



Re-thinking the HACCP team: An investigation into HACCP team knowledge and decision-making for successful HACCP development

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ABSTRACT

The multidisciplinary HACCP team is a firmly embedded part of the HACCP system and it is a generally held belief that the outcome of this team approach will be a stronger food safety system than could be developed by individuals working alone. HACCP team members are normally selected for their operational skills and expertise rather than HACCP knowledge, and are normally trained to an equivalent level in HACCP principle application. However if there are weaknesses in the HACCP team's knowledge about how to apply HACCP principles it follows that there could be weaknesses in the system. Similarly the way that HACCP team members interact and share knowledge could have an impact on food safety, particularly whose view will prevail when there is a difference of opinion, and whether more junior team members have the confidence to challenge their more senior colleagues. It is therefore important to understand the way that HACCP teams work together to make decisions about food safety and HACCP.

In the setting of a multinational manufacturing organisation, this research uses a combination of HACCP knowledge testing of individuals and teams with observation of the HACCP team decision-making process to investigate the impact of HACCP teams on the success of the HACCP development process. Findings are contrary to the expected outcome, in that HACCP team knowledge was not necessarily better than that of the individual team members. A potential effect of the team scribe on HACCP effectiveness was identified. Results are discussed with reference to team decision-making models.

This research provides insight into HACCP team decision-making processes, and identifies potential limitations within HACCP team operation that need to be understood by food companies. The findings challenge traditional views of the HACCP team and propose approaches to team selection that will maximise HACCP development success.

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1. Introduction

It is a generally held belief that HACCP is best applied by a multidisciplinary team and that the outcome of this team approach will be a stronger food safety system than could be developed by individuals working alone. This belief has been promulgated by guidance publications and training interventions (Codex, 2009; Mortimore & Wallace, 1998; Royal Society for Public Health, 2007; WHO, 1993). For example, Codex (2009) lists 'Assemble HACCP team' as the first step in its 'Logic Sequence for Application of HACCP' and suggests

Abbreviations: Codex, Joint FAO/WHO Food Standards Programme, Codex Alimentarius Commission Committee on Food Hygiene; HACCP, the Hazard Analysis and Critical Control Point System of Food Safety Management; NASA, the United States National Aeronautics and Space Administration; NACMCF, the United States National Advisory Committee on Microbiological Specifications for Foods.

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that the optimal way to ensure that appropriate knowledge and expertise is available for the development of effective HACCP is to use a multidisciplinary team approach. In a manufacturing operation, this may be partly because the required knowledge to take decisions about food safety – e.g. knowledge about ingredient and product formulations, processes and handling practices, equipment and environment issues – is likely to be spread amongst several individuals. However, the origins and reasons for the use of HACCP teams in the historical record of HACCP development are unclear.

In the earliest stages of the system that would become HACCP, i.e. the work at NASA on space foods, a multi-agency 'team' approach was used (Bauman, 1993; Ross-Nazzari, 2007), with involvement of parties such as the NASA food/nutrition team under Paul La Chance, the US Army's Natick Laboratories and industry contractors/subcontractors, including the Pillsbury team headed by Howard Bauman. Although the philosophy of analysing hazards and identifying critical control points came out of this work, there was no defined system requiring teams to apply the principles and, in fact, the term HACCP

had not been invented at that stage; being later coined by Pillsbury (La Chance, 2006).

The concept of HACCP teams first appears in the HACCP literature in 1992 in the USA National Advisory Committee on Microbiological Criteria for Foods (NACMCF) HACCP guide (NACMCF, 1992). There is no mention of use of teams in the original HACCP publication (Bauman, 1990, 1993; The Pillsbury Company, 1973). However, further investigation has revealed that Pillsbury did use a variant of HACCP teams 'without exception' when applying HACCP to their civilian retail food operations (Sperber, 2007, pers. comm.). This process, formalised in 1972, required a food microbiologist, process engineer, product development scientist and regulatory officer to review and approve all new product and process developments or modifications, with additional expertise being sought where necessary (Sperber, 2007, pers. comm.).

1.1. Team-work in organisations

It is also likely that trends towards use of teams within the business environment, which have seen particular growth since the 1980s (McKenna, 2000) have played a role in the widespread acceptance of the team approach as being the most appropriate for effective HACCP development. Reasons for use of teams within business organisations include beliefs that team performance will surpass individual performance when the task requires a variety of skills judgement and experience (Mohrman, Cohen, & Mohrman, 1995), which would tie in with the multidisciplinary expertise sought in HACCP. Evidence of productivity gains and reductions in rejects through use of teamwork has also been reported (cited by McKenna, 2000), which is again consistent with HACCP as a continuous improvement-based preventative management system. Arnold, Cooper, and Robertson (1998) report that decisions made by groups can evoke greater commitment than those made by individuals because more people feel a sense of involvement. Certainly gaining the commitment to take forward the outcome of the HACCP team deliberations, i.e. the HACCP plan, and implement it in the operation is central to an effective food safety system, however this transfer of the HACCP plan from being a paper 'specification' to everyday food safety practice generally also involves additional personnel to the HACCP team. Much of the work on effectiveness in teams has been published in the last 30 years, reflecting the move to use of team-work in the business environment over this time. Several definitions of teams can be found in the literature and an example which ties in well with the role of HACCP teams is that of Landy and Conte (2007, p542), which refers to "an interdependent collection of individuals who work together toward a common goal and who share responsibility for specific outcomes for their organisations".

