# ENVIS Newsletter

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## Special Issue on Food Allergens


CSIR-Indian Institute of Toxicology Research
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## IN THIS ISSUE



## EDITORIAL

A food allergy is an adverse immune response to specific food items. Food allergy is different from adverse food reaction or food intolerance. The allergic component in the food is the specific type of protein present in food. The allergic reactions appear when body's immune system identifies a particular protein as harmful for body and starts producing white blood cells to counter attack, and thus triggering an allergic reaction. These reactions can be mild to severe. The allergic reactions may be dermatitis, gastrointestinal and respiratory distress, sometimes life-threatening anaphylactic responses requiring immediate emergency treatment. Food allergies are classified into 3 groups on the basis of their mechanism of the allergic reaction.1. IgE-mediated (classic) – the most common type, occurs shortly after eating and may involve anaphylaxis. 2. Non-IgE mediated – characterized by an immune response not involving immunoglobulin E; may occur some hours after eating, complicating diagnosis. 3. IgE and/or non-IgE-mediated – a hybrid of the above two types. Symptoms of allergies vary from person to person. The amount of food needed to trigger a reaction also varies from person to person. The most common food allergies are due to milk, eggs, peanuts, tree nuts, seafood, shellfish, soy and wheat. These are often referred to as "the big eight." A person with certain type of allergy, must be wear a medical alert bracelet or necklace, and carry an auto-injector device containing epinephrine (adrenaline) since, some time it is life threatening. One can prevent the symptoms of food allergy by avoiding certain food items identified as allergic by removing them from the diet.



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## ODDS AND ENDS

**Current overview of allergens of plant pathogenesis related protein families.**

[Scientific World Journal. 2014 Feb 16;2014:543195.]

Pathogenesis related (PR) proteins are one of the major sources of plant derived allergens. These proteins are induced by the plants as a defence response system in stress conditions like microbial and insect infections, wounding, exposure to harsh chemicals, and atmospheric conditions. However, some plant tissues that are more exposed to environmental conditions like UV irradiation and insect or fungal attacks express these proteins constitutively. These proteins are mostly resistant to proteases and most of stability at low pH. Many of these plant pathogenesis related proteins are found to act as food them show considerable allergens, latex allergens, and pollen allergens. Proteins having similar amino acid sequences among the members of PR proteins may be responsible for cross-reactivity among allergens from diverse plants. This review analyzes the different pathogenesis related protein families that have been reported as allergens. Proteins of these families have been characterized in regard to their biological functions, amino acid sequence, and cross-reactivity. The three-dimensional structures of some of these allergens have also been evaluated to elucidate the antigenic determinants of these molecules and to explain the cross-reactivity among the various allergens.

***In silico* analyses of structural and allergenicity features of sapodilla (Manilkara zapota) acidic thaumatin-like protein in comparison with allergenic plant TLPs.**

[Mol Immunol. 2014 Feb;57(2):119-28.]

Thaumatin-like proteins (TLPs) belong to the pathogenesis-related family (PR-5) of plant defence proteins. TLPs from only 32 plant genera have been identified as pollen or food allergens. IgE epitopes on allergens play a central role in food allergy by initiating cross-linking of specific IgE on basophils/mast cells. A comparative analysis of pollen- and food-allergenic TLPs is lacking. The main objective of this investigation was to study the structural and allergenicity features of sapodilla (*Manilkara zapota*) acidic TLP (TLP 1) by *in silico* methods. The allergenicity prediction of composite sequence of sapodilla TLP 1 (NCBI B3EWX8.1, G5DC91.1) was performed using FARRP, Allermatch and Evaller web tools. A homology model of the protein was generated using banana TLP template (1Z3Q) by HHPRED-MODELLER. B-cell linear epitope prediction was performed using BCpreds and BepiPred. Sapodilla TLP 1 matched significantly with allergenic TLPs from olive, kiwi, bell pepper and banana. IgE epitope prediction as performed using AlgPred indicated the presence of 2 epitopes (epitope 1: residues 36-48; epitope 2: residues 51-63), and a comprehensive analysis of all allergenic TLPs displayed up to 3 additional epitopes on other TLPs. It can be inferred from these analyses that plant allergenic TLPs generally carry 2-3 IgE epitopes. ClustalX alignments of allergenic TLPs indicate that IgE epitopes 1 and 2 are common in food allergenic TLPs, and IgE epitopes 2 and 3 are common in pollen allergenic TLPs; IgE epitope 2 overlaps with a portion of the thaumatin family signature. The secondary structural elements of TLPs vary markedly in regions 1 and 2 which harbor all the predicted IgE epitopes in allfood and pollen TLPs in either of the region. Further, based on the number of IgE epitopes, food TLPs are grouped into rosid and non-rosid clades. The number and distribution of the predicted IgE epitopes among the allergenic TLPs may explain the specificity of food or pollen allergy as well as the varied degree of cross-reactivity among plant foods and/or pollens.

