



PHLEGM, FOOD & HISTAMINE: UNVEILING THE MUCUS MYSTERY IN HEALTH AND DISEASE

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ABSTRACT Phlegm, commonly perceived as an irritating byproduct of respiratory illnesses, is medically recognized as a form of mucus that serves vital protective functions in the human body. This article explores the dual role of mucus in both the respiratory and digestive systems—acting as a barrier against pathogens and aiding in digestion. While typically beneficial, mucus can become problematic when overproduced due to infections, chronic diseases like asthma or GERD, allergic reactions, or environmental triggers. A central focus is placed on the role of histamine—a biogenic amine—and its dietary and microbial influences on mucus production. Foods rich in histamine or that act as histamine liberators, such as fermented products, bananas, chocolates, and caffeinated beverages, are examined for their potential to exacerbate phlegm production. The article also delves into the role of histamine-producing bacteria found in improperly stored seafood and vegetables, linking them to foodborne illnesses like scombroid poisoning. Additionally, the impact of acidic and reflux-triggering foods on mucus buildup is discussed in relation to gastroesophageal disorders. By highlighting the complex interaction between diet, microbes, and body physiology, this article emphasizes the importance of mindful food choices during infections or inflammatory conditions and encourages medical consultation for personalized dietary guidance.

KEYWORDS :

INTRODUCTION

If asked “What is Phlegm?” or “Explain the effects of Phlegm”, it may sound complicated. When we say, “Phlegm” is a medical term for “Mucus”, it becomes familiar to all of us. The first thing that comes to our mind about “Mucus” is a jelly-like substance, which often makes irritation in our throat when we had cough or any other medical conditions and when it comes out completely, we get relieved. But it is not true. Not all of the mucus gets out of our body; some remains in the respiratory tract. Even, mucus plays an important role in our body.

There is a thin lining of mucus in our respiratory system which plays an essential role in protecting our respiratory system from viruses and allergens from infecting the other vital organs such as lungs. Even the lining of the mucus layer in our digestive system also helps in the assimilation of the food and prevents problems like indigestion. However, when this phlegm increases in quantity as a body defence mechanism due to some infection, it becomes thick, hinder the functioning of organs and cause irritation and discomfort [Johansson, M. E., Sjövall, H., & Hansson, G. C. (2013). The gastrointestinal mucus system in health and disease. *Nature reviews. Gastroenterology & hepatology*, 10(6), 352–361. <https://doi.org/10.1038/nrgastro.2013.35>].

Foods can play a role to release histamine, which eventually results in increased mucus production. So, let us learn more about the foods to be avoided if we have cough or some kind of infection. But it is also important to consult with a medical practitioner about the limit of restrictions in such cases.

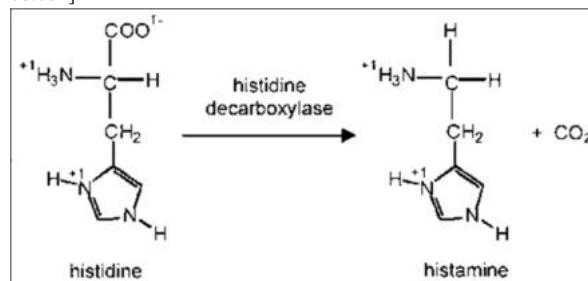
Role Of Biogenic Amines And Bacteria In Histamine Poisoning

Biogenic amines, such as **tyramine** and **β-phenylethylamine**, have been proposed as the initiators of hypertensive crisis in certain patients and of dietary-induced migraine. Another amine, **histamine**, has been implicated as the causative agent in several outbreaks of food poisoning. The toxicity of histamine appears to be enhanced by the presence of other biogenic amines found in foods that can inhibit histamine-metabolizing enzymes in the small intestine [Stratton, J. E., Hutkins, R. W., & Taylor, S. L. (1991). Biogenic Amines in Cheese and other Fermented Foods: A Review. *Journal of food protection*, 54(6), 460–470. <https://doi.org/10.4315/0362-028X-54.6.460>].

