Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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Viewpoint

Ayurveda and COVID-19: Where psychoneuroimmunology and the meaning response meet

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ABSTRACT

The COVID-19 pandemic has led to high levels of psychological distress in the general public, including symptoms of anxiety and depression. Such distress is associated with alterations in immune function, including an elevated risk of viral respiratory tract infections. In this light, the possible effects of Ayurveda, a traditional system of medicine promoted by the Indian government as an "immune booster", are examined from the point of view of psychoneuroimmune mechanisms as well as the "meaning response" described by Moerman. It was found that many of the measures advocated in their guidelines could positively influence immunity either by direct effects on symptoms of depression or anxiety, or through their symbolic significance. Therefore, it is possible that such traditional practices could be beneficial both in terms of psychological quality of life, and in terms of moderating the risk of infection.

1. The meaning response and psychoneuroimmunity: An analysis of the Indian government's Ayurvedic immunity-boosting measures for the COVID-19 crisis

With over 2,400,000 cases and 170,000 deaths reported to date (April 21st, 2020), the COVID-19 pandemic is a global health crisis with an actual or potential impact on citizens of all nations. This outbreak has already had a significant impact on mental health, especially in vulnerable groups such as healthcare workers (Rajkumar, 2020). Besides causing distress in their own right, these psychological symptoms have the potential to adversely impact immune functioning. Psychosocial factors such as stress, anxiety and depression are associated with increased susceptibility to viral upper respiratory infections (Pedersen et al., 2010) and can influence the immune response to the influenza vaccine (Whittaker, 2018). Such findings suggest that a link between psychological distress and immune responses to COVID-19 infection is biologically plausible and deserves further attention.

In India, the practice of modern medicine co-exists with indigenous systems of medicine, such as Ayurveda, Unani and Siddha, which are extensively used by wide sections of the population (Shankar and Patwardhan, 2017). In response to the COVID-19 crisis, the Indian government released a set of guidelines, developed based on the opinion of 16 eminent *vaidyas* (traditional doctors), entitled "Ayurveda's immunity boosting measures for self care during the COVID-19 crisis", and made them available to the public (https://www.ayush.gov.in/docs/123.pdf). These guidelines listed ten measures that were aimed at boosting immunity against infection, though without any specific claims being made with reference to COVID-19.

From a scientific viewpoint, it is worth examining such recommendations in terms of knowledge derived from two contemporary models. The first, psychoneuroimmunology, is based on evidence of an intimate link between the nervous, endocrine and immune systems, and explains the mechanisms by which stress and emotional disorders can modulate the immune response to infection (Kim and Su, 2020). The second, the "meaning response", was developed by Moerman as an alternative to the concept of the "placebo response". According to this model, an individual's response to any given treatment depends not only on its pharmacological properties, but on the meaning they ascribe to this treatment. This meaning is largely shaped by the culture they live in (Moerman, 2013). Both these models – psychoneuroimmunology and the meaning response – are valuable in understanding the effect of treatments that do not work via a conventional "scientific" paradigm, and are not mutually exclusive; a "meaningful" intervention could modulate immune function through its effects on psychological distress.

Table 1 shows the application of these paradigms to the 10 measures recommended by Ayurvedic specialists and published by the Government of India.

A potential psychoneuroimmune mechanism was identified for five of the proposed methods, via neurobiological mechanisms such as modulation of monoamine function, stress axis response and autonomic activity, as well as reduction of anxiety, depression and perceived stress in human subjects (Sarris, 2018). In terms of the "meaning response"

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Table 1
Content analysis of the Government of India's recommended Ayurvedic practices guidelines.

Intervention	Potential psychoneuroimmune mechanism	Meaning response
Drink warm water throughout the day	–	+, seen as "cleansing the body"
Daily practice of yoga	+, via modulation of stress responses, monoamine function and parasympathetic activity	+, seen as promoting physical fitness
Use of specific spices – turmeric, coriander, cumin, garlic	+, via evidence of monoamine and gamma-amino butyric acid neurotransmission and alleviation of depression in controlled trials	+, seen as an essential part of nutrition and "health promoters"
Take *Chyawanprash* (a traditional Ayurvedic preparation) every morning	+, via evidence of reduction of depression and anxiety in controlled trials	+, seen as "rejuvenating" the body
Drink herbal tea made from *tulsi* (basil), cinnamon, black pepper, ginger, raisins	+, via evidence of reduction in depression, anxiety and stress in controlled trials	+, seen as a specific remedy for cough and respiratory problems
"Golden milk: (warm milk with turmeric) once or twice a day	+, see "Use of specific spices" above	+, the "golden" colour symbolizes health and prosperity
Nasal application – apply sesame oil / coconut oil or *ghee* (clarified butter) twice a day	–	+, seen as a healing substance and a "coolant" for the body
"Oil pulling therapy" – rinsing the mouth with oil for 2–3 min and then spitting it out	–	+, a traditional folk remedy for a variety of ailments
Steam inhalation with mint leaves or caraway seeds	–	+, seen as effective against respiratory problems
Use of clove powder mixed with honey or sugar for throat irritation or cough	–	+, seen as a treatment for throat diseases

Key: +, present; -, absent.

evoked by these measures, a symbolic meaning based on relevant tradition from Ayurvedic literature, and often echoed by folk practices, could be identified in all ten cases. These meanings were related to substances seen as rejuvenating, to "cleansing" of the body, to the local application of medicinal substances, to specific effects against cough, sore throat and respiratory disease, and even to the symbolic meaning of a particular colour in terms of health and prosperity (Ali, 1998; Shrivastava et al., 2020).

Viewed through these lenses, it is possible that such traditional measures can positively influence mental health and immune function. For some, there is already putative evidence of a cellular mechanism, at least *in vitro*, which could modulate psychoneuroimmune pathways in a positive way; in others, the effect can only be inferred from evidence of efficacy in alleviating psychological distress or in providing a symbolic meaning related to health, well-being and protection against specific diseases. While there is no direct evidence that the "meaning response" can affect immune function, it may be associated with alterations in immune-inflammatory activity *in vivo*, as well as with reduced stress, anxiety and mood, mediated through effects on mesolimbic and mesocortical brain circuits (Oken, 2008).

The relevance of these effects to psychological and immune function during the COVID-19 outbreak requires direct experimental testing, and the Government's guidelines themselves recommend that these measures be used only side-by-side with appropriate hygienic precautions, and that consultation in a medical setting should be sought immediately if symptoms suggestive of COVID-19 emerge. If they can be confirmed, such effects would be consistent with anthropological perspectives which show that there is no irreconcilable difference between Ayurvedic and "biological" models of mind–body medicine , with psychoneuroimmunology and the meaning response providing potential "missing links" between the two. The further development of such explanatory models could clarify the usefulness of "traditional" medical practices during disease outbreaks, and could facilitate a more synergistic interaction between traditional and modern medicine (Shankar and Patwardhan, 2017).

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.bbi.2020.04.056.

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