**Recent advancements in the therapeutics offoodallergy.**

[Recent PatFoodNutr Agric. 2013 Dec;5(3):188-200.]

Food allergy is a health complication induced by certain food in the susceptible individuals. Due to lack of permanent cure and the global prevalence, the preventive approach is highly required for food allergy. Recently published patents have shown significant improvements in the food allergy research. In this review, an attempt has been done to highlight the recently developed patents related to the detection of allergens in food mixture. Also, patents regarding treatment options like use of herbal therapy, antihistamines, pre-, pro and synbiotics, nanocarriers, hypoallergens and several immune molecules towards amelioration of food allergy have been reviewed in this article.

**First case report of anaphylaxis caused by Rajgira seed flour (Amaranthus paniculatus) fromIndia: A clinico-immunologic evaluation.**

[Asian Pac J Allergy Immunol. 2013 Mar;31(1):79-83.]

The prevalence of food allergy is reported to be 3-4% in adults and about 6% in children. However food allergy across different countries accounts for 35-50 % all cases of anaphylaxis to foods. In the present study, we have reported a case of anaphylaxis to Amaranth grain (*Amaranthus paniculatus*) commonly known as Rajgira (Ramdana) in India. A 60 year old

female suffered anaphylaxis after consuming Rajgira seed flour generally consumed during fasting. Food allergy to Amaranth seeds is not reported so far. The patient reported to hospital with complaints of itching in mouth, choking throat, redness and swelling of face and burning abdomen within 5 min of consuming Rajgira flour. Clinical and immunological investigations revealed SPT and oral challenge positivity beside high allergen specific IgE in the serum of the patient. Three IgE binding protein fractions were detected in roasted Rajgira seed flour extract which could be considered to be allergenically important for triggering anaphylaxis.

**Foodallergies in developing and emerging economies: need for comprehensive data on prevalence rates.**

[Clin Transl Allergy. 2012 Dec 20;2(1):25.]

Although much is known today about the prevalence of food allergy in the developed world, there are serious knowledge gaps about the prevalence rates of food allergy in developing countries. Food allergy affects up to 6% of children and 4% of adults. Symptoms include urticaria, gastrointestinal distress, failure to thrive, anaphylaxis and even death. There are over 170 foods known to provoke allergic reactions. Of these, the most common foods responsible for inducing 90% of reported allergic reactions are peanuts, milk, eggs, wheat, nuts (e.g., hazelnuts, walnuts, almonds, cashews, pecans, etc.), soybeans, fish, crustaceans and shellfish. Current assumptions are that prevalence rates are lower in developing countries and emerging economies such as China, Brazil and India which raises questions about potential health impacts should the assumptions not be supported by evidence. As the health and social burden of food allergy can be significant, national and international efforts focusing on food security, food safety, food quality and dietary diversity need to pay special attention to the role of food allergy in order to avoid marginalization of sub-populations in the community. More importantly, as the major food sources used in international food aid programs are frequently priority allergens (e.g., peanut, milk, eggs, soybean, fish, wheat), and due to the similarities between food allergy and some malnutrition symptoms, it will be increasingly important to understand and assess the interplay between food allergy and nutrition in order to protect and identify appropriate sources of foods for sensitized sub-populations especially in economically disadvantaged countries and communities.

**Urticaria and anaphylaxis in a child after inhalation of lentil vapours: a case report and literature review.**

[Ital J Pediatr. 2012 Dec 13;38:71.]

