Journal of Contemporary Issues in Business and Government Vol. 26, No. 2, 2020
https://cibg.org.au/

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2020.26.02.200

Fruit Juices as A Source of Infection. A Review

VIKRAMAN K S[1], DR. MURALIDHARAN N P[2*], KAVITHA S[3]

[1]Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University
[2]Associate professor, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University
[3]Lecturer, Department of Biochemistry, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University , Chennai.
*Corresponding Author
Email:151801044.sdc@saveetha.com[1], muralidharan@saveetha.com[2], kavithas.sdc@saveetha.com[3]

Abstract: Fresh fruits are always nutritious whether taken raw or made as a juice and consumed. Everyone has an addiction towards fresh fruit juices. But fresh fruit juices always carries a risk of having contaminants in it. These contaminants are risky when it is a pathogenic agent. The risk is more when there is an outbreak of infection. Episodes of disease related to utilization of natural product juice have been a developing general medical issue since the mid 1990s. Because of epidemiologic examinations of episodes in which juice was entrap, the U.S. Food and Drug Administration actualized the process and control measures to manage the creation of organic product juice. The last squeeze guideline, which got powerful in 2002, 2003, and 2004, contingent upon the size of the business, necessitates that juice tasks conform to a risk investigation basic control point (HACCP) plan. The Center for Disease Control and Prevention (CDC) gets reports of food-related episodes of ailment. We looked into natural product juice–related flare-ups of disease answered to the CDC's Foodborne Outbreak Reporting System. From 1995 through 2005, 21 juice-related flare-ups were accounted for to CDC; 10 ensnared squeezed apple or juice, 8 were connected to squeezed orange, and 3 included different sorts of organic product juice. These episodes caused 1,366 diseases, with a middle of 21 cases for each flare-up (2 to 398 cases). Among the 13 flare-ups of known etiology, 5 were brought about by Salmonella, 5 by Escherichia coli O157:H7, 2 by Cryptosporidium, and one by Shiga poison delivering E. coli O111 and Cryptosporidium. Less squeeze related flare-ups have been accounted for since the juice HACCP guideline was actualized. Some juice tasks that are excluded from handling prerequisites or don't conform to the guideline keep on being involved in flare-ups of sickness.

Keywords: Fresh juices; cleaning; outbreak; health.

INTRODUCTION

Fresh fruits are always nutritious, it is taken raw or made as a juice and consumed. Everyone has an addiction towards fresh fruit juices. But fresh fruit juices always carries a risk of having contaminants in it. These contaminants are risky when it is a pathogenic agent. The risk is more when there is an outbreak of infection. Outbreaks of sickness brought about by microscopic organisms and parasites have been connected to juices for a long time(Mathews and Scott Mathews, 2006).Although the affirmation of the causative agents in these outbreaks has been abnormal. The causticity of organic product juice has been truly thought to be an important deterrent against endurance and development of foodborne pathogens(Tribst, de Souza Sant'Ana and de Massaguer, 2009). Many microbes like E.coli, salmonella,enterococcus may contaminate juices(Marickar, Geetha and Neelakantan, 2014)(Priyadharsini *et al.*, 2018b). In 1991, an episode of Escherichia coli O157:H7 contaminations and haemolytic uremic condition (HUS) was connected to generally squeezed apple juice(Gachovska *et al.*, 2008). This pathogen has since been appeared to make due for a few days in new juice at pH esteems extending somewhere in the range of 3.6 and 4.0. A range recently thought to be inhibitory(Thaher *et al.*, 2018). This juice-related episode and others brought about by E. coli O157:H7, Salmonella, parasites, and different pathogens have brought about an expanded familiarity with the microbiological security of organic product juices(Andres, Giannuzzi and Zaritzky, 2001).

Episodes of disease related with utilization of natural product juices have animated new research of the variables influencing the conduct of pathogens in foods grown and how the security of these items can be improved(Girija *et al.*, 2019). Natural acids, hydrogen peroxide monocaprylin , dimethyl bicarbonate , vanillin corrosive , basic oils, and nisin and cinnamon are among the antimicrobials that slaughter or repress the

Copyright © The Author(s) 2020. Published by *Society of Business and management*. This is an Open Access Article distributed under the CC BY license. (http://creativecommons.org/licenses/by/4.0/)

development of foodborne pathogens in organic product juices(Services and North Carolina Department of Health & Human Services, no date). Treatment of apple cider and squeezed orange with ozone makes 4.26.0-log decrease in E. coli O157:H7 and Salmonella(Ashurst, 2016)(Ashwin and Muralidharan, 2015) . Treatment with UV radiation is compelling for slaughtering E. coli O157: H7 and non pathogenic E. coli in organic product juices(Basaran *et al*., 2004). Gamma radiation , electron bar radiation high-pressure treatment ultrasound and beat electric field handling additionally show guarantee for inactivating pathogens(Szabo, 2006).

