 春温 ("spring warmth") and *fu shu* 伏暑 ("lurking summer heat"). The first results from the invasion in winter of the body by pathogenic cold which transforms into heat within the organism before emerging as a warm disease with the warmth of spring; the second results from the aggression in summer of the body by pathogenic summer heat which lurks within the organism and then combines with dampness in autumn or winter before emerging at this or that season. Diseases due to a lurking pathogen present with symptoms of internal heat (e.g. fever, dry mouth, thirst, dark urines) are more serious and have a longer evolution than diseases manifesting immediately after the attack of the body by a warm-heat climatic pathogen.[20]

In *Shi Re Tiao Bian* 湿热条辩 ("Differentiation of Damp-Heat Diseases"), Xue Xue (Xue Sheng-Bai, 1681–1770) discussed on the aetio-pathogeny, differentiation and treatment of damp-heat diseases. He showed that heat was somehow trapped into dampness (hence, the high fever but without any sensation of hot body) resulting in a blockage of the *qi* which cannot circulate anymore within the organism. It is thus necessary to disperse dampness, refresh heat and favour the circulation of *qi* in the body (Warm Disease Theory – Wēn Bìng Xué 2000; Liu 2001).

In *Wen Bing Tiao Bian* 温病条辨 ("Systematic Differentiation of Warm Diseases", 1798), Wu Tang (Wu Ju-Tong, 1758–1836) expanded the theory developed by Ye Tian-Shi and set up a complementary system of differentiation of syndromes based on the pathological changes in the triple burner or upper, middle and lower body cavities where warm or hot pathogens may stagnate.[21] In this way, warm diseases are differentiated into three categories according to their location in the three burners. Usually, a warm disease initiates in the upper burner. If left untreated, it will successively invade the middle and lower burners. With this diagnosis system, it is possible to locate the disease and follow its progression within the body. Wu Tang distinguished six types of *wen bing*, namely, *feng wen* 风温 ("wind warmth"), *wen re* 温热 ("warm heat"), *wen du* 温毒 ("warm toxin"),[22] *wen nue* 温疟 ("warm malaria"),[23] *shi wen* 湿温 ("damp warmth") and *shu wen* 暑温 ("summer heat warmth"). Wu Tang also differentiated warm diseases in two categories

[20] On lurking pathogens and associated diseases, see Warm Disease Theory – Wēn Bìng Xué (2000) and Liu (2001).

[21] See note 5 above.

[22] The concept of "toxin" (*du* 毒) in Chinese medicine differs from that of western medicine where it is related to a toxic protein released by some bacteria. In Chinese medicine, "toxin" refers to three different realities: toxic nature of herbs, particular patterns in dermatology (e.g. herpes zoster) and toxic warm heat which may manifest within the body with localized symptoms (e.g. local redness, swelling and pain, sometimes also local eruptions or open ulcerations). Three main diseases in Chinese medicine are understood in reference to the concept of warm toxin: "big head fever" (*da tou wen* 大头温), "putrefying throat eruption" (*lan hou sha* 烂喉沙) and "throat-entwining wind" (*chan hou feng* 缠喉风). These diseases somehow overlap certain diseases of western medicine, respectively erysipelas or mumps, scarlet fever and diphtheria (Dunstan 1975; Hoizey 1988; Warm Disease Theory – Wēn Bìng Xué 2000; Liu 2001).

[23] In Chinese medicine, the term *nue* 疟 refers to diseases which manifest with regular alternation of chills and fevers and sweating (Liu 2001). Of course, it is impossible to assert with any degree of certainty that diseases described in the past with these symptoms are really malaria.

according to the presence or absence of dampness, and he proposed specific therapeutic principles for each stage and syndrome. Finally, he described the aetiology and pathogeny of the disease known under the name of "big head fever" (*da tou wen* 大头温) which is due to an attack of the head and face by pathogenic warmth or heat, hence the swollen and redness of this body part. Medical and historical records show that this disease was responsible of severe epidemic outbreaks during the 1580s (Dunstan 1975; Hoizey 1988; Liu 2001).

In *Wen Re Jing Wei* 温热经纬 ("Warp and Woof of Warm-Heat Diseases", 1852), Wang Meng-Ming (Wang Shi-Xiong, 1808–1867) showed the close dependence of summer heat and dampness. He also proposed different treatments for warm lurking diseases and diseases following an initial attack by a warm climatic pathogen. Finally, he warned against the use of too cold remedies in the early stage of a warm disease due to their potentiality to "congeal" the warm-heat pathogen (Liu 2001).

