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GODHUMA *(TRITICUM SATIVUM LAM.):* A PHARMACO-THERAPEUTIC REVIEW

Syeda Nikhat Nausheen[*1] and B. R. Lalitha[2]

[1*] PG Scholar, Department of Dravyaguna, Government Ayurveda Medical College, Bangalore, India.
[2]Department of Dravyaguna, Government Ayurveda Medical College, Bangalore, India.

ABSTRACT

Ayurveda has great potential in the field of Preventive medicine and glorifies the concept of Aahara (food). A properly selected diet and diet plan plays a critical importance in the management of many diseases. Godhuma (wheat) is a cereal using since ancient period, botanically identified as *Triticum sativum Lam.* belonging to Poaceae family. Along with its nutritional property, many medicinal properties have also been explained in Ayurveda classics. Wheat is a rich source of multiple essential nutrients, such as protein, dietary fibre, manganese, phosphorus and niacin. Several B vitamins and other dietary minerals are in significant content. Godhuma has shown proven therapeutic effects in prevention and treatment of various conditions. This paper reviews the botanical identity of Godhuma its synonyms, vernacular names, bhedas, rasapanchaka, karmas, Rogaghnata, doshaghnata, yogas, along with its habit, habitat, morphological features, chemical constituents etc., and some of its research activities.

KEYWORDS

Godhuma, *Triticum sativum Lam* and Cereal.

Author for Correspondence:

Syeda Nikhat Nausheen,

PG Scholar, Department of Dravyaguna,

Government Ayurveda Medical College,

Bengaluru, India.

Email: shimroz8@gmail.com

INTRODUCTION

Godhuma *(Triticum sativum Lam.),* commonly known as Wheat, belongs to Poaceae family. Godhuma is one of shukadhanya (cereal) mentioned in Ayurveda. Different medicinal properties like balya, sthairyakara, Sandhanakrut, Jeevana etc have been explained along with its medicinal preparations as well as dietary preparations in many diseases like Hrudroga, Prameha, Asthibhagna, Vatarakta etc.

Wheat a cereal grain, which is a worldwide staple food and it is a grass widely cultivated for its seed. There are many species of wheat, the most widely grown is common wheat *(T. sativum).* The

nutritional composition of the wheat grain varies somewhat with differences in climate and soil. Approximately the kernel contains 12 per. water, 70 per. carbohydrates, 12 per. protein, 2 per. fat, 1.8 per. minerals, and 2.2 per. crude fibres. Vitamins like Riboflavin, niacin, Thiamine and small amount of vitamin A are present, but the milling processes removes most of these nutrients with the bran and germ[28].

Gluten meaning "glue"(Latin) is a composite of prolamins and glutelins (storage proteins) that are stored together with starch in the endosperm of wheat grains[32].

Wheatgrass are the leaves of the common wheat plant, used as a food, drink or dietary supplement.

Bran is the hard outer layers of cereal grain, which consists of the combined aleurone and pericarp. Bran is rich in dietary fibre and essential fatty acids. It contains significant quantities of Protein, vitamins, Starch and dietary minerals. It is also a source of phytic acid, an anti-nutrient that prevents nutrient absorption.

The wheat germ is the embryo of the wheat kernel that has been separated in the milling process, is concentrated source of several essential nutrients, including vitamin E, folate (folic acid), phosphorus, thiamine, zinc, and magnesium, good source of fibre, as well as essential fatty acids and fatty alcohol.

In this article an attempt has been made to review on Godhuma from different classical texts, its pharmacognostical aspects and about its pharmacotherapeutics.

CHRONOLOGICAL REVIEW

Vedic references[6]

- In Yajurveda, there is explanation about godhuma along with other Vanaspati's.
- Godhuma description is available in Taittiriya Samhita and also Atharvavediya Paippalaada Samhita.
- Saayana has considered Godhuma as Prashasta when compared to Yava and Vrihee.

Samhita kala[1-5, 18, 19]

- In Bhela Samhita, Godhuma guna has been explained in Bhojanavidhi Adhyaya and also in Dhanyavargaadhikaara of Vangasena Samhita.
- Guna-karma of Godhuma has been described in Prathama Sthana of Harita Samhita.
- Bhrihatrayis mentions it as Sandhanakrut and Sthairyakara and as Ahaara in Vasanta, sharat and varsha rutus.
- Bhavaprakasha, and Chakradatta in the context of Asthibhagna Chikitsa, has advised intake of Godhuma along with ghruta.