1.2. Makeup of the HACCP team

Within HACCP teams, key disciplines are reported to be technical/quality assurance, manufacturing/operations/production and engineering, with additional specialists, e.g. microbiologists, raw material specialists, distribution personnel, chemical contaminant experts, product developers, etc., brought in to assist the core team depending on the scope of the HACCP study (Mortimore & Wallace, 1998).

Within the multidisciplinary HACCP team the individual team members are expected to bring appropriate expertise and experience from their discipline to allow the team to complete its task (i.e. develop an effective HACCP plan) and to work in cooperation with their colleagues within the team. This expertise needs to be combined with data and documentation relevant to the specialism being represented, e.g. raw material specialists and supplier auditors respectively can provide appropriate technical specifications and supplier audit reports such that the team has sufficient information to take decisions about raw material safety.

In addition to the common role of HACCP team member, it is normal practice for an individual to take on a team coordination or leadership role in order to facilitate teamwork progress (Mortimore & Wallace, 1998). A second team role identified as important to HACCP team work is that of the scribe (Mortimore & Wallace, 2001) or rapporteur (Moy, Kaferstein, & Motarjemi, 1994; WHO, 1993).

Whatever the origin of the multidisciplinary HACCP team, it is now a firmly embedded part of the HACCP system (Codex, 2009; NACMCF, 1997) and HACCP team members are normally selected for their operational skills and expertise rather than HACCP knowledge, then are usually trained to an equivalent level in HACCP principle application (Mortimore & Wallace, 1998). However if there are weaknesses in the HACCP team's knowledge about how to apply HACCP principles it follows that there could be weaknesses in the system, e.g. incorrect identification of CCPs if there is confusion about how to apply CCP decision trees, or incorrect decisions about which hazards need to be controlled, and how, in a given operation. The basis of these decisions is knowledge about the HACCP principle application process, along with technical knowledge of likely hazards and possible control options in the food industry sector.

Similarly, the way that HACCP team members interact and share knowledge, particularly whose view will prevail when there is a difference of opinion, and whether more junior team members have the confidence to challenge their more senior colleagues, could have an impact on food safety. It is therefore important to gain an understanding of HACCP team knowledge and the way that HACCP teams work together to make decisions about food safety and HACCP.

Decisions about HACCP principle application within HACCP teams are dependent on both the collective knowledge of the team members, i.e. the knowledge that each individual member of the team brings, and the holistic team knowledge, i.e. the knowledge of the team as a whole, which is affected by processing behaviours within the team (Cooke, Salas, Cannon-Bowers, & Stout, 2000). In order to understand the role of HACCP knowledge in team decisions, it is, therefore, important to establish a measure of both individual and team knowledge (Fig. 1).

HACCP knowledge, therefore, is likely to be one factor involved in the HACCP team's ability to develop a sound HACCP system for food safety management, i.e. the team effectiveness for food safety. Other variables are also likely to be involved in this process and it is useful to investigate established models to further illuminate this aspect of HACCP application.

1.3. The input–process–output model of team effectiveness

The main model used to study team effectiveness is the 'input–process–output' model (Gladstein, 1984; Landy & Conte, 2004, 2007; Salas, Cooke, & And Rosen, 2008). This model suggests that inputs either directly affect team outputs or indirectly affect team outputs via team processes (Fig. 2) and the groups of variables introduced in the model are useful in unpicking the potential impact factors in the effectiveness of HACCP team decision-making and performance.

The input–process–output model of team effectiveness stems from organisational psychology and it is accepted as fit for purpose in the study of teams within organisations (Landy & Conte, 2007). Consideration of variables from the input–process–output model of team effectiveness applied to HACCP is useful in providing a foundation for exploring how HACCP team decisions are made, and for understanding some of the likely limitations of team-work tasks. For example, from the process variables, 'Norms' are the informal and often unspoken rules that regulate team behaviour and can have an impact on team decision-making and performance (Forsyth, 1999). Examples of Norms include punctuality, productivity, acceptable behaviour and dress-code. Although this latter point is less likely to be relevant as a group norm in the food industry, where dress code is specified by industrial and organisational hygiene requirements, it is possible that other norms around ability to challenge more senior staff might impact the HACCP

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