Nutrizione
Nawala Education
https://jurnal-ilcaagam.com/index.php/JN/index
Volume 3 Issue 1, 2026
e-ISSN: 3048-4138
DOI : https://doi.org/ 10.62872/jn.v3i1.639

A HACCP-Based Framework for Evaluating Food Safety and Food Handler Hygiene-Sanitation in Elementary School Canteens

Rosmaria[1]✉
Universitas Islam Negeri Sulthan Thaha Saifuddin Jambi[1]
e-mail: rosmariar4@gmail.com[1]

ARTICLE INFO

Accepted:
01 March 2026
Revised:
15 March 2026
Approved:
25 May 2026

Keywords:
feeding practices; maternal nutrition literacy; nutritional status; preschool children; responsive feeding

ABSTRACT

School canteens are important food environments for children, yet routine hygiene-sanitation assessments may not identify where significant hazards arise within food-production processes. This methodological paper develops a HACCP-based framework for evaluating food safety and food-handler hygiene and sanitation in elementary school canteens. The framework integrates prerequisite Good Hygiene Practices (GHPs), structured direct observation, process-flow mapping, hazard identification, critical control point (CCP) decision logic, critical limits, monitoring, corrective actions, verification, and documentation. Its regulatory basis combines the Codex General Principles of Food Hygiene, WHO food-safety guidance, and current Indonesian requirements for ready-to-eat food premises, including canteens. The proposed assessment domains cover personal hygiene, handwashing, water and sanitation, cleaning and disinfection, pest and waste control, raw/cooked separation, storage, cooking, holding, serving, and food-safety records. Rather than presenting synthetic numerical findings as empirical results, the paper provides an operational evaluation structure that can be applied in future field studies. Empirical application should report the actual setting, sampling procedure, validated observation instrument, measured time-temperature data, menu-specific process flows, CCP decision records, and ethics or institutional permissions where applicable.

INTRODUCTION

Food safety is an essential component of child health because school-age children may consume meals and snacks prepared or served within school environments. Foodborne hazards may arise from contaminated raw materials, inadequate cooking, cross-contamination, poor hand hygiene, unsafe water, inappropriate storage temperatures, or unsanitary equipment and food-contact surfaces. The global burden of foodborne disease remains substantial, and children are among the populations disproportionately affected by unsafe food (World Health Organization, 2024). The World Health Organization (WHO) summarizes core preventive behaviors through the Five Keys to Safer Food: keeping clean, separating raw and cooked foods, cooking thoroughly, keeping food at safe temperatures, and using safe water and raw materials (World Health Organization, 2006).

How to cite:
Example: Rosmaria R. (2026). A HACCP-Based Framework for Evaluating Food Safety and Food Handler Hygiene-Sanitation in Elementary School Canteens. *Journal Nutrizone,* 3(1), 1-9. DOI: 10.62872/jn.v3i1.639

School canteens require particular attention because food is often prepared and served within a limited time window to a relatively large number of children. Inadequate facilities, high workload, insufficient training, and weak monitoring may compromise food-safety practices even when food handlers possess basic knowledge. Studies in educational foodservice settings have repeatedly identified gaps between food-safety knowledge and consistent practice (Ali et al., 2022; Bulochova et al., 2024). Evidence from primary-school canteens has also shown that food-safety training can improve knowledge and observed hygiene practices, particularly raw-food handling and equipment sanitation (Abdul-Mutalib et al., 2012).

Recent institutional-catering evidence also demonstrates the limitations of relying exclusively on self-assessment. A 2024 study conducted in school kitchens found that external auditors consistently rated food-safety conditions lower than internal staff, with important differences in judgments concerning personal hygiene, storage, cleaning, and disinfection (Mihalache et al., 2024). This finding emphasizes the value of structured direct observation and independent verification when evaluating canteen safety.