The rise of juice-related episodes additionally stimulated the improvement of new administrative methodologies(Cody *et al.*, 1999). In 1998, the U.S. The Food and Drug Administration (FDA) published the last squeeze marking guideline as a between time measure to disease coming about because of utilization of contaminated organic product juice(Ashurst, 2016). The juice naming guideline was focused on processors of refreshments containing juice or juice fixings that had not been prepared to accomplish a 5-log pathogen decrease. These processors are required to utilize a notice mark showing the wellbeing dangers related with drinking these refreshments(Beletic, Beletic and Amico, 2006). In 2001, the FDA distributed the last squeeze dangers investigation and basic control point (HACCP) guideline which necessitates that juice.(Comes and Beelman, 2002). The procedure used to forestall natural pollution must result in at any rate a 5-log decrease in the pathogen of worry to general wellbeing, normally E. coli O157:H7 or Salmonella(Sohaib Shahzan, Smiline Girija and Vijayashree Priyadharsini, 2019). Treated juices should be ensured to prove that they achieve a 5-log reduction(Pratha, Ashwatha Pratha and Geetha, 2017). The juice HACCP regulation applies to all juice processors except those who qualify as retail establishments. Businesses qualify as retail establishments when they process juice themselves and sell directly and exclusively to consumers(Girija *et al*., 2019). Presented here is the epidemiology of juice-associated outbreaks in the United States as reported to the Centre for Disease Control and Prevention (CDC) during the period of 1995 through 2005(Miñano *et al.*, 2008).While trying to all the more likely see a portion of the reasons why juices have been involved in episodes of human ailment, the endurance, development, and inactivation qualities of foodborne pathogens in these items are quickly depicted.Our team has rich experience in research and we have collaborated with numerous authors over various topics in the past decade (Deogade, Gupta and Ariga, 2018; Ezhilarasan, 2018; Ezhilarasan, Sokal and Najimi, 2018; Jeevanandan and Govindaraju, 2018; J *et al.*, 2018; Menon *et al.*, 2018; Prabakar *et al.*, 2018; Rajeshkumar *et al.*, 2018, 2019; Vishnu Prasad *et al.*, 2018; Wahab *et al.*, 2018; Dua *et al.*, 2019; Duraisamy *et al.*, 2019; Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Gheena and Ezhilarasan, 2019; Malli Sureshbabu *et al.*, 2019; Mehta *et al.*, 2019; Panchal, Jeevanandan and Subramanian, 2019; Rajendran *et al.*, 2019; Ramakrishnan, Dhanalakshmi and Subramanian, 2019; Sharma *et al.*, 2019; Varghese, Ramesh and Veeraiyan, 2019; Gomathi *et al.*, 2020; Samuel, Acharya and Rao, 2020)

Sources of fruits

A fruit is the seed-bearing structure in flowering plants (also known as angiosperms) formed from the ovary after flowering.Those fruits were cultivated by the farmers in all parts of the world.A lot of fertilizers and manures was used for proper growth of the fruits and for protecting it from flies, insects etc.The fertilizers and pesticides used during cultivation can be both organic and inorganic.If chemicals such as nitrates and sulphur in inorganic fertilizers exceeds certain amount it will causes certain diseases in humans while consuming those fruits. This can have a small but cumulative effect on the health of people that consume them. At worst, chemical fertilizers may increase the risks of developing cancer in adults and children and adversely affecting fetal brain development. Microorganisms present in human and animal feces can also contaminate the fruits.Contamination of fruits can also happen due to improper handilng during transport and storage due to improper packing,lack of maintaining optimum temperature. Fruits are the significant source of vitamins,minerals and antioxidants(Saan, 2007).They may contain substantial amounts of potassium,calcium,magnesium,iron,copper and sulphur. Fruits are usually low in sodium and contain trace minerals.Fruits are also rich in water soluble vitamins such as vitamin-c (citrus fruits,strawberries).Vitamins of B group and carotenoids , precursors of vitamin A('Hornik, Jiri', 2011)(Maajida Aafreen M, Geetha RV and Lakshmi Thangavelu, 2019).Different fruits contains different vitamins.They are also important source of carbohydrates like fiber and sugar.They are low in calories and naturally sweet.Fruits and their juices are important sources of water too. Mangoes,papayas,melons and citrus fruits like oranges and grapefruit are high in vitamin C. Canned fruits packed in syrup have a lot of added sugars(Marriott *et al.*, 2010).