Among legumes, lentils seem to be the most common legume implicated in pediatric allergic reactions in the Mediterranean area and India, and usually they start early in life, below 4 years of age. A 22 -month-old child was admitted to our Pediatric Department for anaphylaxis and urticaria. At the age of 9 months she presented a first episode of angioedema and laryngeal obstruction, due to a second assumption of lentils in her diet. At admission we performed routine analyses that were all in the normal range, except for the dosage of specific IgE, which revealed a positive result for lentils. Prick tests too were positive for lentils, while they were all negative for other main food allergens. The child also performed a prick by prick that gave the same positive result (with a wheal of 8 mm of diameter). The child had not previously eaten lentils and other legumes, but her pathological anamnesis highlighted that the allergic reaction appeared soon after the inhalation of cooking lentil vapours when the child entered the kitchen. Therefore a diagnosis of lentils vapours allergy was made. Our case shows the peculiarity of a very early onset. In literature there are no data on episodes of anaphylaxis in so young children, considering that our child was already on lentils exclusion diet. Therefore a diet of exclusion does not absolutely preserve patients from allergic reactions, that can develop also after their cooking steams inhalation.

**Impact of thermal processing on legumeallergens.**

[Plant Foods Hum Nutr. 2012 Dec;67(4):430-41.]

Food induced allergic manifestations are reported from several parts of the world. Food proteins exert their allergenic potential by absorption through the gastrointestinal tract and can even induce life threatening anaphylaxis reactions. Among all food allergens, legume allergens play an important role in induction of allergy because legumes are a major source of protein for vegetarians. Most of the legumes are cooked either by boiling, roasting or frying before consumption, which can be considered a form of thermal treatment. Thermal processing may also include autoclaving, microwave heating, blanching, pasteurization, canning, or steaming. Thermal processing of legumes may reduce, eliminate or enhance the allergenic potential of a respective legume. In most of the cases, minimization of allergenic potential on thermal treatment has generally been reported. Thus, thermal processing can be considered an important tool by indirectly prevent allergenicity in susceptible individuals, thereby reducing treatment costs and

reducing industry/office/school absence in case of working population/school going children. The present review attempts to explore various possibilities of reducing or eliminating allergenicity of leguminous food using different methods of thermal processing. Further, this review summarizes different methods of food processing, major legumes and their predominant allergenic proteins, thermal treatment and its relation with antigenicity, effect of thermal processing on legume allergens; also suggests a path that may be taken for future research to reduce the allergenicity using conventional/ nonconventional methods.

**Safety evaluation of genetically modified mustard (V4) seeds in terms of allergenicity: comparison with native crop.**

[GM CropsFood. 2012 Oct-Dec;3(4):273-82.]

Genetically modified (GM) mustard line (V4) with increased carotenoid content was compared with native mustard to find the difference in allergenic potential, if any. Simulated gastric fluid (SGF) digestibility of crude protein extract from GM as well as its native counterpart mustard crop was envisaged to understand the intended or unintended changes in GM crop along with IgE immunoblotting. BALB/c mice were used as model for allergenicity studies for monitoring total and specific IgE, specific IgG1, histamine level, histopathology, and systemic anaphylaxis score. Allergenicity of mustard was checked in humans by clinical history, skin prick test and IgE levels. Similar results were evident by significant increase in total IgE, specific IgE, IgG1, histamine levels, in GM and native mustard in comparison to control group. Prominent anaphylactic symptoms (score 2: 60%; score 3: 20%; score 4: 20% in native mustard and score 2: 40%; score 3: 40%; score 4: 20% in GM mustard) and eruptive histopathological changes were observed in both GM and native mustard when compared with controls. One protein of approximately 16 kDa was found stable up to 1 h in both GM as well as non GM mustard. IgE immunoblotting detected three protein components of approximately 29, 24 and 16 kDa in both GM and non GM varieties. Collectively, our data demonstrate substantially equivalent allergic responses against GM as well as its native counterpart. Therefore, the GM mustard may be as safe as its native counterpart with reference to allergenic responses.

**Antihistaminic and antiallergic actions of extracts of Solanum nigrum berries: Possible role in the treatment of asthma.**

[J Ethnopharmacol. 2012 Jun 26;142(1):91-7]

