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COOK-CHILL A CAUSE FOR CONCERN?

Introduction

The NHS catering system is a large one. According to the 1983 Rayner Scrutiny, it produces 1,400,000 meals a day and employs 1,200 catering managers and assistant managers and another 36,000 ancillary staff.

Over the years there have been strong criticisms of NHS catering. In 1985 it was reported that 279 patients had died from food poisoning in NHS hospitals in the preceding five years. The Institute of Environmental Health Officers also claimed that, if it were not for Crown Immunity (which has since been lifted), one in ten hospitals would be charged with contravening the Food Hygiene Regulations.

At the same time the Government is pressing health authorities to achieve major financial savings in catering services and is also requiring that ancillary services should be seen as viable business units from the point of view of the introduction of competitive tendering.

Cook-chill catering is being increasingly seen by health authorities as a way of improving hygiene within hospital catering services and as a means of cutting costs. So far some 127 hospitals are using cook-chill, but others are bound to follow. This 'Health News Briefing' looks at the potential benefits from using cook-chill, but also examines the associated risks and what needs to be done to minimise these.

What is cook-chill?

DHSS guidelines specify that cook-chill means chilling cooked food within 90 minutes of cooking to a temperature of between 0oC - 3oC and then storing it at this temperature for no more than five days (including the day of production and the day of consumption). The food is cooked and 'blast chilled' at a central production unit (ie the main meal producing kitchen). It is then transported in insulated containers (if the journey is

short)* or in refrigerated vans (if long) to the various satellite kitchens for storage. Then immediately before consumption it is regenerated by heating it so that the central food temperature reaches 70oC. Between chilling and regeneration the food temperature must not rise above 10oC. If it does, it must be disposed of, as should all reheated and uneaten food.

There is also a similar process called 'Cook-freeze' which involves freezing food at between -10oC and - 28oC. The storage times are longer, but it is a less versatile system and has not been taken-up in the public sector to any great degree.

Cook-chill offers many potential benefits. One of these is that the catering manager should be able to spend more time acting as a manager, rather than merely following the dictates of day-to-day food production, and can therefore devote attention to planning menus, revising procedures etc.

Cook-chill is seen as freeing hospital catering from its 'cinderella service' image, as a large influx of new equipment and capital investment will be necessary. Increased capital investment is occurring slowly in the conventional cook-serve systems as the new threat of prosecution forces District Authorities to upgrade old kitchens. Yet cook-chill is arguably the only system to entail district-wide analysis of the catering service, allowing for the possible eradication of differences within districts, ie Plymouth had one 300 bed hospital with a kitchen capable of supporting 1,700 beds, while other larger hospitals had to make do with a cramped and underfinanced catering service.

It is hoped that the large scale operation involved in cook-chill will give NHS catering services the power to demand better quality raw and manufactured products. The system also promises a wider choice and a more flexible service to the patient, avoiding the much criticised method of 'warm-holding'. Finally, cook-chill is looked to as a means of making financial savings, particularly in labour costs.

Many of these sought after benefits would seem to improve the quality of the catering service for the consumer. But what evidence is there that any of the above are achievable and at what cost? Unfortunately, it would appear that cost savings are prioritised by planners, often without proper evaluation of these or indeed any other aspects of the system. This means that little research has been carried out into the nutritional effects of cook-chill or any potential safety hazards involved in the system. These are examined in the next section of this paper.

* The terms 'short' and 'long' are not defined in the DHSS guidelines

Nutritional effects of cook-chill

With cook-chill, nutritional depletion (the term used for the reduction of essential nutrients in food due to catering processes) occurs at three main points: first, during the period between initial cooking and blast chilling; secondly during storage and thirdly at the final reheating. The degree to which cook-chill nutrient depletion will harm a patient depends on the degree to which their diet comprises cook-chill meals. Long stay patients would therefore be the ones most at risk, but it is arguable that even for short stay patients food should be of a high quality to aid recovery.