Storage

Storage is an important process. Fruits meant for direct consumption should be stored properly. The storage environment should be clean and free from microbes and pathogens and the following factor should be noticed(Roe, 1986). All the important parameters such as room temperature,visual guide,Ageing due to ripening, sofetining , undesirable metabolic changes, respiratory heat production and undesirable growth should be maintained in optimum condition(Southgate, 1976). The fruits for such purpose should be packed

immediately after cleaning till it is opened for consumption. Storage at the juice vendor's place is more important because they are unaware of the mode of contamination and possible transmission of infection.

Cleaning

All the fruits that are purchased from the market can be rinsed in running water, followed by rubbing with hands. This is all that is needed to clean a majority of fruits. The FDA recommends, "Rinse produce before you peel it, so dirt and bacteria aren't transferred from the knife onto the fruits.There is a myth that soap, detergent or any special liquid is required to clean produce. "Gently rub produce while holding under plain running water. There's no need to use soap or a produce wash." If damage or bruising occurs before eating or handling, it is best to cut away the damaged areas before preparing .Use a clean vegetable brush to scrub firm produce such as melons. Berries require extra attention during the cleaning process, place them in a colander and rinse them under running water to remove pathogens (Sapers, 2009; Girija As and Priyadharsini J, 2019). In big factories the quantity of production is high so the machines were used. Fruit washing equipment consists of a roller with a brush washing machine for washing fruits. Roller with a brush is made up of stainless steel tube and brush(Girija, Jayaseelan and Arumugam, 2018). Brush is made of polyethylene and will revolutionize the movement of stainless steel chains. Fruits are driven to circulate and washed by brush. Simultaneously, the terrible or dismissed organic products are gotten by manual and afterward sent away to a piece passing on gadget.(Paramasivam, Vijayashree Priyadharsini and Raghunandhakumar, 2020)

Preservation methods

There are various techniques to prevent pathogenic as well as non pathogenic microflora such as chilling,freezing,water activity, modified atmosphere packaging pasteurization ,nonthermal physical techniques to inactivate microorganisms(Raybaudi-Massilia *et al.*, 2009)(Smiline, Vijayashree and Paramasivam, 2018). Another method is by use of some chemical preservatives such as sodium benzoate and potassium sorbate is used to prevent microbial spoilage of fruit juices(Massaguer *et al.*, 2014). Customers relate manufactured additives as fake items bringing about dismissal of this sort of food prepared. So demands for natural preservatives have increased drastically. Natural antimicrobials such as bacteriocins, organic acids, essential oils(Vaishali and Geetha, 2018) and phenolic compounds have shown considerable use in food products(Rupasinghe, Vasantha Rupasinghe and Juan, 2012). Many herbs and plant extracts have broad spectrum activity against microorganisms(Martin-Belloso and Fortuny, 2010)(Tajkarimi, Ibrahim and Cliver, 2010). Food antimicrobials are generally biostatic and not biocidal. Hence their effects on foods are limited. On other hand, a combination of antimicrobial and nonthermal methods is effective against pathogenic and spoilage microorganisms(Centers for Disease Control and Prevention (CDC), 2010). So combination of these techniques could provide synergistic effects on prolong shelf period of fruit juices and potentially as the best option for traditional pasteurization methods(Aneja, 2008)(Priyadharsini *et al.*, 2018a).

Clean containers

Container holders have to be washed totally with water and disinfect the compartments with chlorine containing disinfectant. The sanitized container should be air dried and then juices can be stored in containers and covered with a tigh(Williamson and Clifford, 2010).

Health of food material handler

Anemia was the most well-known disorder among the food handlers (Rathore, 1993; Girija As and Priyadharsini J, 2019) are orodental lesions, gastroenteritis and febrile sickness,many of these settings present multiple opportunities for spread of pathogens within at-risk populations, and extra vigilance must be applied. Unfortunately, hand hygiene is not always carried out effectively, and both enteric and respiratory diseases are easily spread in these environments.This plays a vital role in transmission of food borne diseases. The health of the food handlers is of great importance for maintaining hygiene quality of food prepared and served by them(Mohan *et al.*, 2017).Handwashes and mouthwashes and sanitizers can be used to prevent the spread of infection(Selvakumar and Np, 2017)(Shahana and Muralidharan, 2016). The individuals may be able to satisfy their taste and nutrition needs, but should pay little attention to hygiene and food safety.

