FOOD ADULTERATION DETECTION METHODS pdf

1: Full text of "Simple methods for detecting food adulteration"

Methods for Detection of common adulterants in food This topic covers the Information related to the Methods for Detection of common adulterants in food.

Food Adulteration is an act for debasing the quality of food with an admixture or through the substitution of inferior substances or by removing some valuable ingredients from the food product. Food Adulterants are the substances which are added to food items for economic and technical benefits. Such substances reduce the value of nutrients and also causes the food contaminated and not fit for consumption. As per Food Safety and Standards Authority of India, a food article could be declared adulterated if: When an substance is added which depreciates or injuriously affects it. Cheaper or inferior substances are substituted wholly or in part. Any valuable or necessary constituent has been wholly or in part abstracted. It is an imitation. It is colored or otherwise treated, to improve its appearance or if it contains any added substance injurious to health. For whatever reason its quality is below the standard. FSSAI shares the list of common adulterants and the tests which can be done at home for detecting the harmful substances: Tests which can be done at home for the adulteration in Milk: Water â€" The presence of water can be detected by putting a drop of milk on a polished slanting surface. The drop of pure milk flows slowly leaving a white trail behind it, whereas milk adulterated with water will flow immediately without leaving a mark. Starch â€" Add a few drops of tincture of Iodine or Iodine solution. Formation of blue colour indicates the presence of Starch. Urea â€" Take a teaspoon of milk in a test tube. Add half teaspoon of soybean or arhar powder. Mix up the contents throughly by shaking the test tube. After 5 mins, dip a red litmus paper after half a minute. A change in colour from red to blue indicates the presence of Urea in milk. Detergent â€" Shake ml of sample with an equal amount of water. Lather indicates the presence of detergent. Synthetic Milk â€" Synthetic milk has a bitter taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating. The colour chart of the Urease Strip test given below will show the quantity of Urea present in Milk.

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2: Methods for Detection of Common Adulterants in Food

Ever since the horsemeat scandal, the awareness of food adulteration and food fraud has heavily increased. The varying prices and availability of food products from different origin provide opportunities for the incorrect declaration of food components, both from a quality and quantity point of view.

After reading this article you will learn about the methods for detection of common adulterants in food. The presence of water can be by putting a drop of milk on a polished slanting surface. The drop of pure milk either or flows lowly leaving a white trail behind it, whereas milk adulterated water will flow immediately without leaving a mark, 2. Add a few drops of tincture of Iodine or Iodine solution. Formation of blue colour indicates the presence of starch. Iodine solution is easily available in the medical stores. Take a teaspoon of milk in a test tube. Mix up the contents thoroughly by shaking the test tube. After 5 minutes, dip a red litmus paper in it. A change in colour from red to blue indicates the presence of urea in the milk. Take 3 ml of milk in a test tube. Add 10 drops of hydrochloric acid. Mix up one teaspoonful of sugar. After 5 minutes, examine the mixture. The red colouration indicates the presence of vanaspati. Take 10 ml of milk in a tests tube and add 5 ml of con sulphuric acid from the sides of the wall without shaking. If a violet or blue ring appears at the intersection of two layers then it shows presence of formalin. Formalin enhances the life of milk and thus is added for it preservation purpose. Synthetic milk has a bitter after taste, gives a soapy feeling on rubbing between the fingers and turns yellowish on heating. Synthetic milk test for protein: The milk can easily be tested by Urease strips available in the Medical stores because Synthetic milk is devoid of protein. It means milk is adulterated. If it is made; synthetically by; adding while colour water paint. Oils, alkali, urea and detergent etc. Glucose, inverted sugar syrup is added in milk to increase the consistency and test. Ghee, cottage cheese, condensed milk, khoa, milk powder Coal Tar Dyes: Add 5 ml of dil. HCl to one teaspoon full of melted sample in a test tube. If HCl does not give colour dilute it with water to get the colour. Detection from Milk and Milk Product: Take1 teaspoon full of curd in a test tube. Mix up the contents shaking the test tube gently. The red colouration indicates the presence of vanaspati in the curd. Take a teaspoon of rabri in a test tube. Add 3 ml of hydrochloric acid and 3 ml of distilled water. Stir the content with a glass rod. Remove the rod and examine. Presence of fine fibres to the glass rod will indicate the presence of blotting paper in rabri. Khoa and its products: Boil a small quantity of sample with some water, cool and add -a few drops of Iodine solution. Formation of blue colour indicates the presence of starch 4. Boil a small quantity of sample with some water, cool and add a few drops of Iodine solution. Detection from Oil and Fats: Take about one tea spoon full of melted sample of Ghee with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. Shake for one minute and let it for five minutes. Appearance of crimson colour in lower acid of Vanaspati or Margarine. The test specific seasame which is for oil compulsorily added is to Vanaspati and Mrgarine. Some coal tar colours also give a positive test. If the test is positive i. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present. Mashed Potatoes, Sweet Potatoes and other starches: Take about one teaspoon full of melted sample of butter with equal quantity of concentrated Hydrochloric acid in a stoppered test tube and add to it a pinch of sugar. The test is specific for seasame oil which is compulsorily added to Vanaspati and Margarine. Some coal tar colour also give a positive test. If the crimson or red colour develops after adding and shaking with sugar, then alone Vanaspati or Margarine is present ii. Mashed potatoes other starches: The presence of mashed potatoes and sweet potatoes in a sample of butter can easily detected by adding a few drops of iodine which is brownish in colour , turns to blue. Take 5 ml of sample in a test tube and add 5 ml of concentrated hydrochloric acid. Shake gently, let it stand for 5 minutes. Colour will separate in the upper layer of the solution. Place a small bottle of oil in refrigerator. Coconut oil solidifies leaving the adulterant as a Separate layer. Detection from Sweetening Agents: Dissolve 10 gm of sample in a glass of water, allow settling, Chalk will settle down at the bottom. On dissolving in water it gives a smell of ammonia. Dissolve 10 gm of sample in a glass of water, allow to settle, chalk will settle down at the bottom. Yellow colour Non- permitted: Take 5 ml in a tests tube from the above solution and add a few drops of conc. A pink colour in lower acid layers shows the presence of