Nighantu kala[8-11, 13-17]

- Most of the Nighantus attributes Godhuma as Sandhanakrut and Sthiratvakaraka.
- It is mentioned as balya and Veeryavardhaka in Raja Nighantu.
- Nighantu ratnakara explains godhuma as Dhatu Vriddhikara, Bhagnasandhanakaaraka, and Sthairyakara.
- Balya, Sthira and Sandhanakrut property of godhuma has been explained in Shodala Nighantu.

In modern period also Godhma has been explained elaborately in books like Wealth *of India*[26]**,** *Indian medicinal plants*[27]. *"Wheat production, Properties and Quality"; "The constituents of Wheat and Wheat products"; "Wheat chemistry and technology"* etc.

Paryaayas of Godhuma[8-17]

Godhuma; Sumana; Yavana/yavaka; Mleccha Bhojana; Satyanama; Hudmba; Rasika; Girija; Chamada; Kshudra; Madhuli; Rupasheetala; Nandimukha; Alpa Godhuma; Lokeshi; Paasika; Nistusha; Ksheeri; Rasaala; Bahudughda; Apoopa.

Bhedas[1,3, 8-12,16].

- Mahagodhuma.
- Madhuli/Swalpagodhuma.
- Pisheetika.
- Deerghagodhuma/Nishooka/
- Sukshma/Nandimukhi.
- Laghugodhuma.

Rasapanchaka[1-4, 8-15, 17]

Godhuma is having *Madhura rasa; Guru, Snigdha, Sheeta guna;Sheeta virya;Madhura Vipaka; Vatapittahara and Kaphavardhaka.*

Karma[8-11, 13, 16]

Godhuma is mainly *Sandhanakara, Sthairyakara, Balya, Jeevana, Brumhana, Ruchiprada,*

Shukraprada, Varnya, Vranya, Veeryavardhana, Saaraka, Asyandi, Alparechi Karma.

Rogaghnata[22]

Godhuma is used mainly in treatment of diseases like *Asthibhagna; Shoola; Kasa; Hrudroga; Prameha; Kushta; Vatarakta; Vrana.*

Yogas of Godhuma[18,20]

Asthisamharini Churna; Godhuma Churna; Godhumaarjuna Leha/paaka; Apara Godhumadi utkaarika; Godhumadi ghrita; Godhumachurnadi Lepa; Mashadi Pupalika; Godhumapishtaadi Dhoopa.

PRAYOGAS: (THERAPEUTIC USES)[22]

- Churna of Godhuma along with Asthisamhara, Laksha, and Arjuna has been mentioned to be taken with milk and ghee in disorders of joints and fractures.
- In Kasa, it has been mentioned that Godhuma, Yava churna along with the drugs of Kakolyadi varga should be mixed with honey, ghee and taken with milk.
- Wheat powder and Kunduru mixed with sheep milk should be applied as warm paste. It is useful in Bradhna.
- Rough paste of Kalaaya, Masura, Godhuma and Harenu are applied on the wound for pressing.
- Powder of old wheat mixed with honey should be used in abdominal pain caused by Kapha.
- In Vatarakta, paste of wheat powder mixed with goat's milk and ghee should be applied.

Binomial name[28]

Triticum sativum Lam.

Synonyms[28]

Triticum sativum Lam.

Triticum vulgare Vill.

BOTANICAL DESCRIPTION

***Triticum sativum* Lam**[26]

Syn. *T. aestivum* Linn; *T. vulgare* Vill;

History and Origin[26]

Wheat *(Triticum sativum Lam)* has been used as a food by man since prehistoric times. The ancient civilisations of Babylonia, Crete, Egypt, Greece and Rome used wheat as one of the principal food plants and the Chinese also grew this cereal as long back as 2700 BC.

Bread wheat/Common Wheat *(T. sativum Lam.)* is noted first in contexts which date it c. 5800-5600 BC. At Telles Sawwan, in Iraq.

