



Designing Life: A Comparative Analysis of Ayurvedic *Pumsavana Karma* and Modern Designer Baby Technologies

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ABSTRACT

Background: The aspiration to shape the health and qualities of offspring predates modern science. Ancient Ayurvedic texts codify *Pumsavana Karma*, a prenatal sacrament employing herbal preparations, dietary regulation, and ritual practices while contemporary genetic medicine deploys CRISPR-Cas9 and preimplantation genetic diagnosis (PGD) to achieve similar goals through direct embryonic genome manipulation.^{1,2}

Objective: To conduct a structured comparative analysis of *Pumsavana Karma* and the designer baby paradigm, examining methods, goals, ethical implications, and integration potential.

Methods: Narrative review of four classical Ayurvedic texts (*Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Samgraha*, *Ashtanga Hridayam*) and peer-reviewed biomedical literature on genetic engineering, reproductive medicine, and bioethics.

Results: Both paradigms seek healthy, intelligent, disease-free progeny. *Pumsavana Karma* employs *nasya* (nasal instillation of herbal preparations), dietary regulation, and astrological timing within a holistic framework. Designer baby technology uses embryo biopsy (PGD) and germline gene editing (CRISPR-Cas9). Key ethical concerns include gender selection bias (Ayurvedic), and genetic inequality and consent issues (modern).

Conclusion: An integrative model drawing on Ayurveda's holistic epigenetic insights and modern genetics' molecular precision offers a more comprehensive and ethical approach to prenatal health optimization.

Keywords: *Pumsavana Karma*; designer baby; CRISPR-Cas9; preimplantation genetic diagnosis; genetic engineering; Prenatal care; Epigenetics; *Garbha Samskara*

INTRODUCTION

The desire to bring forth healthy, intelligent, and gifted offspring is among the oldest documented aspirations of human civilization. From ancient Sanskrit rituals to twenty-first-century gene-editing laboratories, humanity has consistently sought to influence the biological and qualitative endowments of the next generation. This intersection of tradition and technology forms the central subject of the present article.

The term 'designer baby' entered popular usage coinciding with advances in assisted reproductive technology and molecular genetics.¹ A designer baby is defined as an embryo or fetus whose genetic makeup has been intentionally selected or altered typically to eliminate heritable disease, select phenotypic traits, or enhance non-medical characteristics.² The enabling milestones include the first successful PGD in 1990,³ the Human Genome Project (completed 2003)⁴, and the introduction of CRISPR-Cas9 in 2012.⁵ Most recently, the 2018 announcement of the world's first gene-edited babies provoked global ethical controversy.⁷

Long before these developments, Ayurveda codified elaborate prenatal care protocols within its system of *Shodasha Samskara* (sixteen life-cycle sacraments). Chief among these is *Pumsavana Karma*, described in the *Charaka Samhita*, *Sushruta Samhita*, *Ashtanga Samgraha*, and *Ashtanga Hridayam*, prescribing specific herbal formulations, dietary interventions, astrological timing, and ritual practices to promote the health, sex, and virtue of the unborn child.^{6,7,8,9}

MATERIALS AND METHODS

Study Design

This study constitutes a narrative comparative review. No original experimental data were collected. The review synthesizes information from classical Ayurvedic texts and contemporary biomedical literature on genetic engineering, reproductive medicine, and bioethics.

Ayurvedic Source Texts

The four principal texts consulted were:

- *Charaka Samhita Sharirsthana*, Ch. 2⁶
- *Sushruta Samhita Sharirsthana* 2/32⁷
- *Ashtanga Samgraha* ⁸
- *Ashtanga Hridayam* ⁹

These texts were examined for their descriptions of *Pumsavana Karma* including timing, ingredients, routes of administration, preparatory procedures, and post-procedure dietary advice. Botanical identifications of Ayurvedic plant names were cross-referenced using pharmacognostic literature.