non-permitted colour. A cotton wick dipped in pure honey when lighted with a match stick burns and shows the purity of honey. If adulterated, the presence of water will not allow the honey to burn, If it does; it will produce a cracking sound. This test is only for added water. Add a few drops of solution HC1. Effervescence shows presence of washing soda. Dissolve a little amount sample in water in a test tube, chalk powder settles down. Add 3 ml of alcohol and shake the tube vigorously to mix up the content. Pour 10 drops of hydrochloric acid in it. A pink colouration indicates the presence of metanil yellow colours in jaggery. Add a drop of honey to a glass if water, if the drop does not disperse in water it indicates that the honey is pure. However, if the drop disperses in water it indicates presence of added sugar. Add 1 ml of HC1 to a little of bura sugar. Effervescence occurs if washing soda is present. Dissolve 2 gm of sugar in water; dip a red litmus paper in the solution. If washing soda is present, it will turn blue. Sweetmeats, Ice-cream and beverages: Metanil yellow a non- permitted coal tar colour: Extract colour with luke warm water from food articles. Add few drops of concentrated Hydrochloric acid. If magenta red colour develops the presence of metanil yellow is indicated. Taste a small quantity. Saccharin leaves a lingering sweetness on tongue for a considerable time and leaves a bitter taste at the end. Detection from Food Grain and their Products: Dust, pebble, stone, straw, weed seeds, damaged grain, weevilled grain, insects, rodent hair and excreta: These may be examined visually to see foreign matter, damaged grains, discoloured grains, insects, rodent contamination etc. In moderately excessive amount can resultin risk to health,Discard the damaged undesirable grains before use 2. Resultant atta or cheap flour: When dough is prepared from resultant or left out atta, more water has to be used. The normal taste of chapattis prepared out of wheat is somewhat sweetish whereas those prepared out of adulterated wheat will taste insipid. Take a small amount of sample in a test tube, add some water and shake.

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3: QUALITY CONTROL: Types of food adulteration

Food is the basic necessity of life. Synonyms like admixture and substitution helps to define the word adulteration. Food adulteration can be defined as lowering the quality of food by intentional or unintentional substitution of food with some inferior foreign particle or by removal of some value added food substitute from main food item.

Vegetable oil Castor oil Take 1 ml. Of acidified petroleum ether. Shake vigorously for 2 minutes. Add 1 drop of Ammonium Molybdate reagent. The formation of turbidity indicates presence of Castor oil in the sample. Argemone oil Add 5 ml, conc. Allow to separate yellow, orange yellow, crimson colour in the lower acid layer indicates adulteration. Of the sample in a test tube. Cool and a drop of iodine solution. Blue colour indicates presence of Starch. Vanaspati Take 5 ml. Of Hydrochloric acid and 0. Insert the glass stopper and shake for 2 minutes. Development of a pink or red colour indicates presence of Vanaspati in Ghee. Rancid stuff old ghee Take one teaspoon of melted sample and 5 ml. Of HCl in a stoppered glass tube. Shake vigorously for 30 seconds. A pink or red colour in the lower acid layer indicates rancidity. Synthetic Colouring Matter Pour 2 gms. Of filtered fat dissolved in ether. Divide into 2 portions. Of HCl to one tube. Shake well and allow to stand. Presence of pink colour in acidic solution or yellow colour in alkaline solution indicates added colouring matter. Of solvent ether to 5 ml. Shake well and decant the ether layer in a petri dish. Evaporate completely by blowing the ether layer. Of resorcinol 1 gm. Of resorcinol resublimed in 5 ml. Of honey in a porcelain dish. Orange red colour indicates presence of sugar. HCl to a small quantity of dal and keep on simmering water for about 15 minutes. The pink colour, if developed indicates the presence of Kesari dal. HCl to a small quantity of dal in a little amount of water. Immediate development of pink colour indicates the presence of metanil yellow and similar colour dyes. Lead Chromate Shake 5 gm. Of pulse with 5 ml. Of water and add a few drops of HCl. Pink colour indicates Lead Chromate. Of Carbon tetra chloride and allow to stand. Grit and sandy matter will collect at the bottom. Excessive bran Sprinkle on water surface. Bran will float on the surface. Chalk powder Shake sample with dil. HCl Effervescence indicates chalk. However, if the colour disappears upon adding distilled water the sample is not adulterated. Pour the seeds in a beaker containing Carbon tetra-chloride. Black papaya seeds float on the top while the pure black pepper seeds settle down. Powdered bran and sawdust float on the surface.