Food-handler hygiene represents a major prerequisite for safe food preparation. Hands can transfer microorganisms between raw ingredients, equipment, surfaces, and ready-to-eat foods when handwashing is inadequate or performed at inappropriate times. Research in Indonesian contract catering has likewise documented limited food-safety knowledge, poor hygiene practices, and microbiological contamination in selected food samples, reinforcing the importance of repeated training and direct verification (Palupi et al., 2024). Observational foodservice research indicates that reported or perceived hygiene can differ substantially from actual behavior, supporting direct observation rather than questionnaires alone (Bulochova et al., 2024).

Good Hygiene Practices (GHPs) form the foundation of an effective food-safety management system. The Codex Alimentarius General Principles of Food Hygiene (CXC 1-1969) provide the international framework for food hygiene and include guidance on the Hazard Analysis and Critical Control Point (HACCP) system. The current Codex framework emphasizes the relationship between prerequisite GHPs and HACCP-based control of significant hazards (Codex Alimentarius Commission, 2022). Practical GHP and HACCP guidance also emphasizes that prerequisite hygiene controls must be established before process-specific HACCP controls can function effectively (Food and Agriculture Organization of the United Nations, 2023).

HACCP is a preventive and systematic approach that identifies significant biological, chemical, and physical hazards and establishes controls at steps where loss of control could result in unacceptable food-safety risk. Its seven principles comprise hazard analysis, determination of critical control points, establishment of critical limits, monitoring procedures, corrective actions, verification procedures, and documentation and record keeping. In small foodservice settings such as school canteens, HACCP should be supported by effective prerequisite programs rather than applied as a substitute for basic sanitation.

School canteen studies have frequently focused on food-handler knowledge, attitudes, practices, or general sanitation. Although these dimensions are important, they do not necessarily identify where hazards emerge within the food-production flow or which process steps require critical control. Reviews of foodservice food-safety research have identified limited use of direct observation and mixed measures, particularly for handwashing, temperature control, separation, and cleaning (Bulochova et al., 2024). An

integrated assessment combining hygiene-sanitation observations with HACCP principles can therefore provide a more operational picture of food-safety vulnerabilities.

Accordingly, this paper develops a HACCP-based methodological framework for evaluating food safety and food-handler hygiene and sanitation in elementary school canteens. The framework is intended to: (1) structure direct assessment of prerequisite hygiene-sanitation conditions; (2) map biological, chemical, and physical hazards across food-production processes; (3) support transparent, menu-specific determination of critical control points (CCPs); and (4) specify monitoring, corrective-action, verification, and documentation requirements. The paper does not claim empirical prevalence estimates and should be applied to verified field observations before conclusions are drawn about any specific school population

METHODOLOGY

Framework Design and Scope

This paper uses a methodological framework-development approach rather than an empirical cross-sectional study. The framework is designed for elementary school canteens that prepare or serve unpackaged ready-to-eat foods on site. Its components were organized from the Codex Alimentarius General Principles of Food Hygiene and HACCP system, WHO food-safety guidance, current Indonesian standards for ready-to-eat food premises, and recent foodservice food-safety literature. Because no verified field dataset accompanied the manuscript, no school, city, observation period, participant sample, or prevalence estimate is reported.

Intended Units of Application

The framework is intended to be applied at two linked levels: the canteen/process level and the food-handler practice level. Eligible field settings should include canteens that receive, store, prepare, cook, portion, hold, or serve unpackaged foods. Canteens selling only factory-sealed products may be excluded when no food-production process is present. In an empirical application, authors should report the sampling frame, sampling technique, number of schools and handlers approached and included, eligibility criteria, exclusions or non-response, and the rationale or calculation used to determine sample size.

Evidence and Regulatory Basis

No synthetic numerical dataset is used in the revised framework. Operational criteria should be derived from authoritative sources and documented before data collection. For Indonesian applications, the assessment should be aligned with Regulation of the Minister of Health of the Republic of Indonesia No. 11 of 2025, specifically the Appendix on the Standard Label Higiene Sanitasi Pangan (HSP). The HSP provisions explicitly include canteens within ready-to-eat food premises and define the relevant food-management setting. Operational checklist items should therefore be mapped to the applicable HSP provision, while HACCP-specific hazard analysis and CCP determination should follow Codex CXC 1-1969 (2022) and the Codex CCP decision tree. Where local or institutional requirements are stricter, the stricter validated criterion should be used and cited.

