



Swarna Bindu Prashana—an Ancient Approach to Improve the Infant's Immunity

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Abstract

Swarna bindu prashana (SBP) is a metallic medicinal preparation widely used in *Ayurveda* pediatrics. The main ingredients of SBP are swarna prashan (gold nanoparticle), gou ghrita (cow ghee), madhu (honey), and other medhya dravyas (drugs which enhance intellectual, memory). According to the Indian classical text, SBP has been proposed as a potent medicine for immunotherapies and vaccine development due to its indefinite size, shapes, charges, and surface functionality. In this review, we describe the plausible mechanism of SBP in dendritic cells maturation and subsequent T cell activation. But being herbo-metallic preparation, its safety and efficacy are well supported by the classical publications of *Ayurveda*. To conclude, SBP is an immune booster for infants against any viral disease, and it is necessary to validate its safety and efficacy through systematic methodological research.

Keywords Swarna bindu prashan (SBP) · Pediatric · Immune booster · Herbo-metallic · Immune-modulatory · Vaccine

Introduction

In *Ayurveda*, administration of the gold particles in children is considered to be a unique practice termed as swarna prashana [1]. The term swarna refers to gold and prashana refers to consuming or ingesting. Therefore, swarna prashana refers to the act of consuming or ingesting gold in the prescribed dose and quantity [2]. Gold is one among seven metal categorized pure metals which is mainly used for preventive and curative purposes. The benefits of children, who consumed swarna prashana, improve their intellectual, digestion and metabolism, physical strength, immunity, fertility, and lifespan [3–5].

For the past several decades, experimental evidence proved that gold nanoparticles (AuNPs) have become better biocompatible metal nanoparticles in disease diagnosis and therapeutics [5]. These nanoparticles can be synthesized by using various methods which include chemical and electrochemical

radiation, photochemical method, and biological techniques [1]. Nanoparticles synthesized for therapeutics using physical and chemical techniques have major limitation, namely, toxic and hazardous chemicals being produced during the synthesis process [6]. To overcome this limitation, synthesis of nanoparticles using biological conjugates such as proteins, peptides, oligonucleotide, polysaccharides, fatty acid, and amino acids might be done reducing the toxic nature of the prepared nanoparticles [1]. These gold nanoparticles also possess antibacterial, anti-cancer, and anti-inflammatory properties [7, 8]. Similarly, synthesis of swarna prashana was also done by using biological conjugates such as ghee, honey, and herbs. This will increase the immunity of the infant to acts on pathogens, cancer cell, and inflammatory agent [4, 9, 10].

In swarna prashana, gold particles are encapsulated by honey, ghee, and herbs, and it helps the gold particles to form into various size, shape, charges, and composition. This irregular form of the gold particles in swarna prashana may induce the non-specific immunity by activating both cellular and humoral immunity [4, 9, 11, 12]. In general, pathogens undergo several mutations naturally or induced by man. Therefore, human system which acquired non-specific immunity will be ready to defend against any pathogens and inflammatory substances that enter or develop in our system [13]. It is evident that gold nanoparticles are efficiently interacting with the target cells in terms of immunological responses and cytotoxicity [14].

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At present, the whole world is facing one of the greatest pandemics (COVID-19) in a century caused by a novel coronavirus. As a result, COVID-19 patient exhibits severe acute immune response causing cytokine release syndrome and acute respiratory distress. In the future, to avoid this kind of pandemic situation, ancient immunization technique, namely, SBP, could play a vital role in developing the resistance against any viral disease [15]. SBP not only has the capacity to attenuate the manifested disease but also produces resistance to the offspring of next generation [3]. The purpose of this mini-review is to highlight its role, preparations, salient features, mode of administration, and plausible mechanisms of SBP in manipulating both cellular and humoral immunity.

