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Review Article

FROM *NASA* TO *GARBHASHAYA*: DECODING THE NEURO-HORMONAL PATH OF *NASYA*

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ABSTRACT

Nasya karma, a principal *Panchakarma* procedure, uses the nasal route to access the brain and central nervous system directly, a concept articulated in classical Ayurveda as *Nasa hi shiraso dwaram*. This review examines the neuro-hormonal basis of *Nasya*, integrating classical descriptions with contemporary neuroanatomical and pharmacological understanding. The nasal mucosa, innervated by the olfactory, trigeminal, and facial nerves, provides a pathway that bypasses the blood-brain barrier, enabling drugs to influence the hypothalamus and limbic system. Lipid-based media such as *Taila* and *Ghrita* used in *Nasya* are discussed as functional analogues of modern lipid-based permeation enhancers, while *Choorna* formulations are compared with bio-adhesive intranasal powders. The review further explores the nasal-reproductive axis, proposing that *Nasya* modulates *Prana Vata* and *Apana Vata* to influence hypothalamic GnRH pulsatility and the Hypothalamic-Pituitary-Ovarian axis, thereby affecting ovarian steroidogenesis, endometrial receptivity, and *Garbhashaya* function. These correlations offer a plausible neuroendocrine mechanism for the therapeutic use of *Nasya* in gynecological conditions such as abnormal uterine bleeding, anovulation, and functional infertility, reinforcing *Nasya* as a non-invasive neuroendocrine intervention bridging Ayurvedic and modern medical science.

INTRODUCTION

Nasya karma, one among key component of *Panchakarma*, occupies a unique position in Ayurvedic therapeutics due to its direct access to the brain and central nervous system. According to Ayurveda classics *Nasyakarma* is defined as "*Nasa hi shiraso dwaram*", the nasal route is recognized as the most effective gateway for treating conditions of head and neck regions. This conceptualization, articulated centuries ago, finds remarkable resonance in contemporary neuroscience, which acknowledges the nasal cavity as a critical interface between the external environment and the central nervous system.

Nasal administration serves as a route of drug delivery to the nose that are absorbed through the nasal mucosa to exert local or systemic therapeutic and preventive effects.[1] Nasal mucosa is supplied by both ophthalmic and maxillary branches of trigeminal nerve and facial nerve also contribute to supply the region, whereas olfaction is facilitated by olfactory nerve. Thus has the action of three cranial nerves. *Nasya* facilitates functional modulation of higher brain centers, including the hypothalamus and limbic system. These centers play a pivotal role in maintaining neuroendocrine homeostasis, emotional regulation, and cognitive processing, thereby extending the effects of *Nasya* beyond mere local action.[2]

Acharya Charaka explains that medicines administered through the nasal route reach the brain and selectively eliminate morbid *Doṣhas*.[3] This view is supported by *Acharya Sushruta's* anatomical descriptions and further detailed in *Ashtanga Sangraha*, which states that nasally administered drugs spread to the brain and head–neck region via *Shringataka Marma*, facilitating the removal of diseased *Doṣhas*.[4]

Drug delivery to the brain is challenging due to physiological barriers such as the blood–brain barrier, enzymatic degradation, hepatic metabolism, and systemic elimination. Most macromolecules cannot

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cross the BBB, resulting in reduced drug availability and therapeutic efficacy in the brain.[5]

MATERIALS AND METHODS

Relevant information was collected from classical Ayurvedic texts including *Charaka Samhita, Sushruta Samhita*, and *Ashtanga Sangraha*, along with contemporary literature retrieved from PubMed, Google Scholar, and Scopus. Articles published addressing the neuroanatomical basis, pharmacokinetics, and therapeutic applications of nasal drug administration were reviewed and synthesized to correlate classical Ayurvedic concepts with modern neuro-hormonal mechanisms.

Review of Literature

Types of *Nasya*

Nasya, one of the important *Panchakarma* procedures, is classified into several types based on the nature and purpose of the therapy. The main types of *Nasya* include *Navana, Avapida, Dhumapana, Dhmapana*, and *Pratimarsa. Navana Nasya* is commonly employed for both *Snehana* and *Sodhana* purposes; *Snehana Navana* is useful in hormonal imbalances and *Vata*-predominant menopausal symptoms, while *Sodhana Navana* is indicated in *Kapha*-predominant conditions such as PCOS and infertility. *Avapida Nasya* is primarily used for *Sodhana* and *Sthambhana* actions, making it beneficial in conditions like bleeding disorders including *Asrigdara*. *Dhumapana Nasya* helps in *Srotoshodhana* and is especially useful in disorders like *Ardhavabhedaka. Dhumana Nasya* is mainly indicated in *Kapha*-predominant conditions. *Pratimarsa Nasya*, a mild and daily applicable form, plays an important role in regulating the menstrual cycle and is widely used as a preventive therapy.[6]

