# LESSONS LEARNED

NIOSH commissioned this project and the three case studies with the hope of showing how participatory approaches could enhance efforts to control ergonomic problems in meatpacking plants and other types of workplaces faced with these kinds of problems. This section is an attempt to draw together the lessons learned from these demonstration cases.

At the outset, it is meaningful to ask whether the meatpacking plants and companies involved in the case studies were typical of the industry. Two of the plant sites for the interventions (Case Studies #1 and #2) are part of large, diversified meatpacking companies. All three were relatively large capacity plants with employment over 700 and with both slaughtering and processing operations. Workers at the two pork plants (Case Studies #1 and #2) were unionized, while the beef plant workers (Case Study #3) were not represented by a union. The two pork plants operated in rural environments and consequently drew workers from the surrounding rural area. In contrast, the beef plant was located in the center of a large metropolitan area. Industry competition affected each of the plants, as none had products sufficiently differentiated from others in the market that they were immune from the demands of the marketplace. Given these and other considerations as noted in the case reports, the study sites, though few in number, appeared to be fairly typical conditions for conducting the demonstrations. Thus, the experiences gained from this work were believed to have relevance to a significant part of the meatpacking industry.

Also, mention must be made again that these case studies and the results gathered from the attempts to solve ergonomic problems are not to be viewed as research efforts. The experiences reported and lessons learned are primarily rooted in observations and surveys which lack control measures in most instances. Nevertheless, the urgency of addressing ergonomic problems in meatpacking gives importance to intervention efforts such as those described in this report.

Pointers or guides in developing participatory and team-building approaches for problem solving based upon the literature were charted in an earlier section of this report (pages 40-41). The table on pages 191-194 summarizes the efforts and results reported in the three case studies in light of these different pointers. The text below elaborates further on these observations in describing the lessons learned from the three case studies. As will be shown, the lessons reaffirm many of these points but also add qualifiers or other considerations.

## MANAGEMENT COMMITMENT

Top management commitment and support is key to successful problem-solving efforts involving teamwork and participatory approaches. Variable expressions of this were in evidence in the three cases. For example, the Case Study #2 company had recognized the need for controlling ergonomic hazards several years before the OSHA citations brought widespread public attention to the CTD hazards in meatpacking. This company had taken steps to form a corporate-wide employee-involved continuing program for the purpose of ergonomic hazard control. An experienced industrial engineer with training in ergonomics functioned as the coordinator of the program and trained members of ergonomics committees established at various plants. Moreover, this individual sat on the corporate steering committee which included top management persons charged with setting policies and priorities and allocating resources for the plants making up the corporation. On this basis one could say that ergonomics issues had representation at the highest level of the corporation's management. The company issued policy statements acknowledging management support of ergonomic hazard control measures and promoting employee awareness of and education about such problems. As was noted, the demonstration study in this company offered an opportunity to examine ergonomic program efforts in a plant whose performance appeared, by some measures, to be behind other plants in the same corporation.

Though starting later, the Case Study #1 company also developed formal policies endorsing participatory efforts to attack ergonomics problems, and used inside safety and health personnel with

Table 1. Summary observations in case reports re pointers in worker participation/team approaches to ergonomic problem-solving as suggested by the current literature.

| Conditions | Observations |
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| **Management Commitment** | Case Study #1: Formalized policy on ergonomics hazard control efforts involving worker participation. Plant-wide committee formed to deal with such problems comprising department heads, worker representatives, others instrumental in accomplishing goals. Made resources available to implement team-proposed solutions in a minimal time period.<br><br>Case Study #2: Instituted program in 1986. Issued formal policy on worker participation in ergonomics problem solving. Designated an ergonomics program coordinator to oversee multi-plant efforts who sat on the top decision-making group of the corporation. Ergonomics committees formed in each plant with representatives from management, workers' groups, and others in position to put into effect proposed changes.<br><br>Case Study #3: Offered resources to support team-building activities including overtime pay for workers to attend meetings. Ranking managers/directors sat on ergonomics teams with workers. |
| **Training** | Case Study #1: Provisions made for training in both team-building and ergonomics problem solving to team members, the latter including opportunities for practicing methods and techniques. General awareness training on ergonomic problems given to all plant employees. Company safety and health officer capable of handling efforts, some university investigator assistance.<br><br>Case Study #2: Specialty training on ergonomic issues given to team members. Awareness training on ergonomic hazards given to all employees, including office staff, as part of overall corporate policy. Capable corporate ergonomics coordinator assumed responsibility for all such training. |