Modern Biomedical Literature

Contemporary literature was accessed from established databases. Sources included peer-reviewed articles on PGD,³ CRISPR-Cas9,⁵ genetics ethics,¹ and reproductive technology ethnography.⁴ NIH Genetics Home Reference and AddGene repositories were also consulted.⁵

Comparative Framework

Thematic comparison was performed across five dimensions identified *a priori*: (1) mechanism and method; (2) timing and conditions; (3) goals and outcomes; (4) philosophical underpinnings; and (5) ethical implications.

RESULTS

Historical Development of Genetic Engineering

Modern genetic engineering evolved through landmark discoveries: Watson and Crick's elucidation of DNA's double-helical structure (1953); the first successful recombinant DNA experiment (1973); the Human Genome Project (1990–2003); and the transformative introduction of CRISPR-Cas9 (2012).⁵ Each milestone progressively expanded the technical capacity to read, interpret, and ultimately modify the human genome.

Designer Babies: Technology and Mechanisms

Preimplantation Genetic Diagnosis (PGD): PGD involves biopsy of one or more blastomeres from an IVF embryo at the cleavage or blastocyst stage, followed by genomic analysis. It enables screening for: monogenic disorders (e.g., cystic fibrosis); chromosomal abnormalities (e.g., trisomy 21); sex chromosome aneuploidies; and, prospectively, polygenic risk scores for multifactorial conditions.²

CRISPR-Cas9 Gene Editing: CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) is a bacterial adaptive immune mechanism adapted for precision genome editing.⁵ Paired with the Cas9 endonuclease, the guide RNA directs the enzyme to a specific genomic locus to introduce a double-strand break, enabling deletion, insertion, or replacement of sequences. Modifications introduced into a preimplantation embryo are heritable, persisting in all somatic cells and transmissible to subsequent generations. He Jiankui's 2018 application of CRISPR to human embryos targeting *CCR5* for HIV resistance resulted in twin births and global ethical condemnation.⁷

Pumsavana Karma: Classical Ayurvedic Prenatal Optimization

Etymology and Classification: *Pumsavana* derives from Sanskrit *pums* ('a soul or human being') and *savana* ('ceremony'). Its three classical objectives are: *garbha grahanaya* (facilitating conception); *garbha sthapanartha* (stabilizing the embryo); and *putra apatya jananartha* (promoting healthy, virtuous progeny).¹⁰

Preconception Preparation: Charaka prescribes a period of celibacy followed by therapeutic cleansing (*Snehana, Swedana, Vamana, Virechana, Basti*).⁶ The male is advised to consume milk and ghee processed with sweet-tasting herbs; the female consumes *masha* (*Vigna mungo*), sesame oil, and pitta-augmenting substances. Intercourse is timed to even days (4th, 6th, 8th, 10th, 12th) for male progeny and odd days (5th, 7th, 9th, 11th, 13th) for female progeny.⁶

Timing of Pumsavana Karma: All four texts specify administration before *Garbha Vyakti Bhava* (external expression of gestation), reflecting recognition of maximal embryonic plasticity in early development. Specific timing varies across texts as detailed in Table 1.

Table 1. Timing of *Pumsavana Karma* as described in the four classical Ayurvedic texts

| Text | Prerequisite | Timing |
|--------------------------------|-------------------------------|--|
| Charaka Samhita ⁶ | <i>Apanna Garbha Lakshana</i> | 2nd or 3rd month of pregnancy |
| Sushruta Samhita ⁷ | <i>Labdha Garbha Lakshana</i> | Before 3rd month; immediately after conception |
| Ashtanga Samgraha ⁸ | <i>Labdha Garbha Lakshana</i> | Day of conception; within 1 month |
| Ashtanga Hridayam ⁹ | <i>Labdha Garbha Lakshana</i> | 1st month of pregnancy |

Herbal Formulations and Route of Administration: The primary route is *nasya* (nasal instillation), with some preparations administered orally. The key herbs and their botanical identifications are presented in Table 2. All texts specify that collection and administration must occur on the auspicious *Pushya Nakshatra* (lunar asterism).^{6,7,8,9}

