FOOD SAFETY ADVISORY COMMITTEE

GUIDELINES ON COOK-CHILL SYSTEMS IN HOSPITALS AND CATERING PREMISES

REPORT NO. 7


REPORT TO THE MINISTER FOR HEALTH AND THE MINISTER FOR AGRICULTURE AND FOOD

BAILE ÁTHA CLIATH:
ARNA FHOILSIÚ AG OIFIG AN tSOLÁTHAIR.

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DEPARTMENT OF
HEALTH
FOOD SAFETY ADVISORY COMMITTEE

GUIDELINES ON COOK-COOL SYSTEMS IN HOSPITALS AND CATERING PREMISES

REPORT TO THE MINISTER FOR HEALTH AND THE MINISTER FOR AGRICULTURE AND FOOD

[Stamp: Ministry of Health]

25 November 1992
FOOD SAFETY ADVISORY COMMITTEE

The Food Safety Advisory Committee was established by the Minister for Health and the Minister for Agriculture and Food in July, 1989.

Terms of reference

1. To advise the Minister for Health and the Minister for Agriculture and Food on matters relating to food and zoonotic diseases referred to it and to make recommendations to the Ministers.

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Irish Society of Medical Officers
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GUIDELINES ON PRE-COOKED MEALS IN CATERING:

This document is applicable to all cook-chill catering operations in hospitals and catering premises. Commercial operations using cook chill and retail outlets are not covered.

1. INTRODUCTION

1.1 These Guidelines apply only to catering operations i.e. to activities involving the production and service of meals whether or not the meals are consumed at the place of production e.g. meals on wheels. They do not give guidance on chilled foods produced under special conditions using processes and packaging designed to provide an expected shelf-life of more than five days, i.e. commercial operations.

1.2 The cook-chill system can give increased flexibility in the preparation and service of meals. It is regarded as satisfactory for use in hospitals, other forms of institutional catering, including meals on wheels and “special function” catering provided that the basic principles in this document and other good catering practices are carefully followed at all times. Catering installations are likely to use these systems for part of their total output of meals.

1.3 The Guidelines do not deal in detail with general or personal aspects of food hygiene. However, it is essential that the highest standards of hygiene are maintained at every stage of the operations. The system must comply with the requirements of the FOOD HYGIENE REGULATIONS 1950/89 and other relevant legislation. Before any staff are deployed on these systems they must be given specific training on all food hygiene aspects of the operations. This training should be repeated and updated at appropriate intervals and its effectiveness monitored. The health board through its authorised officers and/or other competent bodies should be requested to advise on suitable training.

1.4 The cook-chill operation should not commence until the local Department of Community Care is satisfied that the necessary structural and operational facilities are in place. This should be followed by continuous assessment. Ideally the operation should be inspected by authorised personnel once a month. It is essential that suitable, scientific and technical expertise is available either from within the organisation operating the system or, if this is not available,
from suitably qualified consultants. In the case of hospitals the control of infection officer and/or microbiologist should also be consulted.

1.5 Pre-planning is an essential factor in achieving a successful cook-chill operation. It is strongly recommended that the following in particular should be considered in detail when planning a system: suitability of existing buildings for conversion; food to be produced; special equipment required including bulk cooking, refrigeration and reheating equipment; design of central production unit and satellite unit; food distribution; hazard analysis; quality assurance; and staff training.

2. BASIC PRINCIPLES OF THE SYSTEM

2.1 The basic principles of the cook-chill system are:
- all raw materials should be of good microbiological quality;
- cooking should ensure the destruction of the vegetative stages of any pathogenic micro-organisms present;
- post-cooking rapid chilling should control growth of micro-organisms;
- cross contamination should be avoided at all stages particularly between raw and cooked food;
- storage and distribution conditions for cooked food should ensure its quality and safety;
- reheating and service procedures should ensure the food's safety and are crucial to its palatability; they should be very carefully monitored.

2.2 This document gives detailed recommendations, in terms of times, temperatures and other operating requirements, to give effect to these basic principles. Any proposal(s) to adopt alternative procedures (e.g. because of the use of new technology) should be discussed and agreed with the appropriate officers.

