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# Application of HACCP to identify hygiene risks in the home

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**Abstract**

Hygiene related health hazards in the home include ingestion of microorganisms or toxins, inhalation of toxins, allergens or microorganisms and infections through the skin. Bacteria, fungi and viruses may all be involved. For any particular family these hazards translate into different risks ranging from mild irritations to serious health threats. These will require different responses in terms of hygiene practice and hygiene product use. The consumer needs help to identify which hazards in his/her home pose a high risk and which are insignificant. Risk analysis techniques especially HACCP (Hazard analysis—critical control point) have been proven as effective tools in controlling hazards in the food industry. We have applied HACCP principles to a risk analysis of a typical home. We conclude that further studies are warranted and to focus on particular groups (e.g. families with infants, pensioners). Such information could be valuable in drawing up hygiene codes of practice and for forming the basis of educational material aimed at different target groups. 

*Keywords:* Family health; Disinfection; Surface hygiene; Risk analysis; Kitchen hygiene; HACCP.

## 1. Introduction

In many developing countries infectious diseases are the major cause of death particularly of children and incidences of microbial and parasitic infections are many times that in the developed world. The WHO estimates that 1-in-3 deaths are due to infectious diseases (WHO, 1996). Much of this death and suffering is preventable and hygiene practice within the family has a key role to play in preventing infection. Indeed it is arguable that hygiene will have an increasing role to play in disease prevention as the range of multiply-drug resistant microorganisms increase and vaccination programmes are unlikely ever to control the majority of infectious diseases.

Even in developed countries where the death rate from infectious diseases is low (but rising), people suffer every year from illnesses ranging from minor respiratory infections or mild gastric upsets to serious food poisoning that requires urgent medical attention and time off work or school. Most of these minor illnesses go unreported. For example, population surveys on gasterointestinal disease in Wales indicated that only 1 in 26 cases involved consultation with a doctor (Palmer et al., 1996). The inexorable increase in food poisoning cases observed in nearly every European country has been attributed to a combination of lifestyle changes and poorer home hygiene (Rudolf Schulke Foundation, 1996). Even though seldom admitted by the public, the majority of food poisoning cases arise within the home; for example a recent study in Italy found 74% of *Salmonella* outbreaks to be associated with home prepared foods compared with 14% outbreaks associated with public eating places (Scuderi et al., 1996). The combination of low appreciation of hygiene amongst both the public and authorities combined with the re-emergence of many infectious diseases, newly identified pathogens and increasing antibiotic resistance resulted in the recent call for increased efforts and resources to be focused on hygiene and the control of infectious diseases (Rudolf Schulke Foundation, 1996).

## 2. Is home hygiene important?

A central question to be addressed is the relative importance of disease transmission in the public and domestic domains (Cairncross et al., 1996). In general it is recognised that transmission of infectious disease in the public domain (e.g. through water supplies) is potentially more dangerous to the community, but domestically-acquired infections should not therefore be ignored. Pickles studying dysentery, hepatitis and other infectious diseases in several Yorkshire villages in the 1930's showed that numerous cases of faecal-oral transmission had

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occurred during visits to relatives or friends in their homes. Further he demonstrated how a single case infect dozens or even hundreds of others if the patient (often a child) was allowed to attend school or other public events (Pickles, 1984). Transmission of pathogens within the household is sometimes seen as inevitable. However, Khan (1982) has shown at least for Shigellosis, most of the domestic transfer can be prevented by simple behavioural changes. This raises a political issue over responsibility. Transmission of disease in the public domain is a public concern that often involves intervention and a legal framework administered by various authorities. Hygiene practice in the domestic environment is largely a question of an individual's habits and knowledge about the risks. However failure to correctly identify and report early cases can lead to significant delays in controlling disease outbreaks (Palmer et al., 1996).