Cross contamination

Cross-contamination is the physical movement or transfer of harmful bacteria from one person, object or place to another. Preventing cross-contamination is a key factor in preventing food borne illness.There are three main types of cross-contamination: food-to-food, equipment-to-food, and people-to-food. In each type, bacteria are transferred from a contaminated source to uncontaminated food.For instance, in a refrigerator, meat drippings from raw meat stored on a top shelf might drip onto cooked vegetables placed on the lower shelf.Our institution is passionate about high quality evidence based research and has excelled in various fields ((Pc, Marimuthu and Devadoss, 2018; Ramesh *et al.*, 2018; Vijayashree Priyadharsini, Smiline Girija and Paramasivam, 2018;

Ezhilarasan, Apoorva and Ashok Vardhan, 2019; Ramadurai *et al.*, 2019; Sridharan *et al.*, 2019; Vijayashree Priyadharsini, 2019; Chandrasekar *et al.*, 2020; Mathew *et al.*, 2020; R *et al.*, 2020; Samuel, 2021)

CONCLUSION

The demand for fresh juices has been increasing due to their health benefits. Changes in dietary and social habits and preservation methods have led to an decrease in disease outbreaks linked mainly with fresh juices in recent years. In this review, we discussed with previous articles relating to fresh juices during outbreaks. Adequate precautions should be taken to prevent autoinoculation during any outbreaks. The moistness of fruits will hold the microbes viable for a longer period in the atmosphere.

REFERENCES

1. Andres, S. C., Giannuzzi, L. and Zaritzky, N. E. (2001) 'Mathematical Modeling of Microbial Growth in Packaged Refrigerated Orange Juice Treated with Chemical Preservatives', Journal of Food Science, pp. 724–728. doi: 10.1111/j.1365-2621.2001.tb04628.x.
2. Aneja, R. (2008) 'Myocardial dysfunction in sepsis: Check a BNP!*', Pediatric Critical Care Medicine, pp. 545–546. doi: 10.1097/pcc.0b013e3181849f5d.
3. Ashurst, P. R. (2016) Chemistry and Technology of Soft Drinks and Fruit Juices. John Wiley & Sons. Available at: https://play.google.com/store/books/details?id=tER2CwAAQBAJ.
4. Ashwin, K. S. and Muralidharan, N. P. (2015) 'Vancomycin-resistant enterococcus (VRE) vs Methicillin-resistant Staphylococcus Aureus (MRSA)', Indian journal of medical microbiology, 33 Suppl, pp. 166–167. doi: 10.4103/0255-0857.150976.
5. Basaran, N. et al. (2004) 'Influence of Apple Cultivars on Inactivation of Different Strains of Escherichia coli O157:H7 in Apple Cider by UV Irradiation', Applied and Environmental Microbiology, pp. 6061–6065. doi: 10.1128/aem.70.10.6061-6065.2004.
6. Beletic, J. E., Beletic, J. W. and Amico, P. (2006) 'Introduction', Experimental Astronomy, pp. 1–3. doi: 10.1007/s10686-006-9037-2.
