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## What Your Tongue Color Can Tell You: Understanding Your Health

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### ABSTRACT

The human tongue, a vital organ for taste, speech, and food manipulation, exhibits diverse colors that can offer insights into an individual's health. This comprehensive review explores the correlation between tongue color variations and various health conditions. A healthy tongue typically appears pink with a thin white coating, owing to its textured surface comprising papillae. Deviations from this norm signal potential health concerns: a white tongue indicates dehydration, oral thrush, or bacterial buildup; redness may suggest vitamin deficiencies, infections, or specific ailments like Kawasaki disease or radiation-induced oral mucositis. The emergence of a black or brown tongue may result from lifestyle factors like smoking, medication, or underlying conditions like HIV. Yellow and purple hues signify bacterial buildup, liver issues, or circulatory problems, respectively, while gray or orange tongues can stem from multiple factors including smoking, medication, or inadequate oral hygiene. Green tongues might result from bacterial accumulation or consumption of pigmented foods, while blue tongues can indicate low blood oxygen levels or specific medical conditions. Understanding these color indicators facilitates early identification and prompt intervention for underlying health issues, emphasizing the importance of regular medical and dental assessments to maintain oral health and overall well-being.

### INTRODUCTION

The tongue, a muscular structure located within the oral cavity, holds a pivotal role in several functions such as taste perception, speech articulation, and the manipulation of food during chewing and swallowing. It is composed of muscles that allow for flexible movement and is covered with a mucous membrane. (1) The surface of the tongue is covered with tiny projections called papillae, which contain taste buds responsible for detecting different tastes such as sweet, salty, sour, and bitter. (2) In addition to its role in taste and speech, the tongue also assists in the process of chewing and swallowing food. It is a vital part of the digestive system, helping to move food around the

mouth and down the throat. (3) The tongue is divided into three main parts: the anterior two-thirds, covered with papillae housing taste buds; the posterior one-third with circumvallate papillae at the back; and the root extending into the throat, connected by the lingual frenulum, while its intrinsic and extrinsic muscles, blood supply from the lingual artery, and innervation by the hypoglossal and facial nerves collectively contribute to its gross anatomy.(4) These divisions help describe the tongue's structure and aid in discussions about its various functions and anatomical features. The intrinsic muscles of the tongue, such as the superior and inferior longitudinal muscles, transverse muscle, and vertical muscle, contribute to fine-tuned movements and



changes in shape.(5) Extrinsic muscles, like the genioglossus, primarily aid in protrusion, the styloglossus in retrusion and elevation, and the hyoglossus in retraction and depression, collectively enabling the tongue's versatility in functions such as taste, speech, and swallowing.(6) The tongue's vasculature is a complex system of blood vessels essential for supplying oxygen and nutrients to this vital organ. Predominantly, the lingual artery, originating as a branch from the external carotid artery, serves as the primary blood source for the tongue. This artery courses along the underside of the tongue, dividing into smaller vessels that intricately spread across the different regions of the tongue, ensuring adequate nourishment and oxygenation of its musculature and tissues. (7) The venous drainage of the tongue is facilitated by the lingual vein, which typically follows the course of the lingual artery. Blood from the tongue is eventually returned to the internal jugular vein. (8) tongue's rich blood supply is crucial for sustaining its numerous functions, including taste perception, speech articulation, and the mechanical aspects of chewing and swallowing. (1,2,8) Understanding the vasculature is essential in medical and dental contexts, particularly in surgeries or interventions involving the tongue. The human tongue is divided into the dorsum (upper surface) and ventral surface (underside). (9) The drainage system of the tongue's lymphatic network is quite intricate. Lymphatic vessels originating from the tip of the tongue direct towards the submental lymph nodes, their path determined by the lesion's location, either on one side or both sides. Lymph from the central anterior two-thirds of the tongue flows towards the deep cervical lymph nodes, while lymph from the lateral anterior section moves towards the submandibular nodes. The lymphatic drainage from the base of the tongue occurs bilaterally,

connecting to the deep cervical lymph nodes on both sides. (10) The appearance and color of the tongue can sometimes provide insights into a person's overall health, and changes in tongue color or texture may be indicative of certain health conditions(11) Changes in the color, texture, or appearance of the tongue can sometimes be indicators of underlying health conditions.(12) Regular dental and medical check-ups can help monitor oral health, including the condition of the tongue.