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| | Case Study #3: Formal training limited in time and focused completely on ergonomics issues. No in-house expertise; handled exclusively by outside university consultant. |
| **Composition** | Case Study #1: Team memberships assured inputs from production workers engaged in the problem jobs, supervisory and engineering personnel plus maintenance persons from the same department or a combination who could facilitate data gathering, development and implementation of proposals. Teams were 7-9 members in size and were apparently small enough to be effective, considering overall results reported. Second level, plant-wide ergonomics committee representatives included the purchasing head, which is a recommended practice, and other members who provided close team support (e.g., nurse member supplied injury/medical data in defining problem jobs).<br><br>Case Study #2: With two exceptions, departmental teams were formed similar to Case Study #1 as were the plant-wide ergonomics committee at the intervention site. One difference was the presence of the corporate ergonomics coordinator who served in an advisory capacity at both the team and plant committee level. The ergonomic coordinator's presence at this site and other plants in the corporation suggested close oversight of all company ergonomics activities and possible limits on individual team/plant autonomy.<br><br>Case Study #3: Teams as formed included production workers assigned to the problem jobs plus supervisory staff and maintenance people from the areas of concern. Top plant officials were also members whose presence could have limited openness of discussion and inputs from production workers although one top official was intentionally absent from many meetings so as not to exert disproportional influence on the team. The teams experienced some turnover in production worker members, had to cope with language/literacy limitations of some participants. Reasonable efforts were made to deal with some of these problems. |
| **Information Sharing** | Case Study #1: Individual teams received company information on CTD prevalence, worker's compensation claims and costs, sick-absence and employee turnover to assist in defining problem jobs though the means of access and/or mode of data presentation were not described. A direct way for workers to track injuries was recommended. Opportunities to collect other data reflecting risk factors, interviewing workers as to complaints were freely granted. Varied efforts made to publicize and keep all plant employees informed of team's activities, progress, and accomplishments. |

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| **Information Sharing (continued)** | Case Study #2: It is intimated that teams shared similar data to that noted in Case #1 for the jobs that were preselected by the management and the corporate ergonomics coordinator for study at the plant intervention site. Also the teams had access to ergonomics risk factor information and could collect other information that went into the decisions to focus on these jobs. Monthly and quarterly reports on the team's progress were circulated to other plants in the corporation.<br><br>Case Study #3: Team members were provided injury statistics and workers' compensation data at the start of the project, but the teams did not review these records as the project progressed. Team activities were publicized in a quarterly newsletter distributed to all employees. |
| **Activities & Motivation** | Case Study #1: Teams attempted to follow an orderly approach in defining and rank-ordering jobs through using injury/medical record data and risk factor evidence, then brainstorming and prioritizing ideas for improvement along with means for implementation. These experiences should build team member skills and lay a strong foundation for future efforts. Proposed solutions took account of ease of implementation, feasibility and cost and opted primarily for engineering changes, a preferred approach. Those actually implemented proved to have positive effects but did not meet the expectations of some teams and the workforce as a whole. This resulted in feelings of dissatisfaction with the overall program. More realistic goal setting would seem indicated.<br><br>Case Study #2: Procedures used customized forms, checklists for data gathering on risk factors, and decisions on solutions developed by the company. These gave order to team activities. Teams focused efforts on preselected problem jobs which were recognized as posing difficult problem-solving elements based on earlier attempts. Easier job targets could have provided the teams with some early success and positive motivations; the teams expressed disappointment that proposed changes would take some time to implement.<br><br>Case Study #3: Two jobs for study were preselected by management and the investigator. A team was formed for each job Team activities almost solely directed to brainstorming for solutions which were then prioritized as to feasibility and cost factors. Approach jumps to solution without allowing for much team understanding of the problem. Although some improvements were made to the jobs, some aspects of the jobs had intractable elements making it difficult for the teams to have successes. |

