



The taste of heat: How humoral qualities act as a cultural filter for chemosensory properties guiding herbal medicine



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ABSTRACT

Ethnopharmacological relevance: Organoleptic properties, and more specifically chemosensory cues, have been shown to guide therapeutic applications of medicinal plants. Humoral qualities, on the other hand, are widely believed to be an abstract concept, mainly applied *post hoc* to validate therapy. However, the nexus between humoral qualities, chemosensory properties, and medicinal plant uses has never been systematically assessed.

Aim of the study: To systematically analyse the correlations between chemosensory properties, humoral qualities, and medicinal uses of selected botanical drugs.

Methods: The issue was approached experimentally via an organoleptic testing panel, consisting of Zoque healers in Chiapas, Mexico. The healers smelled and tasted 71 selected herbal drugs and subsequently commented on their humoral qualities and therapeutic uses. The resulting dataset is analysed for correlations between these variables using Bayesian statistics. Qualitative data on the characteristics and role of the hot-cold dichotomy complement the quantitative analysis, facilitating meaningful interpretation.

Results and discussion: The results reproduce and extend the findings of previous studies, which established specific correlations between chemosensory cues and nosological units. The key predictors of drugs' therapeutic uses, however, are their humoral qualities, which are themselves conditioned by taste and smell. These findings appear to be valid for drug samples known to the participants as well as for unfamiliar samples. Thus, this study establishes the role of the hot-cold dichotomy as an important cultural filter connecting organoleptic properties and therapeutic uses of herbal drugs.

Conclusions: There is considerable cross-cultural consensus in Mesoamerica for the specific correlations described in this study. Given the continued pervasiveness of the hot-cold dichotomy, humoral qualities and the underlying organoleptic properties ought to be increasingly considered in the design of pharmaceutical products as well as public health strategies. Such culturally appropriate adjustments may considerably improve the perceived quality and effectiveness of healthcare.

1. Introduction

The hot-cold dichotomy is the most widespread explanatory concept in Mesoamerican folk medicine and has received considerable amount of attention in anthropological research (see Anderson, 1987; Foster, 1994; Manderson, 1987; and Messer, 1987 for an overview). According to this concept, illness is the result of a disturbed equilibrium and treatment is based on the principle of opposites. Its basic framework, thus, strikingly resembles the maxims of humoral medicine (cf. Galen, 1561; Jackson, 2001). Indeed, the influence of European humoral concepts on

Mesoamerican medical beliefs and practices is undeniable (Currier, 1966; Foster, 1953, 1987, 1994: 147–164; Madsen, 1955). On the other hand, epistemological evidence (see glossary) implies a pre-Columbian (before CE 1492) foundation, as the principle of binary opposition figured prominently in indigenous medical systems (Lopez Austin, 1980: 285–318; Manderson, 1987; Messer, 1987; Ortiz de Montellano, 1980; Tedlock, 1987). Bye et al. (1995: 76) and Ortiz de Montellano (1990: 205–9) have argued that analogous concepts of polar opposites formed the basis for the rapid syncretic evolution of medical theory and practice in post-conquest Mexico.

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A recent ethnopharmacological study (García-Hernández et al., 2015) pointed out the crucial role of humoral qualities (see glossary) in determining therapeutic uses of herbal drugs. Foster (1988, 1994: 134) and Messer (1981), on the contrary, concluded that the hot-cold dichotomy serves only for *post hoc* validation of treatment. That is, remedies are not chosen based on humoral criteria; rather, humoral qualities are assigned, *a posteriori*, according to the drugs' perceived effectiveness in curing particular ailments. Despite its continued pervasiveness, the hot-cold dichotomy has been criticised for being excessively abstract, arbitrary, flexible, and narrow in order to be empirically verified (Ankli et al., 1999; Brett, 1994; Foster, 1994: 138; Logan and Morrill, 1979; Ortiz de Montellano and Browner, 1985). However, recent pharmacological studies indicate that there is a physiological basis for the hot-cold classification of herbal drugs in traditional Chinese and Iranian medicine (Chao et al., 2011; Parvinroo et al., 2014; Zhao et al., 2011).

Among Mesoamerican societies, chemosensory properties (see glossary) play an important role in evaluating the medicinal potential of plants (Ankli et al., 1999; Brett, 1998; Brett and Heinrich, 1998; Frei et al., 1998; Heinrich, 1998; Leonti et al., 2002). Gustatory and olfactory cues are considered when distinguishing medicinal from non-medicinal taxa as well as for guiding specific uses. As sensory cues can be related to plant secondary metabolites, these data have a particular potential to bridge the gap between traditional medicine and modern pharmaceutical sciences (Ankli et al., 1999; Brett and Heinrich, 1998; Johns, 1990: 288; Shepard, 2004). While sensory perception is essentially a physiological process, the interpretation and evaluation of chemical stimuli is to a large degree determined by culture (Brett and Heinrich, 1998; Classen, 1997; Johns, 1990: 3, 14, 163; Leonti, 2011; Purves et al., 2004: 355; Sorokowska et al., 2014).