It is impossible and undesirable to try to prevent all pathogens from entering the home. Microorganisms will enter with our food, on our clothes and skin, through the air, via pets etc. A healthy adult who practises good home and personal hygiene is at little risk from most of these threats. Some groups of people (young children, pregnant women, the old, the sick) are at much greater risk and a very minor food poisoning case for a 25 year old male can become life threatening for a pensioner. It is not suprising that a person's awareness of the need for hygiene is much greater when there are very young children or sick persons in the home. Because microbial hazards are largely invisible, hygiene education is crucial if we wish to reduce the incidence of illnesses contracted in the home. Bloomfield and Scott (1997) recognise that various activities in the home e.g. cleaning, food hygiene, infant care, sickcare etc, are regarded as separate problems rather than a 'total system of home healthcare' which may share microbiological hazards and can become related through various cross contamination routes.

## 3. Hazards and risks in the home

Health hazards in the home include ingestion of microorganisms (bacteria and viruses), ingestion of toxins (bacterial, fungal or chemical), inhallation of toxins, allergens or microorganisms and infections through the skin. The routes of infection for most bacterial diseases have been well characterised (but see comments on Listeria below) and the hygiene measures necessary to minimise cross infection are known (though not necessarily by the people affected). For example, in the U.K., bacterial dysentery is typically brought into the home by young children who contract it at nursery or playschool. It is transmitted to other family members with high frequency via the faecal-oral route but careful attention to toilet and personal (hand) hygiene can greatly reduce the spread of disease.

Other microbial hazards are less well understood. Fungi are perceived to be a cosmetic problem (black staining of paint, fabrics, wallpaper etc) but may also be important health threats. Respiratory and allergenic problems have been associated with fungal spores in the air and other data suggests that fungal toxins may cause long term health problems including cancer (Flannigan et al., 1991). However, direct correlations between spore loads in the indoor air and respiratory problems in household members is often lacking and the exact contribution of fungi to poor health still needs to be defined (Burge, 1996).

Many viral diseases are contracted in the home but the routes of transmission are less well understood. Data from public health surveillance in the UK (Djuretic et al., 1996) has shown that 27% of gasteroenteritis outbreaks have a viral cause and 50% of person-to-person transmitted cases are due to small round structured viruses (SRSV). Viral diseases show a marked seasonality with rotavirus being a major pathogen during the winter months and bacteria such as Salmonella and Campylobacter being dominant in summer and autumn. The time enteric viruses can survive on home surfaces is considerable (Abad et al., 1994) which together with the potential for dissemination from the toilet (Gerba et al., 1975) indicates that hard surface toilet and bathroom disinfectants should be virucidal as well as bactericidal. A similar case has been made for the disinfection of environmental surfaces to help prevent the spread of rhinoviruses (Sattar et al., 1993).

Insects and mites complete the range of biological hazards found in most homes. Insects, particularly cockroaches, can act as disease vectors and in addition, cockroaches have been shown to be as likely a cause of childhood asthma as the the ubiquitous dust mite (Rosenstreich et al., 1997).

It should be clear from the above, that any particular family will be exposed to a wide range of hazards in their home with consequences ranging from mild irritations to serious health threats and these require different responses in terms of hygiene practice. The relative risk needs to be understood by the householder in order to use his/her time and resources effectively. There is no value in promoting measures to deal with remote and/or low risks which waste time, energy and chemicals. The remainder of this article considers how the risks in the home might be assessed and how to communicate these to the public.

## 4. Application of HACCP to the home and family

Risk analysis techniques especially HACCP Hazard analysis—critical control point) have been proven as effective tools in controlling chemical and microbiological hazards in the food industry (Mayes and

Kilsby, 1989; Baird-Parker, 1990). An extension of these techniques with some minor modification has allowed them to be applied to catering and other food preparation areas where there are potential health risks to consumers from food poisoning microorganisms. Indeed several studies (reviewed by Griffith and Worsfold, 1994) have used HACCP to analyse food preparation practices in the home and relate these to incidences of enteric disease (Michanie et al., 1987, 1988). Griffith and Worsfold have further suggested that such risk analyses can be used as a basis for consumer education and for writing recipes.