T. sativum Lam, the most highly evolved, is the most widely cultivated of all wheat species. It has numerous forms, cultivars and hybrids, mostly developed by breeding as well as by selections. There are winter, spring, and intermediate growth-types.

Habitat and Habit[26]

An annual grass, commonly 60-150cm. in height, but as short as 30cm. when grows under very dry conditions, or considerably over 150cm. in height under conditions exceptionally favorable for vegetative growth.

Habit

A cultivated annual crop plant.

Root

Adventitious.

Stem

Wheat stem is erect, cylindrical, herbaceous, fistular, with distinct nodes and internodes, unbranched, glabrous, with number of tillers.

Leaf

Wheat grass leaf is simple, alternate, green, exstipulate, with entire margin, parallel venation. Acute apex and sheathing leaf base, membranous ligule present at the junction of leaf sheath and leaf blade.

Inflorescence

Spike of Spikelet's.

Flower

Bracteates, sessile, hermaphrodite, zygomorphic, incomplete, hypogynous, flower lies between superior and inferior palea.

Fruit

Wheat grains, botanically, are the fruits (caryopsis) of the whole wheat plant.

Macroscopic features[31]

- Wheat grains are generally oval shaped, almost spherical to long.
- The dorsal side (with respect to the spikelet axis) is smoothly rounded, while the ventral

side has the deep crease down one side where it was originally connected to the wheat flower.

- At the point of attachment of the spikelet axis, embryo (germ) is situated and a brush of fine hairs can be seen in the distal end.
- The grain is usually between 5 and 9mm in length, weighs between 35 and 50mg.

Microscopic features[31]

- The wheat grain contains 2-3% germ, 13-17% bran and 80-85% mealy endosperm.
- The *Bran* (outer layer of wheat grain) is made up of several layers, which protect the main part of the grain.
- *Pericarp and Seed coat* (two external layers of the grain) are made up of dead empty cells. The aleurone layer (inner bran layer) consists of cells filled with living protoplasts.
- The Endosperm is surrounded by the fused pericarp and seed coat. The special structure present in aleurone layer of outer endosperm consists of single layer cubic shaped cells. The endosperm without the aleurone layer (inner endosperm), is referred to as mealy or starchy endosperm.
- The germ lies at one end of the grain.

POWDER MICROSCOPY

Revealed the presence of Abundant Simple Starch grains, Oil globules, Lignified Xylem Parenchyma, Lignified Fibres, Cotyledons with Starch grains, Parenchyma Cells, Trichomes.

Distribution[26]

It is widely distributed in lands with suitable climate and also extensively cultivated in India as a major food crop.

Varieties[28-30]

There are wide variety of *Triticum* Species, The various species have been developed into thousands of cultivars (over 25,000, by one estimate) that differ in chromosome number.

Major cultivated species of wheat[30-32]

The commercial types of wheat cultivated in India can be classified as,

Triticum sativum; Triticum durum; Triticum dicoccum; Triticum spherococcum; Triticum vulgare.

Other Varieties are

Triticum spelta; Triticum compactum; Triticum monococcum; Triticum turgidum, etc.

CULTIVATION AND PROPAGATION[26]

Grown in almost all the temperate and in most of the subtropical countries of the world and also at high elevations in some of the tropical countries.

In India, cultivated throughout the greater part of the country, mainly in the plains of northern India. The chief wheat growing states are Uttar Pradesh, Punjab, Madhya Pradesh, Bihar, Haryana, and Rajasthan. It is also cultivated in West Bengal, Gujarat, and Maharashtra, and to a limited extent in Himachal Pradesh, Jammu and Kashmir and Karnataka.

Wheat can be sown either by broadcasting or by line sowing. It can also be dibbled.

Climate[26]

Wheat adapts itself to a variety of climates. The great wheat regions of the world are found in temperate zones between 30-60`N and 24-40`S, but wheat has also been grown in north of the Artic Circle and close to the Equator.

Diseases and Pests[26]

In India wheat suffers from many diseases but the most destructive of them are the diseases caused by fungi, viz. the various types of rusts, smuts and bunts, leaf-spots and foot-rots, and mildews. Bacterial and viral diseases are comparatively much less important.

The only pest that has, to a sizeable extent, come in the way of wheat production in this country is the termite or white ant.

