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"VIRYA AND THE THERMAL AND METABOLIC EFFECTS OF MEDICINAL PLANTS: A CRITICAL REVIEW OF EXPERIMENTAL APPROACHES TO USHNA AND SHEETA POTENCY"

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ABSTRACT
Virya, usually translated as potency, is the property by which Ayurveda explains a drug's main action. In the dominant two-fold scheme, drugs are either ushna (hot) or sheeta (cold). Hot drugs are said to promote digestion, sweating and dissolution of accumulations, and cold drugs to soothe, nourish and stop bleeding. The concept parallels the hot and cold properties of traditional Chinese medicine and the temperaments of Persian medicine. We review how virya can be tested. At the molecular level, the discovery of thermosensitive transient receptor potential (TRP) channels showed that the heat receptor TRPV1 responds to capsaicin and the cold receptor TRPM8 to menthol, providing a mechanism by which plant compounds evoke sensations of heat and cold. At the physiological level, a meta-analysis of human studies found that capsaicin and capsiate modestly increase energy expenditure and fat oxidation. A three-month randomised trial of ginger extract, by contrast, found no change in resting energy expenditure. Research on Chinese hot herbs, such as aconite, dried ginger and cinnamon, has linked them to activation of brown adipose tissue and thermogenic gene expression, and cold herbs to antipyretic effects through TRPM8 and fever mediators. Research on Ayurvedic virya itself is sparse and has used indirect measures such as the thermal diffusivity of oils. We propose a set of physiological endpoints for testing ushna and sheeta virya, from sensory and TRP-channel assays to energy expenditure, thermoregulation and digestive function, and recommend comparative studies of drugs of opposite virya under standardised conditions.

KEYWORDS: Virya, ushna, sheeta, TRP channels, TRPV1, TRPM8, thermogenesis, energy expenditure, Dravyaguna

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INTRODUCTION

Among the five properties by which Dravyaguna describes a drug – rasa, guna, virya, vipaka and prabhava – virya is regarded as the one through which a drug acts.[1] Classical authors record two views: an eight-fold virya comprising pairs such as hot and cold, unctuous and dry, heavy and light, and soft and sharp, and a two-fold virya of ushna (hot) and sheeta (cold) that became the dominant scheme.[1,2] Ushna drugs are described as promoting digestion, sweating, thirst and burning, dissolving accumulations and aggravating pitta, whereas sheeta drugs are soothing, nourishing, stop bleeding and pacify pitta.[1]

The hot–cold scheme is not unique to Ayurveda. Traditional Chinese medicine classifies herbs by hot and cold properties, and Persian medicine by temperament. These parallels suggest that the scheme reflects real, perceptible effects of plants on the body. Modern physiology offers tools to test it: receptors that detect heat and cold, measurements of energy expenditure and thermoregulation, and molecular markers of thermogenesis. This review summarises relevant experimental evidence and proposes how Ayurvedic virya could be tested.

METHODS

This is a critical narrative review. We searched PubMed, publisher websites and repositories for studies relevant to the thermal and metabolic effects of medicinal plants classified as hot or cold in Ayurveda or other traditional systems, including studies of thermosensitive receptors, energy expenditure, thermogenesis and fever.

3. MOLECULAR BASIS: THERMOSENSITIVE TRP CHANNELS

The identification of thermosensitive transient receptor potential (TRP) channels transformed understanding of how plant compounds evoke sensations of heat and cold. TRPV1 is a heat-activated channel that responds to capsaicin, the pungent compound of chilli.[3] TRPM8 is activated by cold and by menthol, which explains the cooling sensation of mint.[4] Piperine, the pungent alkaloid of black and long pepper, also activates TRPV1.[5] These findings show that the hot sensation produced by many ushna drugs and the cool sensation produced by some sheeta drugs have defined molecular receptors (Table 1).

Table 1. Thermosensitive TRP channels and plant compounds relevant to virya.

Channel	Physiological stimulus	Plant activators	Relevance to virya
TRPV1	Noxious heat	Capsaicin;[3] piperine[5]	Burning sensation of ushna, pungent drugs (Maricha, Pippali)
TRPM8	Cool to cold temperatures	Menthol[4]	Cooling sensation of some sheeta drugs
TRPA1	Noxious cold; irritants	Pungent compounds from mustard, garlic, cinnamon	Pungency without heat; mixed thermal effects

A receptor that produces a sensation of heat is not the same as a drug that heats the body, but the two may be linked. TRPV1 activation in the gut and sensory nerves can trigger thermogenic and sympathetic responses, and channels of this family are expressed beyond the mouth and skin.[6]