It was also our view that an approach to home hygiene based on best hygiene practice from the food or public health areas would have more relevance to typical consumers than practices drawn from clinical situations. However we were aware that the HACCP studies to date have focused almost entirely on food preparation and kitchen hygiene. As outlined above, there are other potentially serious threats to family health which should also be taken into account Bloomfield and Scott (1997) have categorised hygiene into personal hygiene, food hygiene, home hygiene and home health care. The latter relates to the increasing need for nursing sick family members at home as well as routine situations with increased infection risk (neonates, decontamination of 'spillages' etc). It is obvious that these are related and an integrated approach is needed. Therefore we attempted to carry out a risk analysis, based on HACCP principles, of a typical home in which each room in the home was examined in turn. The activities carried out in that room were analysed for microbiological/health hazards associated with them. Risks to the householder and family were identified and ranked. The basic principles and application of HACCP have been summarised in several guides (Anon, 1993).

The following sequence of work was undertaken

1. Identify types and numbers of microorganisms present in homes.
2. Classify hazards present and assess risks.
3. Identify measures to control hazards and reduce risks.

Data was obtained from microbiological in-home audits where a large number of sites were swabbed for surface microorganisms. Sampling in 60 homes was concentrated on the kitchen and bathroom/toilet areas. Swabs were examined for total bacterial counts, coliforms, Staphylococcus aureus, yeasts and moulds. Total viable count