3. DESCRIPTION OF THE SYSTEM

3.1 Cook-chill means a catering system based on the full cooking of food followed by fast chilling and storage in controlled low temperature conditions above freezing point (0°C to +3°C) and subsequent thorough reheating close to the consumer before consumption. Food can be used for up to five days including the day of production and the day of consumption but not longer as food quality diminishes.
3.2 Because cook-chilled products are stored above their freezing points it is essential to handle these products in accordance with the Guidelines to minimise the growth of any micro-organisms that may be present.

3.3 Initial cooking (see 7) will ensure destruction of the vegetative stages of any pathogenic micro-organisms present. Some micro-organisms produce spores which are not killed by normal cooking. The temperature ranges (from about +7°C to +60°C) at which these surviving organisms can readily multiply must be spanned as rapidly as possible to minimise growth during cooling, after cooking or reheating. Detailed recommendations on these aspects of the systems are set out below (see 8—15).

3.4 Most but not all non-sporing pathogens will not multiply readily below +7°C. A temperature at or below +3°C is required primarily to reduce growth of spoilage organisms and to achieve the required storage life. However, because some micro-organisms can grow at these temperatures it is strongly recommended that storage life for cook-chilled products is not greater than five days, including the day of production and the day of consumption.

3.5 In practice the storage life may be limited by considerations other than those of microbiology.

4. NUTRITION AND FLAVOUR EFFECTS

4.1 Users should be aware that loss of nutrients occurs in cooking and at a steady rate while food is kept chilled. However, if these Guidelines are strictly observed the overall loss of nutrients from food using a cook-chill system will be kept to a minimum and should not be greater than those from alternative conventional catering systems.

RETENTION OF NUTRIENTS

4.2 The nutrient content and hence the nutritional quality of any food at the point of consumption is governed by:-

(i) the quality of the original raw materials;
(ii) the storage conditions;
(iii) the extent and nature of processing.

4.3 In particular, in any catering system, the vitamin C content of fresh vegetables decreases the longer they are held in store before preparation
and in water after preparation. Optimal retention of vitamin C and other unstable nutrients occurs if the vegetables are cooked quickly and eaten as soon as possible afterwards.

4.4 Over-cooking and prolonged delay between reheating and consumption (see 13 for reheating and service recommendations) reduce nutritional quality and result in loss of flavour and palatability which can affect the acceptability and therefore the consumption of the food.

4.5 In addition losses occur during cooking and between reheating and consumption, and in the cook-chill process losses of nutrients also occur during the chilling process. However, these are reduced by fast chilling.

4.6 During storage of the cooked food in chilled air a number of changes due to chemical oxidation take place. Among changes observed are:

(i) some reduction in vitamin C content of vegetables when stored between 0°C and +3°C. This may vary from one vegetable to another and is most marked in the first 24 hours of storage;

(ii) some other vitamins are lost to a lesser extent in the cook-chill process. Over-heating, poorly refrigerated storage and delay between re-heating and consumption add to these vitamin losses;

(iii) oxidative changes in fatty foods, particularly those of high unsaturated fatty acid content. This may result in changes in flavour due to rancidity which is more marked with longer chilled storage.

MENU SELECTION

4.7 It may be necessary to select menu items with lower unsaturated fatty acid content. Such items oxidise slowly and will not detract from the palatability of the meal, but care needs to be taken that the overall diet remains nutritionally sound and palatable.

4.8 The greatest losses in any cooking and distribution system are of vitamin C content. This can effectively be countered by the inclusion in a meal of fresh sources of vitamin C such as fresh fruit and vegetables, salads or a glass of almost any fresh fruit juice. As potatoes lose vitamin C at different rates depending on the cooking method, a choice of different forms of potato should be offered on different days e.g. baked, boiled, mashed, roast. This ensures better delivery of vitamin C from this important source over longer periods of time.
Similarly, other vegetables lose vitamin C at different rates during cooking and cook-chill storage. It is good nutritional as well as catering practice to vary the choice of vegetables over the week to ensure the best long term delivery of this and other unstable nutrients to the consumer.

5. RAW MATERIALS

5.1 In these Guidelines the term 'raw materials' means all foods used as ingredients in meals, including those which have been pre-cooked.

5.2 All raw materials entering the Central Production Unit must be of a specified good quality. Poor quality material should be dealt with promptly through agreed procedures with the supplier and not used in the process.