Hygiene-Sanitation Observation Instrument

A structured direct-observation checklist should cover personal hygiene and protective practices; handwashing facilities and behavior; health-related practices; potable water; waste and pest control; cleaning and disinfection; equipment and food-contact surfaces; receiving and storage; separation of raw and cooked foods; cooking;

holding; serving; and food-safety documentation. The source of every item should be documented (for example, Indonesian regulatory inspection criteria, Codex, WHO, or a previously validated instrument). Each item should have an operational definition and be coded as compliant, non-compliant, or not applicable. Domain compliance should be calculated as compliant observations divided by applicable observations multiplied by 100; not-applicable items should be excluded from the denominator. If interpretation categories are used, their cut-offs must be prespecified and justified rather than assigned post hoc. For empirical studies using multiple observers, training, pilot testing, content validation, and inter-observer agreement (for example, percentage agreement or Cohen's kappa where appropriate) should be reported.

HACCP-Based Process Evaluation and CCP Decision Logic

For each major menu item or process family, investigators should construct and verify an on-site process-flow diagram from receiving through storage, preparation, cooking, holding, serving, cooling, reheating, and disposal or reuse where applicable. At each step, biological, chemical, and physical hazards should be identified and rated for significance using prespecified severity and likelihood criteria. CCPs should not be assigned generically. Instead, each significant hazard should be evaluated using the Codex HACCP decision logic: whether control at the step is necessary for food safety, whether a control measure exists, whether the step is specifically designed to eliminate or reduce the hazard to an acceptable level, whether contamination or growth could reach unacceptable levels, and whether a subsequent step will eliminate or reduce the hazard. The resulting CCP decision should be recorded with the menu/process, hazard rationale, control measure, and justification.

Critical Limits, Monitoring, Corrective Actions, and Verification

Critical limits should be measurable and linked to the authoritative standard selected for the study. This framework does not impose a universal numerical temperature limit because the appropriate criterion depends on the food, process, and applicable provision. For Indonesian applications, hygiene-sanitation requirements should be traced to the relevant provisions of the HSP Appendix to Minister of Health Regulation No. 11 of 2025; HACCP critical limits should additionally be established and validated in accordance with Codex CXC 1-1969 (2022) and the FAO GHP/HACCP guidance. The protocol should state the exact limit, source or provision, measurement method, instrument calibration procedure, monitoring frequency, responsible person, corrective action, and verification record for every confirmed CCP. A numerical criterion should be reported only when its source and applicability to the observed food process are explicit.

Planned Analysis for Empirical Application

The framework itself does not generate inferential statistics. In a field application, the primary unit of analysis and denominators should be defined in advance. Categorical observations may be summarized as n/N and percentages by domain and canteen, while measured temperatures may be reported using appropriate descriptive statistics and the proportion meeting prespecified critical limits. If associations are examined, authors should specify the predictor and outcome variables, statistical test, assumptions, software, two-sided significance level, and confidence intervals. When multiple food handlers or repeated observations are nested within the same canteen, clustering should be addressed analytically, for example through canteen-level summaries, cluster-robust standard errors, or multilevel methods as justified by the design.

Ethical and Institutional Considerations

This methodological framework does not involve human participants or identifiable institutions and therefore does not itself require participant consent or ethics approval. Any empirical application should obtain the permissions required by the responsible ethics committee or institutional review body, education authority, school management, and participating canteens, as applicable. The final empirical report should state the actual approval or waiver, approval number where issued, consent procedure where relevant, and institutional permissions; these details must not be fabricated

RESULTS AND DISCUSSION

Results

Proposed Hygiene-Sanitation Evaluation Framework

The revised framework organizes school-canteen food-safety evaluation into complementary prerequisite and process-control components. The prerequisite component assesses conditions that must be consistently maintained for safe food handling, including personal hygiene, handwashing, water and sanitation, cleaning and disinfection, pest and waste control, equipment condition, storage, separation of raw and cooked foods, and documentation. No numerical compliance percentage is reported because no verified field observations were provided.

