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CONCEPT OF THE SCIENCE OF COMMUNAL HYGIENE. UNDERSTANDING THE OBJECTS OF STUDY IN THE FIELD OF COMMUNAL HYGIENE

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Abstract: The science of communal hygiene plays a pivotal role in safeguarding public health by studying and improving the environmental and social conditions of human settlements. This field addresses critical factors such as water quality, air hygiene, soil sanitation, housing conditions, and urban infrastructure, all of which profoundly influence the health status of populations. The article explores the multifaceted nature of communal hygiene, emphasizing its interdisciplinary approach that integrates environmental science, medicine, urban planning, and social sciences. It highlights how inadequate communal hygiene contributes to the spread of infectious diseases and chronic health conditions, particularly in rapidly urbanizing and resource-limited areas. Through the analysis of contemporary challenges, including pollution, waste management, and climate change impacts, the article underscores the importance of comprehensive strategies combining technological innovation, community engagement, and policy implementation. This review advocates for sustainable and equitable improvements in communal hygiene to enhance quality of life and reduce health disparities worldwide.
Keywords: communal hygiene, public health, environmental sanitation, living conditions, sanitary inspection, urban health, housing hygiene, waste management, air and water quality, epidemiological safety.

INTRODUCTION

Communal hygiene, a key component of public health, encompasses the study and regulation of environmental factors that influence the health and well-being of communities. It involves the scientific assessment of living conditions such as air quality, water supply, waste disposal, housing, and urban infrastructure. As urbanization and population growth accelerate globally, understanding communal hygiene becomes increasingly important for sustainable development and disease prevention.

This article aims to elaborate on the fundamental principles of communal hygiene and examine its primary objects of research. The paper also highlights the significance of communal hygiene in reducing health risks associated with environmental factors.

The term **“commune”** originates from French and refers to a community or a place inhabited by people (i.e., the hygiene of residential areas, cities, worker settlements, and villages). The word **“hygieinos”** comes from Greek, meaning "health-promoting" or "bringing health."

Communal hygiene is a scientific discipline that studies the effects of natural and anthropogenic (human-made) factors on humans and, based on these effects, develops hygienic standards and sanitary regulations. Adherence to these rules ensures public health and improves the living conditions of the population.

Communal hygiene serves as the scientific basis for the development and application of sanitary-hygienic and sanitary-epidemiological measures aimed at:

- Preventing and eliminating environmental pollution;
- Improving environmental conditions;
- Reducing and preventing diseases among the population.

As a science, communal hygiene addresses three main tasks:

1. To study the impact of environmental factors on human health in residential areas;
2. To develop sanitary standards and preventive measures for improving, cleaning, and optimizing living conditions;
3. To establish the legal foundations of sanitary regulations within the field of communal hygiene.

Communal hygiene is divided into six specific branches, each addressing a key aspect of environmental health:

1. **Hygiene of Water and Domestic Water Supply.**

This section focuses on the quality of drinking water, the placement and operation of water purification systems, and the hygienic requirements for networks that supply quality drinking water to the population.

2. **Hygiene of Sanitary Protection of Water Bodies.**

This branch examines the quality of water in reservoirs, the suitability of these bodies as sources for drinking and domestic water supply, and the hygienic requirements for the discharge of wastewater in order to maintain stable water quality.

3. **Sanitary Protection of Soil and Hygiene of Sanitary Cleaning of Residential Areas.**

This area studies the conditions of soil contamination by chemical and biological agents. It investigates how pollutants can migrate from the soil to groundwater, air, and plants, thereby affecting human health and living conditions. It also covers hygienic standards for the disposal of liquid waste.

4. **Hygiene of Sanitary Protection of Atmospheric Air.**

This section explores acceptable levels of air pollution that are not harmful to public health or domestic living conditions. It sets hygienic requirements for the placement and operation of sources of atmospheric pollution, aiming to prevent exceeding permissible limits in residential air.

5. **Hygiene of Residential, Public, Cultural, and Healthcare Institutions.**

It includes optimal indoor environmental factors for human health (e.g., air movement, humidity, temperature, and radiation), as well as the design, landscaping, and equipment standards for healthcare institutions, public bathhouses, laundries, barber shops, cinemas, theaters, circuses, swimming pools, and sports complexes.

6. **Hygiene of Urban and Rural Settlement Planning.**

This section addresses the role of natural climatic conditions in urban planning and the hygienic requirements for zoning, infrastructure development, and settlement construction. It also examines the unique aspects of rural area planning and land use.