According to *Acharya Susruta, Nasya* is described under the terms *Nasya, Sirovirechana, Pratimarsa, Avapida*, and *Pradhmana. Sirovirechana Nasya* is emphasized for expelling morbid *Doṣhas* from the head, while *Pratimarsa* is advocated for regular use.[4]

According to *Acharya Vagbhaṭa, Nasya* is mainly classified based on its therapeutic action into *Virechana (Sodhana), Bṛmhaṇa,* and *Samana* types, highlighting both eliminative and nourishing effects of nasal drug administration.[7]

Mode of action of *Nasya*

Nasya therapy involves the intranasal administration of medicated substances in liquid, powder, or gaseous forms. Most *Nasya* drugs possess *Katu, Tikṣṇa*, and *Uṣṇa* properties, which promote *Dravikaraṇa* (liquefaction) and *Chedana* (elimination) of vitiated *Doṣhas*, while *Kashaya rasa* produces astringent effects and *Madhura rasa* provides cooling and nourishing actions. Following administration, the drug traverses the *Nasa srotas* and reaches *Sṛngataka marma*, an *Urdhvajatrugata Sadyapraṇahara marma* connected with the vascular channels of the nose, eyes, ears, and tongue. From this site, the medicament disseminates to the *Sira pradesha*, facilitating the removal of morbid *Doṣhas*, which are expelled through nasal secretions, lacrimation, and salivation.

Scientifically, *Nasya* drugs are absorbed through the nasal mucosa, enhancing regional blood circulation via venous drainage into the cavernous sinus through inferior ophthalmic veins and possibly through direct access to the cerebrospinal fluid. Stimulation of olfactory and trigeminal nerve endings transmits impulses to the central nervous system, influencing cerebral circulation and neuroendocrine regulation through the olfactory-hypothalamic-pituitary axis and limbic system. The *Purvakarma* procedures, such as head lowering, limb elevation, and facial fomentation, further augment craniofacial circulation by stimulating superficial vasodilator nerves. Classical texts describe the nose as "*Nasa hi siraso dvaram*", the gateway to the head and a seat of *Praṇa;* hence, *Nasya* plays a vital role in correcting *Praṇa*-related disturbances affecting higher cerebral, sensory, motor, and psychological functions, thereby supporting its use in conditions like *Apasmara* and *Unmada*.[2]

Modern anatomic perspective of *Nasya karma*

The nose is a vital sensory organ divided into external and internal parts. The nasal cavity is separated by the septum into two halves and extends from the nostrils to the nasopharynx. It consists of three regions-vestibule, respiratory region and olfactory region. The presence of turbinates increases the surface area of the nasal cavity, enhancing drug contact.

The nasal mucosa is of two types: olfactory mucosa, located in the upper part of the nasal cavity and respiratory mucosa, which lines the remaining area. The nasal mucosa is supplied by the olfactory nerve and branches of the trigeminal and facial nerves, indicating the involvement of three cranial nerves. The respiratory mucosa mainly filters dust particles, whereas the olfactory mucosa plays a key role in drug absorption and neural stimulation.

Olfactory receptor cells transmit impulses through the olfactory nerve via the cribriform plate to the olfactory bulb and higher brain centres such as the limbic system and hypothalamus, which are related to autonomic and conscious responses. Although the Blood Brain Barrier (BBB) and Blood CSF Barrier (BCB) limit drug entry into the CNS, intranasal administration allows certain drugs to bypass these barriers through olfactory and trigeminal nerve pathways.

The lateral wall of the nasal cavity communicates with paranasal sinuses that have rich vascular supply, enabling systemic and meningeal drug absorption. Lipid soluble substances like *Taila* and *Ghrita* are easily absorbed through the nasal and olfactory epithelium.[8]

RESULTS AND DISCUSSION

Bypassing the barrier

Drug delivery to the brain is challenging due to physiological barriers such as the blood–brain barrier (BBB), enzymatic degradation, hepatic metabolism, and systemic clearance. The BBB, formed by tightly joined endothelial cells supported by astrocytes and pericytes, restricts the entry of most drug molecules from systemic circulation into the CNS. Consequently, macromolecules and drugs with low CNS bioavailability show reduced therapeutic efficacy. To overcome this, invasive delivery methods such as intrathecal, intracerebroventricular, and intraparenchymal injections are used, but these approaches are painful, poorly accepted, and associated with infection risk. Intranasal administration offers a non-invasive alternative that can bypass the BBB and enable direct CNS delivery, particularly for neurotrophic proteins, neuropeptides, and nucleic acids, making it a promising route for treating neurological disorders, cerebral ischemia, and brain tumors.[9]

Strategies to enhance intranasal drug delivery to the brain

Tight junction modulators are an important strategy to enhance intranasal drug delivery to the brain by overcoming the restrictive paracellular barrier of the nasal epithelium. These modulators act by reversibly opening tight junctions, thereby increasing drug permeability. They are broadly classified into three types: natural polymers, tight junction modulating lipids and peptides. Lipid-based modulators like fatty acids, phospholipids, and bile salts alter membrane fluidity and indirectly disrupt tight junction integrity, facilitating drug diffusion. For effective nose-to-brain delivery, drug deposition in the upper part of the nasal cavity, particularly the olfactory epithelium, is essential, as it provides a direct pathway to the brain and bypasses the Blood Brain Barrier.