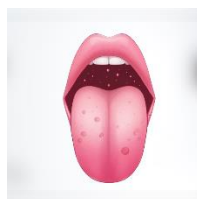
## What Can Your Tongue's Color Reveal About Your Health?

The color of the tongue can reveal various aspects of one's health. Typically, a healthy tongue appears pink with a thin white coating. However, deviations from this norm may signal different conditions. A white tongue might indicate dehydration, oral thrush, or bacterial buildup. (13) A red or bright pink tongue could suggest vitamin deficiencies or infections. (14) Yellow discoloration may be linked to poor hygiene or liver issues, (15) Black or brown tongues may result from smoking, medications, or bacterial overgrowth. Uncommon colors like blue or purple might signal circulatory problems. Any persistent color changes accompanied by discomfort should prompt a consultation with a healthcare professional for proper assessment and guidance. (16,17)

## What color and texture show that a tongue is healthy?

### Pink Color

A healthy tongue looks pink and feels smooth. A healthy tongue usually looks pink with a thin white layer. It's textured due to small bumps called papillae that cover its surface. (Figure 1) (7)



**Figure 1:** A Healthy Tongue (Pink in Color)

## Other Unusual Tongue Colors: Red Tongue

A red-colored tongue can serve as a visual cue for an array of health conditions and potential deficiencies. This vivid hue often signals underlying issues such as



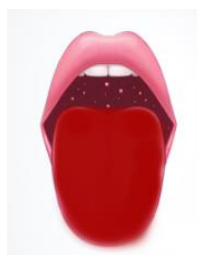
deficiencies in essential nutrients like vitamin B12 and iron or dehydration (18). Additionally, it can be a sign of heightened body temperature during fever or indicative of streptococcus infections.

Kawasaki disease, commonly affecting children, can manifest distinctive oral symptoms such as a "strawberry tongue," characterized by a swollen, red tongue resembling a strawberry. ((19) Additionally, the lips might become inflamed or appear red and cracked. Changes in the mouth lining, marked by redness and inflammation, can also occur. These oral manifestations often coincide with systemic symptoms such as fever,

rash, swollen lymph nodes, and alterations in the extremities. (20)

Radiation-induced oral mucositis is a common side effect of radiation therapy targeting the head, neck, or oral cavity. It involves inflammation and ulceration of the mucous membranes lining the mouth. The radiation damages rapidly dividing cells in the oral tissues, leading to pain, redness, and the development of sores or ulcers in the tongue, buccal mucosa and throat. (21)

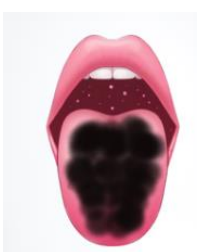
While occasional redness might not raise concerns, persistent discoloration or coupled with discomfort necessitates prompt medical evaluation to ensure accurate diagnosis and suitable treatment. (22)



**Figure 2:** Red Tongue

A black tongue, commonly referred to as "black hairy tongue," can arise from several causes. ((23)(24) Inadequate oral hygiene can lead to the accumulation of debris and bacteria on the tongue's surface, resulting in discoloration. (25) or tobacco use can stain the tongue, contributing to its dark appearance. Certain medications, especially those containing bismuth, along with chemical irritants found in some mouthwashes, may also cause tongue discoloration. (26) Additionally, dry

mouth conditions or fungal infections can promote bacterial growth, leading to a blackened tongue. (27) usually harmless, addressing the underlying cause by improving oral hygiene, quitting smoking, adjusting medications, and staying hydrated typically resolves this condition. HIV can also cause black tongue in rare cases (28). Consulting a healthcare professional is advisable if the discoloration persists or presents with accompanying symptoms for proper evaluation and guidance. (29)



**Figure 3:** Black Tongue

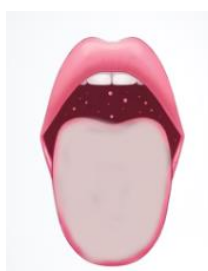
### **White Tongue**

A white-coated tongue can stem from various reasons. Oral thrush, caused by *Candida* yeast, leads to white patches on the tongue.(30) Leukoplakia, often associated with smoking or irritation, manifests as white patches indicating potential precancerous changes.(31)

Additionally, lichen planus, an inflammatory condition, results in white patches or lesions on the tongue and oral mucosa, often accompanied by discomfort.(32) Dehydration or poor oral hygiene can also contribute to a white tongue due to the accumulation of debris and dead cells. Identifying the specific cause often requires



medical assessment, particularly if the condition persists or presents with discomfort or additional concerning symptoms.