Import and Export[26]

Though India ranks as the third highest wheat producer in the world, it does not export to any appreciable extent, its share in global export was around 0.22 in the year 2017-2018.

India's major export destinations are Nepal, Bangladesh, UAE and U.K.

It is a net importer of wheat. It imports wheat from the USA, USSR, Canada, Australia, and Argentina.

PRODUCTION AND CONSUMPTION[26]

In 2016, global wheat production was 749 million tones. Wheat is the primary food staple in North Africa and the Middle East, and is growing in uses in Asia. Unlike rice, wheat production is more widespread globally, though 47% of the world total in 2014 was produced by just four countries – China, India, Russia and the United States.

ADULTERATION

Ergot, Datura seeds, marbles, stones, Sand particles, straw pieces, low quality and damaged grains, insect infected grains, insects and insect eggs, rodent contamination etc.

PHYTO CONSTITUENTS[28]

The chemical composition of wheat kernel varies widely, being influenced by environment, soil, and Variety. The variations are so large that only the ranges of values for the proximate composition may be meaningful.

RESEARCH ACTIVITIES

"Pharmacognostic standardization, antioxidant and free radical scavenging activity of the seeds of *Triticum aestivum* L - A dietary staple."[33]

The phytochemical studyof wheat seeds mainly revealed the presence of carbohydrates, phenolics, proteins, resins, lipids and flavonoids. *Triticum aestivum* at different doses (i.e. 5e45 mg/ml) showed free radical scavenging activity in dose dependent manner. The 313.5 µg/mg phenolic components found in wheat seeds indicates its considerable antioxidant activity. *Triticum aestivum*ethanolic extract administered at dose level of 100 mg/kg/day for 21 days along with CCl4; Biochemical and histopathological results conclude that the seeds have hepatoprotective activity.

"Therapeutic potential of *Triticum sativum Lam.* (Wheat Grass or Green Blood Therapy) in the treatment and prevention of Chronic and Acute Diseases: An Overview."[34]

The overall review of this study revealed that

Wheatgrass consists of carbohydrate, protein, fat, sugar, vitamins like thiamine, riboflavin, niacin, pantothenic acid, folate, choline ,Vitamin E, Vitamin K, amino acid; enzymes; minerals such as calcium, potassium, magnesium, sodium, zinc and choline; along with chlorophyll one of the most important component of wheat grass which helps in therapeutic activity.

Wheat grass juice resembles to haemoglobin in our blood so it is called as green blood and its therapy is known as green blood therapy.

It is advised for the patient suffering from cancer, ulcers, joints related diseases such as gout, osteoarthritis, thalassemia, skin disease like eczema, ache; diseases related to digestive system, circulatory system, reproductive system, respiratory system, blood, tooth and gum.

It is absorbed easily in the bloodstream, hence gives energy. In empty stomach it is easily assimilated in blood in approximately 20 min. And their activity remains throughout the day.

From the above review it can be concluded that wheat grass have highly curative value.

"Ameliorative effect of *Triticum sativum Lam*against experimentally induced arsenic toxicity in male albino rats."[35]

This experimental study evaluated the effect of Wheatgrass extract against arsenic induced toxicity in male albino rats. Wheatgrass extract (200 and 400mg/kg) was administered orally to rats for 20 consecutive days before oral administration of sodium arsenite (10 mg/kg) for 8 days.

Wheat grass extract ameliorated the changes induced by arsenic. The observations found during this study concluded that Wheat grass extract possessed remarkable effect against arsenic induced organ toxicity in male albino rats mediated by alleviation of arsenic induced oxidative stress by enhancing the anti-oxidant defence mechanism and also by detoxification of free radicals generated in the body.