It is broadly agreed that cook-chill has a drastic effect on vitamin C, causing depletion of between 30-90% according to the kind of meal and the producer (Bognar 1980). This is similar to the 36-90% depletion noted due to warm-holding, but is substantially more of a problem than in domestic kitchens where the average depletion is 35%. There is little evidence that cook-chill will provide a nutritionally improved end product. Furthermore, many hospitals introducing a cook-chill system combine it with warm-holding, thus aggravating nutrient depletion. The fact that cook-chill does not improve on the depletion rate of warm-holding methods is important, as research shows that many patients fail to receive DHSS recommended rates of iron, energy, protein and vitamins, including vitamin C. The lack of vitamin C in one study was found to overlap with the range found in clinical scurvy.

Folic Acid, essential for the body to recover from wounds and illness and crucial in the early stages of pregnancy, is recognised to be seriously affected during storage with losses of up to 8% per day. According to the Yorkshire Regional Health Authority Interim Report on cook-chill the effect of nutrient losses can be mitigated by:

- carefully controlled cooking processes for vegetables
- ensuring that portioning, packing and chilling takes place as rapidly as possible. (For vegetables chilling should ideally take place within 10 minutes of cooking time)
- when possible ensuring that chilled vegetables are not stored for more than 2/3 days
- convenience products used (eg dehydrated potato) are supplemented with ascorbic acid
- foods such as orange juice, with known high ascorbic acid and folic acid content, are on the menu.

There are different views as to the effect of cook-chill on thiamin and riboflavin. One study claimed a potential loss of around 10% in both over the maximum storage time of 5 days. Similarly Professor Lacey of Leeds University claims that the aminoacid lysine is greatly depleted by cook-chill, as are fatty acids. However little is known about the effect of cook-chill on vitamins D and A. Vitamin D is particularly necessary for housebound older people who do not get it direct from sunlight

but must receive it in food. Given these uncertainties, there is undeniably a need for increased research into the effects of cook-chill on nutrients.

Finally, there is evidence that at the same time as cook-chill is being introduced, automatic drink dispensers are also being introduced. This should be looked at very carefully as elderly people have been found to receive up to one third of their protein intake from ward issues (ie milk in tea and coffee). A reduction in the amount of tea and coffee consumed could seriously affect health.

Safety

Safety is the other main area of debate surrounding cook-chill. There have been no reported outbreaks of food poisoning as a result of cook-chill in hospitals. However there is evidence of food poisoning due to cook-chill on airlines (another major user of the system, although ACHCEW is advised that it is not "a cook-chill system with respect to the DHSS guidelines of 1980"), and it must be a major cause for concern that 30% of hospitals were thought not to be complying with DHSS guidelines on cook-chill. The logic of the microbiological arguments imply that it is just a matter of time before food poisoning does occur.

Danger occurs because of the high degree of handling involved in cook-chill, firstly in cooking, secondly at chilling and thirdly at plating and regeneration. If the DHSS guidelines for cooking and temperature control are followed, complete destruction of harmful bacteria should occur. The problem arises in that temperature control must be very strict.

Firstly, food must be chilled to a temperature of between 0-3oC within an hour and a half of cooking. For this to be achieved food must be placed in trays no more than two inches deep. The microbiological reason for imposing a 90 minute limit is that bacteria have a stationary period in their growth of between one and a half to two hours before they react to optimum conditions and grow rapidly. For joints of meat this time limit does cause problems, therefore the DHSS allow for 2 1/2 hours chilling, whilst admitting that this involves risk.

Secondly, the transportation, unpacking, and plating processes which in some large hospitals can take a long while, are all potentially hazardous periods which should be carefully monitored to ensure that food does not rise in temperature above 10oC.