7. Centers for Disease Control and Prevention (CDC) (2010) 'Incidence of end-stage renal disease attributed to diabetes among persons with diagnosed diabetes --- United States and Puerto Rico, 1996-2007', MMWR. Morbidity and mortality weekly report, 59(42), pp. 1361–1366. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21030940.
8. Chandrasekar, R. et al. (2020) 'Development and validation of a formula for objective assessment of cervical vertebral bone age', Progress in orthodontics, 21(1), p. 38. doi: 10.1186/s40510-020-00338-0.
9. Cody, S. H. et al. (1999) 'An outbreak of Escherichia coli O157:H7 infection from unpasteurized commercial apple juice', Annals of internal medicine, 130(3), pp. 202–209. doi: 10.7326/0003-4819-130-3-199902020-00005.
10. Comes, J. E. and Beelman, R. B. (2002) 'Addition of fumaric acid and sodium benzoate as an alternative method to achieve a 5-log reduction of Escherichia coli O157:H7 populations in apple cider', Journal of food protection, 65(3), pp. 476–483. doi: 10.4315/0362-028x-65.3.476.
11. Deogade, S., Gupta, P. and Ariga, P. (2018) 'Effect of monopoly-coating agent on the surface roughness of a tissue conditioner subjected to cleansing and disinfection: A Contact Profilometric In vitro study', Contemporary Clinical Dentistry, p. 122. doi: 10.4103/ccd.ccd_112_18.
12. Dua, K. et al. (2019) 'The potential of siRNA based drug delivery in respiratory disorders: Recent advances and progress', Drug development research, 80(6), pp. 714–730. doi: 10.1002/ddr.21571.
13. Duraisamy, R. et al. (2019) 'Compatibility of Nonoriginal Abutments With Implants: Evaluation of Microgap at the Implant-Abutment Interface, With Original and Nonoriginal Abutments', Implant dentistry, 28(3), pp. 289–295. doi: 10.1097/ID.0000000000000885.
14. Ezhilarasan, D. (2018) 'Oxidative stress is bane in chronic liver diseases: Clinical and experimental perspective', Arab journal of gastroenterology: the official publication of the Pan-Arab Association of Gastroenterology, 19(2), pp. 56–64. doi: 10.1016/j.ajg.2018.03.002.
15. Ezhilarasan, D., Apoorva, V. S. and Ashok Vardhan, N. (2019) 'Syzygium cumini extract induced reactive oxygen species-mediated apoptosis in human oral squamous carcinoma cells', Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology, 48(2), pp. 115–121. doi: 10.1111/jop.12806.
16. Ezhilarasan, D., Sokal, E. and Najimi, M. (2018) 'Hepatic fibrosis: It is time to go with hepatic stellate cell-specific therapeutic targets', Hepatobiliary & pancreatic diseases international: HBPD INT, 17(3), pp. 192–197. doi: 10.1016/j.hbpd.2018.04.003.
17. Gachovska, T. K. et al. (2008) 'Ultraviolet and Pulsed Electric Field Treatments Have Additive Effect on Inactivation ofE. coliin Apple Juice', Journal of Food Science, pp. M412–M417. doi: 10.1111/j.1750-3841.2008.00956.x.
18. Gheena, S. and Ezhilarasan, D. (2019) 'Syringic acid triggers reactive oxygen species-mediated cytotoxicity