Table 1. Proposed hygiene-sanitation assessment domains and operational reporting requirements.

Assessment domain	Core operational criteria	Empirical reporting
Personal hygiene and protective practices	Clean attire; hair restraint/protective practices; no unsafe handling behavior; health-related requirements as applicable	Report compliant/applicable observations (n/N) and %
Handwashing facilities and behavior	Accessible handwashing facility; running water; soap; appropriate handwashing at critical times	n/N, %, and observer-agreement information if assessed
Cleaning and disinfection	Documented cleaning procedures; clean food-contact surfaces; appropriate cleaning/disinfection materials and practices	n/N, %, frequency, and any not-applicable items
Water, waste, and pest control	Safe water source; protected waste handling; absence/control of vectors and pests	n/N, %, and regulatory criterion used
Raw/cooked food separation	Separate storage, utensils, surfaces, or workflow sufficient to prevent cross-contamination	n/N and % by relevant process
Storage practices	Protected storage; stock	n/N, measured temperatures

	rotation; separation; temperature control where required	where applicable
Cooking and serving practices	Adequate cooking process; protected serving; clean utensils; minimized unsafe holding	n/N and process-specific observations
Temperature monitoring	Calibrated thermometer available and used; time-temperature measurements documented	Measured values, denominator, and % meeting the cited limit
Records and food-safety documentation	Receiving, cleaning, temperature, corrective-action, and verification records as applicable	Presence/completeness and applicable denominator
Overall assessment	Calculated only from prespecified applicable items; no post-hoc category assignment	Overall n/N and %, with cut-offs defined a priori if categories are used

For empirical reporting, each domain should be presented using the observed compliant count and applicable denominator (n/N), percentage compliance, and the prespecified interpretation criterion if one is used. Items marked not applicable should be excluded from the denominator and reported transparently. This approach avoids unsupported categorical labels and permits readers to understand how each percentage was derived.

Table 2. HACCP process-evaluation template for school-canteen food preparation.

Process step	**Potential hazard & control measure**	**CCP decision**	**Critical limit / criterion**	**Monitoring, corrective action & verification**
Receiving	Biological, chemical, or physical contamination. Use approved sources and receiving/package-quality checks.	Apply the Codex decision tree to the actual ingredient and process.	Use the exact applicable receiving criterion and cite its source.	Document receiving checks and supplier records. Reject, segregate, or otherwise manage nonconforming ingredients.
Cold storage	Microbial growth and cross-contamination. Maintain refrigeration, segregation, and	Determine from menu-specific hazard analysis; do not assume CCP status.	Use the exact temperature/storage criterion selected for the study and cite the provision or authoritative	Check temperature with a calibrated instrument at a prespecified frequency;

	protected storage.		source.	verify logs. Restore control, assess exposure, and discard food if safety cannot be assured.
Preparation	Cross-contamination; allergen/chemical contamination; physical hazards. Separate raw and cooked workflow, maintain hand hygiene, and use clean utensils/surfaces.	Usually controlled through prerequisite GHPs unless the Codex decision logic supports CCP status for a specific process.	Use operational criteria for separation, hygiene, and sanitation from the applicable standard.	Use direct observation and cleaning records with supervisory verification. Stop the process, clean/disinfect, and replace contaminated food or utensils as appropriate.
Cooking	Survival of pathogens. Apply a validated heat treatment.	Determine with the Codex decision tree for the actual food and process.	Specify and cite the validated core temperature/time criterion applicable to the food.	Measure defined batches/processes using a calibrated thermometer and verify records. Continue cooking or discard when the validated safety criterion is not achieved.
Hot holding	Microbial growth. Maintain food under controlled hot-holding conditions.	Determine with the Codex decision tree for the actual service process.	Specify and cite the applicable holding temperature/time criterion.	Perform time-temperature checks at prespecified intervals and verify logs. Restore control promptly; reheat or discard according to a validated