5.3 The quality of incoming ingredients should be assured and controlled i.e. all delivered foods must be thoroughly checked, examined, weighed and, where appropriate, temperature recorded before being accepted in the premises. This may be achieved by incorporating appropriate specifications into contracts — including full compliance with the relevant industrial codes of good manufacturing practice and by inspection of suppliers’ premises by competent persons and certification provided. Food should be purchased only from suppliers whose premises have been approved by authorised personnel. Checks should include the conditions under which supplies are handled and enquiries should be made about suppliers’ staff training in the handling of food. Food must be removed from its packaging and wrappers and placed in clean containers prior to being placed into storage or directly into the preparation area. Packaging and wrapping materials must be suitably disposed of. Separate temperature probes must be available in the delivery area in order to carry out extensive temperature checks of all vulnerable foods. Suitable facilities must be provided in this area for decanting. A wash-hand basin serviced with a constant and instantaneous supply of hot and cold water must be provided and sufficient tables and weighing scales must also be provided.

6. PREPARATION AND STORAGE BEFORE COOKING

6.1 Raw materials should be stored at appropriate temperature and humidity levels so that growth of micro-organisms and loss of nutrients are minimised and general sensory quality is maintained. Suitable facilities should be provided for the storage of raw materials including
refrigerated storage for perishable foods and freezer storage for foodstuffs which are to be held frozen until needed. All equipment used for the temperature controlled storage of food should be provided with accurate (to +0.5°C) thermometers so that the air temperature can be monitored. During the design stage refrigeration specialists should be asked for advice as to the most appropriate position for the thermometers and recorders — ideally temperature recording equipment which provides a permanent record of all temperature readings continuously should be installed.

6.2 **VEGETABLE STORE**

This store should have an ambient temperature below +10°C. A system of ventilation capable of providing a minimum of two air changes per hour is required to prevent mould growth. It is not envisaged that mechanical refrigeration would be required.

6.3 **DRY GOODS STORE**

This store must be maintained at a constant temperature of between +10°C and +15°C with no excessive humidity, no condensation and well ventilated. It is not envisaged that mechanical refrigeration would be required.

6.4 Preparation of raw materials should take place in areas physically separated from the cooking and post-cooking areas. Preparation should take place on suitable working surfaces and under hygienic conditions. All goods supplied must be decanted into suitable containers supplied by the Central Production Unit in an area separate from the main preparation/production area. All goods received should be subject to Quality Control Inspection — foods which do not meet agreed quality specifications should not be accepted. Particular care should be taken with raw vegetables, salads, raw meat, poultry and fish which should be prepared on surfaces used solely for these raw materials. To prevent transfer of micro-organisms from raw to prepared food, it is strongly recommended that personnel handling raw materials should confine themselves to the raw material area. They should not handle food or equipment in other working sections of the processing unit without changing protective clothing, washing their hands with suitable hand-cleansing agents and thoroughly drying them.
6.5 Separate machines and utensils (particularly knives) should be identified and dedicated for cooked and for raw foods and they should be situated in the appropriate area. A colour coding system is recommended.

6.6 Special controlled thawing equipment will be necessary if frozen raw materials or pre-prepared ingredients are to be used. Such equipment should be operated in accordance with the manufacturer's instructions. Microwave equipment should not be used for thawing unless it has been specially designed to avoid uneven thawing as it is likely to leave parts of the food frozen, thus reducing the efficiency of cooking.

6.7 To facilitate cooling after cooking, it is recommended that joints of meat or packs of meat products should not exceed 2.5 kilograms in weight and 100mm in thickness or height, and that large poultry carcases should be broken down into sections not exceeding these parameters. However see 9.3 for large meats.

6.8 Every effort should be made to ensure that quantities of foods in excess of available cooking capacity are not prepared. However, if quantities of food prepared for the cooking process are in excess of the available capacity of the cooking space then such prepared food should be held at temperatures at or below +3°C until the cooking process commences (or in their appropriate storage areas until preparation commences).

7. THE COOKING PROCESS

7.1 The time and temperature of the cooking should be sufficient to ensure that heat penetration to the centre of the foodstuffs will result in the destruction of non-sporing pathogens. (For nutritional considerations see 4). This is normally achieved when the centre of the food reaches a temperature of +74°C (to ensure the destruction of Listeria monocytogenes the temperature throughout the food should be held at above +74°C for not less than 2 minutes). It is important that the temperature is checked by inserting a probe thermometer into the slowest heating point (normally the centre) and the reading recorded.