| **Evaluation** | Case Study #1: Data collection addressed both team-building and performance issues in ways that showed changes over time, including first indications of positive results of team-generated ergonomic improvements following implementation. Both subjective survey methods and traditional objective measures were included in the evaluation with efforts made to tap not only team responses but the workforce as a whole and to analyze the results in terms of those whose jobs were affected and those not affected.<br><br>Case Study #2: Data collection included self-report surveys of team members on how well meetings were run, productivity, representations, quality of leadership and other team-building issues. Data also collected in symptom surveys to corroborate problems and risk factors and set a baseline for determining benefits of improvements along with the more traditional injury/medical data points.<br><br>Case Study #3: Surveys of teams concentrated on aspects of member interaction, team effectiveness, and responses to the objectives of the program as a morale builder, some given at the beginning and end of the study period. Data analyzed by different representative groups to show differences in views between management/supervisory staff and production worker team members. Besides symptom surveys, a plan was included to collect measurements of hand/wrist motions before and after some proposed job improvements to offer quantitative indications of the potential benefits of certain job changes in more immediate ways. |
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supplemental assistance from outside ergonomics experts to drive the efforts. Additionally, resources were made available to successfully implement the first team-generated proposals in minimal time. The demonstration in this case study offered an opportunity to observe early efforts at team-building. The Case Study #3 plant site also provided observations of team-building but had no formal written program as to ergonomics control objectives or employee involvement. This plant, like the other two, offered resources to support team activities and implement solutions judged feasible, even paying workers overtime wages to attend ergonomics team meetings so production schedules were not interrupted (a problem in all three study sites). An outside ergonomics researcher largely directed the resulting team approach, working primarily with the company human resource manager. When compared to the two other case demonstrations, this plant did not appear to make as much progress and the teams have not continued to function.

These cases support the lesson that sustained efforts in ergonomics problem-solving requires strong in-house direction and involvement and significant staff expertise in the subject matter. It is not clear from the case study reports whether the top management support of the participatory approach extended to middle managers or supervisors. Such persons did serve on the various teams formed at the three plant sites, and in that regard they may have played pivotal roles in transmitting proposed solutions to higher level committees or garnering resources to implement proposed solutions.

## TRAINING

The literature suggests that to function effectively, ergonomic work teams must be trained both in teamwork skills and skills related to identifying and analyzing ergonomics problems. The three case studies offer varied illustrations of this training. Case Study #1 reported that both types of instruction were provided for the ergonomics teams. Team-building instruction highlighted

group techniques in task analyses, interpersonal processes, and developing consensus. The ergonomics training emphasized risk factors related to CTDs and afforded practice in using videotapes and job analyses to rate different job operations in terms of risk. Apart from this instruction, general awareness training in ergonomics was given to all plant employees via the company safety and health personnel. The Case Study #2 company also trained the entire workforce, including office workers, as part of an overall corporate policy. This instruction was handled by the corporate coordinator of the ergonomics program who, along with the university investigators, gave specialty training in the etiology of CTDs and back disorders and approaches to solving ergonomics related problems at the actual plant site. In this context, mention is made of participatory problem-solving techniques (but with little elaboration, and the report notes that little time was spent in actual team-building activities). In contrast to the varying levels of training and coverage of workers shown for Cases #1 and #2, Case #3 provided ergonomics training to only the team members. This training was handled exclusively by the outside university investigator. This training was one and one-half hours in length, although training continued throughout the project during team meetings. Team-building training was limited to the researcher imploring team members to express their thoughts about problems and solutions openly. Nothing more formal was done, however the report does note that added efforts were made to help team members with literacy difficulties.