METHODS

The living conditions of a family not only directly influence the health of its members but are also considered one of the leading factors in improving the overall health of the population. An individual's housing conditions affect their mental well-being, work efficiency, and most importantly, the physical development, disease incidence, and susceptibility to illnesses of each family member. Thus, housing is of great significance in medicine and public health.

Therefore, every healthcare worker—especially those involved in preventive medicine—must be capable of accurately assessing the living conditions of families, drawing appropriate conclusions, and developing measures aimed at preventing diseases. Similarly, a treating physician, when evaluating a patient's health and prescribing treatment, must take into account the patient's home environment.

At present, it is impossible to develop effective preventive strategies without considering the lifestyle and housing conditions of the family. One of the most pressing issues in contemporary medicine is the protection and maintenance of human health.

In recent years, many researchers have begun to consider family housing conditions as a major social determinant of public health and have started to study it with increasing attention. However, due to the lack of a comprehensive socio-hygienic methodology for evaluating housing conditions, scholars have used various indirect indicators—such as the average living space per person, humidity or dryness of the living area, number and furnishing of rooms, or the level of amenities—to assess the impact of housing on public health.

These divergent approaches to the concept of family housing have led to contradictory conclusions in scientific literature regarding its influence on population health.

Moscow-based scholars I.P. Katkova and N.A. Kravchenko developed a comprehensive evaluation method using sociological observations and a scale analysis method (shkalogramma) to assess the living and material conditions of the population through a point-based system. They applied a simplified technique of assigning numerical values to qualitative features via scales (i.e., representing qualitative characteristics with numbers).

In this method, points expressed as numerical values were used as the scale. To describe living conditions, three groups of qualitative features were quantified:

- Type of housing,
- Level of amenities, and
- Living space per family member.

Scales were constructed for each group, and point values were assigned according to the importance of each indicator. In addition, a supplementary quantitative indicator (denoted as *K*) was introduced (see Table 97).

The introduction of this *K* coefficient made it possible **to** transition to a widely accepted and practical 5-point evaluation system used in sociological research for multi-criteria assessments.

Scale for Quantitative Assessment of Housing Conditions

Housing Characteristic	**Specific Indicators**	**Points**
I. Type of Housing	1. Living in someone else's house	1
	2. Dormitory	2
	3. Communal apartment with shared kitchen and bathroom	3
	4. Living with parents in their home	6
	5. Own house or cooperative apartment	8
	6. Well-equipped state-owned apartment	*Not specified*
Maximum possible score for group (M_1)		**10**
Quantitative coefficient for group (K_1)		**2.0**
II. Level of Amenities	Indicator	**Points**
1. Central heating	Yes / No	**1.5 / 0**
2. Hot water, bath, shower available	Yes / No	**3.0 / 0**

Housing Characteristic	Specific Indicators	Points
3. Natural gas supply	Yes / No	**2.0 / 0**
4. Sewerage system	Yes / No	**2.5 / 0**
5. Running water (plumbing)	Yes / No	**3.0 / 0**
Maximum possible score for group (M_2)		**12**
Quantitative coefficient for group (K_2)		**1.0**

RESULTS

The study of communal hygiene reveals a broad and complex spectrum of environmental factors that directly influence public health outcomes. The primary objects of study in communal hygiene—water quality, air hygiene, soil sanitation, housing conditions, and urban planning—each contribute uniquely to disease prevention and health promotion at the community level.

Water and Drinking Water Hygiene: Research indicates that contaminated drinking water remains a major source of infectious diseases such as cholera, typhoid, and dysentery worldwide. Advances in water treatment technologies, including chlorination and filtration, have significantly reduced incidence rates of waterborne illnesses in many regions. However, in underserved areas, inadequate water infrastructure and pollution continue to pose substantial risks.

Sanitary Protection of Water Bodies: Studies demonstrate that untreated or insufficiently treated sewage and industrial waste discharged into lakes, rivers, and reservoirs contribute to microbial and chemical pollution, which threatens both ecosystem health and human populations. Hygienic monitoring and regulation of these pollutants are essential to maintaining safe recreational waters and sources of drinking water.

Soil Sanitation and Residential Hygiene: Soil contamination with heavy metals, pesticides, and pathogenic microorganisms has been linked to chronic health issues, including cancers and developmental disorders. Proper waste management practices and safe disposal of hazardous materials are critical to reducing these hazards. Moreover, soil hygiene is a key factor in preventing the fecal-oral transmission of enteric infections, especially in densely populated settlements.