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4: FOOD SAFETY: ADULTERATION DETECTION

Adulteration in food products is the accidental or deliberate con- tamination of foods with chemical and physical substances which should not be naturally present in the product [1].

Wednesday, 15 June Food adulteration detection methods Adulterants, both harmful and simple, can be detected easily through small tests. These tests can be done at home too. What one needs is a set of equipment and chemicals and the culprits can be found out easily through these simple anti-adulteration tests. These adulterants can be detected by the following two tests: In case of castrol oil: Shake vigorously for 2 minutes. Add 1 drop of ammonium molybdate reagent. The formation of turbidity indicates presence of castor oil in the sample. In case of argemone oil: Yellow, orange yellow or crimson colour in the lower acid layer indicates adulteration. Ghee is generally mixed with mashed potato or sweet potato to make it weighty and creamy. Often vanaspati is also added to Ghee. In case of mashed potato or sweet potato: Blue colour indicates presence of starch. Colour disappears on boiling and reappears on cooling. In case of vanaspati: Insert the glass stopper and shake for 2 minutes. Development of a pink or red colour indicates presence of vanaspati in Ghee. Often old ghee rancid stuff is added. To detect this, take one teaspoon of melted sample and 5 ml. Restopper and shake for 30 seconds and allow to stand for 10 minutes. A pink or red colour in the lower acid layer indicates rancidity. Synthetic colours in food items: To find out whether synthetic colouring matter is used in food items, pour 2 gms. Divide into 2 portions. Shake well and allow to stand. Presence of pink colour in acidic solution or yellow colour in alkaline solution indicates added colouring matter. Honey is good for health and it has several curative properties. But honey is generally adulterated with invert sugar or jaggery. There are two tests to find out whether the honey in question is pure or adulterated. Shake well and decant the ether layer in a petri dish. Evaporate completely by blowing the ether layer. Add aniline chloride solution 3 ml of aniline and 7 ml. Orange red colour indicates presence of sugar. Besan atta or pulses are adulterated with Kesari dal Lathyrus sativus. To find out the adulterant, add 50 ml. The pink colour, if developed, indicates the presence of Kesari dal. Pulses are also adulterated with metanil yellow dye. To find this out, add concentrated HCL to a small quantity of dal in a little amount of water. Immediate development of pink colour indicates the presence of metanil yellow and similar colour dyes. To find out whether lead chromate is used in the pulses, shake 5 gm. Pink colour indicates lead chromate. Wheat flour or atta: Atta is generally contaminated with excessive sand and dirt. Shake a little quantity of sample with about 10 ml of carbon tetrachloride and allow to stand. Grit and sandy matter will collect at the bottom. Often chalk powder is used in atta. To find out, shake sample with diluted HCL. Effervescence indicates chalk Common spices: Common spices like turmeric, chilly and curry powder are also adulterated by colours. Extract the sample with petroleum ether and add 13N H_2SO_4 to the extract. Appearance of red colour which persists even upon adding little distilled water indicates the presence of added colours. However, if the colour disappears upon adding distilled water the sample is not adulterated. Sprinkle on water surface. Powdered bran and sawdust float on the surface. Coriander powder is adulterated with dung powder. To find out, soak in water. Dung will float and can be easily detected by its foul smell. Brick powder, grit, sand, dirt, filth, etc are used in chillies, especially chilli powder. Pour the sample in a beaker containing a mixture of chloroform and carbon tetrachloride. Brick powder and grit will settle at the bottom. Lead chromate is used to give turmeric its natural color. Dissolve it in 1: Add 1 or 2 drops of 0. A pink colour indicates presence of lead chromate. Grass seeds coloured with charcoal dust is used. Rub the cumin seeds on palms. If palms turn black adulteration in indicated. Items like soap stone and other earthy matter is used for adulteration. Shake a little quantity of powdered sample with water. Soap stone or other earthy matter will settle at the bottom. In case chalk is used as an adulterant, shake sample with carbon tetrachloride CCl_4. Asafoetida will settle down. Decant the top layer and add diluted HCL to the residue. Effervescence shows presence of chalk. To test the adulterants, take a filter paper impregnated with ninhydrin 1 per cent in alcohol. Put some grains on it and then fold the filter paper and crush the grains with hammer. Spots of bluish purple colour indicate presence of hidden insect infestation.

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5: QUALITY CONTROL: Food adulteration detection methods

Methods for Detection of Common Adulterants in Food Article shared by: After reading this article you will learn about the methods for detection of common adulterants in food.