in HepG2 cells', Human & experimental toxicology, 38(6), pp. 694–702. doi: 10.1177/0960327119839173.
19. Girija, A. S. S. et al. (2019) 'Plasmid-encoded resistance to trimethoprim/sulfamethoxazole mediated by dfrA1, dfrA5, sul1 and sul2 among Acinetobacter baumannii isolated from urine samples of patients with severe urinary tract infection', Journal of Global Antimicrobial Resistance, pp. 145–146. doi: 10.1016/j.jgar.2019.04.001.
20. Girija As, S. and Priyadharsini J, V. (2019) 'CLSI based antibiogram profile and the detection of MDR and XDR strains of Acinetobacter baumannii isolated from urine samples', Medical journal of the Islamic Republic of Iran, 33, p. 3. doi: 10.34171/mjiri.33.3.
21. Girija, S. A., Jayaseelan, V. P. and Arumugam, P. (2018) 'Prevalence of VIM- and GIM-producing Acinetobacter baumannii from patients with severe urinary tract infection', Acta microbiologica et immunologica Hungarica, 65(4), pp. 539–550. doi: 10.1556/030.65.2018.038.
22. Gomathi, A. C. et al. (2020) 'Anticancer activity of silver nanoparticles synthesized using aqueous fruit shell extract of Tamarindus indica on MCF-7 human breast cancer cell line', Journal of Drug Delivery Science and Technology, p. 101376. doi: 10.1016/j.jddst.2019.101376.
23. 'Hornik, Jiri' (2011) Benezit Dictionary of Artists. doi: 10.1093/benz/9780199773787.article.b00089611.
24. Jeevanandan, G. and Govindaraju, L. (2018) 'Clinical comparison of Kedo-S paediatric rotary files vs manual instrumentation for root canal preparation in primary molars: a double blinded randomised clinical trial', European Archives of Paediatric Dentistry, pp. 273–278. doi: 10.1007/s40368-018-0356-6.
25. J, P. C. et al. (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', Clinical implant dentistry and related research, 20(4), pp. 531–534. doi: 10.1111/cid.12609.
26. Maajida Aafreen M, Geetha RV and Lakshmi Thangavelu (2019) 'Evaluation oEvaluation of anti-inflammatory action of Laurus nobilis-an in vitro studyf anti-inflammatory action of Laurus nobilis-an in vitro study', International Journal of Research in Pharmaceutical Sciences, 10(2), pp. 1209–1213. doi: 10.26452/ijrps.v10i2.408.
27. Malli Sureshbabu, N. et al. (2019) 'Concentrated Growth Factors as an Ingenious Biomaterial in Regeneration of Bony Defects after Periapical Surgery: A Report of Two Cases', Case reports in dentistry, 2019, p. 7046203. doi: 10.1155/2019/7046203.
28. Marickar, R. F., Geetha, R. V. and Neelakantan, P. (2014) 'Efficacy of Contemporary and Novel Intracanal Medicaments againstEnterococcus Faecalis', Journal of Clinical Pediatric Dentistry, pp. 47–50. doi: 10.17796/jcpd.39.1.wmw9768314h56666.
29. Marriott, B. P. et al. (2010) 'Intake of added sugars and selected nutrients in the United States, National Health and Nutrition Examination Survey (NHANES) 2003-2006', Critical reviews in food science and nutrition, 50(3), pp. 228–258. doi: 10.1080/10408391003626223.
30. Martin-Belloso, O. and Fortuny, R. S. (2010) 'Advances in Fresh-Cut Fruits and Vegetables Processing'. doi: 10.1201/b10263.
31. Massaguer, P. R. de et al. (2014) 'FRUITS AND VEGETABLES | Fruit and Vegetable Juices', Encyclopedia of Food Microbiology, pp. 992–999. doi: 10.1016/b978-0-12-384730-0.00430-4.
32. Mathew, M. G. et al. (2020) 'Evaluation of adhesion of Streptococcus mutans, plaque accumulation on zirconia and stainless steel crowns, and surrounding gingival inflammation in primary molars: Randomized controlled trial', Clinical oral investigations, pp. 1–6. Available at: https://link.springer.com/article/10.1007/s00784-020-03204-9.
33. Mathews, F. S. and Scott Mathews, F. (2006) 'b-Type Cytochrome Electron Carriers: Cytochromesb562andb5, and Flavocytochromeb2', Handbook of Metalloproteins. doi: 10.1002/0470028637.met113.
34. Mehta, M. et al. (2019) 'Oligonucleotide therapy: An emerging focus area for drug delivery in chronic inflammatory respiratory diseases', Chemico-biological interactions, 308, pp. 206–215. doi: 10.1016/j.cbi.2019.05.028.
35. Menon, S. et al. (2018) 'Selenium nanoparticles: A potent chemotherapeutic agent and an elucidation of its mechanism', Colloids and Surfaces B: Biointerfaces, pp. 280–292. doi: 10.1016/j.colsurfb.2018.06.006.
36. Miñano, J. C. et al. (2008) 'Design of a novel free-form condenser overcoming rotational symmetry limitations', Optical Design and Engineering III. doi: 10.1117/12.794254.
37. Mohan, V. et al. (2017) 'Clinical research training and capacity building for prevention and control of non-communicable diseases: A programme in India', The National medical journal of India, 30(6), pp. 340–344. doi: 10.4103/0970-258X.239078.
38. Panchal, V., Jeevanandan, G. and Subramanian, E. M. G. (2019) 'Comparison of post-operative pain after root canal instrumentation with hand K-files, H-files and rotary Kedo-S files in primary teeth: a randomised clinical trial', European archives of paediatric dentistry: official journal of the European Academy of Paediatric Dentistry, 20(5), pp. 467–472. doi: 10.1007/s40368-019-00429-5.
39. Paramasivam, A., Vijayashree Priyadharsini, J. and Raghunandhakumar, S. (2020) 'N6-adenosine