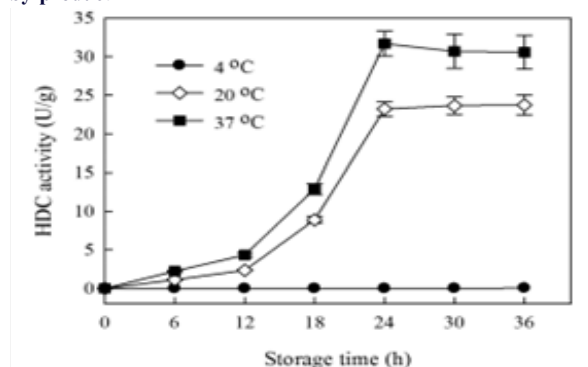
Fresh bananas are not high in histamine themselves, but they can act as histamine liberators as they can stimulate the body to release histamine from cells. In bananas, while ripening, histamine levels drop. They also have biogenic amines like **putrescine**, which increases during ripening, interferes with the enzymes that can break down histamine leading to its higher levels in the body. Putrescine can compete with histamine for the enzyme **diamine oxidase (DAO)**, which is responsible for degrading histamine. This competition can lead to a reduction in histamine breakdown, causing it to accumulate in the body and potentially leading to histamine intolerance symptoms [Sánchez-Pérez, Sònia & Comas-Basté, Oriol & Rabell-González,

Judit & Veciana-Nogués, M. Teresa & Iatorre, mariluz & Vidal-Carou, M. Carmen. (2018). Biogenic Amines in Plant-Origin Foods: Are they Frequently Underestimated in Low-Histamine Diets?. *Foods*. 7. 205. [10.3390/foods7120205](https://doi.org/10.3390/foods7120205)].

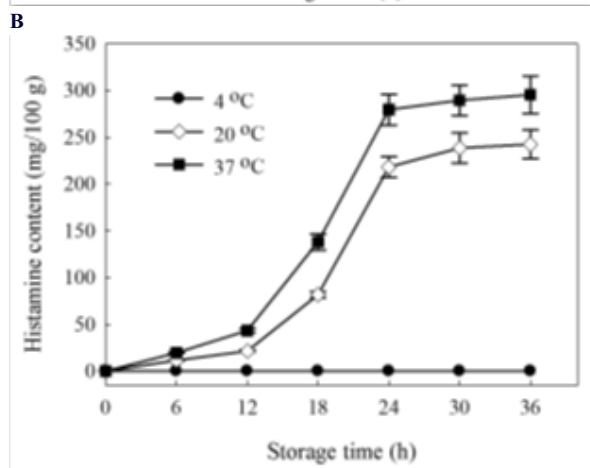
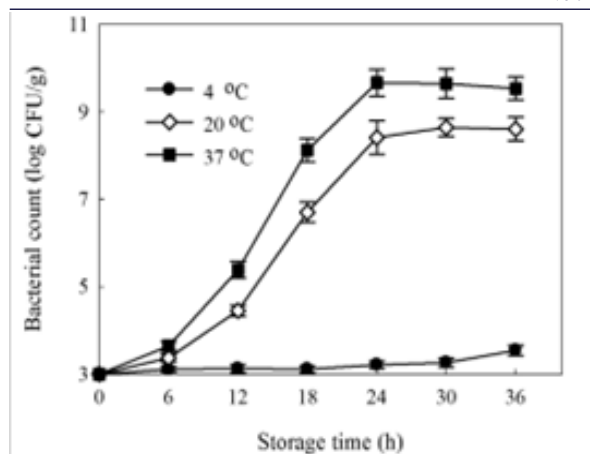
Enterobacter cloacae and **E. aerogenes** are some of the bacteria which lead to histamine production in vegetables such as spinach and fishes (**chub mackerel** and **tuna**) [Oktariani, A. F., Ramona, Y., Sudaryatma, P. E., Dewi, I. A. M. M., & Shetty, K. (2022). Role of Marine Bacterial Contaminants in Histamine Formation in Seafood Products: A Review. *Microorganisms*, 10(6), 1197. <https://doi.org/10.3390/microorganisms10061197>]. **E. aerogenes** is one of main histamine-producing bacteria, which can cause fish spoilage and even lead to some food borne diseases, such as scombroid poisoning [Yi-Chen Lee, Hsien-Feng Kung, Chung-Saint Lin, Chiu-Chu Hwang, Chia-Min Lin, Yung-Hsiang Tsai, Histamine production by Enterobacter aerogenes in tuna dumpling stuffing at various storage temperatures, *Food Chemistry*, Volume 131, Issue 2, 2012, Pages 405-412, ISSN 0308-8146, <https://doi.org/10.1016/j.foodchem.2011.08.072>].