Recognizing that the three demonstration cases in participatory ergonomic interventions are limited one-year efforts, the real issue is whether the resultant positive experiences can lead the company to sustain them if they are not already an established practice. Clearly, training activities both in team building and ergonomics problem solving serve that end by creating in-house staff knowledge and resources to carry the program forward. Cases #1 and #2 show every indication that such training will reap those benefits. From the analysis of the university investigator, Case #3 seems unlikely to continue with the teams in light of the limited training given and the plant's dependency on outside persons to provide the knowledge to drive the program.

## COMPOSITION

The three case study reports depict both similarities and differences in organizational structure and team formation in undertaking the intervention efforts described. For example, in Case Studies #1 and #2 the ergonomics work teams for the intervention studies were each formed within different departments and these groups reported to a plant-wide ergonomics committee that had responsibilities for the plant's overall ergonomics program. In Case Study #2 however, the plant ergonomics committee at the study site (as well as other corporate sites) were responsive to a higher level corporate steering committee which set organization policies, priorities, and resource allocations. The corporate ergonomics coordinator served as a member of the steering committee and tracked all reports dealing with ergonomic issues within the various plants. He regularly attended plant committee meetings where the activities of the department teams were presented. The size and make-up of both the department teams as well as the plant committees were essentially similar in Case Studies #1 and #2. The teams were five to nine persons consisting of production workers, industrial engineers, and supervisory and maintenance personnel with assignments in the department in question. The corporate ergonomics coordinator also served on the teams described in Case Study #2 in an advisory capacity. The ergonomics committees in both the Case Studies #1 and #2 plants included representatives from management and labor, plus production department heads, industrial engineers, the personnel director, and medical staff. The case study #1's committee also included supply and purchasing managers. In Case Study #3, two teams were formed. The plant manager was a member of one team, and other ranking officers, such as the Director of Human Resources, and the Manager of Safety, on both teams. Each of these two teams also included a supervisor and five to six production workers from the departments chosen for study. In effect, this latter team combined the two tiers of ergonomics committee/team make-up into one. As a consequence, the size of the teams in Case #3 were larger, specifically, 14 to 15 people, although not all team members attended each meeting.

The literature suggests that no single form of participatory problem solving can fit all situations and this seems true in the cases described above. The reported experiences do offer some confirmation of factors that are important to consider in structuring this approach. For example, Case Studies #1 and #3 suggest that for best results department ergonomics teams should not include top plant management or employee representatives who may have other agendas in mind. Their presence on a second level ergonomics committee is more appropriate; for one thing, it reduces concerns about the willingness of individual workers to speak freely in team meetings. Case Study #1 made a particular point about the need to keep team size down to a minimum to promote maximal interaction. At the same time the report mentioned the benefits of having a mix of new and experienced workers as team members to capitalize on fresh ideas as well as those with more seasoning. Team leadership factors and their strong influence on team performance and effectiveness was noted in Case Studies #1 and #2. Case Study # 3 reported both turnover and language/ literacy limitations among employee members of its teams. Having other workers help in interpreting and communicating information appeared beneficial but raises further questions about who can best contribute to the participatory problem-solving approach. Stressing this point further, a member of one team strove to be a disruptive influence in team meetings.

Evidently, having direct or indirect access to maintenance people and services was an instrumental factor in team performance, especially at the implementation stage. Hence, their presence as team members bears consideration in structuring an intervention approach.