Table 2. Principal herbal formulations used in *Pumsavana Karma* with botanical identification

| Ayurvedic Name | Botanical Name | Preparation / Route | Text Reference |
|---------------------------------------|--------------------------------|---|----------------|
| <i>Lakshmana</i> | <i>Ipomoea sepiaria</i> | Root macerated in milk; <i>nasya</i> | CS, SS, AS, AH |
| <i>Nyagrodha</i> (<i>vatangura</i>) | <i>Ficus benghalensis</i> | Leaf buds macerated in milk; <i>nasya</i> | CS, SS, AS, AH |
| <i>Sahadeva</i> | <i>Sida cordifolia</i> | Macerated in milk; <i>nasya</i> | SS, AS |
| <i>Jeevaka</i> | <i>Microstylis wallichii</i> | Milk processed with herb; oral | CS, AH |
| <i>Rishabhaka</i> | <i>Malaxis muscifera</i> | Milk processed with herb; oral | CS, AH |
| <i>Apamarga</i> | <i>Achyranthes aspera</i> | Paste; <i>nasya</i> | CS, AH |
| <i>Shweta Brihati</i> | <i>Solanum torvum</i> | Root juice; <i>nasya</i> | AS, AH |
| <i>Shankhapushpi</i> | <i>Convolvulus pluricaulis</i> | Milk macerated; oral/ <i>nasya</i> | AS |

CS = Charaka Samhita; SS = Sushruta Samhita; AS = Ashtanga Samgraha; AH = Ashtanga Hridayam

Post-Procedure Regimen: For five days following the procedure, the patient observes a sweet-predominant diet with milk processed with *Jivaneeya Gana* herbs (*Jeevaka*, *Rishabhaka*, *Meda*, *Mahameda*, *Kakoli*, *Ksheerakaoli*, *Mudgaparni*, *Mashaparni*, *Jeevanti*, *Madhuka*) and milk rice gruel (*Payasodana*). The spouse is instructed to maintain a pleasant demeanor; sexual relations are avoided.⁶

Stated Benefits of Pumsavana Karma

The classical texts enumerate four principal benefits: (1) promotion of a healthy and strong fetus; (2) enhancement of intelligence and vital energy (*Ojas*); (3) prevention of congenital disorders; and (4) harmonization of the child's mind-body-spirit continuum. These correspond directly to the goals of modern designer baby technology: embryo selection for chromosomal health (PGD) and elimination of pathogenic alleles (CRISPR-Cas9).¹⁰

Structured Comparison

Table 3 presents a comprehensive thematic comparison of the two paradigms.

Table 3. Comparative analysis of Pumsavana Karma and Designer Baby technology across key dimensions

| Dimension | Pumsavana Karma (Ayurveda) | Designer Baby (Modern Science) |
|---------------------|---|--|
| Primary method | Herbs (<i>nasya</i>), diet, rituals, astrological timing | CRISPR-Cas9, IVF, PGD, embryo biopsy |
| Core aim | Healthy, intelligent, virtuous child; <i>Ojas</i> promotion | Disease elimination, trait selection, enhancement |
| Nature | Holistic, natural, non-invasive | Technological, molecular, invasive |
| Philosophical basis | <i>Tridosha</i> harmony; karma; mind-body-spirit unity | Genetic determinism; molecular precision |
| Timing | Before/at conception; 1st–3rd month of pregnancy | Pre-implantation (PGD) or early embryo (CRISPR) |
| Heritability | Epigenetic influence; not directly heritable | Germline edits heritable across generations |
| Key ethical concern | Historical gender preference; cultural bias | Genetic inequality; eugenics; consent; 'playing God' |
| Evidence base | Classical texts; traditional experiential practice | Peer-reviewed trials; molecular studies |
| Accessibility | Low cost; widely accessible | High cost; limited to specialized centers |

DISCUSSION

The present analysis reveals that both *Pumsavana Karma* and the designer baby paradigm emerge from a shared anthropological imperative: the desire to shape the biological and qualitative endowments of future generations. Despite the vast technological gulf separating nasal instillation of *Ipomoea sepiaria* macerated in milk from CRISPR-Cas9 editing of a human blastomere, the teleological orientation of both systems is remarkably convergent.