1. Transformation from histidine to histamine with the help of the enzyme histidine decarboxylase also releasing carbon dioxide as a by-product



A



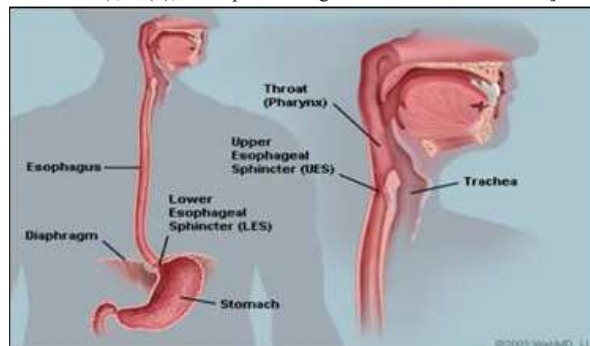
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2. Graphs showing the relations between: a) Bacterial count vs Storage Time, b) HDC activity vs Storage Time and c) Histamine content vs Storage Time at different temperatures

In this study, bacterial count, HDC activity and histamine content in chub mackerel inoculated with *E. aerogenes* stored at 4, 20 and 37 °C were investigated. Results showed that bacterial count of *E. aerogenes* and amount of histamine rapidly increased from 12 to 24 h when samples were kept at 20 and 37 °C. Cold storage (4 °C) could delay microbial growth, fish spoilage and histamine accumulation. Results from this study indicated that cold or ice storage of chub mackerel could be an effective means to control histamine level in fish [https://doi.org/10.1590/1678-457X.07716]. Fermented foods like yoghurt, alcoholic beverages, sauerkraut, dry sausage and soy sauce contain histamine along with other biogenic amines. Microorganisms possessing the enzyme, **histidine decarboxylase**, which converts **histidine** to **histamine**, are responsible for the formation of histamine in foods. Organisms like *Lactobacillus buchneri*, may be important to the dairy industry due to its involvement in cheese-related outbreaks of histamine-poisoning. Alcohol is also a **diuretic**, which means if consumed much, it could lead to dehydration and make it difficult for phlegm to drain properly.

What is the role of chocolates in mucus production?

We all love chocolates. But even chocolates or caffeine present in coffee beans also play a role in increased mucus production, particularly, if a person has an **acid-reflux disorder** such as **laryngopharyngeal reflux** or **gastroesophageal reflux disease (GERD)**. Chocolates can weaken lower and upper oesophageal sphincters. These **sphincters** serve as gatekeepers that make sure that foods and liquids flow in proper downward direction and prevent stomach acid from entering the **pharynx, larynx or oesophagus**. If the malfunction occurs, we get hoarseness, a sore throat, a heartburn, a persistent cough and mucus in the back of our throat. According to studies, foods that trigger GERD are: **fried foods, chillis, tomatoes, citrus fruits, peppermint, fatty meats such as bacon and cheese** [Wei, T. Y., Hsueh, P. H., Wen, S. H., Chen, C. L., & Wang, C. C. (2019). The role of tea and coffee in the development of gastroesophageal reflux disease. *Tzu chi medical journal*, 31(3),

169–176. https://doi.org/10.4103/tcmj.tcmj_48_18]. Besides, food additives and preservatives can cause dangerous inflammatory reactions or intestinal diseases. Citrus fruits such as oranges, lemons and grapes and even strawberries can be consumed in the later phase as they contain Vitamin C and hence has antioxidants which helps in strengthening our immune system [Mieszczakowska-Frąc, M., Celejewska, K., & Plocharski, W. (2021). Impact of Innovative Technologies on the Content of Vitamin C and Its Bioavailability from Processed Fruit and Vegetable Products. *Antioxidants (Basel, Switzerland)*, 10(1), 54. https://doi.org/10.3390/antiox10010054].



3. Physiology Of The Upper And Middle Digestive Tract And Also The Respiratory Tract

What causes too much phlegm?

Our immune system starts an inflammatory response to fight off diseases including colds and sinus infections. As part of this response, our body overproduces mucus, which can lead to coughing, runny nose, sore throat, or breathing issues. Chronic disorders such as cystic fibrosis, asthma, or chronic obstructive pulmonary disease that impair the mucosal tissue can also cause excessive amounts of phlegm [Hauber, H. P., Foley, S. C., & Hamid, Q. (2006). Mucin overproduction in chronic inflammatory lung disease. *Canadian respiratory journal*, 13(6), 327–335. https://doi.org/10.1155/2006/901417].

Allergies can result in excessive mucus production, which can cause congestion or breathing issues, as well as other symptoms including skin rashes, oedema, and dizziness. Some of the most frequent food allergies are eggs, milk, soy, fish, shellfish, wheat, peanuts, and tree nuts. Phlegm can also be experienced even if a person is a non-allergic. Exposure to pollution or smoke can also lead to excessive amounts of mucus to ward off environmental irritants.