Packaging Hazards Polyethylene, polyvinyl chloride and allied compounds are used to produce flexible packaging material. While this method of packaging is very convenient, it must not contain any noxious thermal breakdown products, which could be injurious to health. Further, temperatures used for heat sealing, or sterilization should not result in formation of toxic residues. To avoid such incidences, it is essential that only food grade plastic packaging materials be used for packaging foods. Toxicants Naturally Present In Some Foods Some foods contain toxic substances, which may cause serious illness, when consumed in large amounts. An important example is the legume, Lathyrus sativus which contain a toxin which may produce neurotoxic effects. When consumed in large amounts, it subjects develop a crippling disease known as lathyrism. The toxin can be easily removed by soaking the pulse in hot water and discarding the water. Some varieties of mushrooms contain toxic substances which when consumed produce serious ill-effects. For example, ananita phalloides contains the toxin called phalloidin which causes hypoglycaemia and convulsions, vomiting in human subjects. Liver and kidney damages also occur. Stepping up the integrated pest management programme to teach farmers to use pesticides judiciously. No spraying should be done a week before harvest. Taking up on a warfooting the control of pest using their natural predators. Preventing industries from dumping poisonous effluents. Considering health costs while deciding pesticide policy. Use safer pesticides like synthetic pyrethroids or Malathion. A thorough washing of vegetables does help to get rid of much of toxin. Purple black longer size grains in bajra show the presence of ergots. Ergot floats over the surface while sound grains settle down. Tea leaves sprinkled on wet filter paper would immediately release added colour. Spread a little slaked lime on white porcelain tile or glass plate. Sprinkle a little tea dust on the lime. Red orange or other shades of colour spreading on the lime will show the presence of coal tar dye. In the case of genuine tea, there will be only a slight greenish yellow colour due to chlorophyll, which appears after sometime. The Lactometer reading should not ordinarily be less than 1. The presence of water can be detected by putting a drop of milk on a polished vertical surface. The drops of pure milk either stops or flows slowly leaving a white trail behind it. Whereas milk adulterated with water will flow immediately without leaving a mark.

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6: How to identify food adulteration - Just for Hearts

Food adulteration is a global concern and developing countries are at higher risk associated with it due to lack of monitoring and policies. However, this is one of the most common phenomena that has been overlooked in many countries.

The Agency has long been a leader in research to improve the detection of adulterated food products, through the efforts of its cadre of top-notch scientists and public health experts and its partnerships with outside academic institutions, private companies, food consortia, and other government agencies. The events of September 11, , highlighted the need to enhance the security of the U. Section d of the Bioterrorism Act directs FDA to provide for research on tests and sampling methodologies designed to test food to detect adulteration rapidly--particularly methodologies that detect intentional adulteration and tests that are suitable for inspections of food at ports of entry to the United States. Section d also requires the Agency to report annually to Congress on its progress in research on testing for rapid detection of food adulteration. This is the second annual report to Congress under section d. Since the Bioterrorism Act was enacted, FDA has initiated more than intramural and extramural research projects to develop tests and sampling methodologies for detection of adulterated food. Researchers also are exploring food testing protocols using the latest cutting edge technologies, such as the optical affinity biosensor technology and the quadruple time of flight mass spectrometer, to improve the timeliness and accuracy over existing available techniques. These new data and technologies have been shared across the Federal government and with States and localities to equip them to perform food safety testing. Other research products have resulted in commercial production and publication in well-respected, peer-reviewed journals. Introduction The events of September 11, , highlighted the need to enhance the security of the U. Section d of the Bioterrorism Act see Appendix A directs FDA to provide for research on test methods and sampling methodologies that allow for rapid detection of food adulteration and that offer significant improvements over available technology in terms of accuracy, timing, or costs. It instructs the Agency to give highest priority to research related to detection of intentional adulteration and to focus particularly on developing tests that are suitable for use in inspecting foods at ports of entry into the United States. Section d further requires FDA to prepare an annual report to Congress describing its progress in research on methods for rapid detection of adulterated food. The possibility of a biological, chemical, or radiological attack on the food supply is particularly worrisome because such an event could have significant public health consequences and could be especially dangerous for children, the elderly, and those who are immunocompromised. Therefore, the Agency is focusing on improving its capability to assess and respond to risks associated with threats to harm Americans through the food they eat. Research also primarily targets agents that pose the greatest threats to the public, which include some biological agents that the Centers for Disease Control and Prevention CDC has classified as "Category A" or "Category B" agents due to their potential for adverse public health impact and large-scale dissemination, as well as priority chemical agents identified by CDC, and radiological agents. Our key food defense research goals are the development of field-deployable analytical detection methods and the characterization of microbiological, chemical, and radiological agents in FDA-regulated foods. For some agents of concern, new microbiological, chemical, and radiological methods must be developed, validated, and used to detect, enumerate, and identify non-traditional agents that may threaten the food supply. Characteristics research involves assessment of the abilities of non-traditional bacterial pathogens to survive and grow in food, as well as determination of the stability and activity of chemical agents while present in food. Researchers also are developing a transportable system for radionuclide analysis of FDA-regulated foods. Intramural food defense research is conducted by the following components within FDA: The Center for Food Safety and Applied Nutrition CFSAN is responsible for oversight of the food supply and has an active research program to support its regulatory responsibilities, which include responding rapidly to newly emerging food safety threats to public health. The Center for Veterinary Medicine CVM has authority over feed and feed additives and drugs that will be given to animals, including food-producing animals. The Agency also coordinates its food defense research agenda, as