Berries of the plant *Solanum nigrum* Linn (Solanaceae) are used for the treatment of asthma in folk medicine and ancient books. To evaluate potential of the plant berries in the treatment of asthma. Petroleum ether, ethanol and aqueous extracts of *S. nigrum* berries (50, 100 and 200mg/kg, i.p.) were screened for the treatment of asthma by the various methods viz. effect on clonidine and haloperidol induced catalepsy, milk-induced leucocytosis and eosinophilia, mast cell stabilizing activity in mice and studies on smooth muscle preparation of guinea pig ileum (in vitro). Active petroleum ether extract was standardized by HPTLC. The petroleum ether extract of *S. nigrum* berries inhibited clonidine-induced catalepsy significantly but not haloperidol-induced catalepsy. Petroleum ether extract significantly inhibited increased leukocyte and eosinophil count due to milk allergen and showed maximum protection against mast cell degranulation by clonidine. Petroleum ether extract resisted contraction induced by histamine better than other extracts. All the results are dose dependant. Active petroleum ether extract showed presence of antiasthmatic compound, ß-sitosterol. The petroleum ether extract of *S. nigrum* berries can inhibits parameters linked to the asthma disease.

## DID YOU KNOW

- While more than 160 foods can cause allergic reactions in people with food allergies.
- The law identifies the eight most common allergenic foods.
- These foods account for 90 percent of food allergic reactions, and are the food sources from which many other ingredients are derived.
- The top eight allergy foods identified by the law:
  - Milk (dairy)
  - Eggs
  - Fish (e.g., bass, flounder, cod)
  - Crustacean shellfish (e.g. crab, lobster, shrimp)
  - Tree nuts (e.g., almonds, walnuts, pecans)
  - Peanuts
  - Wheat
  - Soybeans

## ON THE WEB

1. Food Allergy Research & Education: http://www.foodallergy.org
2. Food allergy -Health A-Z -NHS Choices: http://www.nhs.uk/conditions/food-allergy/Pages/Intro1.aspx
3. Food Allergies AAAAI: http://www.aaaai.org/conditions-and-treatments/allergies/food-allergies.aspx

## BOOK STOP

**1. Food Allergies and Food Intolerance:**

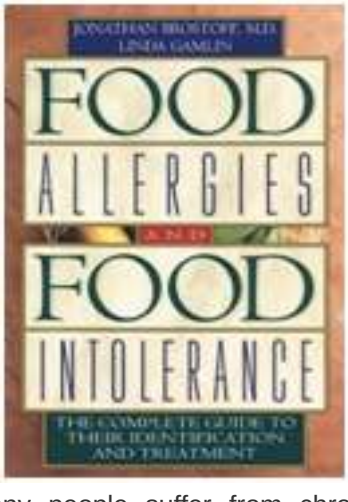
The Complete Guide to Their Identification and Treatment

Author: Jonathan Brostoff, Linda Gamlin

Publisher : **Healing arts press**

ISBN : 0892818751

Pages: 470




Many people suffer from chronic, unexplained health problems--migraine headaches, poor digestion, recurring sinus symptoms, aching muscles and joints, persistent fatigue--whose causes remain elusive, even to doctors. When conventional tests fail to provide a clear-cut diagnosis, doctors often suggest that these symptoms are due to stress or anxiety, but now Jonathan Brostoff and Linda Gamlin demonstrate that quite often food allergies and food intolerance are the true culprits in these situations.

**2. Management of Food Allergens**

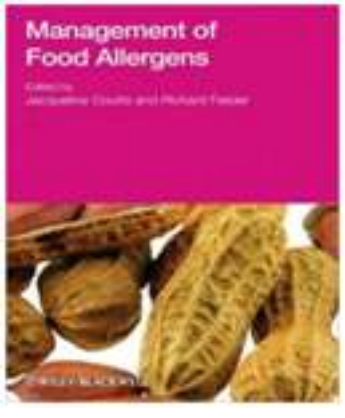
Author: Jacqueline Coutts, Richard Fielder

Publisher: Blackwell publishing ltd.

ISBN : 1444309927

Pages: 253

This volume provides an overview of the safe management of food allergens, aiming to help all those with a vested interest in understanding how to protect consumer health through good manufacturing practice and clear labelling advice.




**3. PlantFood Allergens**

Author: E. N. Clare Mills, Peter R. Shewry

Publisher : Blackwell publishing ltd.

ISBN : 0470995165

Pages: 213

In order to study the complex problems of food allergy a EU funded network, called PROTALL was set up, bringing together a wide range of clinicians and scientists. This important book is largely based on the outcome of its investigations.

## CONFERENCE

**Food Allergy and Anaphylaxis Meeting (FAAM) 2014**

Dublin, Ireland on 9-11 October 2014.