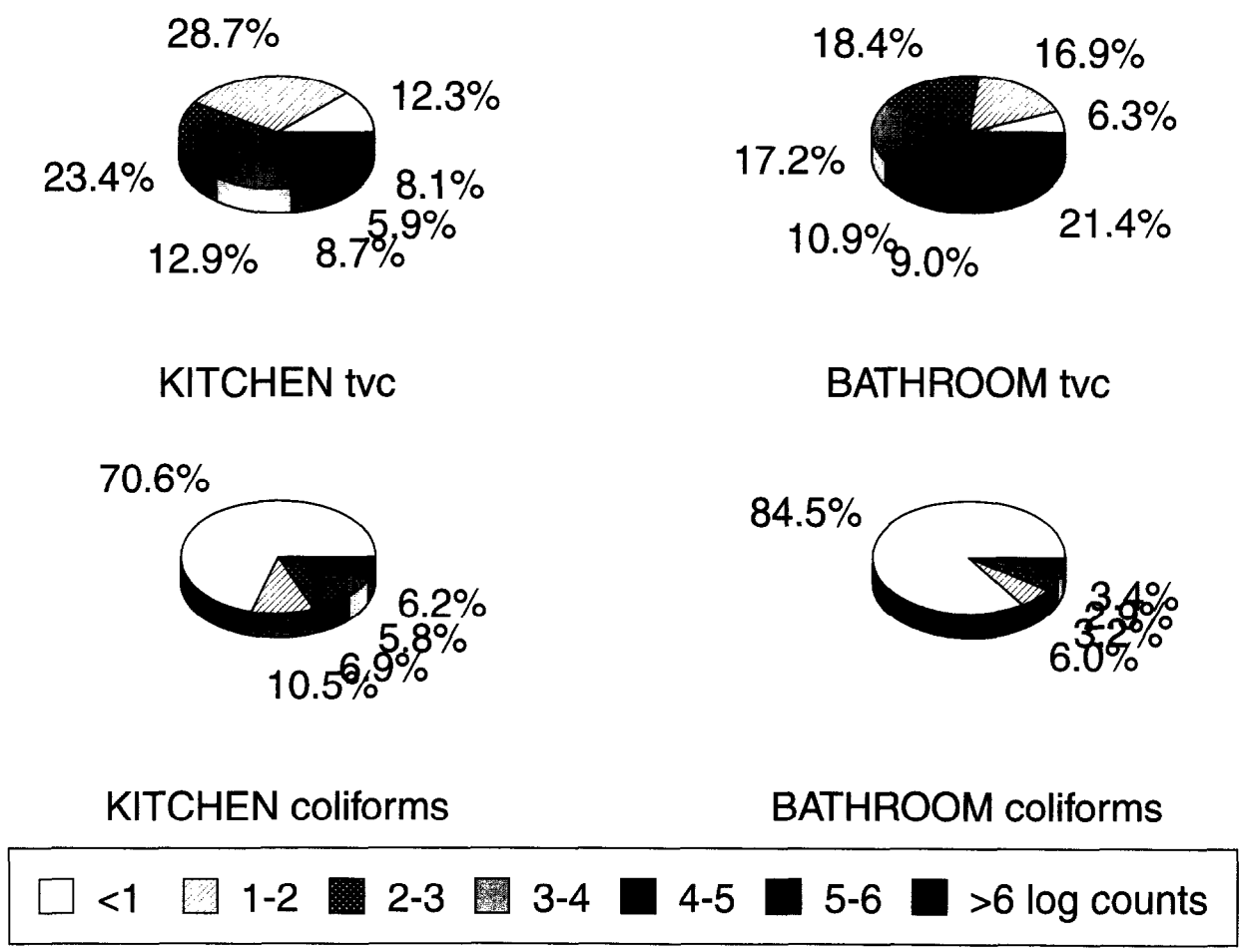


Fig. 1. Frequency of Bathroom and Kitchen sites with bacterial counts in the ranges shown.

Table 1
Home sites with high[1] surface coliform counts

| Kitchen sites | Bathroom sites |
|---|---|
| Sink-plug hole area | Sponge/flannel |
| Cloth | Cloth |
| Sink draining board | Wash basin—plug hole area |
| Chopping board | Wash basin taps |
| Waste bin | Shower curtain |
| Floor | Surface under soap |
| Taps | |
| Sink-sides | |
| Refridgerator (inside surfaces) | |

[1]High is defined as greater than $10^3$ coliforms per swab. Sites in order of decreasing frequency.

and coliform data are summarised in Fig. 1 where it is clear that home sites with high bacterial numbers ($>10^3$ cfu.cm$^2$) are frequently encountered. Coliform counts greater than $10^3$ were observed from 12% kitchen sites and 6.3% bathroom sites (Fig. 1) and these sites are listed in Table 1. The frequency of isolation of high coliform counts varied from nearly 60% of kitchen sinks (around plug hole) and 30% of kitchen cloths to only 1% of surfaces inside refridgerators. This data is of course only a 'snapshot' and particular activities could lead to locally high but transient contamination. For example the preparation of egg dishes with *Salmonella enteritidis* contaminated eggs, resulted in substantial contamination of kitchen worksurfaces and viable *S. enteritidis* could be recovered from worksurfaces 24 h after food preparation (Humphrey et al., 1994).

We have also recently attempted to isolate enteroviruses from household surfaces using direct culturing and PCR techniques. Only a very low level of positive virus identifications resulted from these studies but parallel sampling of surfaces for protein, amylase and blood (Table 2) indicated the potential risk of surface contamination with virus infected body fluids (Bellamy and Laban, unpublished data). Swab samples positive for blood were recovered, in particular, from bathroom wash basin and toilet sites. Amylase was also regularly detected on telephones and 'baby contact' sites such as changing mats, cot rails and pottys.

In addition, published data on microbial levels (Davis et al., 1968; Finch et al., 1978; Scott et al., 1982) and distribution of specific pathogens (e.g. Listeria) in the home were also considered. The latter (Beumer, 1997) was particularly interesting as it identified a high frequency of Listeria in bathroom sites in addition to kitchen sites previously reported (Cox et al., 1989). Studies on the microbiological hazards in institutional, catering and clinical environments (e.g. Mendes and Lynch, 1978) were also considered when there was clearly an analogous situation in the home. Our data are broadly in agreement with previous studies indicating, in particular, the potential of wet sites in the kitchen and bathroom to act as reservoirs of microorganisms with the risk of dissemination/cross contamination (Bloomfield and Scott, 1997). We have not sampled soft furnishings in living rooms and bedrooms as previously published studies have suggested that these are likely to have low counts of pathogens (Finch et al., 1978). However two recent studies have demonstrated that in institutional settings carpets can act as sources of contamination with coliforms (Kaltenthaler et al., 1995) and streptococci (Sarangi and