**Figure 4:** White Tongue

**Yellow Tongue** A yellow tongue can have various causes. It often results from bacterial buildup due to poor oral hygiene or dry mouth conditions. When the tiny bumps on the tongue (papillae) enlarge, they can trap bacteria, leading to a yellowish appearance. Additionally, more serious health issues may be involved, such as a potential link between yellow tongue and diabetes, as suggested by various research. (33) Jaundice, a condition related to liver problems, can also cause yellowing of the tongue, skin, and eyes (17). Eczema, also known as atopic dermatitis, is a chronic skin condition characterized by inflammation, itching, and redness of the skin. It typically affects areas like the hands, arms, behind the knees, and face. However,

eczema does not directly impact the color of the tongue. (15) color of the tongue isn't typically affected by eczema unless the condition extends into the oral cavity, which is rare. In some cases, if there's inflammation or irritation in the mouth due to eczema, it might cause discomfort or changes in the oral mucosa & altering the color of the tongue isn't a rare feature of eczema. ((34) The specific cause usually requires medical evaluation, especially if the discoloration persists or is accompanied by other worrisome symptoms. Maintaining good oral hygiene and addressing underlying health concerns are crucial in managing and preventing tongue discoloration.

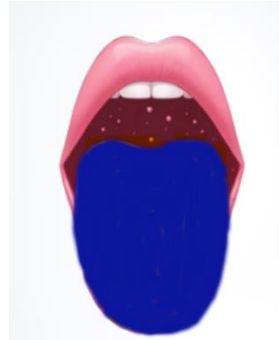


**Figure 5:** Yellow Tongue

### **Purple Tongue**

A purple tongue can signal various underlying issues. It might indicate poor circulation or cyanosis, where a lack of oxygen in the blood leads to bluish or purplish discoloration. Exposure to extreme cold can also cause temporary constriction of blood vessels, resulting in a purple hue on the tongue.(33) Sometimes, medical conditions like heart or respiratory issues, low blood

pressure, or vascular problems can lead to inadequate oxygenation, causing the tongue to appear purple.(12) Identifying the precise cause typically necessitates medical evaluation, especially if the discoloration persists or accompanies other concerning symptoms. Immediate medical attention is advised if a purple tongue is noticed alongside severe symptoms like difficulty breathing or chest pain.

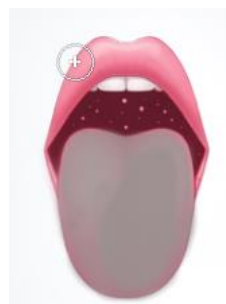


**Figure 6:** Purple Tongue

**GRAY TONGUE**

Gray tongue can have various causes. Conditions like geographic tongue or oral lichen planus may lead to irregular, grayish-white patterns on the tongue (35). Additionally, smoking or certain medications can contribute to changes in tongue color, potentially causing a grayish hue. ((36) Poor oral hygiene might

result in bacterial buildup on the tongue's surface, altering its color. (3) the specific cause usually requires medical evaluation, especially if the discoloration persists or accompanies other symptoms. Maintaining good oral hygiene and addressing potential underlying issues are crucial for managing and preventing tongue discoloration.



**Figure 7:** Gray Tongue

**ORANGE TONGUE**

An orange tongue can arise from various factors. This discoloration might be due to bacterial accumulation from insufficient oral hygiene or dry mouth conditions. ((27) Consumption of foods or drinks containing vibrant colorants, especially in shades of orange, can also briefly stain the tongue. ((37,38) Furthermore, smoking or tobacco use introduces chemicals that could potentially

lead to an orange hue on the tongue. ((36) Some medications or, less commonly, underlying health issues may also contribute to changes in tongue color. While often linked to external factors such as diet or habits, consulting a healthcare provider is wise if the discoloration persists, causes discomfort, or arises without an evident cause for proper assessment and advice. (38)