Several studies discuss the relationship between chemosensory and humoral qualities of medicinal plants (Berlin and Berlin, 1996: 60–67; Brett, 1994; Frei et al., 1998; Leonti et al., 2002; Messer, 1981; Tedlock, 1987). However, the interrelation and its role in determining therapeutic uses have never been systematically assessed. This case study with the Chiapas Zoque therefore aims at:

- (i) Contributing to an enhanced scientific understanding of humoral theory in traditional Mesoamerican medicine by describing the hot-cold dichotomy as an ethnomedical concept of the Chiapas Zoque.
- (ii) Providing further data describing the role of chemosensory cues for the selection of herbal medicine.
- (iii) Assessing whether there is an empirical basis for the hot-cold dichotomy in folk medicine by testing for correlations between humoral qualities, chemosensory properties, and medicinal uses of selected botanical drugs (Fig. 1).

2. Ethnobotanical background

The Zoque belong to the Mixe-Zoque linguistic family (Wichmann, 1995: 8–12), the members of which are considered to have descended from the Olmecs, Mesoamerica's "mother culture" (e.g. Campbell and Kaufman, 1976; Coe and Houston, 2015: 14; Coe and Koontz, 2013: 62; Justeson and Kaufman, 1993). The Chiapas Zoque have established their communities in diverse ecological environments, including both humid and dry tropical lowlands as well as humid temperate highlands (Thomas, 1974: 33–38; Villa Rojas, 1975: 21). Although the national and globalized cultures are increasingly influential in Zoque communities, most still rely on family-based agriculture for their subsistence and traditional medicine plays an important role in local healthcare. In a recent study we have documented 3633 use-reports on 421 plant species used medicinally by the Zoque of Chiapas (Geck et al., 2016).

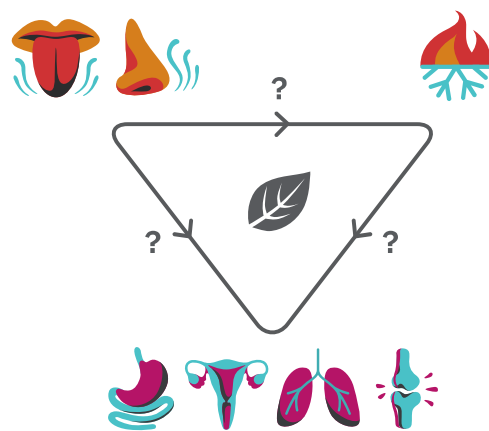


Fig. 1. The epistemological model underlying the principal research question: How are chemosensory cues, humoral concepts and therapeutic uses of medicinal plants correlated?.

3. Methods

Field research was carried out from July 2014 to July 2015 in five municipalities of Chiapas, Mexico. Participant observation and semi-structured interviews were essential for establishing the ethnobotanical background. The former was particularly important in order to achieve a certain degree of embodiment of local flavours and odours. Terms in Zoque language have been transcribed according to the standard established by indigenous academics and the Mexican National Institute of Indigenous Languages (INALI, 2011).

3.1. Focus group sessions

In order to obtain a detailed understanding of the concepts underlying the ethnomedical system, four focus groups were established (Bernard, 2006: 232–239), representing the ecological diversity of the Zoque homeland. Each focus group consisted of four to six healers and in each group at least one midwife, one bonesetter, and one herbalist were present (purposive sampling; cf. Bernard, 2006: 189–191). All informants also participated in the previous ethnobotanical study and were fluent in both Zoque and Spanish. Every group met for three two-day sessions revolving around the following topics:

- (i) Disease classification and aetiology (see glossary);
- (ii) The hot-cold dichotomy and its function and meaning in traditional worldview and medicine;
- (iii) Concepts and terminology of taste and smell and their importance in regard to herbal medicine.

In session one, the participants classified all the illnesses and diseases recorded during fieldwork (Geck et al., 2016) in a modified version of free pile sorts (Bernard, 2006: 311–315). The disease terms were written on pieces of paper, which the participants grouped and regrouped until circumscribable categories, or nosological units (see glossary), emerged. The consensus between the four focus groups yielded 17 emic-defined (see glossary) disease-categories (cf. Staub et al., 2015). In the following, discussions focussed mostly on the aetiology of the different types of illness and disease.

In the second session, the participants were asked to explain their understanding of hot and cold and the applicability of this concept to different aspects of the natural and supernatural world. Subsequently, the emphasis was on the role of the concept in traditional Zoque medicine. Specific questions discussed included:

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