7.2 For nutritional and microbiological reasons cooking should be automatically controlled with correct setting and siting of the sensor to ensure proper cooking. Hot holding of food after cooking should be strictly controlled (see 13).
8. PREPARATION OF COOKED FOOD FOR CHILLING

8.1 If pathogens contaminate cooked food, they or their toxins may survive until consumption. It is therefore imperative that the strictest conditions of hygiene are observed. As the risk of contamination of food and equipment cannot be totally eliminated, handling or further treatment should be kept to a practicable minimum. Disposable gloves may be used but they do not remove the need for frequent hand washing as necessary.

8.2 A separate portioning area must be provided. When food is portioned (i.e. divided into smaller quantities) after cooking, this should be completed as soon as possible and in any event within 30 minutes for any product. In some installations cooked food is portioned directly from the cooking equipment e.g. boiling pans into multi-portion pans for immediate chilling. However, it is recommended that wherever possible any handling of food after cooking should be done in a controlled environment room with a maximum ambient temperature of +10°C.

8.3 There are several basic types of containers available for the portions of cooked food. Shallow, (50mm) re-usable stainless steel, aluminium or porcelain trays are generally suitable. All of these will allow good hygienic practices, including washing and disinfecting of containers before use. Disposable single use containers can also be used. These are hygienic, available in a wide variety of shapes and sizes, and are constructed of foil or fibre which has been provided with an impervious surface during manufacture. Disposable single use containers can also be used. These types of container are particularly suitable where no washing-up facilities exist at the point of usage. Disposable containers should be stored under good hygienic conditions and discarded if they have become dirty or torn. The use of disposable gloves for each separate task is recommended.

8.4 Whichever type of container is used the food should be spread as evenly as possible throughout the container and the depth be restricted to 50mm or less (but for joints of meat see 6.7) depending upon the density of the food item. A greater depth of food may be used if it has been shown that the equipment is capable of achieving an equivalent chilling time. Containers with lids have some advantage in that they can protect against contamination and will minimise dehydration of the food surface. However, lidding will add to the
chilling time which must still be within the maximum time previously stated and, in general, foods should be chilled without lids to avoid excess condensation in lidded containers.

8.5 All equipment used should be capable of being easily cleaned and disinfected and chill cabinets and fans should be cleaned at least once a day and in the case of liquid chillers after each operation. If returnable trays are used special washing equipment should be provided and installed in a suitable area, separate from food handling areas, in the production unit. Trays should be hygienically dried and stored after washing.

9. COOK-CHILL: THE CHILLING PROCESS

9.1 In order to preserve the appearance, texture, flavour, nutritional quality and safety of the cooked food, chilling should commence as soon as possible after completion of cooking (and portioning if it is done after cooking) and in any event within 30 minutes of leaving the cooker — but see 9.3 regarding large meat joints.

9.2 The food should be chilled to between $0^\circ C$ and $+3^\circ C$ within a further period of 90 minutes. A specially designed rapid chilling apparatus is required if rapid reduction of temperature is to be achieved.

9.3 It may not be practicable to chill pieces of meat and poultry to $+3^\circ C$ within 90 minutes — see 6.7 for size recommendations. After cooking there are two main methods of dealing with these large meats:

(i) slice hot immediately after cooking and then transfer the slices into a rapid chiller within 30 minutes of the joints leaving the oven. It should be noted however, that this method may cause dehydration of the slices during chilling;

(ii) immediately following cooking, chill the joints. The temperature of the joints must be reduced to $+10^\circ C$ or below within 2.5 hours of removal from the cooker. When the temperature has reached this level the joints should be sliced in a temperature controlled room immediately on a clean slicer and the slices transferred to the rapid chiller without delay.

9.4 Whichever method is used holding times at warm temperatures should be kept to the absolute minimum to avoid serious health hazards.
The speed of chilling of a foodstuff will also be affected by the following:-

— size, shape, weight of food and construction material of the container;
— food density and moisture content;
— heat capacity of the food and the container;
— thermal conductivity of the food;
— the design of the chiller will affect chilling speed;
— temperature of the food entering the chiller;
— whether the container is provided with a cover.