methylation (m6A): a promising new molecular target in hypertension and cardiovascular diseases', Hypertension research: official journal of the Japanese Society of Hypertension, 43(2), pp. 153–154. doi: 10.1038/s41440-019-0338-z.
40. Pc, J., Marimuthu, T. and Devadoss, P. (2018) 'Prevalence and measurement of anterior loop of the mandibular canal using CBCT: A cross sectional study', Clinical implant dentistry and related research. Available at: https://europepmc.org/article/med/29624863.
41. Prabakar, J. et al. (2018) 'Comparative Evaluation of Retention, Cariostatic Effect and Discoloration of Conventional and Hydrophilic Sealants - A Single Blinded Randomized Split Mouth Clinical Trial', Contemporary clinical dentistry, 9(Suppl 2), pp. S233–S239. doi: 10.4103/ccd.ccd_132_18.
42. Pratha, A. A., Ashwatha Pratha, A. and Geetha, R. V. (2017) 'Awareness on Hepatitis-B vaccination among dental students-A Questionnaire Survey', Research Journal of Pharmacy and Technology, p. 1360. doi: 10.5958/0974-360x.2017.00240.2.
43. Priyadharsini, J. V. et al. (2018a) 'An insight into the emergence of Acinetobacter baumannii as an oro-dental pathogen and its drug resistance gene profile – An in silico approach', Heliyon, p. e01051. doi: 10.1016/j.heliyon.2018.e01051.
44. Priyadharsini, J. V. et al. (2018b) 'In silico analysis of virulence genes in an emerging dental pathogen A. baumannii and related species', Archives of Oral Biology, pp. 93–98. doi: 10.1016/j.archoralbio.2018.07.001.
45. Rajendran, R. et al. (2019) 'Comparative Evaluation of Remineralizing Potential of a Paste Containing Bioactive Glass and a Topical Cream Containing Casein Phosphopeptide-Amorphous Calcium Phosphate: An in Vitro Study', Pesquisa Brasileira em Odontopediatria e Clínica Integrada, pp. 1–10. doi: 10.4034/pboci.2019.191.61.
46. Rajeshkumar, S. et al. (2018) 'Biosynthesis of zinc oxide nanoparticles usingMangifera indica leaves and evaluation of their antioxidant and cytotoxic properties in lung cancer (A549) cells', Enzyme and microbial technology, 117, pp. 91–95. doi: 10.1016/j.enzmictec.2018.06.009.
47. Rajeshkumar, S. et al. (2019) 'Antibacterial and antioxidant potential of biosynthesized copper nanoparticles mediated through Cissus arnotiana plant extract', Journal of photochemistry and photobiology. B, Biology, 197, p. 111531. doi: 10.1016/j.jphotobiol.2019.111531.
48. Ramadurai, N. et al. (2019) 'Effectiveness of 2% Articaine as an anesthetic agent in children: randomized controlled trial', Clinical oral investigations, 23(9), pp. 3543–3550. doi: 10.1007/s00784-018-2775-5.
49. Ramakrishnan, M., Dhanalakshmi, R. and Subramanian, E. M. G. (2019) 'Survival rate of different fixed posterior space maintainers used in Paediatric Dentistry - A systematic review', The Saudi dental journal, 31(2), pp. 165–172. doi: 10.1016/j.sdentj.2019.02.037.
50. Ramesh, A. et al. (2018) 'Comparative estimation of sulfiredoxin levels between chronic periodontitis and healthy patients - A case-control study', Journal of periodontology, 89(10), pp. 1241–1248. doi: 10.1002/JPER.17-0445.
51. Rathore, M. H. (1993) 'Human Herpesvirus 6', Southern Medical Journal, pp. 1197–1201. doi: 10.1097/00007611-199311000-00001.
52. Raybaudi-Massilia, R. M. et al. (2009) 'USE OF MALIC ACID AND OTHER QUALITY STABILIZING COMPOUNDS TO ASSURE THE SAFETY OF FRESH-CUT "FUJI" APPLES BY INACTIVATION OFLISTERIA MONOCYTOGENES,SALMONELLAENTERITIDIS ANDESCHERICHIA COLIO157:H7', Journal of Food Safety, pp. 236–252. doi: 10.1111/j.1745-4565.2009.00153.x.
53. R, H. et al. (2020) 'CYP2 C9 polymorphism among patients with oral squamous cell carcinoma and its role in altering the metabolism of benzo[a]pyrene', Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, pp. 306–312. doi: 10.1016/j.oooo.2020.06.021.
54. Roe, D. A. (1986) 'History of promotion of vegetable cereal diets', The Journal of nutrition, 116(7), pp. 1355–1363. doi: 10.1093/jn/116.7.1355.
55. Rupasinghe, H. P. V., Vasantha Rupasinghe, H. P. and Juan, L. (2012) 'Emerging Preservation Methods for Fruit Juices and Beverages', Food Additive. doi: 10.5772/32148.
56. Saan, H. (2007) 'Retorno a Ottawa 1986', Promotion & Education, pp. 59–60. doi: 10.1177/10253823070140022002x.
57. Samuel, S. R. (2021) 'Can 5-year-olds sensibly self-report the impact of developmental enamel defects on their quality of life?', International journal of paediatric dentistry / the British Paedodontic Society [and] the International Association of Dentistry for Children, 31(2), pp. 285–286. doi: 10.1111/ipd.12662.
58. Samuel, S. R., Acharya, S. and Rao, J. C. (2020) 'School Interventions-based Prevention of Early-Childhood Caries among 3-5-year-old children from very low socioeconomic status: Two-year randomized trial', Journal of public health dentistry, 80(1), pp. 51–60. doi: 10.1111/jphd.12348.
59. Sapers, G. M. (2009) 'Disinfection of Contaminated Produce with Conventional Washing and Sanitizing Technology', The Produce Contamination Problem, pp. 393–424. doi: 10.1016/b978-0-12-374186-8.00016-1.