Table 2
Contamination of home surfaces with protein, blood and amylase

| | Location and frequency of sites with highest levels of contamination [1] | | | | | | |
|---|---|---|---|---|---|---|---|
| | Blood (% positive swabs) | | ATP (RLU) (% >500) | Protein ug/ml (%>15) | | Amylase U·L (%>15) | |
| Survey | 1 | 2 | 1 | 1 | 2 | 1 | 2 |
| Toilet | +(0.5) | +(1.5) | 102 (35.9) | 21 (7.4) | 25 (8.4) | 26 (9.0) | 38 (12.7) |
| Washbasin | +(2,3) | +(2.7) | 87 (46.5) | 23 (11.7) | 23 (11.7) | 32 (17.0) | 40 (20.0) |
| Bath | +(1.7) | +(2.4) | 40 (30.3) | 10 (7.6) | 7 (4.9) | 7 (5.3) | 5 (3.6) |
| Telephone | 0 | 0 | 8 (23.5) | 4 (11.8) | 0 | 9 (26.5) | 16 (40) |
| Baby | 0 | 0 | 9 (39.0) | 2 (9.0) | 1 (4.5) | 6 (27.3) | 8 (33.4) |
| Kitchen | 0 | 0 | 21 (32.8) | 8 (12.3) | 6 (9.2) | 13 (19.7) | 12 (15.4) |

[1]Sites included in each group are:

| | |
|---|---|
| Toilet | Cistern, bowl (above and below flush), seat hinges, lid, seat, flush handle, and surfaces near the toilet which may be contaminated by flushing, door handle, outer surfaces of bowl. |
| Washbasin | Bowl, taps, surfaces behind taps, surfaces above washbasin (15 and 45 cm). |
| Bath | Bath surfaces and taps. |
| Telephone | Mouthpiece and handpiece. |
| Baby | Cot rails, trainer seat, potty inside and outside surfaces, and change mat. |
| Kitchen | work surface, fridge door and door handle. |

Rowsell, 1995). Future studies should perhaps re-examine these surfaces particulary in the home with young children and/or pets.

Microorganisms were listed in terms of known home location, typical numbers present at that location, routes of transmission to human (direct infection, ingestion, inhalation etc.), and (where known) infective dose. Further consideration was given to primary and secondary sources of the hazard and routes of cross contamination. Cross contamination is particularly important in considering domestic hazards. In contrast to segregation practised commercial operations, most rooms in the home are multi-functional and 'incompatible' activities regularly occur in close proximity. Nowhere is this more obvious than in the kitchen. A typical but simplified scheme of sources of enterobacteria and potential cross contamination routes in the kitchen is shown in Fig. 2.

Risks were then identified by analysing each room in a typical house in turn and listing activities undertaken in that room and the potential hygiene risks associated with that activity. Further, unlike an industrial process, it is not realistic to analyse every step of every activity that might occur in the home. Rather, general activities (e.g. cooking) were broken down into typical and generic steps (e.g. preparation of raw foods, food storage, dish-washing etc.). This procedure has proved useful for risk analysis in catering operations. It is recognised that this approach is at present highly subjective and, until we have better quantitative information, open to challenge.

Risks were grouped broadly into high, medium and low risk categories (Table 3). The risk ranking will vary with the consumer's sensitivity to that risk (e.g. old people and young babies might be considered to be at higher risk than healthy adults), the awareness of the risk and the degree of hygiene knowledge possessed. In contrast to commercial or manufacturing operations, assessing risks in the home depends on an appreciation of an individual's knowledge and habits. Susceptibility data also needs to be regularly reviewed. For example, a recent paper by Salamina and colleagues (Salamina et al., 1996) has indicated that Listeria food posioning may affect healthy adults who are normally supposed to be at little risk. Further there was evidence from this study that cross contamination from kitchen surfaces or utensils may have played a role in this outbreak (Salamina et al., 1996). A summary of risk assessments for the kitchen, bathroom and living rooms are given in Appendix.