Swarna Bindu Prashan

When the swarna bhasma is administered in very low dose for a particular time, it is known to increase the memory power along with immunity [4, 16]. Swarna prashana is easily absorbable in oxide form. There are such confusions regarding the mixing and absorption of swarna bhasma although it is the simplest form. Then, how come the simple ashudha swarna in the crude form gets absorbed is a matter of discussion. So here, swarna may remain unabsorbed in the body and act as an incompatible substance or binding material by playing a significant role in the stimulation of the immune system [1, 5, 8]. Gold has already proved its immune-modulatory effects because of its antibacterial action against different organisms, but when it is mixed with kinds of honey and clarified butter, it widens its spectrum of action to stimulate body immune cells [4, 5, 16]. It is administered orally on an empty stomach, preferably in the early morning. It can be given from birth up to 16 years of age. It is given with clarified butter and honey in a dose of two drops up to 6 months and four drops after 6 months. It can be given daily for a minimum of 30 days and maximum of 180 days. Alternately, it can be given every pushya nakshatra (every 28 days) for a minimum of 30 doses [3, 4].

SBP can be administered to all children from day 1 up to 5 years. It will be more beneficial in children with low immunity, low intellect, low memory power, and dyslexia [2, 4]. It is contraindicated among children suffering from fever, dysentery, and indigestion, etc.

Properties and Benefits of SBP It enhances the immunity, improves memory intelligence and appetite, and tones up the skin [4]. As per Kashyapa Samhita, SBP will enhance medha, bala, agni, aayu, varnya, pavitra, and manglyakarak. Therapeutically, it is used as ghraha badha and vrushya [17].

Mode of Action SBP Swarna bhasma has moisturizing and unctuous effect on the body, as its madhura helps as rasayana,

and through detoxification can treat vishamjwara, antra jwara (Enteric fever), weakness, etc. Scientifically, it has been proved that swarna bhasma also possesses antioxidant, antidepressant, anti-cancerous, antibacterial, and anti-rheumatoid property and acts as a nerve stimulant [7, 16, 18, 19].

Toxicity Clinical tests revealed that SBP is free from toxicity as the ingredients used for its preparation are only after their non-toxic certification [20].

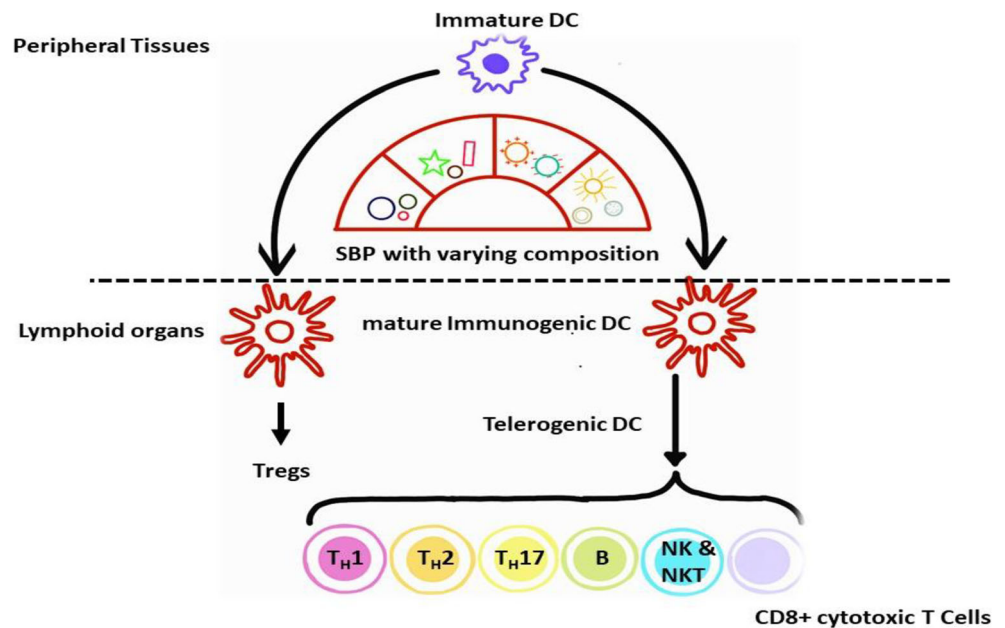
Side Effects Sometimes due to smell of medicine and different taste, babies may vomit it. Except this, no other side effects have been reported [1, 4, 20, 21].