				procedure.
Cooling / storage of leftovers	Spore germination, microbial growth, and toxin formation. Use rapid cooling and controlled refrigeration.	Assess only when leftovers or advance preparation are actually used.	Specify and cite the validated time-temperature cooling criterion.	Maintain a time-temperature log and verify the cooling procedure. Discard food outside the validated limit or take an approved corrective action.
Reheating	Survival or growth of pathogens. Apply rapid and thorough reheating.	Assess only where reheating occurs.	Specify and cite the validated reheating criterion.	Measure each relevant batch and verify thermometer calibration. Continue reheating or discard if safety cannot be assured.
Serving	Cross-contamination and time-temperature abuse. Protect food, use clean utensils, and control service time/temperature.	Determine from the hazard analysis; often a prerequisite/control point rather than a CCP.	Specify and cite service-protection and time-temperature criteria where applicable.	Observe service practices and verify records where used. Replace contaminated food, correct handling, or discard when safety is uncertain.

Table 2 is presented as a process-evaluation template rather than as evidence from observed canteens. The table has been simplified to improve readability and to distinguish four decisions that must be documented in an empirical application: the process-specific hazard and control measure, the CCP decision and rationale, the exact source-linked critical limit or criterion, and the monitoring/corrective-action/verification procedure. CCP status must be determined from the verified process flow and Codex decision logic rather than inferred from generic foodservice practice.

Discussion

The framework addresses a recurrent limitation in school food-safety research: hygiene checklists and food-handler knowledge measures do not by themselves identify

where process-specific hazards arise or whether controls are effective at critical stages. Integrating prerequisite hygiene-sanitation assessment with HACCP process analysis provides a clearer distinction between foundational deficiencies and failures that require specific critical control.

Hand hygiene remains a core prerequisite because food handlers can transfer microorganisms among raw ingredients, equipment, environmental surfaces, and ready-to-eat foods. WHO guidance places cleanliness and separation of raw and cooked foods among its Five Keys to Safer Food (World Health Organization, 2006). However, the revised framework does not assume that hand hygiene is weak in any particular school; that conclusion must come from direct observation.

Direct observation is particularly important when evaluating food-handler behavior. Self-reported hygiene can overestimate actual compliance because workers may know the expected answer even when routine practice differs. A review of 118 foodservice food-safety studies found that observation was used in only a minority of studies and recommended combining cognitive and behavioral measures to improve validity (Bulochova et al., 2024). Similarly, a 2024 institutional-catering study found that external auditors rated school-kitchen food-safety conditions less favorably than internal staff, particularly for personal hygiene, storage, cleaning, and disinfection (Mihalache et al., 2024).

Raw/cooked separation should likewise be evaluated as an observable prerequisite control. Cross-contamination can occur through hands, cutting boards, knives, containers, cloths, and food-contact surfaces. Current Indonesian hygiene-sanitation standards for ready-to-eat food premises also emphasize facility design and work practices that prevent cross-contamination. In empirical application, the finding should be reported from observed practices rather than presumed from plausibility.

Temperature control requires objective measurement. Visual inspection cannot establish whether food has reached, maintained, or returned to a safe temperature. Accordingly, the framework requires calibrated thermometers, documented time-temperature observations, and source-specific critical limits. This converts a general hygiene assessment into a verifiable process-control evaluation.

The distinction between GHP and HACCP is central to interpretation. Codex identifies GHPs as the foundation of food hygiene systems, while HACCP provides a systematic method for controlling significant hazards that require specific process controls (Codex Alimentarius Commission, 2022). Food-safety policy evidence from catering establishments indicates that HACCP-based and related interventions can reduce microbial contamination, although the available evidence still has methodological limitations (Levy et al., 2022). Poor handwashing facilities, inadequate cleaning, pests, or lack of potable water should not simply be labeled CCP failures; they are prerequisite-program weaknesses that must be corrected to make HACCP implementation credible.

The framework therefore treats cooking, holding, cooling, or reheating as potential CCPs only when the menu-specific hazard analysis and Codex decision logic support that designation. For some foods, a step may be controlled adequately through prerequisite programs or a later process; for others, loss of control may create an unacceptable risk. This decision-based approach is more defensible than assigning the same CCPs to all school canteens.