appropriate, with other Federal agencies, such as the CDC, the U. Specific counterterrorism-related food research projects are listed in the table provided in Appendix B. Accomplishments and Opportunities in Research on the Development of Tests and Sampling Methodologies Since the Bioterrorism Act was enacted in June , FDA has initiated more than research projects to develop tests and sampling methodologies to increase detection of adulterated food. Other projects, though still ongoing, have nevertheless produced significant accomplishments. Scientists developed new tools to quickly screen large numbers of food samples for C. Currently the Agency is negotiating a contract for bulk production of these kits. Also, through an Interagency Agreement with the U. Army, researchers assessed and validated an electrochemiluminescent assay for C. FDA researchers developed n ew methods to isolate and identify certain Category A biological agents in foods. The agents included Bacillus anthracis, which causes anthrax; Francisella tularensis, which causes tularemia; and Yersinia pestis , which causes plague. Through a contract with the Midwest Research Institute, researchers developed and validated a p olymerase chain reaction PCR method to detect F. Since this work was completed under budget, researchers were granted permission to use the remaining funds to develop methods to isolate and identify Y. Researchers successfully demonstrated that this PCR method was more sensitive than a commercially available test kit. Agency scientists established a protocol for detecting ricin, a Category B agent, in solid and liquid foods using lateral flow devices and a commercially available ELISA test. FDA researchers developed new sampling techniques and a novel infrared procedure to measure cellular fatty acids in food to classify bacteria and to identify bacteria by spectral comparison. This methodology was published in two peer-reviewed journals. Agency scientists established the usefulness and application of a portable x-ray fluorescence device to rapidly identify certain CDC priority chemical agents in food. Scientists successfully identified several heavy metals -- arsenic, lead, mercury, cadmium, thallium, and chromium -- in 60 seconds or less using the XRF device. Extramural researchers established a method for detecting monofluoroacetic acid, a highly toxic rodenticide, in foods, using liquid chromatography-mass spectrometry. FDA researchers developed a multi-class method to confirm residues of 9 aminoglycoside drugs in edible tissues of cattle, swine, horse, rabbit, and poultry. FDA scientists developed a liquid scintillation counting method to determine gross alpha and beta radioactivity in food. FDA researchers optimized a set of tuning parameters for accurate and precise measurements of radionuclides such as plutonium, plutonium, and americium Next steps will be to develop and evaluate ICP-MS and alpha spectrometry methods with sufficient sensitivity to detect micro levels of radioactive elements in foods. The genomes of these bacteria are being studied and catalogued using bioinformatics to characterize the total genetic diversity within wild-type populations of these pathogenic groups. These studies, then, focus on distinguishing food contamination and human infection with normal circulating strains "wild type" of these pathogens from strains that may be genetically manipulated and may have enhanced ability to cause human disease. The Agency has initiated several promising food defense research projects, which include developing a method for identifying Y. Other new projects focus on chemical agents and toxins. The Agency has made significant strides in developing and improving methods to rapidly detect food adulteration and in characterization of agents that might be used to contaminate food. Several significant studies continue, and others are just beginning. We are confident that our commitment to this important research will lead to more rapid detection of food adulteration and, ultimately, to better protection for the American public. Scientists developed and evaluated an LC-MS method for extraction and detection of various MFA concentrations in food matrices with possible interferences, including salt, fat, and sugar content. Also determined limit of detection and limit of quantitation of the method. Scientists developed and evaluated an immunocapture-polymerase chain reaction PCR method for isolating and identifying F. Currently evaluating an immunocapture-PCR method for isolating and identifying Y. Also identified several methods for the detection of Brucella spp. Researchers conducted a preliminary test of species barrier of CWD for humans. Work with proprietary hybridoma has begun, with goal of producing immunoassay kits to detect tetrodotoxin. Scientists determined that ORIGEN Analyzer FASTube assay can be performed in about one hour and is sufficiently sensitive in certain high-priority food matrices to be used as a rapid immunoassay method to screen for C. With data on detection of B. Scientists evaluated hand-held assays to detect C. Delivered assays to FDA laboratories. Yeast Prion as a Surrogate Protein: Researchers developed