Philosophical Divergences

The fundamental distinction lies in philosophical framing. Ayurvedic prenatal care is embedded within a holistic cosmological framework in which the body is understood as a dynamic equilibrium of three fundamental forces (*tridosha*: *vata*, *pitta*, *kapha*) and in which offspring quality is influenced not merely by genetic constitution but by maternal mental state, spiritual practice, dietary habits, and astrological timing. *Pumsavana Karma* thus intervenes at the level of the mother-fetus dyad as a unified psychosomatic system.

Modern genetic medicine operates within a reductionist paradigm that locates health determinants primarily in the DNA sequence. The precision of CRISPR-Cas9 capable of modifying a single nucleotide

within a three-billion-base-pair genome exemplifies this power. However, the limitations of genetic determinism are increasingly acknowledged: polygenic traits such as intelligence and disease susceptibility are influenced by thousands of genetic variants in complex interaction with environmental and epigenetic factors that Ayurveda has addressed holistically for millennia.

Epigenetic Convergence

The most intellectually significant convergence lies in epigenetics. Contemporary research has established that maternal diet, stress, and emotional state during pregnancy alter fetal gene expression through epigenetic mechanisms DNA methylation, histone modification, and non-coding RNA regulation—without altering the underlying DNA sequence. The *Garbha Samskara* concept, of which *Pumsavana Karma* is a component, anticipates this understanding by emphasizing that the prenatal environment—nutritional, sensory, emotional, and spiritual fundamentally shapes the child's constitution. Several herbs prescribed in *Pumsavana Karma*, *Convolvulus pluricaulis*, *Achyranthes aspera*, *Sida cordifolia*, possess documented neuroprotective, adaptogenic, and immunomodulatory properties that merit systematic pharmacological investigation.¹⁰

Ethical Analysis

Pumsavana Karma has been critiqued for historical son preference—the ritual name references the male child. However, classical texts also describe formulations for female progeny (left nostril administration in *Ashtanga Samgraha*; odd-day intercourse for female progeny in *Charaka Samhita*), suggesting a more nuanced original intent than pure son selection.^{6,8}

Designer baby technologies raise more urgent contemporary ethical concerns. Heritable germline editing raises the spectre of a new eugenics¹ wherein genetic enhancements become stratified by socioeconomic status. The condemnation of He Jiankui's experiment⁷ reflects widespread moral intuition that deliberate germline alteration crosses a categorical threshold. The absence of consent from the future person who will live with the consequences of germline editing presents a fundamental challenge under any rights-based ethical framework. By contrast, *Pumsavana Karma* operates through naturally occurring substances and introduces no heritable genetic alterations, presenting a qualitatively distinct ethical profile.

Towards Integration

A productive integration of these paradigms might proceed along several lines: (1) systematic phytochemical and pharmacological investigation of herbs prescribed in *Pumsavana Karma* using modern analytical methods; (2) incorporation of Ayurvedic dietary and lifestyle principles into evidence-based prenatal care guidelines; (3) development of an ethical framework for genetic medicine informed by Ayurveda's principle of natural balance and reverence for biological integrity; and (4) application of epigenomic research methods to characterize the molecular mechanisms underlying *Garbha Samskara* practices.

CONCLUSION

Both ancient Ayurveda and modern genetic science share the aspiration to bring forth healthy, intelligent, and disease-free progeny. Designer baby technology offers unprecedented precision in eliminating genetic disease but is accompanied by profound ethical and ontological dilemmas, particularly concerning heritable germline modifications, genetic inequality, and the absence of future consent. *Pumsavana Karma* exemplifies Ayurveda's commitment to natural balance, holistic development, and harmonization of body, mind, and spirit within the prenatal environment, anticipating contemporary epigenetic science.

Rather than competing paradigms, these represent complementary approaches whose integration, harnessing molecular precision within an ethical framework informed by holistic wisdom offers the most promising path toward genuine health optimization for future generations. Such integration, pursued through rigorous interdisciplinary research, can guide future generations toward health, ethical responsibility, and sustainability.

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