9.5 In order to achieve the recommended chilling process the chiller used must have a performance specification showing it capable of reducing the temperature of a 50mm layer of food from +74°C to +3°C or below in a period not exceeding 90 minutes when fully loaded. This performance cannot be achieved in a storage refrigerator. With certain foods, for the reasons set out in 9.4, it may not be possible to achieve this temperature reduction on a 50mm layer of food; in which case the depth of the food should be reduced to allow the required performance to be achieved.

9.6 Three typical methods of chilling are:

(i) **Blast**; the use of clean high velocity recirculating air at low temperatures in mechanical apparatus. Special mechanical chillers for liquids are available but these require appropriate cleaning and disinfection between batches;

(ii) **Cryogenic**; the use of cryogenic apparatus involving the use of non-oxidising gas at low temperatures;

(iii) **Immersion**; the immersion of packed products in a safe and suitably refrigerated liquid.

9.7 Whichever type of chiller is used automatic controls are required, including an accurate (+0.5°C) indicating thermometer and temperature recorder. These should be independently wired. Ideally all chillers should be fitted with 5 way digital temperature probes linked to an audible alarm to sound when +3°C is reached on all probes. Alternatively a thermometer should be placed into the centre of the food while chilling with an indicating temperature read out on the outside of the chiller to inform personnel that the apparatus is
operating correctly. In the mechanical type of chiller, controls must hold the temperature of the food at or below $+3^\circ\text{C}$ until the apparatus is unloaded. Food, air, or inert gas temperatures require monitoring.

9.8 The capacity of the rapid chiller(s) must be sufficient to match peak production scheduling to ensure that rapid chilling can commence within 30 minutes of completion of cooking.

10. STORAGE OF CHILLED FOOD

10.1 The refrigerated store used for holding pre-cooked chilled foods in quantity should be specially designed for the purpose and must be located in close proximity to the rapid chilling units. It should allow for: access and pre-chilling of clean empty trolleys (where used); the storage of packs on shelves (as required); racking (as required) and, for proper stock rotation, handling methods. Foods coming from the rapid chilling unit should be placed immediately into refrigerated storage.

10.2 In order to avoid the risk of contamination the store should be used solely for the products of the cook-chill process. If it were used for general purposes the more frequent opening of doors would cause unacceptable temperature fluctuations in the product. Risks of cross-contamination from other products could also arise.

10.3 The store should have a refrigeration unit capable of maintaining the products within an operational range of $0^\circ\text{C}$ to $+3^\circ\text{C}$. Air temperature in the store should be measured by recording apparatus, the accuracy of which should be checked at least quarterly. There should also be an alarm device which will indicate that the air temperature within the store has risen above acceptable operational tolerance.

Remote recording at set intervals on a continuous basis of all refrigerated spaces is recommended. The recorder should preferably be located in the quality assurance or technical manager's office. Where possible temperature alarms should be connected to points which are continuously manned such as switchboards or security offices. Storage provision must also be made for food items that do not pass through the cooking and chilling processes in the units. Salad items which are prepared in the unit, commercially manufactured and portioned (generally in sealed containers), yoghurts and desserts etc. require a separate store with a controlled environment at a temperature not greater than $+5^\circ\text{C}$. 

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10.4 An identification system should be adopted. In particular, each container of foodstuff should be conspicuously marked with the date of production and date of expiry clearly visible to and understood by all the staff who may handle the food.

10.5 A strict system of stock control should be operated so that stored foods are consumed in proper sequence. Should any food in the store exceed the agreed expiry date it should be regarded as unsuitable for consumption and destroyed.

11. DISTRIBUTION OF PRE-COOKED CHILLED FOOD

PRIMARY DISTRIBUTION — FROM CENTRAL PRODUCTION UNITS TO SATELLITE KITCHENS

11.1 The distribution of chilled foods is the most difficult part of the process to control effectively in terms of temperature fluctuation. It is essential that the temperature does not rise above the designated storage temperature of the food, as stated in 12.1 (i), particularly if the storage period is to be extended (up to the maximum) at the consumer outlet after distribution.

11.2 Where the distribution period is very short and is to be followed by immediate reheating and consumption, insulated containers may be adequate for temperature preservation although the temperature rise which occurs in such situations should be regularly monitored. Insulated containers should be chilled before use. It is recommended that distribution containers or vehicles should be refrigerated where the distribution period is greater than 15 minutes prolonged, or when ambient air temperatures are high and where distribution is to be followed by further storage in refrigerated stores at the consumer outlet. All vehicles used for transportation must be fitted with the necessary temperature control equipment. Temperature testing of food should be carried out during transportation and at its destination in order to check the effectiveness of the temperature control equipment of the vehicle.