The European Academy of Allergy and Clinical Immunology (EAACI) is an association of clinicians, researchers and allied health professionals, dedicated to improving the health of people affected by allergic diseases. With over 7,800 individual members and 42 National Societies, EAACI is the primary source of expertise in Europe for all aspects of allergy. EAACI offers free Junior member-ship to individuals under 35 years of age (with online access to the Journals Allergy and Pediatric Allergy and Immunology). In addition, EAACI also offers a 50% reduction on membership fees to members from countries with a GNP of less than USD 10,000, with full membership benefits

As an EAACI member you will be kept informed of the latest research and developments through our official journals Allergy and Pediatric Allergy and Immunology (available in printed or electronic version) and Clinical and Translational Allergy.

## CURRENT CONCERN


Public awareness and concern about food allergens is growing. Concerns about food allergens have become linked to the application of biotechnology to produce genetically engineered crops and has resulted in many regulatory proposals and regulations. Food allergies result from the exposure of predisposed individuals to an allergen and, once sensitized, further exposure can result in escalating adverse responses. The most common allergenic responses are atopic reactions in the form of hives and other skin responses and gastric distress, but severe reactions can result in death from anaphylaxis. As the awareness of food allergies has grown so has the public perception of the size of the sensitive population. True food allergies are an immunological response and occur in about 2% of the adult population and 5–8% of young children. The remaining cases of 'food allergy' are often due to other dietary difficulties such as lactose intolerance, that is, an enzyme deficiency rather than an allergy. Several different proposals have been presented to explain the apparent perception of the increased incidence of food allergies, among which is the 'hygiene hypothesis'. This suggests that cleaner modern life-styles result in fewer immunological challenges at an early age which' in turn' results in increased sensitivity to other immunological challenges leading to food allergies amongst its effects. Food allergies do have a genetic component exhibited in multiple generations of some families.

Allergies can result from exposure to new immunological challenges from the increased diversity of modern diets containing plant-derived products from throughout the world. One example is the kiwi fruit that became widely available in Western countries relatively recently. Kiwi fruit is allergenic to a significant fraction of consumers causing atopic and other reactions requiring avoidance for sensitive people. Other allergens that have the potential for serious reaction with increasing incidence in Western countries are sesame and sunflower. Allergenic reactions to the storage proteins of tree nuts, sesame, sunflower, and peanuts are responsible for many scores of deaths in the US and Europe on an annual basis, with many more worldwide, but they are not as diligently recorded in the medical literature. Any new and novel food has the potential to introduce new allergens although with the increasing world distribution of agricultural products relatively few of these 'new' foods have elicited significant allergies among consumers.

**Food Allergies on the Rise**

For the worldwide food industry, the allergen issue emerged slowly at first beginning in late 1980s in several countries but had become a major public health focus in several countries by the late 1990s . According to a study released in 2013 by the Centers for Disease Control and Prevention, food allergies among children increased approximately 50% between 1997 and 2011. Researchers are trying to discover why food allergies are on the rise in developed countries worldwide, and to learn more about the impact of the disease in developing nations. More than 17 million Europeans have a food allergy, and hospital admissions for severe reactions in children have risen seven-fold over the past decade, according to the European

Academy of Allergy and Clinical Immunology (EAACI). FRAP(Food Allergy Research and Resource Program ) is a Food industry consortium created to address/ support research and methods development for food allergen issues . It was formed in 1996 and now it has 57 member companies from 11 countries. It develops the tools for industry to assess and control allergen risks – analytical detection methods, sanitation strategies, etc.

**Foods Commonly Associated with Food Allergies**

The most common food allergens include peanuts, milk, eggs, tree nuts, fish, shellfish, soy, and wheat these foods account for about 90% of all allergic reactions. The most common food allergies in adults are shellfish, peanuts, tree nuts, fish, and egg. The most common food allergies in children are milk, eggs, peanuts, and tree nuts. Six to eight percent of children under the age of three have food allergies and nearly four percent of adults have food allergies. For reasons that are not entirely understood, the diagnosis of food allergies has apparently become more common in Western nations in recent times. In the United States, food allergy affects as many as 5% of infants less than three years of age and 3% to 4% of adults. There is a similar prevalence in Canada. Seventy-five percent of children who have allergies to milk protein are able to tolerate baked-in milk products, i.e., muffins, cookies, cake and hydrolysed formulas. About 50% of children with allergies to milk, egg, soy, peanuts, tree nuts and wheat will outgrow their allergy by the age of 6. Those that are still allergic by the age of 12 or so have less than an 8% chance of outgrowing the allergy. Peanut and tree nut allergies are less likely to be outgrown, although evidence now shows that about 20% of those with peanut allergies and 9% of those with tree nut allergies will outgrow them.