Care must be taken at all times to ensure the quick efficient movement and handling of food. DHSS guidelines suggest that larger hospitals should have a 'cold room' to help maintain temperature control during the unpacking and plating processes. The room would be kept at a continual temperature of 10oC, so workers would need protective clothing and would take frequent breaks. As this requires further capital expenditure, many hospitals may decide to do without the cold room, thus increasing

potential temperature control problems. The Yorkshire Regional Health Authority Interim Report on cook-chill would appear to set an even lower ideal temperature for the 'cold room'. They state "the thermostat in the assembly/despatch area should be set to ensure a temperature not exceeding 3oC (and not 10oC)".

Regeneration is seen as the answer to all bacteriological risks encountered, in that heating to 70oC is supposed to kill all harmful bacteria. However regeneration is a more difficult process than previously recognised. Food can be under or unevenly cooked. The main problem occurs because foods reheat at different temperatures. This can be compounded by unsuitable or faulty equipment and insufficient staff training. As a result food may be heated to a level insufficient to kill bacteria.

A further concern is whether the safety levels outlined in the DHSS guidelines are stringent enough. Firstly, the DHSS guidelines recognise that the initial cooking of food to a central temperature of 70oC does not kill all pathogenic organisms, but suggests that the chilling process will control their growth to within tolerable limits. However, there are bacteria which have been found to grow at very low temperatures. For example, clostridium botulinum: type E grows at 3.3oC. It is reported to be a rare organism except in some fish and marine products and its toxin is not heat resistant. Yersinia entercolitica, listeria monocytozenes both grow at between 4oC and 7oC. Straphylococcus aureus and Salmonella can grow between 5oC and 12oC. Staphylooccus aureus enterotoxin is heat resistant. Bacillus cereus can grow at very low temperatures, its 'emetic' toxin is also heat resistant. Experts in the field while recognising these dangers feel that DHSS guidelines are sufficient if temperatures of cold storage are tightly maintained and initial microbiological monitoring and subsequent targetted monitoring are carried out.

The need for careful microbiological testing in the planning stages of cook-chill is also of paramount importance in avoiding risks to health. Microbiological testing in Plymouth led to the discovery that vegetables were not being chilled according to the DHSS guidelines and hence a heavy bacterial growth was detected, not in itself harmful, but unsatisfactory. Given an unfortunate combination of circumstances, vegetables could become contaminated with pathogens during production. However, none of the samples tested showed this to be the case. It also found high surface colonisation of food held in plastic buckets. This procedure has now been successfully modified. The Yorkshire RHA Interim Report states "Microbiological guidance in the planning and commissioning stages of individual systems, although time consuming, has proved of great value in permitting the safe introduction of cook-chill catering. During implementation a risk analysis of the whole cook-chill process should be determined." Conformity to the guidelines at this stage is not a guarantee of risk free cook-chill products. Transportation and regeneration both carry risk factors which need to be studied, standards set and maintained.

Furthermore there are groups of patients with distinctive problems arising from their medical condition and therapy. These already seriously ill people can become colonised with the bacteria in the food they eat and although this may not always cause food poisoning can lead to subsequent infections which are difficult to treat. Although equally true for all production systems.

Taste

Palatability is also under question with the cook-chill method. If food of adequate palatability cannot be provided then whatever care is given to nutritional and safety standards becomes largely irrelevant.

Firstly the DHSS guidelines point out that fatty foods can cause an off-taste with even short storage times. Secondly, the London Food Commission outline one German study which showed distinct deterioration of food held at 2oC by the fourth day of storage, when only 62% of meals tested were found to be either 'very good' or 'good' compared with 81.1% on day three and 97.6% on day one. Vegetables lost colour, odour and taste after 2-4 days. Potatoes tasted mildly bitter from 2-3 days. Meat dishes involving poultry, veal and fish became impaired after 3 days storage. Hence the need to comply with the DHSS storage guidelines of not more than five days, including preparation and regeneration days.

Little research has been done into the effect of regeneration ovens on food palatability. Food may be dehydrated, over or under heated, or unevenly heated, scorching may occur and any fat that gets onto reheating services, will give an off-taste to food during regeneration. The type of oven used is also important.

