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HYGIENIC ASSESSMENT OF ORGANOLEPTIC AND PHYSICAL PROPERTIES OF DRINKING WATER

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Abstract: Safe drinking water is one of the most important prerequisites for sustainable public health and socio-economic development. The organoleptic and physical characteristics of water serve as primary indicators of water quality and provide rapid information regarding contamination, treatment efficiency, and consumer acceptability. The purpose of this study was to analyze the hygienic significance of odor, taste, color, transparency, turbidity, temperature, and electrical conductivity in drinking water assessment. A literature-based analytical review was conducted using international sanitary and hygienic guidelines. The analysis demonstrated that organoleptic indicators are highly valuable for early detection of environmental pollution and operational failures within water-treatment systems. Turbidity and conductivity measurements additionally support evaluation of suspended solids and dissolved mineral content. However, acceptable organoleptic characteristics alone cannot guarantee microbiological or toxicological safety because pathogenic microorganisms, nitrates, pesticides, and heavy metals may remain undetected. The findings emphasize the importance of integrating organoleptic observations with laboratory investigations and comprehensive risk management systems.
Keywords: drinking water, hygienic assessment, organoleptic properties, turbidity, color, temperature, electrical conductivity, public health.

Introduction

Access to safe drinking water remains a global public health priority. Population growth, urbanization, industrial activity, agricultural pollution, and climate change continue to place pressure on water resources worldwide. The quality of drinking water directly affects the incidence of infectious diseases, gastrointestinal disorders, and chronic health conditions. Hygienic evaluation of water quality therefore represents a critical component of preventive medicine.

Organoleptic and physical indicators are among the first parameters assessed during water-quality investigations. Changes in odor, taste, color, and turbidity frequently provide early warning signs of contamination. Consumers often judge water quality on the basis of these characteristics before laboratory results become available. Consequently, these indicators play an important role in public confidence regarding municipal water supplies.

From a sanitary perspective, organoleptic assessment allows rapid screening of potential environmental hazards. Unpleasant odors may indicate algal growth, sulfur compounds, industrial pollutants, or distribution-system deficiencies. Variations in taste may reflect elevated

mineralization, salinity, corrosion products, or contamination by chemical substances. Similarly, color changes may indicate the presence of iron, manganese, humic substances, or organic pollution. The objective of this study was to evaluate the hygienic importance of organoleptic and physical properties of drinking water and to summarize modern approaches to their interpretation in environmental health practice.

Materials and Methods

This study was conducted as a narrative review and analytical assessment of scientific literature, sanitary regulations, and international drinking-water guidance documents. Relevant publications addressing water-quality management, environmental hygiene, public health, and sanitary monitoring were examined.

Comparative analysis was used to identify the hygienic significance of major organoleptic and physical indicators. Descriptive methods allowed summarization of assessment procedures, interpretation criteria, and practical applications. Particular attention was devoted to odor, taste, color, turbidity, temperature, and electrical conductivity.

The analytical framework consisted of three stages: identification of indicators, assessment of measurement techniques, and interpretation of public-health significance. Information was synthesized to develop an integrated hygienic assessment model suitable for drinking-water surveillance.

Results

Odor assessment remains one of the most sensitive indicators of water-quality deterioration. Sulfur-containing compounds, microbial metabolites, industrial chemicals, and algal blooms frequently produce detectable odors before serious contamination becomes visible. Persistent or unusual odors should therefore trigger sanitary investigation.

Taste characteristics are influenced by dissolved salts, mineral content, treatment chemicals, and corrosion products. Excessive salinity or metallic taste often decreases consumer acceptance and may indicate underlying environmental or infrastructure problems.

Color evaluation provides important information regarding dissolved organic matter and metal contamination. Elevated concentrations of iron and manganese can produce yellow, brown, or reddish discoloration. Organic compounds derived from vegetation may also alter water appearance.

Turbidity represents one of the most significant physical indicators. High turbidity levels reduce aesthetic quality and may shield microorganisms from disinfection processes. Increased turbidity often reflects inadequate filtration performance or contamination events within source waters.

Temperature influences chemical reactions and microbial activity. Elevated temperatures may promote bacterial regrowth and biofilm formation in distribution networks, thereby affecting water stability.

Electrical conductivity provides indirect information regarding dissolved ions and mineralization. Significant deviations from normal values may indicate changes in salinity, industrial discharge, or groundwater influence.

Overall, the analysis demonstrated that combined evaluation of organoleptic and physical properties provides an effective preliminary assessment of drinking-water quality.

Discussion

The findings support the view that organoleptic and physical indicators remain fundamental elements of sanitary surveillance systems. Their principal advantage lies in rapid detection of abnormalities requiring further investigation. Unlike advanced laboratory analyses, these indicators can often be evaluated quickly and at relatively low cost.

Nevertheless, several limitations must be acknowledged. Clear, colorless, and odorless water is not necessarily microbiologically safe. Numerous harmful contaminants cannot be detected through sensory examination alone. Therefore, reliance solely on organoleptic characteristics may result in underestimation of health risks.

Modern risk-management strategies emphasize integrated monitoring systems combining field observations, instrumental measurements, microbial testing, chemical analysis, and environmental surveillance. Such approaches improve the reliability of water-quality evaluation and support evidence-based public-health interventions.

From a public-health perspective, continuous monitoring of drinking-water quality contributes to disease prevention, consumer protection, and sustainable management of water resources. Hygienic assessment should therefore be considered an ongoing process rather than a single inspection activity.

Organoleptic and physical indicators constitute essential components of drinking-water hygiene assessment. Odor, taste, color, turbidity, temperature, and electrical conductivity provide valuable information regarding environmental conditions, treatment efficiency, and potential contamination.

These indicators facilitate early detection of water-quality deterioration and support preventive sanitary measures. However, they should not be regarded as substitutes for microbiological and chemical analyses. Comprehensive monitoring programs integrating laboratory investigation and risk-based management remain necessary for ensuring safe drinking water.

Sustainable protection of public health requires continuous surveillance of water resources, modernization of treatment technologies, and implementation of evidence-based sanitary standards.

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