Documentation is included as a verification component rather than assumed to be deficient. Practical records may include receiving checks, cleaning schedules, thermometer calibration logs, time-temperature records, corrective-action forms, and

supervisory verification. Simple documentation can be proportionate to small canteen operations while still providing evidence that controls are implemented consistently.

Training is relevant but should not be treated as sufficient by itself. Research in school and institutional foodservice has shown that training can improve knowledge and some observed practices (Abdul-Mutalib et al., 2012; Al-Akash et al., 2022). Systematic reviews indicate that training effects are generally strongest for knowledge, while consistent behavioral change is more difficult to achieve and depends on intervention design, organizational context, reinforcement, and follow-up (Young et al., 2020; Cotter et al., 2023). These findings support training that includes demonstrations, supervision, repeated feedback, and workplace reinforcement rather than one-time classroom instruction alone.

School food safety also requires organizational support. Canteen managers and schools must provide adequate handwashing facilities, potable water, cleaning materials, functional refrigeration, food-grade equipment, pest control, and sufficient workflow separation. Food handlers cannot consistently apply safe practices when the physical environment makes compliance difficult. Food-safety culture research emphasizes that resources, leadership, communication, commitment, work pressure, and management systems can shape safe behavior at the organizational level (Zanin et al., 2021; Zanin et al., 2022).

The main strength of the framework is its integration of person-level hygiene practices, environmental prerequisites, and process-level hazard control. It also requires transparent denominators, operational definitions, menu-specific flow diagrams, explicit CCP decision logic, measurable limits, and verification records. These features respond to concerns in the foodservice literature about overreliance on self-report and insufficient direct or mixed measurement (Bulochova et al., 2024). The framework has important limitations. It has not been empirically validated in the present manuscript, and field validation is essential before broader application. Future testing should explicitly assess feasibility, content validity, inter-observer reliability, sensitivity to different menu and workflow types, and the framework's ability to discriminate between canteen conditions. Observation may also alter food-handler behavior, and a single visit may not represent routine practice. Repeated or unannounced observations, microbiological testing where feasible, and triangulation with documentary records can strengthen future applications.
Future empirical studies should apply the framework to a clearly defined sampling frame, report actual school and canteen characteristics, validate the observation instrument, document all denominators, use calibrated temperature measurements, and justify every CCP from the observed menu and process flow. Only verified field data should be used to estimate compliance or make claims about food safety performance.

CONCLUSION

This paper provides a structured HACCP-based framework for evaluating food safety and food-handler hygiene and sanitation in elementary school canteens. The framework links prerequisite GHP assessment with menu-specific hazard analysis, transparent CCP decision logic, measurable critical limits, monitoring, corrective actions, verification, and documentation. By removing synthetic prevalence estimates and treating the manuscript as a methodological framework, the revised approach avoids presenting illustrative values as empirical findings. Its next step is field validation using clearly described sampling, validated observation criteria, calibrated measurements, institutional permissions, and verified process-flow data.

(Rosmaria)

REFERENCES

Abdul-Mutalib, N. A., Abdul-Rashid, M. F., Mustafa, S., Amin-Nordin, S., Hamat, R. A., & Osman, M. (2012). Knowledge, attitude and practices regarding food hygiene and sanitation of food handlers in Kuala Pilah, Malaysia. Food Control, 27(2), 289-293.

Al-Akash, H., Abu Arrah, A., Bhatti, F., Maabreh, R., & Abu Arrah, R. (2022). The effect of food safety training program on food safety knowledge and practices in hotels' and hospitals' food services. Italian Journal of Food Safety, 11(1), 9914. https://doi.org/10.4081/ijfs.2022.9914

Ali, S. W., Ahmad, M., Asif, M., Amir, R. M., & Ali, A. (2022). Assessment of food safety knowledge, attitude, practices of food handlers and microbial contamination in foods at the canteens of a University in Pakistan. Italian Journal of Food Safety, 11(3), 10051. https://doi.org/10.4081/ijfs.2022.10051

Bulochova, V., Evans, E. W., Haven-Tang, C., & Redmond, E. C. (2024). Methods and measures in food service food safety research: A review of the published literature. Heliyon, 10(4), e25798. https://doi.org/10.1016/j.heliyon.2024.e25798

Codex Alimentarius Commission. (2022). General Principles of Food Hygiene (CXC 1-1969). Food and Agriculture Organization of the United Nations and World Health Organization.