A similar conceptual basis can be observed in *Nasya Karma* of Ayurveda, where *Taila* and *Ghrita* are administered through the nasal route to influence *Urdhva-Jatrugata* (supraclavicular) regions, including the brain.

Taila and *Ghrita* can be viewed as functional analogues of lipid-based permeation enhancers. Their lipid-rich nature may:

- Improve membrane fluidity of nasal epithelial cells.
- Facilitate transcellular diffusion of active phytoconstituents.
- Possibly influence tight junction permeability indirectly.

Additionally, the unctuous (*Snigdha*) and subtle (*Sukshma*) properties described in Ayurveda may correspond to:

- Muco-adhesion and prolonged residence time.
- Enhanced penetration through microscopic channels, analogous to paracellular/transcellular pathways.

Medicated *Ghrita*, due to its lipophilic base and ability to carry both lipid- and water-soluble components (*Samskara Anuvartana* property), may resemble nanocarrier or lipid vesicular systems in modern pharmaceutics, aiding deeper tissue and possibly neuronal delivery.

Furthermore, the classical statement that the nose is the gateway to the head (*Nasa hi Shiraso Dwaram*) aligns closely with the modern concept of olfactory and trigeminal nerve pathways enabling direct brain targeting. Proper administration of *Nasya* ensures deposition in the upper nasal cavity, which parallels the requirement for effective olfactory region targeting in contemporary intranasal delivery systems.

Drug absorption through the nasal route is influenced by several formulation factors. Increased viscosity enhances the residence time of the drug within the nasal cavity by reducing mucociliary clearance, thereby allowing prolonged contact with the mucosa and improving absorption.

In the context of Intranasal powder delivery, it absorbs moisture from the nasal mucosa, swells and facilitates drug release and absorption

Similarly in case of *Nasya* therapy, these concepts support the use of *Choorna* (medicated powders). It can adhere to the nasal mucosa, absorb moisture and remain longer in the nasal passage, thereby enhancing the therapeutic effect. The fine particulate nature and potential bio-adhesive properties of *Choorna* facilitate better drug retention and absorption.

Nasal-reproductive axis

Nasya Karma, can be critically interpreted as a targeted neuroendocrine intervention influencing *Garbhasaya* (uterine) physiology. *Nasya* modulates *Prana Vata*, which orchestrates central neural and cognitive processes and *Apana Vata*, the principal regulator of pelvic organ function including ovulation, menstruation etc. The harmonization of these *Vata* subtypes is crucial for maintaining *Artava Pravritti* and optimal *Garbhasaya Kriya*, while also alleviating *Srotorodha* (channel obstruction) at the level of *Manovaha* and *Artavavaha Srotas.*

Intranasal Drug delivery facilitates direct interaction with hypothalamic nuclei, thereby modulating the pulsatile secretion of GnRH and downstream regulation of the pituitary gonadotropins (FSH and LH). Consequently, the Hypothalamic Pituitary Ovarian (HPO) axis is influenced, leading to improved ovarian steroidogenesis, endometrial receptivity, and uterine functional integrity. Such neuro-hormonal modulation provides a plausible mechanistic basis for the therapeutic efficacy of *Nasya* in gynecological disorders such as AUB, anovulatory cycles, and functional infertility. Thus, *Nasya* may be conceptualized as a sophisticated, minimally invasive modality exerting systemic reproductive effects through central neuroendocrine regulation.

CONCLUSION

Nasya karma, rooted in the classical principle of "*Nasa hi shiraso dwaram*", emerges as a sophisticated therapeutic modality that bridges traditional Ayurvedic wisdom with modern neurobiological understanding. By utilizing the nasal route, *Nasya* enables direct interaction with central neural pathways, bypassing physiological barriers such as the blood–brain barrier and influencing higher regulatory centres including the hypothalamus and limbic system. This neuro-hormonal modulation extends its effects beyond the cranial region, impacting the Hypothalamic-Pituitary-Ovarian axis and thereby regulating reproductive functions of the *Garbhashaya*. The integration of concepts such as lipid-mediated absorption, neural transport pathways, and endocrine regulation provides a scientific basis for its classical indications. Thus, *Nasya* can be interpreted as a non-invasive, targeted neuroendocrine intervention with significant therapeutic potential in both neurological and gynecological disorders.

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