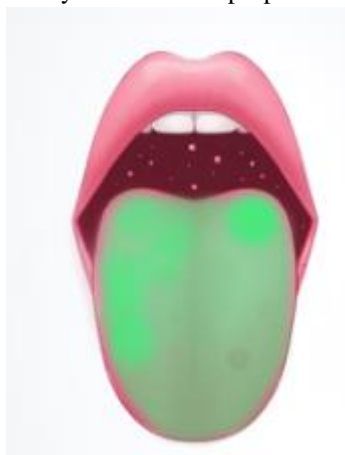
**Figure 8:** Orange Tongue



## GREEN TONGUE

A green tongue can arise from various sources. Inadequate oral hygiene or dry mouth conditions might lead to bacterial accumulation on the tongue, causing it to take on a greenish hue. ((39) Consuming foods or beverages with strong green pigments, such as certain candies or drinks containing dyes, can temporarily stain

the tongue green. Additionally, some medications or, less commonly, underlying health conditions might contribute to changes in tongue color. (40) often linked to external factors like diet or habits, seeking medical advice is recommended if the discoloration persists, causes discomfort, or arises without an evident cause for proper evaluation and guidance.

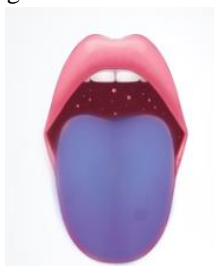


**Figure 9:** Green Tongue

## BLUE TONGUE

A bluish tinge on the tongue can signal insufficient oxygen in the blood, which can stem from various sources such as inadequate oxygenation from the lungs, blood disorders, blood vessel disease, or kidney disease. ((17) Low oxygen levels in the blood are concerning and

necessitate immediate medical attention. Eczema is also noted as a potential cause of a blue tongue. ((15,34) Identifying the underlying reason for the discoloration is crucial, especially considering the severity of low blood oxygen levels, requiring prompt evaluation and treatment by a healthcare professional.



**Figure 10:** Blue Tongue

## DISCUSSION

The tongue, often regarded as a barometer of one's health, presents a spectrum of colors, each potentially signaling underlying health conditions. Understanding these color variations can be pivotal in identifying and addressing health concerns.

A healthy tongue typically boasts a pink hue, accompanied by a thin white coating due to its textured surface. Any deviation from this norm warrants

attention. For instance, a white-coated tongue might suggest dehydration or bacterial overgrowth. This simple visual cue can prompt measures to enhance hydration or address oral hygiene to mitigate potential risks.

Redness on the tongue, though occasionally benign, could signify deficiencies in crucial nutrients like vitamin B12 or iron. More concerning are indications of infections or specific diseases like Kawasaki disease,



characterized by a vivid, swollen tongue resembling a strawberry. Such visual cues, coupled with systemic symptoms, demand immediate medical evaluation for timely intervention.

The emergence of a black or brown tongue, often termed "black hairy tongue," may arise from lifestyle factors like smoking or medication use. However, in rare instances, it could point to underlying conditions like HIV. Promptly addressing these lifestyle factors or seeking medical advice for further evaluation is crucial. Yellow and purple hues present their own set of potential health implications. Yellow tongues might signal bacterial buildup or even be associated with diabetes or liver issues. On the other hand, a purple tongue could be indicative of circulatory problems or inadequate oxygenation, emphasizing the need for thorough medical assessment.

The tongue's discoloration isn't limited to common hues; variations such as gray, orange, green, and even blue can emerge due to a range of factors including medication, lifestyle, or specific health conditions. Gray tongues might result from smoking or certain medications, while orange or green tongues could stem from dietary factors or inadequate oral hygiene. Blue tongues, though rare, could suggest severe underlying medical conditions requiring immediate attention.

Overall, the color variations in the tongue serve as visual cues for underlying health issues. Regular oral health check-ups become imperative, not just for dental hygiene but also for overall health monitoring. Being vigilant about changes in tongue color and seeking timely medical evaluation when necessary can aid in early detection and management of potential health concerns, contributing to overall well-being.

In conclusion, understanding the language of tongue colors offers a glimpse into one's health status, allowing for proactive measures and timely interventions, ultimately promoting holistic health.

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