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Original Article

Hot, cold, moist, and dry qualities in Unani (Greek) and Avicennian medicine: A modern medical perspective

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ABSTRACT

In Traditional Greek Medicine and the medical teachings of Avicenna (Ibn Sina), foods, natural and herbal products, chemical compounds, and nutritional supplements are categorized based on four fundamental temperaments: "hot," "cold," "moist," and "dry." Each temperament is believed to exert distinct effects on metabolism, circulation, nervous system activity, hormonal regulation, and fluid balance in the body. Despite the widespread use of this classification, the underlying physiological and biochemical mechanisms have not been fully elucidated within the framework of modern medicine, and its applications have largely relied on clinical observations. This paper proposes a conceptual model that links traditional temperaments to specific neurohormonal, vascular, and biochemical pathways. The hot temperament is associated with increased sympathetic activity, elevated catecholamines, enhanced thyroid hormone levels, reduced prostaglandins, increased basal metabolic rate, and a tendency toward metabolic alkalosis. The cold temperament correlates with parasympathetic dominance, reduced thyroid hormone levels, increased prostaglandins, decreased basal metabolism, and a tendency toward metabolic acidosis. The moist temperament is linked with activation of the renin–angiotensin–aldosterone system (RAAS) and increased secretion of antidiuretic hormone (ADH), resulting in water and sodium retention, whereas the dry temperament is associated with decreased ADH activity or increased water excretion and elevated plasma osmolality, with influences from both the sympathetic/parasympathetic systems and aging. This model not only aligns traditional concepts with modern physiological structures but also provides a foundation for designing future empirical studies to validate these correlations using measurable biochemical and physiological markers.

Keywords: Traditional Greek Medicine, Avicenna, Temperament, Neurohormonal regulation, RAAS, ADH, Prostaglandins, HPA axis.

Introduction

The theory of temperaments in Greco-Arabic medicine, extensively described in the works of Avicenna, especially in *The Canon of Medicine*, provides a crucial framework for understanding how foods, medicinal plants, and pharmacological substances affect human health. According to this theory, each substance possesses inherent qualities that can influence the body toward heat, cold, moisture, or dryness, with these changes mediated through complex physiological pathways. (Avicenna, 2005; Avicenna, 2012)

Despite significant advances in neuroscience, endocrinology, and biochemistry, scientific interpretations of these concepts have received limited attention. The aim of this study is to present a conceptual model that integrates traditional temperament classifications with known physiological, neurological, hormonal,

and biochemical pathways. (Guyton & Hall, 2021)

Materials and Methods

This research adopts a conceptual modeling approach. Sources include classical texts of Greco-Arabic medicine, Avicenna's writings, and modern studies in neuroendocrinology, cardiovascular physiology, water and electrolyte balance, and metabolism. (Avicenna, 2005; Avicenna, 2012)

Based on the data, the four primary temperaments were mapped to the following pathways:

- **Hot temperament:** Increased sympathetic activity, elevated epinephrine/norepinephrine, increased thyroid hormones (T3/T4), reduced prostaglandins, increased basal metabolic rate (BMR), tendency toward metabolic alkalosis. (Poyser, 1973)
- **Cold temperament:** Increased parasympathetic activity, reduced thyroid hormones, increased prostaglandins, decreased BMR, tendency toward metabolic acidosis. (Poyser, 1973)
- **Moist temperament:** Activation of RAAS, increased ADH secretion, water and sodium retention. (Patel et al., 2017)
- **Dry temperament:** Decreased ADH activity or increased water excretion, elevated plasma osmolality, and influence of aging. (Kanbay et al., 2019; Verbalis, 2003)

Results and Discussion

Linking temperaments to physiological pathways

This model suggests that the hot–cold axis is primarily associated with autonomic nervous system regulation and thyroid function, whereas the moist–dry axis is linked with water and electrolyte regulatory systems such as RAAS and ADH. (Patel et al., 2017)

Basal Metabolic Rate (BMR)

BMR refers to the minimum energy required to maintain essential physiological functions like respiration, cardiac rhythm, body temperature regulation, and cellular activities at rest. Factors such as age, sex, body weight, composition, and genetics influence BMR, which typically accounts for 60–75% of daily energy expenditure. This explains why BMR is elevated in hot temperaments and reduced in cold temperaments.

Acid–base balance and blood pH

- The normal pH range of blood is between 7.35 and 7.45, with an average of approximately 7.40.
- The tolerable range is narrow, from 7.00 to 7.70, and deviations can lead to coma or death.
- The body maintains this balance through three buffering systems: bicarbonate, proteins (especially hemoglobin), and phosphates.