Cotter, S., Yamamoto, J., & Stevenson, C. (2023). A systematic characterization of food safety training interventions using the analyze, design, develop, implement, evaluate (ADDIE) instructional design framework. Food Control, 145, 109415. https://doi.org/10.1016/j.foodcont.2022.109415

da Cunha, D. T., Stedefeldt, E., & de Rosso, V. V. (2014). The role of theoretical food safety training on Brazilian food handlers' knowledge, attitude and practice. Food Control, 43, 167-174.

Food and Agriculture Organization of the United Nations. (2023). Good Hygiene Practices (GHP) and HACCP Toolbox for Food Safety. FAO.

Levy, N., Hashiguchi, T. C. O., & Cecchini, M. (2022). Food safety policies and their effectiveness to prevent foodborne diseases in catering establishments: A systematic review and meta-analysis. Food Research International, 156, 111076. https://doi.org/10.1016/j.foodres.2022.111076

Mihalache, O. A., et al. (2024). The effectiveness of food safety self-checking systems in institutional catering. Applied Food Research, 4(2), 100488. https://doi.org/10.1016/j.afres.2024.100488

Murphy, M., Coffey, A., Pallan, M., et al. (2024). Changing the food environment in secondary school canteens to promote healthy dietary choices: A qualitative study with school caterers. BMC Public Health, 24, 1970. https://doi.org/10.1186/s12889-024-19513-7

Palupi, I. R., Budiningsari, R. D., Khoirunnisa, F. A., & Hanifi, A. S. (2024). Food safety knowledge, hygiene practices among food handlers, and microbiological quality of animal side dishes in contract catering. Italian Journal of Food Safety, 13(3), 12554. https://doi.org/10.4081/ijfs.2024.12554

Soares, L. S., Almeida, R. C. C., Cerqueira, E. S., Carvalho, J. S., & Nunes, I. L. (2012). Knowledge, attitudes and practices in food safety and the presence of coagulase-positive staphylococci on hands of food handlers in the schools of Camaçari, Brazil. Food Control, 27(1), 206-213.

Tan, S. L., Bakar, F. A., Karim, M. S. A., Lee, H. Y., & Mahyudin, N. A. (2013). Hand hygiene knowledge, attitudes and practices among food handlers at primary schools in Hulu Langat district, Selangor (Malaysia). Food Control, 34(2), 428-435.

Ministry of Health of the Republic of Indonesia. (2025). Regulation of the Minister of Health of the Republic of Indonesia No. 11 of 2025 on Standards for Business Activities and Product/Service Standards in Risk-Based Business Licensing in the Health Subsector. Jakarta: Ministry of Health.

World Health Organization. (2006). Five keys to safer food manual. World Health Organization.

World Health Organization. (2023). World Food Safety Day: Call to action. World Health Organization.

World Health Organization. (2024). WHO Foodborne Disease Burden Epidemiology Reference Group for 2021-2024: First report. World Health Organization.

Young, I., Waddell, L. A., Wilhelm, B. J., & Greig, J. (2020). A systematic review and meta-regression of single group, pre-post studies evaluating food safety education and training interventions for food handlers. Food Research International, 128, 108711. https://doi.org/10.1016/j.foodres.2019.108711

Zanin, L. M., Luning, P. A., & Stedefeldt, E. (2022). A roadmap for developing educational actions using food safety culture assessment - A case of an institutional food service. Food Research International, 155, 111064. https://doi.org/10.1016/j.foodres.2022.111064

Zanin, L. M., Stedefeldt, E., & Luning, P. A. (2021). The evolvement of food safety culture assessment: A mixed-methods systematic review. Trends in Food Science & Technology, 118, 125-142. https://doi.org/10.1016/j.tifs.2021.08.013