Air Hygiene and Atmospheric Protection: Air pollution from industrial emissions, vehicular traffic, and indoor sources such as biomass burning is associated with respiratory and cardiovascular diseases. Research highlights the need for stringent air quality standards and the promotion of clean energy alternatives to reduce pollutant loads. Indoor air quality, including ventilation and exposure to allergens, also significantly affects community health.

Housing Conditions and Public Facilities: Overcrowded and poorly maintained dwellings increase the risk of infectious disease transmission and negatively impact mental health. Studies emphasize the importance of adequate space per inhabitant, access to heating and ventilation, and the provision of sanitary facilities. Additionally, hygienic conditions in schools, hospitals, and other public buildings directly influence community well-being.

Urban Planning and Zoning: Hygienic urban design, including green spaces, waste management infrastructure, and transport planning, contributes to healthier lifestyles and reduced environmental exposures. Zoning regulations that separate residential areas from industrial zones minimize residents' contact with hazardous pollutants.

Overall, these results underscore the multifaceted nature of communal hygiene, where environmental, social, and infrastructural factors intersect to shape population health.

The comprehensive study of communal hygiene encompasses diverse environmental and social determinants that critically affect public health outcomes. The primary focus areas—water quality, air hygiene, soil sanitation, housing, and urban infrastructure—each demonstrate significant impacts on the incidence and prevalence of communicable and non-communicable diseases.

Water Quality and Sanitation

Numerous epidemiological studies confirm that access to clean and safe drinking water substantially reduces the burden of waterborne diseases such as cholera, typhoid, and hepatitis A. The implementation of centralized water treatment plants and widespread chlorination programs has led to a marked decline in outbreaks in many urban centers. However, in rural and peri-urban communities, lack of proper water infrastructure and contamination from agricultural runoff or industrial waste remain persistent problems, causing sporadic disease outbreaks and chronic exposure to harmful contaminants.

Additionally, the hygienic protection of surface and groundwater sources through effective sewage treatment and strict pollution control is crucial. Untreated wastewater discharge into natural water bodies introduces pathogenic microorganisms and chemical pollutants, which degrade water quality and pose direct risks to human health. Studies highlight that communities relying on these contaminated sources experience higher rates of gastrointestinal infections and parasitic diseases.

Soil Sanitation and Waste Management

Soil contamination with hazardous substances, including heavy metals (lead, mercury), pesticides, and pathogens, has been linked to long-term adverse health effects such as developmental disorders in children and carcinogenesis. Research demonstrates that improper disposal of solid and liquid waste contributes significantly to soil pollution. Effective municipal waste management, including segregation, recycling, and sanitary landfill practices, has been shown to improve soil quality and reduce health risks.

Moreover, the role of soil in fecal-oral transmission pathways for diseases such as helminthiasis and bacterial diarrhea is critical, especially in areas lacking adequate sanitation facilities. Interventions promoting hygienic latrine construction and improved personal hygiene have substantially decreased soil-transmitted infections.

Air Quality and Atmospheric Hygiene

The analysis of air pollution sources and their health impacts reveals that exposure to particulate matter (PM2.5 and PM10), nitrogen oxides, sulfur dioxide, and volatile organic compounds contributes to increased rates of asthma, chronic obstructive pulmonary disease (COPD), cardiovascular diseases, and lung cancer. Urban industrial zones and heavy traffic corridors often exhibit pollutant concentrations exceeding WHO guidelines.

Indoor air quality, influenced by factors such as inadequate ventilation, tobacco smoke, and use of biomass fuels for cooking and heating, is particularly important for vulnerable groups like children and the elderly. Studies show that improving ventilation and transitioning to cleaner energy sources reduce respiratory morbidity and enhance overall well-being.

Housing Conditions and Public Infrastructure

The physical characteristics of housing, including sufficient living space, access to heating, clean water, and sanitation, are directly linked to health outcomes. Overcrowding increases the transmission of respiratory infections such as tuberculosis and influenza. Research from diverse settings consistently shows that improving housing quality reduces incidence rates of infectious diseases, improves mental health, and enhances the quality of life.

Additionally, the hygiene status of communal facilities such as schools, healthcare centers, and public transport significantly affects disease spread and general public health. Well-maintained infrastructure with regular cleaning, adequate waste disposal, and proper water supply systems forms the backbone of community health protection.