These mechanisms explain why hot temperaments are prone to alkalosis, while cold temperaments are associated with acidosis.

Thyroid activity

Even within normal ranges, thyroid hormones can fluctuate slightly, influencing energy, metabolism, body weight, and mood. These variations may subtly reflect the dominance of hot or cold temperaments.

Prostaglandins

Prostaglandins are hormone-like compounds produced in response to physiological stimuli or tissue injury, leading to effects such as vasodilation, increased permeability, fever, pain, and smooth muscle contraction. Elevated prostaglandins are linked with cold temperaments, while reduced levels are associated with hot temperaments. (Poyser, 1973)

Autonomic Nervous System (ANS)

- **Sympathetic branch:** Increases heart rate, blood pressure, blood glucose, and reduces digestive activity → related to hot temperament.
- **Parasympathetic branch:** Decreases heart rate and blood pressure, increases gastrointestinal motility and secretions → related to cold temperament.

Renin–Angiotensin–Aldosterone System (RAAS) (Patel et al., 2017)

RAAS is a key regulatory mechanism controlling blood pressure and fluid balance. It is activated under conditions of low blood pressure or sodium depletion, leading to the secretion of renin from the kidneys and subsequent formation of angiotensin II and aldosterone. This results in sodium and water retention and vasoconstriction, thereby increasing blood pressure. In contrast, inhibition of RAAS under hypervolemic or hypertensive conditions leads to increased sodium and water excretion and reduced blood pressure. (Patel et al., 2017)

This mechanism aligns with the moist temperament (fluid retention) and, when impaired, the dry temperament (water loss and increased osmolality).

Antidiuretic Hormone (ADH) (Kanbay et al., 2019; Verbalis, 2003)

ADH (vasopressin), secreted by the posterior pituitary gland, plays a major role in water reabsorption in the kidneys. Increased secretion reduces urine volume and raises blood volume, whereas decreased secretion promotes water excretion and dilute urine. Disorders of this system can lead to conditions such as diabetes insipidus or hyponatremia. (Kanbay et al., 2019; Verbalis, 2003)

These functions directly correspond to the moist–dry axis in temperament theory.

Sympathetic and Parasympathetic Regulation of Water Balance

Sympathetic activation causes renal vasoconstriction and stimulates RAAS, leading to sodium and water retention (moist temperament). Conversely, reduced sympathetic tone (parasympathetic dominance) enhances renal blood flow and promotes water excretion (dry temperament). (Patel et al., 2017)

Aging and Body Water Content

Body water content varies across the lifespan: approximately 75% in infants, 55–60% in adults, and potentially 50% or lower in the elderly. This reduction, due to muscle mass loss, increased fat content, and declining kidney function, manifests as dry skin, wrinkles, and heightened dehydration risk, reflecting a natural shift toward the dry temperament in older adults.

Examples

The overall temperament of a substance is determined by the net effect of several physiological mechanisms, with one factor sometimes dominating the others.

- **Ginger:** Increases blood pH, raises BMR, and stimulates the sympathetic system → hot temperament.
- **Cinnamon:** Contains cinnamaldehyde and eugenol → increases BMR, improves peripheral blood flow, mildly stimulates the sympathetic nervous system → hot temperament.
- Red chili: Enhances BMR, stimulates the sympathetic system, promotes thermogenesis, and activates the HPA axis → hot temperament, with minimal impact from prostaglandins. (Poyser, 1973)
- **Sour substances:** Reduce blood pH → cold temperament.
- **Atropine alkaloids (from *Atropa belladonna*):** Inhibit parasympathetic activity → hot temperament.
- **Licorice:** Promotes water retention → moist temperament.
- **Horsetail (*Equisetum*):** Increases water excretion → dry temperament.

Conclusion

Temperament is the net outcome of several physiological mechanisms that may act in different directions. The hot–cold axis is primarily associated with neurohormonal regulation (sympathetic/parasympathetic activity and thyroid function), while the moist–dry axis relates to water and electrolyte balance systems such as RAAS and ADH. Prostaglandins, acid–base status, thyroid function, and autonomic nervous system changes may serve as measurable biochemical markers for describing temperaments. Additionally, age-related changes in body water content explain the tendency of infants toward moist temperaments and older adults toward dry

temperaments. This conceptual model lays the groundwork for designing future empirical studies to explore and validate the relationships between traditional temperaments and quantifiable physiological markers. (Patel et al., 2017)

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