and used a yeast prion protein as a surrogate for TSE prions. Preliminary results indicate that the polymeric form of the yeast prion protein is resistant to, or partially digestible by, proteinase K and keratinase, depending on the enzyme concentration. Scientists identified heat- and protease-resistant protein markers from a gelatin model. Developed, purified, labeled, and mapped the epitopes of monoclonal antibodies to bovine tropomyosin and developed an immunoassay for bovine tropomyosin. Produced monoclonal antibodies for bovine type I collagen. Efforts continue on identifying heat- and protease-resistant protein markers as surrogates for TSE prion proteins and studying the denaturation of such markers using monoclonal antibody immunoassays. Researchers found secondary antibody amplification unnecessary for large-sized cell detection e. H7 by surface plasmon resonance SPR. Also improved sensitivity of SPR for domoic acid fold. Found flow rate, cell thickness, and cell shape to affect adsorption or equilibrium of biomolecules in the SPR detector. Efforts continue on developing a novel optical affinity biosensor technology that will enable fast, sensitive, and specific detection and identification of foodborne pathogens and toxins in food samples. Work continues on developing a synthetic polymeric film MIP imprinted with a macromolecular external membrane component or components of E. H7 as an initial capability. If successful and operationally suitable, the methods developed will be applied to certain select agents on foods. Researchers enumerated spore mixtures to determine the effect of double heat treatments on spore inactivation. Analyzed survival to determine effect of fat level or hold time between treatments on heat sensitivity of spores. Determined survival of C. Work continues on characterizing the risk from C. Will continue to optimize assays and develop a new assay for Vibrio vulnificus. Multiplexing of individual assays planned for FY Researchers found, through preliminary testing, a G protein-based fluorescence assay to be successful at high concentrations to predict the ability of processing treatments to inactivate the infectivity and biological activity of prions. Detected prion in foods with sensor using gold nanoparticles with polyclonal antibodies to PrPSC. Also found a cell-based sensor using chromatophores was not sufficiently robust. Scientists evaluated and selected software as the information technology component to be used in developing the quantitative framework to evaluate the relative risks of contamination of FDA-regulated foods. Developed and revised questions for microbial and chemical hazards that can be used for ranking. Researchers demonstrated the covalent incorporation of nisin into one or more targets in the Bacillus cell. Also demonstrated the effectiveness of nisin in various food models inoculated with B. Scientists found chlorine solution to be effective in controlling growth of S. Project continues to determine the effectiveness of disinfectant washes in reducing S. Data presented at scientific meeting; manuscript submitted for publication. Collaborative study in planning stage; FDA seeking commercial source for bulk production. Developed and tested in dairy products an improved enrichment method for the detection of F. Researchers continue to evaluate rapid methods for other priority agents. Scientists developed a microarray for Staphylococcus spp.

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7: 10 Food Industry Adulteration Detection Tips | The Hearty Soul

This review provides current information on the analytical methods used to identify food adulteration in the six most adulterated food categories: animal origin and seafood, oils and fats, beverages, spices and sweet foods (e.g. honey), grain-based food, and others (organic food and dietary supplements).

Honey is defined as a naturally sweet mixture produced by bees Apis mellifera from the nectar of flowers, from secretions of parts of the living plants or excretions of plant-sucking insects on the living part of plants that the honey bees collect, transform and combine with specific substances of their own such as enzymes , deposit, dehydrate, store and leave in the beeswax honeycombs to ripen and mature. Physically, honey is a viscous material, where all the sugars All components carbohy-drates, water, enzymes, amino acids, pigments, variable amounts of sugar-tolerant yeasts, pollen, traces of vitamins, organic acids and wax and probably crystals of dextrose hydrate are due to maturation of the honey; some are added by the bees, and some are derived from the plants. However, honey from the same floral source can also vary due to seasonal climatic variations or to a different geographic origin. Aside from the definition of honey in the Codex Alimentarius , there are additional definitions in the regulations of many countries and the European Union EU. Various physical types pressed, centrifuged and drained and forms comb, chunk, crystallized or granulated, creamed and heat-processed of honey are on the market. Among the compositional criteria prescribed in the existing EC honey directive are requirements relating to the concentrations of acidity, apparent reducing sugar calculated as invert sugar and apparent sucrose, 5-hydroxymethylfurfural HMF content, mineral content ash , moisture and water-insoluble solids. Consumption of honey and honey products has grown considerably during the last few decades. In case of doubt or fraud, there is no standardized analysis available that can discriminate or determine the botanical floral or vegetable and geographical regional or territorial origin of the honey. Counterfeiting and product adulteration are now commonly practiced in the global food marketplace. Because of its high nutritional value and unique flavor, the price of natural bee honey is relatively much higher than that of other sweeteners. Honey is susceptible to adulteration with cheaper sweeteners; those that have been detected in adulterated honeys include sugar syrups and molasses inverted by acids or enzymes from corn, sugar cane, sugar beet and syrups of natural origin such as maple. Adulteration of pure honey with synthetic honey based on C4 plant sugars has become much more prevalent in recent years. In addition, there has been a recent major adulteration problem in honey from the Far East. It should be emphasized that the adulteration of pure honey is one issue and concern about the botanical and geographical origin of honey or its authenticity is another, but the two can overlap, as in the case of adulteration by honey of other geographical origin, from a country where quality measures are not as stringent and the honey price is much lower. Many foods have the potential to be deliberately adulterated, but those that are expensive and are produced under wide fluctuations in weather and harvesting conditions are particularly susceptible; honey is one such material. Adulteration usually refers to mixing other matter substance of an inferior and sometimes harmful quality with food or drink intended to be sold. With companies concerned about the bottom line, the temptation to cheat is considerable, and unfortunately, the adulteration of honey is a serious economic and regulatory problem. As usual, the losers are the consumers and the processor or re-processor seeking to provide a wholesome product that meets regulatory standards. From an economic point of view, food product adulteration can destabilize the market by bringing in unfair competition. Authentication of pure honey is of primary importance for both consumers and honey processors. Additionally, honey processors do not wish to be subjected to unfair competition from unscrupulous processors who would gain an economic advantage by misrepresenting the honey they are selling. Honey adulteration appeared on the world market in the s when high-fructose corn syrup was introduced by the industry. As the sugars The average ratio of fructose to glucose is 1. The amount of glucose in honey is usually at a supersaturated level at normal temperatures. With reduction in temperature or water content, the glucose can crystallize out. Normally, honey contains The processing of honey includes controlled heating to destroy yeast and dissolve dextrose crystals, combined with fine straining or pressure filtration. Most honey