## INFORMATION SHARING

As stated in the literature, effective participative or team approaches to problem solving demand access to information germane to the problem and related issues. Since the problems in this instance dealt with ergonomic hazards and resulting cases of

CTDs in meatpacking jobs, company or plant information on the prevalence of CTD-type injuries, workers compensation claims and costs data, and sick-absence or employee turnover were vital to determining which jobs presented the greatest risk of such disorders and thus were critical targets for control actions. The reports of Case Studies #1 and #2 acknowledge that this information was made available to department teams identifying and evaluating particular target problems in their respective areas. However, the manner of access and its rendition were not detailed. Intimating that there are needs for improvement, a recommendation in the Case Study #1 report is to establish a management information system which can be used by the teams directly in tracking injuries. In Case Study #3 the activity of gathering and analyzing data from medical records and identifying hazardous jobs were performed by management and the university investigator before the teams were formed. This suggests that the ergonomics teams at this site missed out in learning important fundamentals to ergonomics problem-solving work, although the team members later learned information about the plant's injury and illness statistics and workers' compensation claims.

Also in Case Studies #1 and #2, efforts were made to keep all plant personnel informed of the intervention teams' activities through status reports and other issuances. Case Study #1 exhibited photos and descriptions of changes implemented by the teams in the company's cafeteria. Case Study #2 distributed monthly reports of individual team's work to other plants in the corporation and circulated it in a quarterly ergonomic newsletter. This type of reporting gave the program accountability. Though not mentioned, this publicity could also serve to maintain the awareness of the whole workforce to ergonomic hazards and injury risks but at the same time could have unduly heightened the expectations of many that solutions to CTDs and other musculoskeletal problems were immediately forthcoming. As noted particularly in Case Study #1 there was disappointment in the program's progress especially for those whose jobs were not included for study. The lesson here is perhaps to not oversell the effort to the user or affected group.

## ACTIVITIES AND MOTIVATION

Overall, team activities in the three case studies could be classified as efforts to:

a) identify jobs posing significant ergonomic hazards and/or sort out risk factors in those already targeted as being problem jobs;
b) gather and analyze data from medical records and hazard or symptom surveys to fulfill the needs of (a) above; and
c) brainstorm and prioritize control options along with plans for their implementation.

Work on these tasks was primarily done in team meetings in all three case studies, and reactions of the participants to the numerous sessions yielded reasonably favorable responses in terms of their conduct and accomplishments. Differences between the three case studies were more apparent in terms of the emphasis given the above types of activities and the manner of approach. For example, the longer history of the ergonomics program in Case Study #2 had generated more formal and orderly approaches to carrying out the above tasks, including the development of customized forms for data gathering and check-lists for decision making. Moreover, through centralized tracking of various injury, medical, and hazard data for departments and plants throughout the corporation, problem jobs for study by department teams could be readily identified.

In Case Study #1, the teams had to first identify and rank-order jobs in terms of critical needs for control based on various data gathering methods, as well as define the risk factors and propose remedial measures for the worst situations. The team experiences in Case Studies #1 and #2 showed an orderly progression of actions in laying a foundation for proposed solutions. Team members' ergonomic knowledge and skills are almost certain to have developed in this process and should solidify this approach

in future company problem-solving efforts. In Case #3 team activities were aimed at brainstorming preselected jobs for solutions which then were prioritized as to feasibility and cost factors. Without experience in gathering and analyzing injury and medical records and identifying jobs posing significant risks, it is uncertain whether the team approach described in Case Study #3 will continue.

Team decision making on solutions in the three cases was by consensus. Two studies (#1 and #3) mentioned prioritization which took into account the ease or difficulty of implementation, other feasibility considerations, and cost. The most recommended control measures accepted for implementation were in the category of engineering remedies (e.g., redesign knives or tools, automate the work tasks or provide mechanical assist devices, modify work station layouts or work surfaces) as opposed to other techniques such as changes in work practices.