Other physicians elaborated on the differences between cold damage disorders and warm diseases, devoted books to specific epidemic diseases (e.g. smallpox, measles, scarlet fever, cholera, bubonic plague, etc.), further studied the pathomechanism of warm toxins or attempted to reconcile the theory of warm diseases with that of cold damage disorders (Hoizey 1988; Liu 2001; Hanson 2011). Wang Meng-Ming, for example, who observed the incursion of cholera in Hangzhou in 1837, dedicated a book on seasonal and unseasonal forms of choleric affections.[24]

Nowadays, Chinese medicine distinguishes various categories of warm diseases according to their season of emergence, the nature of the climatic pathogen involved and the fact that they occur after the initial attack or after a phase of latency: *feng wen* 风温 ("wind warmth") and *chun wen* 春温 ("spring warmth") in spring, *shu wen* 署温 ("summer heat warmth") in summer, *shi wen* 湿温 ("damp warmth") in the late summer, *qiu zao* 秋燥 ("autumn dryness") and *fu shu* 伏暑 ("latent or lurking summer heat") in autumn or winter and, finally, *dong wen* 冬温 ("winter warmth") in winter when temperature is abnormally high. Each of these diseases is characterized by specific syndromes according to the body level affected and its location in the triple burner.

2.6 Conclusion

The School of Warm Diseases introduced important changes into the medical perceptions and apprehension of the natural history, aetio-pathogeny and evolution of exogenous febrile diseases and epidemic diseases. Although the concept of warm

[24] The modern term for cholera is *huo luan* 霍乱. In the past, in China as in Europe, the term "cholera" was used to refer to the seasonal or sporadic diarrhoea. In 1841, e.g. during the third pandemic of cholera, John Snow first demonstrated the aquatic nature of the disease. However, its causal agent was only discovered in 1883 in Calcutta and Alexandria by the German bacteriologist Robert Koch. Since that time, the term "cholera" refers only to this affection. On Wang Meng-Ming's perception of cholera, see Hanson (2011).

diseases was present in the early treatises of medicine which ascribed them to the transformation into heat of pathogenic cold contracted in winter, this concept took another meaning with the development of this school of thought. It shows that warm diseases and cold damage disorders have a different nature and that warm diseases are brought on by warm-heat pathogens. Depending on the nature of the climatic pathogen, they may appear at any season. They are characterized by a rapid onset and evolution, with predominance of heat symptoms, and they readily injure body fluids. They may also occur under an endemic or an epidemic form. For example, damp-heat diseases are more common in humid and warm coastal regions of Southeast China than in dry and cold regions of the Northeast (Liu 2001).

The School of Warm Diseases also introduced new aetio-pathogenic concepts for epidemic febrile diseases: heterogeneous pestilential *qi* and epidemic toxins; invasion of the body by the nose and mouth; warm nature of pestilential *qi* or of epidemic toxin; specificity of pestilential *qi* according to the nature of the epidemic disease and to the species (e.g. humans, animals and between animal species); and favouring role of extreme climatic, social or environmental conditions (e.g. droughts, floods, famines, wars and other social turbulences, etc.) in their outbreak.

Two schools of thought on exogenous febrile diseases exist today in China: the School of Cold Damage Disorders and the School of Warm Diseases. Both have developed specific diagnosis and therapeutic approaches. The identification of patterns according to the six stages is used in the diagnosis and treatment of diseases caused by pathogenic wind and cold. The four layers and triple burner approaches are used in the diagnosis and treatment of warm diseases. Nowadays, both serve as a conceptual and diagnosis tool for the differentiation of the underlying syndromes of a wide range of infectious (e.g. eruptive fevers, Japanese encephalitis, typhoid and paratyphoid fevers, dengue fever, HIV/AIDS, scarlet fever, mumps, etc.) and not infectious (e.g. burns, allergies) diseases of western medicine, including some emerging diseases such as the H5N1 influenza or the severe acute respiratory syndrome (SARS).[25]

The theory on warm diseases arises from a thousand years of clinical observations and therapeutic experiences during the various epidemic diseases which plagued China over the time in different environments and regions. It results from the failure of other schools of thought to successfully treat warm diseases and epidemic febrile diseases. As some scholars have put it,[26] this shift in the medical perceptions on infectious and epidemic diseases may be related to the changing nature of epidemic diseases over the time and also to the physicians' growing awareness of local and regional environments with their climatic, epidemiological and medical specificities.

[25] On the apprehension of viral influenza and SARS within the framework of *wen bing*, see Tiquia (2010) and Hanson (2011).

[26] On the impact of the regional perspective in medicine on the formation of the School of Warm Diseases, see Hanson (2011).

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