will crystallize during some period of time unless action is taken to prevent it. This temperature is similar to that in beehives and does not affect the honey very much during the relatively short processing period. However, some honeys are heated to a higher temperature for liquefaction or pasteurization reasons. Adulteration Detection All food products targeted for adulteration are high-value commercial products, including honey. The detection of adulteration can pose a technical problem. The quality of honey is mainly determined by its sensorial, chemical, physical and microbiological characteristics. Analytical methods applied to honey generally deal with different topics: At present, a variety of analytical techniques have been developed to detect adulteration of honey, such as isotopic stable isotope methodology , chromatographic, spectroscopic, trace elements techniques and thermal analysis. Some of these methods are time-consuming, and some are expensive. Although there are powerful methods to prove honey adulteration, they have to be further improved in order to ensure honey quality. Due to the limitations of classical analytical methods, which measure chemical parameters to detect adulteration, many experiments have been carried out using new indicators derived from physical analysis, such as thermal analysis. Differential Scanning Calorimetry Differential scanning calorimetry DSC is a thermal analysis method with a broad field of application. It is an efficient method for characterizing pure food compounds as well as their mixtures. It has been used in monitoring thermal behavior in different foods, as well as in cases where no heat exchange occurs. DSC can monitor and determine heat flows resulting from various structural modifications phase transformations and transitions, glass transition, etc. These phenomena allow the determination of the type of transformation occurring in the studied food product e. DSC can be a useful technique to complement chemical analytical methods which show the limitations of the physicochemical determinations i. DSC has been investigated for the detection of alteration or adulteration, and for quality control of food. The thermal behavior of honey is influenced by several factors, including composition, temperature and amount and size of crystals. Addition of syrups produces commercial honey of lower quality. When sugar syrups are added to authentic honeys, adulteration can be determined easily, since the syrups and honeys show significant differences in thermal phenomena, as well as in their amplitudes and positions on the temperature scale. Honey and sugar syrups demonstrate several thermal or thermo-chemical parameters phenomena , such as the glass transition temperature Tg , along with their respective changes in enthalpy of fusion? Hfus , and heat capacity? Cp which could be determined by DSC. The glass transition temperature Tg is an important physical parameter for determination of food adulteration and has been defined as the midpoint temperature in the range over which the transformation from liquid to amorphous state occurs at a given scan rate. This parameter is specific to each food component and product, although it may vary slightly depending on the thermal history of the material as in the case of honey that has been warmed to a certain temperature to lower its viscosity. Tg values are strongly dependent on the amorphous phases of the material and respond to modification caused by the addition of an exogenous compound. Water decreases the Tg. Most amorphous food components are miscible with water, which acts as a plasticizer, causing a decrease in transition temperature as water content increases. The glass transition is accompanied by a change in heat capacity, which can be observed as the base line change shifts on the heat flow of the thermo-analytical DSC curve thermogram. Addition of syrups to honey can result in a decrease in glass transition temperatures and an increase in the enthalpies of fusion. The Tg position and intensity in honey and syrups are different and can be used to distinguish between them. Pure substances can be characterized by a unique and sharp melting point, which is not the case for honey since it has a complex composition. Experiments showed that the effect that adulterating honey with syrups has on the enthalpy of fusion follows a linear relationship. Figure 1 shows some typical features that may be observed on a DSC temperature scan. Conclusion Different parameters, such as Tg and enthalpy changes, can be used to detect the effects of certain adulterants. DSC is an analytical technique that is capable of accurate and precise measurements and can be applied to routine analysis. She has done considerable research on the thermophysical and rheological properties of foodstuffs, inhibition of browning in fruit and vegetables changes in minimally processed fruit and vegetables , new methods in food preservation and detection of honey adulteration. She can be reached at Vlasta. Nela Nedic Tiban, Ph. She did her Ph. She can be reached at Nela.

FOOD ADULTERATION DETECTION METHODS pdf

8: Advances in Honey Adulteration Detection - Food Safety Magazine

Methods of detecting food adulteration are based on physical, chemical, biochemical, and other techniques. All these methods, which have replaced the early organoleptic and other empirical tests, are continuously updated because food adulteration is unceasing, and new problems are always arising.

We all have done corruption at least once in our life. At least when you were in hurry and the policeman caught you. What did you do? Took the receiptâ€¦ Noâ€¦ just gave Rs. One part of this corruption is adulteration. Increase or decrease in the demand of the product creates adulteration. It will help you earning lot of profit. Some type of such practices can never be caught but for others there are simple home remedies. Adulteration is done in the products which we use in our day -to-day life like milk, milk products, coconut oil, atta, cereals, pulses, coffee, tea, baking powder, non-alcoholic beverages etc. Given below are some techniques which will help one identify is their food adulterated or no: Considering milk, put 3 drops of milk on a slate. If the slowly flows away leaving a mark then it is not adulterated. But if it just flows away quickly then it is definitely adulterated. For coconut oil, just put a small bottle of coconut oil in refrigerator, the oil will solidify leaving the adulteration at the base. Sugar is normally adulterated with calk powder so dissolve the sugar in water and allow it to settle. The chalk powder does not dissolve in water and thus remains at the bottom. Grains like rice, wheat, bajra, the adulteration can be seen by us directly without and method to find out. The other methods of identifying adulteration are by chemical tests, filtering, soaking and drying the product etc. Many a time normal food items are adulterated with chemical substance which is very harmful for our health. One should test before buying any product in order to stay safe and healthy. If you have any other methods to identify adulteration feel free to discuss it with us here.