Table No.1: Classification According to Various Authors[1-4, 8-17]

S.No	Classical text	Gana/varga
1	Charaka Samhita	Shuka Dhanya Varga
2	Sushruta Samhita	Kudhanya Varga
3	Ashtanga Hridaya	Shuka Dhanya Varga
4	Haritha Samhita	Dhanya Varga
5	Bhavaprakash Nighantu	Dhanya Varga
6	Dhanvantari Nighantu	Suvarnadi Varga
7	Kaiyadeva Nighantu	Dhanya Varga
8	Raja Nighantu	Shalyadi Varga
9	Nighantu Ratnakara	Dhanyavarga
10	Madanapala Nighantu	Dhanya guna Varga
11	Priya Nighantu	Dhanya Varga
12	Shodala Nighantu	Shukadhanya Varga
13	Nighantu Adarsha	Trunaadi Varga
14	Shaligrama Nighantu	Dhanya Varga

Table No.2: Vernacular names[27]

English	Common Wheat, Bread Wheat
Hindi	Gehun
Kannada	Godhi
Malayalam	Gotampu, Kotanpam
Sanskrit	Godhumah
Tamil	Godumai
Telugu	Godumulu
Punjab	Gandhum, Gandham
Arabic	Burr, Hintal
Marathi	Ghawn, Kapale, Margham
Bengal	Gam, Giun, Gom
Gujrathi	Gawn, Ghavum, Govum
Persian	Gandum

Table No.3: Taxonomical Position[28]

Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Monocots
Clade:	Commelinids
Order:	Poales
Family:	Poaceae
Genus:	Triticum L
Species:	aestivum/sativum

Table No.4: Phyto constituents of different parts of wheat plant

DIFFERENT PARTS	Phyto constituents
SEEDS / GRAIN	Carbohydrates viz, Starch, Sugars, Cellulose, Hemicellulose. Minerals: Iron, Phosphorus, Calcium, Magnesium, Manganese, Copper, Zinc, Potassium, Sodium, and traces of cobalt. Vitamins: Thiamine, Riboflavin, Niacin, Pantothenic acid, Vitamin B6, Folate (B9), Vitamin E, Vitamin K. Proteins: Amino acids like Arginine, Histidine, Leucine, Isoleucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, Valine. Lipids and Fats: Palmitic, Stearic, Oleic, Linoleic, Linolenic etc. Enzymes like Amylase, Phytase etc are also present Dietary Fibres, Selenium etc. Also contains Flavonoids, Phenolics, and Resins.
WHEAT GRASS	It contains chlorophyll, amino acids, minerals like iron, zinc, copper, potassium, manganese and selenium; vitamins like vitamin A, vitamin C, vitamin E (alpha tocopherol), vitamin K,thiamin, riboflavin, niacin, vitamin B6, dietary fiber, pantothenic acid and enzymes.
WHEAT GERM OIL	Wheat germ oil is rich in tocopherol (Vitamin E) content, ergosterol (provitamin D), and also minerals, proteins and essential fatty acids. Sitosterol, ergosterol, and campesterol, phospatidic and glyceroinosito-phosphatidic acids, phyto-glycolipid, serine, etc., are also reported
WHEAT BRAN	Wheat bran oil is also high in tocopherols, 68% of which is epsilon-tocopherol. Alpha-tocopherol, which has the highest Vitamin E activity of the tocopherols, constitutes only 11% of the tocopherols in the bran oil.

QUALITY STANDARDS[26]

Table No.5: Quality Standards

S.No	Parameters	Standard
1	Loss on drying	Not more than 13%
2	Total ash	Not more than 2.5%
3	Acid insoluble ash	Not more than 0.1%