60. Selvakumar, R. and Np, M. (2017) 'COMPARISON IN BENEFITS OF HERBAL MOUTHWASHES WITH CHLORHEXIDINE MOUTHWASH: A REVIEW', Asian Journal of Pharmaceutical and Clinical Research, p. 3. doi: 10.22159/ajpcr.2017.v10i2.13304.
61. Services, N. C. D. of H. &. H. and North Carolina Department of Health & Human Services (no date) 'North Carolina Public Health: Population Health and Personal Health Care Services', PsycEXTRA Dataset. doi: 10.1037/e323042004-001.
62. Shahana, R. Y. and Muralidharan, N. P. (2016) 'Efficacy of mouth rinse in maintaining oral health of patients attending orthodontic clinics', Research Journal of Pharmacy and Technology, p. 1991. doi: 10.5958/0974-360x.2016.00406.6.
63. Sharma, P. et al. (2019) 'Emerging trends in the novel drug delivery approaches for the treatment of lung cancer', Chemico-biological interactions, 309, p. 108720. doi: 10.1016/j.cbi.2019.06.033.
64. Smiline, A. S. G., Vijayashree, J. P. and Paramasivam, A. (2018) 'Molecular characterization of plasmid-encoded blaTEM, blaSHV and blaCTX-M among extended spectrum β-lactamases [ESBLs] producing Acinetobacter baumannii', British Journal of Biomedical Science, pp. 200–202. doi: 10.1080/09674845.2018.1492207.
65. Sohaib Shahzan, M., Smiline Girija, A. S. and Vijayashree Priyadharsini, J. (2019) 'A computational study targeting the mutated L321F of ERG11 gene in C. albicans, associated with fluconazole resistance with bioactive compounds from Acacia nilotica', Journal de mycologie medicale, 29(4), pp. 303–309. doi: 10.1016/j.mycmed.2019.100899.
66. Southgate, D. A. T. (1976) Determination of Food Carbohydrates. Available at: https://books.google.com/books/about/Determination_of_Food_Carbohydrates.html?hl=&id=hS5BAAAAYAAJ.
67. Sridharan, G. et al. (2019) 'Evaluation of salivary metabolomics in oral leukoplakia and oral squamous cell carcinoma', Journal of oral pathology & medicine: official publication of the International Association of Oral Pathologists and the American Academy of Oral Pathology, 48(4), pp. 299–306. doi: 10.1111/jop.12835.
68. Szabo, G. (2006) 'Hepatitis C Virus NS5A Protein–A Master Regulator?', Gastroenterology, pp. 995–999. doi: 10.1053/j.gastro.2006.01.072.
69. Tajkarimi, M. M., Ibrahim, S. A. and Cliver, D. O. (2010) 'Antimicrobial herb and spice compounds in food', Food Control, pp. 1199–1218. doi: 10.1016/j.foodcont.2010.02.003.
70. Thaher, Y. A. et al. (2018) 'LbL-assembled gentamicin delivery system for PMMA bone cements to prolong antimicrobial activity', PLOS ONE, p. e0207753. doi: 10.1371/journal.pone.0207753.
71. Tribst, A. A. L., de Souza Sant'Ana, A. and de Massaguer, P. R. (2009) 'Review: Microbiological quality and safety of fruit juices—past, present and future perspectives', Critical Reviews in Microbiology, pp. 310–339. doi: 10.3109/10408410903241428.
72. Vaishali, M. and Geetha, R. V. (2018) 'Antibacterial activity of Orange peel oil on Streptococcus mutans and Enterococcus-An In-vitro study', Research Journal of Pharmacy and Technology, p. 513. doi: 10.5958/0974-360x.2018.00094.x.
73. Varghese, S. S., Ramesh, A. and Veeraiyan, D. N. (2019) 'Blended Module-Based Teaching in Biostatistics and Research Methodology: A Retrospective Study with Postgraduate Dental Students', Journal of dental education, 83(4), pp. 445–450. doi: 10.21815/JDE.019.054.
74. Vijayashree Priyadharsini, J. (2019) 'In silico validation of the non-antibiotic drugs acetaminophen and ibuprofen as antibacterial agents against red complex pathogens', Journal of periodontology, 90(12), pp. 1441–1448. doi: 10.1002/JPER.18-0673.
75. Vijayashree Priyadharsini, J., Smiline Girija, A. S. and Paramasivam, A. (2018) 'In silico analysis of virulence genes in an emerging dental pathogen A. baumannii and related species', Archives of oral biology, 94, pp. 93–98. doi: 10.1016/j.archoralbio.2018.07.001.
76. Vishnu Prasad, S. et al. (2018) 'Report on oral health status and treatment needs of 5-15 years old children with sensory deficits in Chennai, India', Special care in dentistry: official publication of the American Association of Hospital Dentists, the Academy of Dentistry for the Handicapped, and the American Society for Geriatric Dentistry, 38(1), pp. 58–59. doi: 10.1111/scd.12267.
77. Wahab, P. U. A. et al. (2018) 'Scalpel Versus Diathermy in Wound Healing After Mucosal Incisions: A Split-Mouth Study', Journal of oral and maxillofacial surgery: official journal of the American Association of Oral and Maxillofacial Surgeons, 76(6), pp. 1160–1164. doi: 10.1016/j.joms.2017.12.020.
78. Williamson, G. and Clifford, M. N. (2010) 'Colonic metabolites of berry polyphenols: the missing link to biological activity?', The British journal of nutrition, 104 Suppl 3, pp. S48–66. doi: 10.1017/S0007114510003946.