PHYSIOLOGICAL EVIDENCE: ENERGY EXPENDITURE AND THERMOGENESIS

Human studies of energy expenditure test whether hot drugs actually increase heat production. A critical review and meta-analysis of seventeen studies concluded that capsaicin and its non-pungent analogue capsiate increase energy expenditure and fat oxidation and may slightly reduce appetite, although the effects are small.[7] In a crossover trial in lean adults, 1 g of red pepper increased postprandial energy expenditure by about 10 kcal over 270 minutes, and oral exposure produced greater effects than capsules, suggesting that sensory stimulation contributes.[8] Ginger, a classical ushna drug, did not increase resting energy expenditure, body composition or blood pressure in a three-month randomised placebo-controlled trial of 600 mg dry extract in women with excess adiposity.[9] Hot taste is therefore not a reliable predictor of measurable thermogenesis, at least at the doses and preparations tested.

Research on traditional Chinese medicine provides the most extensive body of experimental work on hot and cold herbs. A review of this literature found that hot herbs such as Fuzi (processed aconite), Ganjiang (dried ginger) and Rougui (cinnamon bark) promote

thermogenesis, mainly by activating brown adipose tissue and inducing browning of white fat through the PPARγ, SIRT1 and PGC-1α pathway.[10] Cold herbs such as Huanglian, Huangqin and Dahuang showed antipyretic effects associated with TRPM8 activation, TRPV1 inhibition and reduced fever mediators.[10] The review also noted that herbs of the same property can act through quite different targets, so that heat or cold is a shared outcome rather than a shared mechanism.[10]

STUDIES OF AYURVEDIC VIRYA

Direct experimental study of Ayurvedic virya is sparse. One study measured the thermal diffusivity of coconut oil formulations containing plants of hot and cold virya and found that black pepper lowered thermal diffusivity, which the authors interpreted as heat retention, whereas aloe, hibiscus and holy basil increased it; some plants classed as hot behaved unexpectedly, suggesting a concentration dependence.[11] Such physical measurements of a preparation do not test the effect of a drug on the body, which is what virya describes. We found no study that compared a set of classical ushna and sheeta drugs head-to-head using physiological endpoints in humans.

PROPOSED ENDPOINTS FOR TESTING VIRYA

Classical descriptions of the actions of ushna and sheeta virya can be translated into measurable endpoints (Table 2).

Table 2. Classical actions of virya and proposed measurable endpoints.

Classical action	Proposed endpoints
Hot or cold sensation	Trained sensory panel ratings; activity on TRPV1, TRPA1 and TRPM8 in cell assays[3,4]
Promotes heat production (ushna)	Resting and postprandial energy expenditure by indirect calorimetry; brown adipose tissue activity[7,10]
Promotes sweating and thirst (ushna)	Skin temperature and conductance; sweat rate; fluid intake
Promotes digestion (ushna)	Gastric emptying; digestive enzyme secretion; postprandial glycaemia
Cools, pacifies burning (sheeta)	Core and skin temperature in heat stress; antipyretic effect in fever models[10]
Stops bleeding (sheeta)	Haemostatic and vascular measures

The most informative designs would compare several drugs of opposite classical virya under identical, standardised conditions, with blinding where possible, rather than test a single drug against placebo. Such comparative studies would show whether the classical classification predicts the direction of physiological effects.

A DRAVYAGUNA PERSPECTIVE

The evidence suggests that virya captures something real: plant compounds do evoke heat and cold through defined receptors, some hot drugs increase energy expenditure, and hot and cold herbs in Chinese medicine have distinguishable physiological effects.[10] It also shows that the relationship is not simple. Ginger, a classical ushna drug, did not raise energy expenditure over three months,[9] and herbs of the same property work through different mechanisms.[10] Classical texts describe virya as the effect of a drug on the body as a whole, which includes digestion, circulation and tissues, not only heat production. Energy expenditure alone is therefore too narrow a test, and a panel of endpoints is needed.

LIMITATIONS

Much of the experimental evidence comes from traditional Chinese medicine, whose hot and cold categories overlap with but are not identical to Ayurvedic virya. Human studies of capsaicin and ginger used isolated compounds or extracts at doses that may differ from classical use. This review is narrative.

CONCLUSION

Virya rests on observable effects of plants on bodily heat and function, and thermosensitive TRP channels, thermogenesis studies and research on Chinese hot and cold herbs support its general plausibility. Direct tests of Ayurvedic virya are rare, and the available data show that classical hot or cold status does not always predict a measurable thermal effect. Comparative studies using a panel of sensory, molecular and physiological endpoints offer a practical route to testing this central Dravyaguna concept.

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