**Food Allergy Risk Factors and Related Diseases**

Food allergies affect children and adults of all races and ethnicity.A food allergy can begin at any age. Your risk of having food allergies is higher if you have a parent who suffers from any type of allergic disease (asthma, eczema, food allergies, or environmental allergies such as hay fever). Children with food allergy are 2-4 times more likely to have other related conditions such as asthma and other allergies, compared with children who do not have food allergies. Food allergies may be a trigger for or associated with other allergic conditions, such as atopic dermatitis and eosinophilic gastrointestinal diseases.

**Detection of Allergenic Food Residues**

First method (Skerritt ELISA for gluten) was published in 1990 ; commercialized soon after first peanut ELISA (Neogen) marketed in 1996 . Now the food industry has the analytical tools to detect allergen residues. Mostly used allergen detection methods are:

1. Enzyme Linked Immunosorbent Assay (ELISA)
2. General Protein Tests
3. ATP/Bioluminescence Tests
4. Polymerase Chain Reaction (PCR)

FARRP confidential analytical testing ELISAs fully developed for Peanut , Milk , Egg , Processed Soy , Soy Flour , Almond , Hazelnut , Shrimp Tropomyosin , Lupine , Sesame , Gluten/Gliadin (wheat, barley, rye) , Buckwheat, Walnut, Mustard , Clam, Pecan and Cashew.

**Today's Situation : Status of Allergen Testing**

We live in a world without thresholds where uncertainty abounds regarding the safety (or lack of safety) of various products for food-allergic consumers. In some countries (e.g. USA), that world is reasonably safe (at least for packaged foods) but loaded with restricted choices. Regulatory Threshold is an allowed amount or concentration that would be safe for the vast majority of individuals in a group e.g. peanut-allergic consumers. But in current situation public health authorities have not established regulatory thresholds for peanut or other allergenic foods. Industry acutely aware of allergens, no guidance on thresholds so rampant use of precautionary/ advisory labeling. Quality of life for food-allergic consumers suffers partially as a result of seriously restricted food choices. Some food-allergic consumers ignore products with precautionary labels .Threshold Working Group Report of US FDA of 2006 favored use of the quantitative risk assessment-based approach. “Approaches to Establish Thresholds for Major Food Allergens and for Gluten in Food ”; March 2006; Journal of Food Protection, Vol. 71, No. 5, 2008, Pages 1043– 1088.

FDA Conclusion -'the quantitative risk assessment based approach provides the strongest, most transparent scientific analyses to establish thresholds for the major food allergens. However, the currently available data are not sufficient to meet the requirements of this approach. A research program should be initiated to develop applicable risk assessment tools and to acquire and evaluate the clinical and epidemiological data needed to support the approach'.

## REGULATORY TRENDS

The European Union is in the process of considering appropriate allergen labelling, and in the meantime many national organisations have produced guidelines that encourage further adoption of GMP and the provision of consumer information.

The Codex Alimentarius Commission, the EU Commission and other international organisations, are setting out scientific criteria for the selection of allergenic foods for labelling. Peanuts, tree nuts, crustacean, fish, soya beans, cow's milk, eggs, and wheat, as well as sesame (EU Commission) have been selected as major allergens.

While there are no specific provisions under EU food legislation that require potential food allergens to be labelled, the general requirements are that all ingredients added to food must be declared on a product's ingredient list. At the moment, there are certain exceptions to this general rule:

Ingredients that are included in the "25% rule" do not require to be labelled in the ingredient list. This is the case for compound ingredients (an ingredient with a common name but composed of several ingredients), which constitutes less than 25 per cent of the final food;

"Carry-over" ingredients, such as some additives that do not have any technological function in the end product, but are carried over into a food by one of its ingredients; and some foods (e.g. some cheeses, most alcoholic drinks).