11.3 There are several types of refrigeration systems used on vehicles which are suitable:-

(a) an insulated vehicle in which cold CO₂ gas derived from solid CO₂ is circulated;

(b) an insulated vehicle in which cold nitrogen gas derived from liquid nitrogen is circulated;
(c) an insulated vehicle in which cold air from a mechanical refrigerated unit is circulated;
(d) an insulated vehicle which is fitted with eutectic plates pre-chilled prior to the use of the vehicle.

11.4 The manufacturer’s stated specification of the vehicle capability may need to be supported by test reports.

SECONDARY DISTRIBUTION — TO CONSUMERS

11.5 This section refers to distribution of chilled meals from either Central Production Unit to consumers or from satellite units to consumers.

11.6 The meals or meal components will be held in storage units as described in 12. In installations such as hospitals it is necessary to transport the chilled food from a central cold store to points of reheating and consumption e.g. wards. Distribution trolleys are available with facilities for maintaining the cold chain during transport.

11.7 In these installations there are two main methods of distributing chilled meals. Either the chilled food in the bulk trays is plated cold and distributed under chill or the bulk trays are distributed under chill, reheated at the point of consumption and plated hot for immediate service. Where cold plating is carried out, it is recommended that this is done in a separate room under controlled conditions using either air surrounding the food at a maximum of +10°C or other means of maintaining the food within the limits stated at 12.1. Plated meals should be assembled as near as possible to the reheating starting time.

12. TIME AND TEMPERATURE LIMITATIONS IN STORAGE AND DISTRIBUTION OF CHILLED FOODS

12.1 As mentioned at 3.2 chilled foods are vulnerable to temperature abuse during storage. It is therefore essential that the following limits are observed:

(i) the temperature of the cooked food after chilling should be maintained at or below +3°C throughout the entire storage and distribution (including holding in vending machines) until reheating. This is not intended to apply to final transfer from hospital kitchen to ward.
where the temperature requirements are achieved the maximum life of the cooked products should not exceed 5 days including both the day of cooking and the day of consumption — this also applies where pre-cooked chilled products are purchased from outside suppliers;

should the temperature of the cooked food during storage and distribution and before reheating exceed +4°C but not +10°C, the food should be consumed as soon as possible and in any case within 6 hours of this temperature abuse. If not, it should be destroyed.

Provision should be made at ward level to retain individual meals at or below +3°C;

Should the temperature of the cooked food during storage and distribution and before re-heating exceed +10°C, the food should be regarded as unsuitable for use and should be destroyed;

the system is intended to hold food at or below +3°C. It must be clearly understood that the tolerances contained in (i) and (iii) above are not alternative systems of holding cook chill food allowing batches of food to be kept at higher temperatures for shorter times.

12.2 The reheating of chilled, pre-cooked meals at the home of the consumer is permitted only if fully trained staff in cook chill catering provide the re-heating service to each home. Suitable specialised reheating equipment and temperature probes would be essential in each home.

13. REHEATING AND SERVICE

Under no circumstances should the food be reheated at a single central point and distributed hot unless distribution times are less than 15 minutes to the commencement of service. Failure to observe this defeats the basic objective of the cook-chill system.

Reheating of the food should take place immediately at or close to the point of consumption or the food should be placed under refrigerated conditions capable of holding the food at or below +3°C. Suitable temperature control equipment should be provided in this area if holding of food before reheating is necessary. Suitable thermometers must also be fitted to such equipment.
13.3 Reheating of chilled food should begin as soon as possible and no longer than 30 minutes after the food is removed from chill (either bulk chill, secondary chill or chilled trolley). For reasons of safety and palatability the centre temperature of the food should reach at least +70°C and be maintained at not less than +70°C for 2 minutes.

13.4 Suitable types of reheating equipment include infra-red units, microwave units, forced air and steamer convection ovens. Traditional types of hot air ovens are not recommended as they tend to dehydrate exposed areas of the food during reheating. Recipes are usually designed to allow a standard time and temperature to be used for the final reheating of all foods. The reheating should operate automatically to give the required time and temperature, with humidification where appropriate, as the nutritional quality and palatability of the food can be impaired by overheating. Food that has been reheated and allowed to cool should be destroyed.