Figure No.1: Morphological Features of *Triticum sativum Lam*

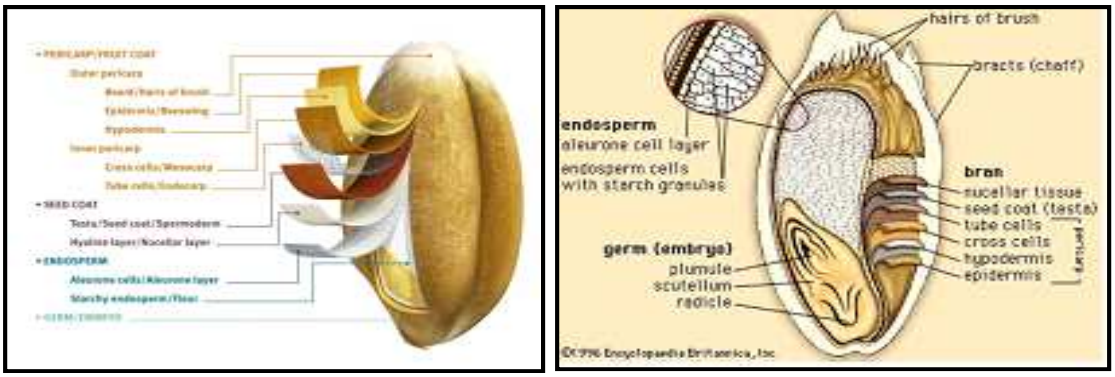
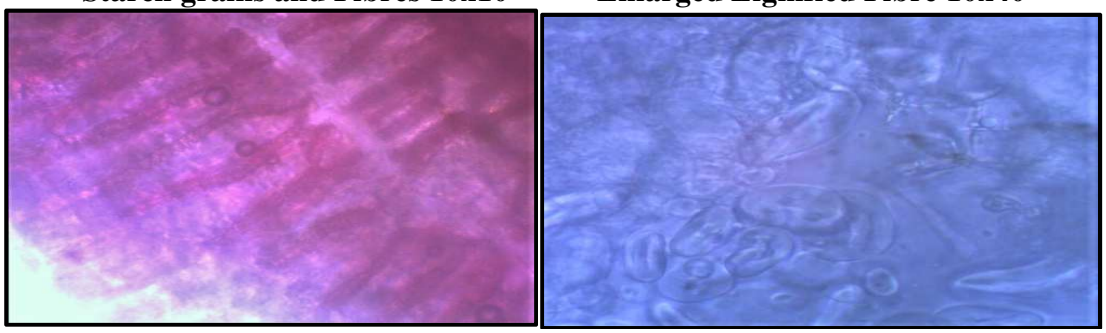
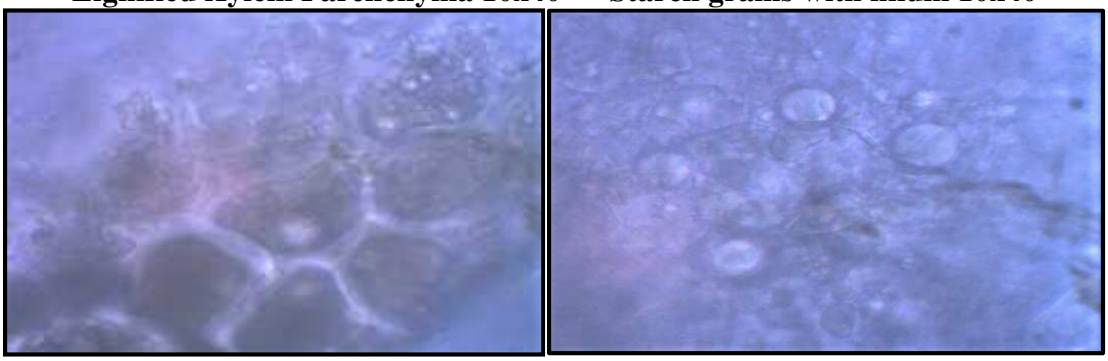


Figure No.2: Different layers of Wheat grain

Starch grains and Fibres 10x10 **Enlarged Lignified Fibre 10x40**



Lignified Xylem Parenchyma 10x40 **Starch grains with hilum 10x40**



Cotyledons with starch grains and Oil globules 10x40 **Oil globules 10x40**

Figure No.3: Microscopic features of Powder Godhuma *(Triticum sativum Lam.)*

DISCUSSION AND CONCLUSION

Godhuma *(Triticum sativum Lam.)* is found throughout India and is cultivated as a major food crop. Godhuma has various references since Vedic kala. In Ayurvedic classics, it is mainly described under Dhanya varga. The pharmacological properties like Madhura rasa; Madhura vipaka; Snigdha, Guru guna; Sheeta virya; Vata-pitta hara and Kapha prada karma along with its Sandhanakrut, Sthiratvakaraka, Balya, Jeevana, brumhana etc., karma have been explained. Powder microscopy of wheat grain revealed the presence of Simple starch grains with hilum, oil globules, and lignified fibers. It is a good source of Nutrients and also a substantive source of Minerals. The research activities carried out on wheat, shows its various pharmacotherapeutics actions. Hence, by reviewing the present article, it can be concluded that Godhumaplays an important role as diet and also medicine being attributed with various therapeutic properties thereby helping in maintaining health and preventing (or) treating various diseases conditions.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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