Equipment

There are six main regeneration methods (forced air convection oven, combination oven using dry and wet heat, microwave, steam and water bath, steam jacketed kettle, the cart). Each has its problems.

Microwave and forced air convection ovens are the most frequently used types. Microwaves are considered to give a good final product when used properly, but due to their low capacity make reheating of a large number of meals difficult. The convection oven causes many problems particularly with dehydration and uneven heating. It is suggested that steam injection into convection ovens, reducing the effects of dehydration and shortening regeneration time, should be considered as a part of equipment redesign. This new type of oven is termed the combination oven and is also favoured by the London Food Commission, although they point out that it is more expensive than other designs and therefore doubt that it will have a large take-up in the public sector.

The cart oven holds individual plated trays and allows food to be stored chilled and then reheated in the same facility. During regeneration it can also keep some foods cool while others reheat, as well as reheating different plated meals in the same cart at different rates, ideal for a ward where varied menus are required for those on diets etc. However, problems of erratic and uneven heating have occured.

The DHSS and Trent Regional Health Authority have commissioned Greene, Belfield-Smith (a large consultancy company in the catering field) to provide a comprehensive reference of specific equipment required for implementation of cook-chill, they will not recommend or approve equipment but will give information sufficient for managers to make a decision based on a best buy basis.

Whatever regeneration equipment is chosen, it is important that adequate training is given to staff, so as to ensure optimum palatability by plating meals appropriately (eg putting easy to heat food at the centre of the plate for microwave reheating).

Some health authorities are attempting to monitor patient reaction to cook-chill and its acceptability. Patient reaction to cook-chill has been varied. However it would appear that palatability may improve as hospitals get used to the system, but this only happens in cases where proper equipment and ward regeneration are present.

Organisational Issues

The main organisational issues that Health Authorities have to address in introducing a cook-chill system are as follows:

1) The establishment of a central processing unit and satellite kitchens
2) Ensuring correct and sufficient equipment
3) Staff training and recruitment
4) Rationalisation of present staff and system
5) Establishing monitoring systems for:
   - microbiological safety
   - nutritional standards/dietary needs
   - compliance with DHSS guidelines
   - compliance with the law covering catering establishments, ie the Food Act (1984) and the Food Hygiene (General) Regulations (1970)
6) Contingency plans to cover emergencies
7) Reaching agreements on standards and lead responsibilities if working on an inter-regional or inter-district basis.

A number of problems can arise with these. For example, existing hospital kitchens may need to be converted to make room for cook-chill equipment and become the new satellite kitchens. The existing kitchen may already have been badly designed, cramped and in need of modernisation, but the modification necessary for

cook-chill does not necessarily eradicate these problems. In fact extra space needs to be found so that chilled and raw foods do not come into contact with one another. Kitchens are also likely to be using a combination of catering methods as cook-chill often only provides for 50% of food consumed in the hospital. In any event sauces and food unadaptable to the cook-chill method have to be produced in the satellite kitchen. This makes heavy demands on a reduced workforce, many of whom will in practice be part-time. The morale of staff and recognition of work pressures needs to be carefully observed as a high turnover of staff will increase pressures on the system, involving increased training costs and the need to use agency workers. Work in the central processing unit will be factory style repetitive work - again without care and consideration being given to working conditions a high staff turnover is likely.

The provision of adequate equipment is essential in complying with DHSS safety guidelines. To ensure shelf life times are monitored properly, computerised equipment may be necessary to search stored stock. Electronic thermometers or probes will be needed for temperature control. If ward regeneration facilities are to be provided (which is the recommended procedure) heat emission needs to be kept to a minimum to ensure that it does not adversely affect temperature on the ward. The equipment chosen needs to be adequate and suitable, and this may mean district engineers will have to test equipment and make recommendations on which should be installed. Ward regeneration equipment and the necessary new crockery can be very expensive: Plymouth spent £180,000 on regeneration ovens, £70,000 on ward regeneration trolleys, £120,000 on ward crockery and baskets, whereas only £80,000 was spent on chillers and £200,000 on kitchen alterations.