Team motivations in the three cases could be expected to be high because of the novelty aspect of the efforts, including the attention paid to them by the outside investigators who collaborated in the intervention effort. Beyond this, there are more questions than answers as to the level of team motivations in the various case studies. For example, the literature acknowledges that selecting less difficult problems and solutions that could yield early successful outcomes would build confidence and satisfaction, especially in newly formed teams. Yet, examples of the jobs targeted for study in Case Study #2 and more notably Case Study #3 for which solutions were proposed did not fall into this category. Indeed, in Case #3, the two problem jobs selected by management and the university investigator had intractable elements based on earlier efforts. Although improvements were made, attempts to improve some aspects of the jobs were ineffective or could not be implemented during the demonstration project. While the interactions among the team members in Case Study #3 reportedly generated positive feelings among team members, the lack of tangible improvements in some aspects of the jobs hindered the progress of the teams. Case Study #1 was able to

implement certain solutions within the time frame, publicize the efforts as already noted, and even report initial results indicating benefits. These should be rewarding to the teams involved; yet the teams' expectations and that of the workforce in general were greater. Setting realistic goals for the teams, providing feedback to their efforts, and communications with the rest of the workforce, including reasonable timetables for progress, could help to allay this problem.

As indicated in the literature and confirmed in the case studies, the role of the team leader is especially crucial to team function and performance. Those who are sincerely interested and enthusiastic about team approaches to problem solving, are personable and democratic in their leadership style, and are intent upon promoting maximal interaction of the members in decision-making appeared to be the most effective.

## EVALUATION

As a requirement of the project, each case study was to furnish data on team building and team performance issues used in efforts to address and solve ergonomics job hazards in their respective meatpacking operations. Forms for doing so are described in the various reports. These included surveys to collect member ratings of how well the meetings were run and their perceptions of team effectiveness in terms of productivity, communications, adequacy of resources, commitment to the program objectives, size of group and representations, quality of leadership, etc. Some were administered early and again at the end of the project term to show differences in the team-building process over time. The information gained from these surveys showed positive human relations effects, apart from any benefits to resolving the ergonomics concerns. The worker participants in particular were pleased to be consulted about needs for changes in their jobs. Without exception the surveys did indicate one major problem — scheduling and attendance at meetings in light of production pressures. This conflict begs for an equitable resolution. Policy statements indicating company concerns for health and safety having the same priority as production and cost reductions demand no less.

The aforementioned measures of team functioning and performance were all subjective. More objective indicators included the number of jobs analyzed, solutions proposed, or those actually approved for implementation, all of which seem suitable as in-process type measures. As noted in the reports, the short time frame for the study in many instances precluded data collection that could actually demonstrate the merits of implementing team-directed solutions in terms of reductions in CTDs or other related medical problems. However, Case Study #1 offered some first indications of such effects, and Case Study #2 analyzed workers' compensation data and injury and illness data from a period early in the implementation of the corporate-wide ergonomics program.

Symptom surveys as used in the various cases suggest a way to get early indications of problems and provide appraisals as to whether proposed solutions will be effective in resolving the difficulties. Waiting for data based on traditional OSHA injury reports, medical referrals, and absenteeism or restricted day cases to demonstrate the benefits imposes lengthy delays which may be frustrating to team members in their desire to show that their work is having an impact. One case study (#3) expects to complete a plan to take measurements of hand/wrist motions before and after some proposed job improvements to offer more quantitative indications of effects from certain job changes. In Case Study #1 ergonomic analyses of implented changes were used to evaluate the controls. Comparisons of pre- and post-intervention ergonomic job analyses provide immediate feedback to the teams about what works.

Clearly, there are different ways for reporting on the participatory teamwork experience and results in ergonomic problem solving. Most important is that evaluation procedures become written into the overall plan for the team efforts, enabling one to appraise progress, provide feedback to affected or interested parties, and make suitable corrections where necessary to improve the overall effort.

The distinctions among the three Case Studies in terms of management commitment, training, team composition, information sharing, team activities and motivation, and evaluation methods outline the lessons learned from these demonstrations. It is hoped these lessons will enhance future participatory ergonomic problem-solving efforts.

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