Till date, there are no published research data available regarding its safety and efficacy. But there are few studies presented in national and international seminars/conferences, which support its safety and efficacy. Besides, some animal studies support its safety and efficacy.

Plausible Mechanisms of Swarna Prashana

Swarna prashana is related to the smaller gold particles perhaps containing wide variation in shapes, sizes, charges, and bio-molecular compositions [4]. These particles retain high stability, low toxicity, and immunogenicity conjugation due to the molecular ingredients found in ghee and honey [21]. The molecular ingredients contain sugars, amino acids, proteins, lipids, vitamins, and other components [10]. Moreover, these components help in capping the gold particles in swarna prashan which exhibits multivalent interactions between the particle and membrane receptor of antigen-presenting cells (APCs) such as dendritic cells [1, 4, 8]. Targeting these dendritic cells is considered to be one of the efficient strategies in promoting immunotherapies and vaccine development [8]. Therefore, the plausible mechanism of swarna prashana in interacting with dendritic cells is as follows: dendritic cells opt several mechanisms in the internalization of swarna prashana particles including receptor-mediated endocytosis, pinocytosis, and phagocytosis [1, 4, 5, 20]. Immature dendritic cells will uptake and internalize the swarna prashana particles in the cytosol. As a result, immature dendritic cells differentiate into mature dendritic that causes expression of CD83 and CD86 and also morphological changes in the maturation of the dendritic cells [8] (Fig. 1). The internalized particles, namely, antigens, are processed in the cytoplasm and initiate T cell response based on antigen presented through MHC complex [4, 7, 19]. Interestingly, swarna prashana particles comprise of mosaic features in terms of size, shape, charge, and composition of the particles which results in intercellular trafficking in dendritic cells [1, 4]. Therefore, dendritic cells present multiple antigens effectively to the T cells [20]. It is believed that the activated dendritic

Fig. 1 Schematic representation of plausible mechanism of activation of immunogenic dendritic cells by SBP



cells and T cells require soluble cytokines including IL-7, IL-6, IL-10, IL-12, IL-23, TNF, and IFN to exhibit immunogenic response [4, 8]. The potential application of swarna prashana in immunomodulation is the development of both prophylactic and therapeutic vaccine [4, 8, 19]. Ancient scripts have suggested that the colloidal preparation of swarna (gold particles) with honey and ghee would significantly induce robust immunity like vaccines [4, 8, 10]. Gold particles are the most promising ones which do not affect living cells and do not produce adverse effects [20]. It is believed that gold is used in ayurvedic, herbal, and herbo-mineral preparations for the treatment of chronic and degenerative disease without any side effect [12, 13, 17]. The advantages of biodegradable gold particles are utilization in the vaccinated organism, high loading efficiency for the target substance, enhanced ability to cross various physiological barriers, and low systemic side effects. In all likelihood, the immune actions of biodegradable nanoparticles and gold nanoparticles as corpuscular carriers are similar. The recent data indicating low toxicity of gold nanoparticles makes it being used in the development of next-generation vaccines [1, 8, 16]. However, no extensive studies on animals or cell lines model are available, and further clinical trials are required on interaction of swarna prashana particles and human functions.

Conclusion

SBP is an immune booster used in pediatrics practice; its safety and efficacy are well supported by the classical texts of *Ayurveda*. In this review, we outlined the plausible mechanisms of swarna prashana in inducing immune system. It is also believed in older days that swarna prashana helps the child to grow

up with a better immune system and intellectual performance. *Ayurveda* also explains about “vyadhikshamatwam” (immunomodulation), i.e., the individual’s resistance to any infectious disease which includes both the capacity of attenuation against manifested disease and resistance to the offspring of the next generation. It is the ancient immunization technique with no adverse effect and provides a good life with physical, mental, and social health. So swarna prashana samskara should be accepted as immunization program. However, its safety and efficacy need to be validated through systematic methodological research.

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