Some authorities feel it is necessary to employ staff especially for the regeneration process so that unlike nursing staff they are directly accountable to the catering manager. Whether new staff are taken on or not, adequate training is necessary for those working on the regeneration process. At Weston General the two weeks training given to 44 new ward hostesses, new both to the system and the hospital, were seen as insufficient. Plymouth CHC monitoring the district's implementation of cook-chill, found that few staff had been trained in the regeneration process and that when absent untrained staff were carrying out their functions. In some hospitals trained staff were meant to train others, this may not always be a satisfactory method of assuring quality.

Sufficient numbers of non-kitchen staff are also necessary. In one hospital chilled food was brought on to the ward and left in ambient temperatures awaiting regeneration over an hour before time, because there were insufficent portering staff to transport food at the correct time.

The extra provision of non-kitchen staff for the transportation of food will be particularly important if hospitals follow the

recommendations of the Yorkshire RHA Interim Report with regard to the regeneration of food. The report states that in cases where the regeneration is done away from the ward, food should be kept at a temperature of 70oC until served. They recognise that holding food at this temperature for any length of time causes depletion in the sensory properties of food and therefore recommend that the time between reheating and serving should not exceed 15 minutes. This will entail frequent monitoring and "increased discipline at all levels".

The London Food Commission has identified a number of possible reasons why Health Authorities fail to comply with DHSS guidelines. These included problems with the adapted kitchens, with chiller utilisation (in particular more food is often prepared than the chiller can accommodate at any one time), with the reheating process and above all lack of resources.

Monitoring needs to take place at various levels. DHSS guidelines assume that health authorities will involve environmental health officers in the planning and implementation of the system. The guidelines also require adequate microbiological monitoring of cook-chill. It is not known to what extent hospitals comply with these sections of the guidelines.

Although environmental health officers are ideally placed to monitor cook-chill, at present their training does not cover cook-chill catering techniques adequately. Some officers have developed a particular interest in cook-chill, but here most of their knowledge has come through involvement in the field. Furthermore, environmental health officers are already falling below their desired quota of visits to food premises: in 1986, one third of all food premises were not visited during the year, despite the Institute of Environmental Health Officers own target of visiting all such premises three times per year. Evidently to fulfil their role in the monitoring operation of cook-chill systems an injection of resources into training and staffing will be necessary. Co-ordination between the Environmental Health Departments of more than one council or borough will also be necessary, if the DHA is covered by more than one. In the case of regionally organised cook-chill, co-ordination between various Environmental Health Departments may become very complex.

Although there is no clear evidence as to how many of the 127 hospitals using cook-chill employ extra staff for monitoring purposes, various hospitals are monitoring in some form or other. Dudley Health Authority has a 'catering grade' who monitors temperatures of food in all wards before handing over to the ward sister for service. Southend has put £17,000 into funding a local authority monitoring officer. Plymouth apparently appointed a senior dietician to compile menus and organise surveys on nutritional needs of patients. The Public Health Laboratory in Plymouth undertook an 18 month long in-depth study of the microbiological quality of cook-chill in a large District General Hospital. The study is now complete and temporary additional laboratory help has left. Further monitoring will

be on a different basis, and much more related to specific problems or risk items.

The Yorkshire RHA Interim Report suggests that the Region has an official expert advisory panel which checks and agrees all future district plans for cook-chill with the right to demand detailed alterations to procedures and/or equipment if necessary before the system can be implemented. The expert body at present evaluating the Yorkshire Regional plans for cook-chill will also be producing a checklist for good practice which will be used in future in conjunction with the DHSS guidelines (1980) on pre-cooked chilled food and the DHSS manual on health service catering hygiene (1986).

All these arrangements become more complicated when a cook-chill operation in one district starts to supply food to another. Would it be sufficient for one district to accept the monitoring and testing going on in the production district? From a financial point of view this may be attractive, but food stored and regenerated in the second district will still need to be tested for the microbiolgical effects of transportation and other processes.