13.5 For quality reasons, following reheating to +70°C, service of the food should commence as soon as possible and within 15 minutes of reheating. If food is to be held after heating, the food must be held above +65°C in suitable temperature control equipment.

13.6 Foods intended to be eaten cold or at room temperature should be consumed as soon as possible and preferably within 30 minutes of removal from chilled storage and the temperature of the food should not rise above +10°C during that period. Salads should be freshly prepared on the date to be served.

13.7 It is essential that any meals not consumed should be destroyed and not reheated or returned to chilled storage.

14. MANAGEMENT OF QUALITY ASSURANCE

ESTABLISHING A SYSTEM

14.1 Because health hazards will arise if the principles in these Guidelines are not carefully followed, a strict system of quality assurance of a production schedule for each menu item should be established and enforced at all times. One system which could be adopted is the hazard analysis critical control point (HACCP) approach. This will require input from technically competent personnel capable of identifying the critical control points in the system, establishing appropriate monitoring procedures for those points and appropriate
training for all staff concerned with food production. In large operations this may be best achieved by appointing a quality assurance manager. For HACCP to be fully effective a corporate approach involving personnel from all the disciplines and crafts involved is essential.

**ACTION ON DEVIATIONS**

14.2 If, during the monitoring of the critical control points, deviations from the established criteria are identified they should be highlighted in the record and the production manager informed immediately so that corrective action can be taken and the unsafe product condemned.

**ESSENTIAL CONTROL CHECKS**

14.3 The following parameters should be checked and recorded for every batch and menu item processed:

(i) the quality of the raw materials at the point of entry including the temperature of perishable goods on delivery;

(ii) the temperature at which perishable raw and pre-cooked materials are stored prior to preparation for cooking;

(iii) the centre temperatures of meat and poultry during cooking;

(iv) the period which elapses during the portioning process;

(v) the period which elapses during the cooling process of large pieces of meat and poultry;

(vi) the time of the rapid chilling process for portioned foods and the centre temperature of the food at the completion of the chilling process as recorded on automatic recording instruments;

(vii) the temperature of the chilling medium;

(viii) the temperature of the food during storage and the air temperature of the chill store as recorded on the automatic recording instrument;

(ix) the temperature of the food before and after refrigeration;

(x) the rotation of stocks within the store;

(xi) the temperature of the food at the completion of its distribution from the refrigerated store;

(xii) the centre temperatures achieved during the reheating process for each type of food.
14.4 An adequate number of electronic thermometers, with a selection of probes, should be available for monitoring the temperature control points indicated above and any additional points identified in the HACCP. Precautions should be taken against transferring microorganisms from raw to cooked material by temperature probes—separate probes must be used and they should be wiped and disinfected after each use. Temperature probes for use in the raw foods area should be clearly distinguishable (e.g. by colour coding) from those for use in the cooked foods area.

14.5 The temperature of the food will not necessarily be the same as that of the surrounding air or cryogenic gas. Some temperature variations are likely to occur at different points in the processes. All records of temperatures and other monitoring results at critical control points should be kept for at least three months. Indications of temperature abuse should be investigated and corrected promptly.

MICROBIOLOGICAL GUIDELINES

14.6 The following microbiological guidelines are not intended to be used for routine testing of batches of food and are not the standards for the acceptance or rejection of any batch. Rather they should be used when setting up a new cook-chill installation or when making alterations to processes or procedures to provide assurance that a satisfactory product can be provided.

14.7 Microbiological surveillance is important to assure that the procedures established locally are satisfactory. Arrangements should be made with the appropriate personnel to ensure that necessary facilities and resources for routine microbiological sampling/analysis are available. Thereafter strict control of the operation with particular attention to monitoring of the critical control points (which may on occasions include microbiological checks of raw materials, food contact surfaces and equipment) is the most reliable means of achieving product safety.

Occasional checks of finished products against these Guidelines may be undertaken at the discretion of the person responsible (see 14.8). Considerable differences must be expected between various types of foods. Failure to meet the limits given in the following paragraph
does not mean that the batch of food should necessarily be condemned; it does, however, indicate that a thorough check should be made of all stages in the process and if there is any doubt the food should be destroyed, apart from samples for further testing.