On a voluntary bases the major critical allergens are already declared on the ingredient lists of certain manufacturers and retailers, even if present in very small amounts. In addition, food producers use labels such as, 'may contain', on products in which small amounts of a potential allergen may adventitiously be present. However, in response to the repeated request from consumers for better information about the foods they purchase, the Comission has issued a proposal for an amendment to the food labelling Directive 2000/13/EC. The proposal will abolish the "25% rule" meaning that all ingredients intentionally added will have to be labelled. The proposal will also establish the obligation to label those ingredients recognised in the scientific literature as liable to cause allergies. The amendment is intended to ensure better information on the contents of foodstuffs in order to enable consumers with allergies to identify allergenic ingredients that may be present.

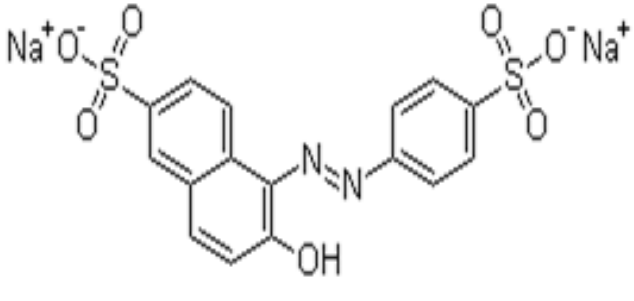
## MINI PROFILE OF Sunset Yellow FCF

**SYNONYMS**: 6-hydroxy-5-[(4-sulphonatophenyl) azo] naphthalene-2-sulphonate, Food Yellow 3, FD&C Yellow No. 6

**CASRN:** 2783-94-0

**MOLECULAR FORMULA:** $C_{16}H_{10}N_2Na_2O_7S_2$

**MOLECULAR STRUCTURE:**




**MOLECULAR WEIGHT:** 452.36

**PROPERTIES:** Appearance: crystals**;** Color: orange-red; pH: Not applicable; Odor: None; Boiling point: 390 ºC ; Melting point: None; Solubility: In water, 19.0 g/100 mL at 25 °C (1.9X10+5 mg/L); Vapor Pressure: 1.43X10-22 mm Hg at 25 ºC.

**USES:** Used in gelatin, frozen desserts, carbonated beverages, dry drink powders, confectionary products, bakery products, cereals, puddings, aqueous drug solutions, tablets, capsules, toothpaste and hair rinses.

TOXICITY DATA : LD50 Oral - rat - > 10,000 mg/kg

| Route | Symptoms | First Aid |
|---|---|---|
| IInhalation/Ingestion | May be harmful if inhaled. Causes respiratory tract irritation.<br>May be harmful if swallowed. | Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.<br>Ingestion: Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention. |
| Contact Eye/Skin | Causes skin and eye irritation. | Eye: Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.<br>Skin: After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cold water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing. |

## PERSONAL PROTECTIVE EQUIPMENT

**Eye/face protection**

Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique

(without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and Good Laboratory Practices.

**Body Protection**

Impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Respiratory protection**

For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges.

Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**STORAGE:** Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Combustible materials should be stored away from extreme heat and away from strong oxidizing agents.

**In the service of the nation for 45 years**

**Our motto -"**

***Safety to Environment***

***&***

***Health and Service***

**to Industry"**

The laboratory through its scientific expertise provides complete facilities for toxicological research, environmental and health risk assessment as well as analysisand testing services conforming to Good Laboratory Practices using NABL andi rnationalguidelines employin test testsystems, biomarkers, analyticalinstrumentsandmathematicalmodels

***Services Offered***

Health and Environmental Monitoring
Consumer Safety
Toxicity Testing
Analysis of chemicals
Information Database
Environmental Impact Assessment
Consultancy
Hazardous Waste Disposal
Environmental Management Plan
Health Status of Occupational Workers
Preparedness of Disaster Management

***Technologies Developed/ Available***

Water Analysis Kit
Mobile Laboratory Van for on spot water quality analysis
Argemone Detection Kit for rapid screening of Argemone in mustard oil
CD-Strip for detection of butter yellow an adulterant in edible oils
Arsenic Detection Kit

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**E-mail: rpbdiitr@yahoo.com** **Website: www.iitrindia.org**

# MAY WE HELP YOU

To keep abreast with the effects fo chemicals on environment and health, the ENVIS Centre of
Indian Institute of Toxicology Research, deals with :

Maintenance of Toxicology Information
Database on Chemicals

Information collection, collation and dissemination

Toxic Chemical related query response service

Preparation of monograph on specified chemicals of current concern

Publishing Abstract of Current Literature in Toxicology

for further details do write to


Scientist In-Charge

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