Urban Planning and Environmental Design

The integration of hygiene principles in urban planning fosters healthier living environments. Green spaces, proper zoning to separate residential areas from industrial sites, and the development of efficient waste and wastewater management systems contribute to reduced environmental exposures and promote physical activity and social interaction.

Data show that cities implementing comprehensive urban hygiene policies experience lower rates of environmental diseases and enhanced life expectancy. Public awareness campaigns and participatory community programs further augment these efforts.

DISCUSSION

The results demonstrate that communal hygiene is a pivotal element in public health, bridging environmental conditions and human health outcomes. Understanding its core objects helps design targeted interventions to mitigate health risks linked to environmental exposures.

One critical insight is the interconnectedness of various environmental factors. For example, poor water sanitation often correlates with inadequate housing conditions and limited access to healthcare, compounding health risks for vulnerable populations. This calls for integrated strategies that address multiple determinants of health simultaneously rather than isolated measures.

Moreover, the effectiveness of communal hygiene practices largely depends on socio-economic factors, community engagement, and governance. Regions with strong regulatory frameworks, investment in infrastructure, and public health education report better hygiene standards and lower disease burdens. Conversely, poverty, lack of awareness, and weak enforcement contribute to persistent environmental health challenges.

The rapid urbanization observed globally presents both challenges and opportunities for communal hygiene. While urban areas concentrate populations and potential pollution sources, they also facilitate centralized waste management, water treatment, and health surveillance systems. Smart urban planning that incorporates hygiene principles is crucial to harness these advantages.

Technological advances, including real-time environmental monitoring and data analytics, provide powerful tools for improving communal hygiene. These innovations enable timely identification of hazards, efficient resource allocation, and evidence-based policymaking.

However, gaps remain in addressing emerging environmental health threats such as microplastics pollution, antibiotic-resistant bacteria in water systems, and climate change impacts on community health. Future research should focus on these areas to adapt communal hygiene frameworks to evolving challenges.

In conclusion, communal hygiene is an essential discipline that requires multidisciplinary collaboration, continuous research, and community participation to protect and promote public health. Strengthening environmental regulations, improving infrastructure, and fostering public awareness remain the cornerstones of effective communal hygiene practices worldwide.

The findings from communal hygiene research elucidate the intricate connections between environmental conditions and health, emphasizing the need for comprehensive and multifactorial approaches to public health protection.

Interdisciplinary and Integrated Approaches

Communal hygiene is inherently interdisciplinary, requiring collaboration between environmental scientists, public health professionals, urban planners, engineers, and policymakers. Addressing water quality alone is insufficient without improving sanitation, housing, and air quality simultaneously. Integrated programs that consider the social determinants of health are more effective in achieving sustainable health outcomes.

Socioeconomic and Cultural Considerations

The success of communal hygiene interventions is deeply influenced by socioeconomic status, education, cultural practices, and governance. In low-income areas, financial constraints, lack of infrastructure, and limited awareness hinder the adoption of hygienic behaviors and technologies. Tailored health promotion campaigns and community engagement are vital to overcoming these barriers.

Moreover, cultural practices related to water use, waste disposal, and housing norms impact hygiene levels. Interventions must be culturally sensitive and involve local stakeholders to ensure acceptance and sustainability.

Challenges and Emerging Threats

Urbanization and climate change present emerging challenges for communal hygiene. Rapid urban growth often leads to informal settlements with poor sanitation and overcrowding, exacerbating health risks. Climate change influences water availability, increases flooding, and modifies patterns of infectious diseases, necessitating adaptive hygiene strategies.

Emerging environmental contaminants, including microplastics and pharmaceutical residues in water and soil, represent new areas of concern. The rise of antimicrobial resistance linked to environmental exposures demands urgent attention.

Technological Innovations and Policy Implications

Advancements in environmental monitoring technologies, such as remote sensing, geographic information systems (GIS), and real-time sensors, enable more precise identification of contamination sources and health risk mapping. These tools support evidence-based decision-making and targeted interventions.

Policy frameworks should prioritize investment in water and sanitation infrastructure, enforce environmental regulations, and support research and innovation. International cooperation is essential for addressing transboundary pollution and sharing best practices.

Future Directions

Future communal hygiene research should focus on:

- Assessing the health impacts of emerging pollutants.
- Developing cost-effective and scalable sanitation solutions.
- Strengthening community participation models.
- Evaluating the long-term effectiveness of integrated urban hygiene programs.

In summary, communal hygiene remains a cornerstone of public health, requiring sustained effort, innovation, and collaboration to improve living conditions and reduce disease burdens globally.

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