Is it cheaper?

The financial arguments are by no means straightforward. The capital and start-up costs have to be set against the running cost and account also needs to be taken of the hidden costs of ensuring the system works properly and safely.

Capital costs can be high - anything between £200,000 and £4 million. They depend on the size and productive capacity of the system. They also depend on whether a full cook-chill system is implemented, since ward regeneration adds considerably to the initial investment. The best pay-back estimates stand at around 3-6 years but the more pessimistic suggest 9 years by which time equipment may well need renewal. A survey carried out for the Ministry of Agriculture, Fisheries and Food on 240 cook-chill operations found savings could only be made effectively where a number of end kitchens were served or in places where remote feeding was necessary. However, there are no guidelines for health authorities as to when it is appropriate to change from a conventional to a cook-chill system. In the attempt to increase the cost savings some parts of the country are pursuing inter-district or regional based cook-chill systems. Such larger scale operations may well encourage more private companies to tender for catering contracts.

The area where most savings are seen to occur is in staffing, South Manchester Health Authority, for example, has reduced their number of cooks from 80 to 14 and another authority has reduced catering staff by one third over the past four years. In the financial report produced for Wakefield HA it was suggested that £200,000 could be saved due to reduced overtime and weekend working. This is now thought to be unrealistic and an

overestimate of the amount of overtime worked. It is argued by Professor Lacey that if Wakefield regenerates chilled food at ward level (on grounds of microbiological safety) then staff savings will be minimal. Wakefield also estimated that savings of up to £100,000 could be made on bulk buying food, they now feel that this too is unlikely. Energy and monitoring costs are also disputed.

Some health authorities have certainly made savings, but these have not been as great as had been originally estimated. Plymouth hoped for annual savings of £215,000 but achieved only £80,000 in the year ending 31st March 1987. Southend hoped to save £400,000 pa, and have saved closer to £260,000. Clearly increased research is necessary into costings for cook-chill systems. Some Health Authorities may also feel the need for independent advice. At present there are 200 or more private food consultants, charging rates of up to £400 per day. However they do not have to disclose any connection with equipment manufacturers and, while some are very good, others have limited knowledge of cook-chill systems.

Conclusion

There is no doubt that the arguments over the installation of cook-chill catering will continue. At the same time it also seems clear that cook-chill systems will be installed in an increasing number of health authorities.

Yet doubts about the safety of cook-chill remain, particularly if systems are installed without adequate ward regeneration systems, with insufficient staff training, in areas where there is high staff turnover, and without effective monitoring processes. The fear must be that under pressure to keep costs down, cook-chill systems will be introduced on the cheap and that sooner or later a catering disaster will occur.

This is not to suggest that existing catering arrangements are satisfactory. In many cases they are clearly not. However, it must be unwise for cook-chill systems to be introduced widely in the NHS without much more independent research being done on the advantages and disadvantages of the various systems, on microbiological safety issues, and on the safeguards which must be built in to any system. The DHSS has indicated that revised guidelines are to be issued on cook-chill catering. It is not clear, however, that they will be significantly different from the existing guidelines. In any event, DHSS guidelines will have no value, unless they are enforced and at present nothing is done to ensure that they are.

In all of this, CHCs have an important role to play. Plymouth, Wakefield and Cambridge CHCs have already been heavily involved. Other CHCs will need to scrutinise very carefully any proposals in their areas for the introduction of cook-chill and, where it has been introduced, to monitor closely its implementation and use.

Cook-chill is no simple answer to the problems of NHS catering. There can be no short-cut to financial savings without the risk that lives will be lost through food poisoning outbreaks. This means that, where it is introduced, a full cook-chill system with adequate ward regeneration facilities must be installed. There must be regular and thorough microbiological monitoring. The whole system must be properly managed with considerable attention being paid to staff training, retention and motivation. Finally, patient satisfaction with the food produced must be regularly surveyed and assesssed.

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