14.8 It is suggested that one sample of about 100 grammes of each item of food be taken from each batch tested. The samples should be taken immediately before the food is due to be reheated so that the results reflect any abuse conditions to which the item sampled has been subjected during storage and transport following processing. Advice from health board personnel should be sought to ensure samples are taken properly. Food should generally achieve the following microbiological criteria:

Total aerobic colony count after incubation of agar plates for 48 hours at +37°C — less than 100,000 per gramme.

*Salmonella* species — not detected in 25 grammes.

*Escherichia coli* — less than 10 per gramme.

*Staphylococcus aureus* (coagulase positive) less than 100 per gramme.

*Clostridium perfringens* less than 100 per gramme.

*Listeria monocytogenes* — not detected in 25 grammes.

NOTE: Variations in the total aerobic colony count are the most useful guide to the hygiene and temperature control of the processes.

14.9 These criteria apply to cooked chilled foods, therefore they will be affected by the quality of the raw materials and the standards of cooking, handling, chilling and chill storage. They are not intended to be applied to the food once it has been re-heated.

14.10 Every day samples (of approx 100 grammes) of each type of meal served should be taken and kept for at least five days. These samples can be used for control purposes in the event that it is suspected that illness resulted from the consumption of meals.

15. EDUCATION, TRAINING AND DISCIPLINE

STAFF TRAINING

15.1 It is necessary that all staff working in the cook/chill, catering area are adequately trained in the principles and practices of food hygiene.
All catering and associated food handling staff should have attained a certificate in hygiene and food hygiene recognised by the health board prior to commencement of employment within the system. No untrained staff should be permitted to work in this area. Catering management and supervisors should be responsible for the implementation of a comprehensive quality control programme and a record of all quality checks should be available for inspection at all times.

All catering staff should be given in-service training each year
— to analyse work practices
— to highlight potential danger areas
— to bring staff up-to-date on new information
— to provide a forum for discussion on improving the service.

PERSONNEL

15.2 Only named, trained, authorised and medically screened individuals may enter the final preparation and pre-packing area. Coloured headgear can be used for 'clean' area operatives (or for differentiation).

Medical screening of personnel is essential and in particular for:
(a) Skin health — absence of acne, boils and other wounds or infections.
(b) Ear, nose or throat infections.
(c) Gastro — intestinal disorders.

Pre-employment screening must be carried out by a physician.

DISCIPLINE

15.3 It should be obligatory before entering the special area that outer garments must be changed for clean overalls, shoes and headgear. Beards and loose hair should be discouraged but there are suitable covering methods available.

(a) Hands must be washed each time before entering the special area with non-perfumed antiseptic soap or lotion.
(b) In reverse the special workwear must not be worn outside the control areas e.g. at breaks.
CONTRACTS OF EMPLOYMENT

15.4 Cognizance should be taken of 15.2 and 15.3 in contracts of employment.

16. MAINTENANCE

16.1 Thermometers, temperature recording devices, refrigerators, chillers, automatic cooking equipment and other devices and equipment should be checked and maintained regularly.

An adequate number of probes must be provided to ensure availability of probes at all times throughout the day.
— Heat treatment is by far the most effective way of achieving disinfection. Boiling of probes for 10 minutes is most effective.

Accuracy of thermometers should be examined every three months, against a certified thermometer.

Thermometers should preferably be selected with the smallest range commensurate with their function in order to maximise sensitivity and legibility.

17. CLEANING AND DISINFECTION

17.1 It is imperative that detailed cleaning schedules are drawn up and adhered to for the entire catering premises. Schedules should be drawn up in consultation with all catering staff, management and authorised officers. Special attention must be given to the selection of cleaning agents and disinfectants to ensure their compatibility and optimum benefit. Beneficial use could be made of a colour coding system of cleaning equipment used in the various posts of the system.

17.2 To prevent the build up of disinfectant tolerant bacteria, disinfectant containers must be emptied daily and washed and dried thoroughly before re-filling.

17.3 There is a need for responsibility for disinfection to be given to a particular person to ensure maximum efficiency. A central disinfection may be required.
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REPORT NO. 7: GUIDELINES ON COOK CHILL SYSTEMS IN HOSPITALS AND CATERING PREMISES

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