9: detection food adulteration - simple tests? | Yahoo Answers

Analytical methods applied to honey generally deal with different topics: determination of botanical or geographical origin, quality control according to the current standards and detection of adulteration or chemical residues.

Food fraud and adulteration has existed for centuries. However, the horsemeat scandal of provoked a widespread distrust in the traceability of foods and food ingredients and raised the profile of food adulteration. In response to this, the British Retail Consortium BRC introduced vulnerability assessment within Global Standard Food Safety Issue 7; this requires companies to assess and annually review the vulnerability of raw materials to adulteration within the supply chain. Vulnerability assessment requires and is supported by a requirement to use the most suitable test methods. Limitations of traditional detection methods Authenticity testing seeks to confirm that all ingredients claimed on a product label are present in that product. It is an essential part of vulnerability assessment and can provide due diligence defence and deterrence value in supporting quality assurance. Quantification of any adulteration in processed foods will always present problems since there are no universal standards for complex food matrices and the relationship between DNA measurement and meat or fish content based upon protein measurement and nitrogen factors is not known. There are many sources of measurement uncertainty in molecular methods for food authentication[1]. PCR based assays are available in different laboratory based formats. Different quantitative PCR assays have been developed to distinguish between various amounts of species in processed and canned foods and for foods derived from genetically modified crops. This limits the use of qPCR as a screening tool for detecting unknown and unsuspected adulterants. Furthermore, real-time qPCR is carried out under relatively nonspecific amplification conditions and is reliant on fluorescence based detection leading to concerns over false positive results, especially when DNA is extracted from processed food matrices. Hence, to date, food and beverage manufacturers have been hampered in their attempts to detect food fraud by tests which can only confirm or deny known adulterants. Detecting any species For many years, DNA sequencing was predominantly reliant on the sequencing method developed by Frederick Sanger and colleagues in , which provided the majority of sequence data for the next 25 years. Firstly the approach is non-targeted, allowing the identification of any species that might be present. Secondly, the approach is self-validating and generates data that can be directly compared with database sequences leading to greater confidence in species identification. Recent data[2] has demonstrated the feasibility of the application of this approach for the quantitative identification of plant, animal and bacterial DNA in food. At present this analysis is too complex and costly for food laboratories but shows promise for the future. Intriguingly the data showed some of the hidden dangers of sequence analysis finding sequence matches with human, mouse and whale DNA due to redundant ancient fragments of DNA or to nuclear mitochondrial translocations NUMTs that can complicate DNA analysis[3]. Mitochondrial sequences are present in multiple copies in every cell which results in increased sensitivity and is therefore preferred for highly processed foods e. Typical NGS sequencing approaches use PCR based amplification using conserved flanking primers to amplify species specific variable intervening sequences, which are then sequenced in thousands of individual sequencing reactions. This metagenomics approach allows non-targeted analysis, so that guessing which species might be present is not required. Individual sequence reads are compiled and assembled using software tools and compared with database sequences to identify the species present. NGS sequencing platforms currently range from those designed for de novo whole genome sequencing WGS to those for resequencing and particularly for sequences of interest identified by WGS. WGS is currently very costly to purchase, run and maintain for routine applications in the food industry and is presently not quantitative. Different platforms for WGS have been reviewed[4]. WGS generates large amounts of complex data requiring expert data interpretation. Alternative NGS platforms, such as pyrosequencing for resequencing, allow resequencing of the same DNA sequence from different sources in order to identify specific mutations or instances of adulteration. It combines highly efficient DNA extraction with non-targeted pyrosequencing. Both peak height and peak position correspond to sequence data at different nucleotide positions and can be used to determine the species of origin and the presence of admixtures. Pyrosequencing

for food authentication was first described in this laboratory for plant speciation by Ortola and colleagues in [7]. Since then the method has been refined and a number of different assays for meat, poultry and fish speciation have been developed. Examples of different fish sequence profiles are shown in Figure 1. Pyrosequencing profiles can also be generated in silico and used to model mixtures allowing the resolution of mixtures of different species. ASPECT assays can therefore resolve unknown and unsuspected DNA mixtures providing an extremely versatile tool for food authentication and a practical tool for manufacturers in their battle against food fraud. Next generation sequencing NGS holds the key to nontargeted testing, thus enabling detection of unknown and unsuspected adulterants. DNA barcoding overestimates the number of species when nuclear mitochondrial pseudogenes are co-amplified. Food Control 18, Leatherhead Food Research offers services ranging from consumer insight, sensory testing and ground-breaking ingredient and product innovation to expert advisory work around food safety and global industry regulations. It also operates an internationally recognised membership programme for the food and drinks industry.

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