In most cases the hazards can (and often are) controlled by application of good hygiene practice. This first and foremost requires that the householder is educated to the

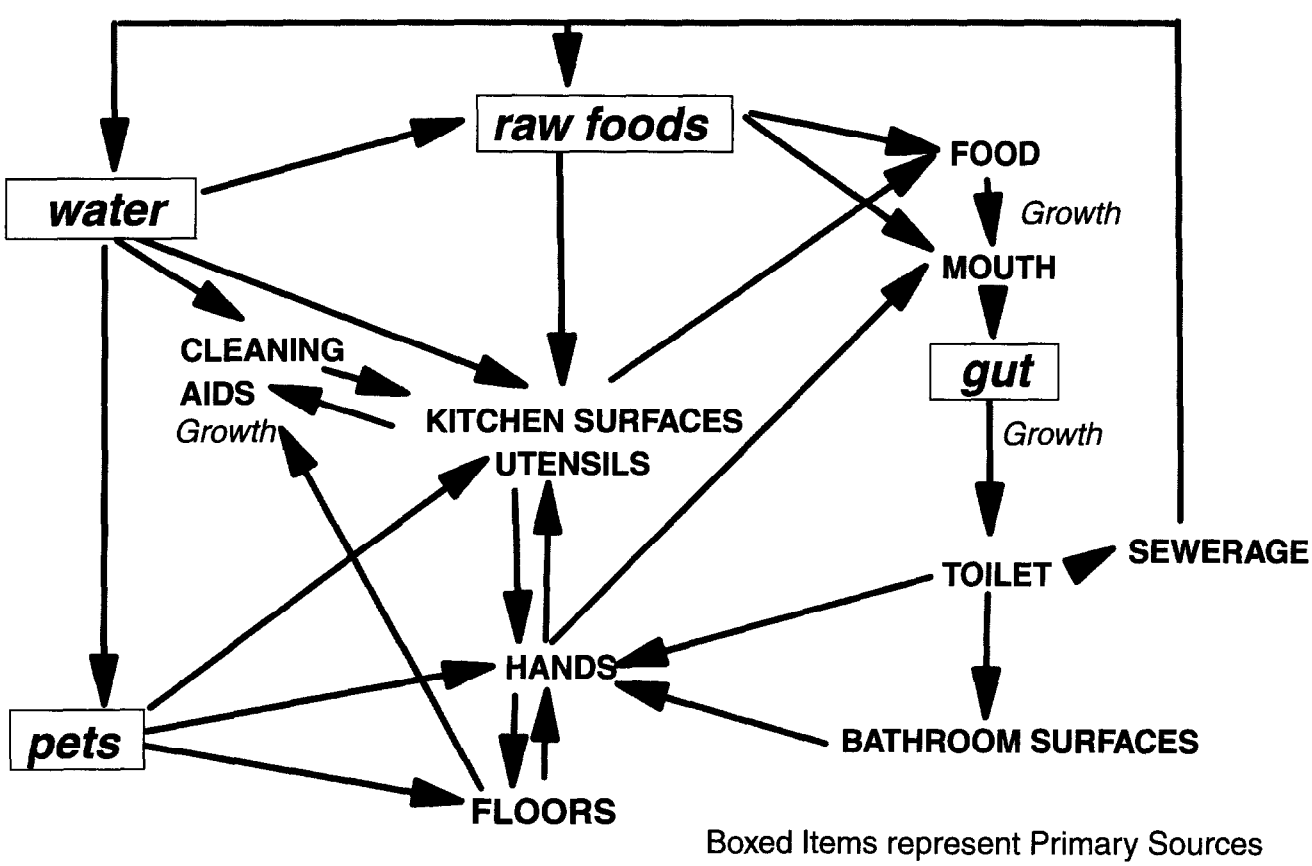


Fig. 2. Cross contamination routes for Enteric Pathogens.

Table 3
Ranking risks in the home

**RISK** depends on
—frequency of occurrence of hazard
—level of exposure and sensitivity to hazard
—consumer awareness of hazard
—consumer knowledge of threat to health posed by hazard

e.g. High numbers of bacteria associated with a wastebin which is both dirty, smelly and attracting flies will be less of a risk than a small number on the hands or kitchen knife simply because householders are more aware of the wastebin and its hazards. Hence, they will be more likely to take suitable steps to deal with the hazard or minimise the risks e.g. by washing their hands after contact.

In 'westernised' homes occupied by consumers with some basic knowledge of hygiene the top ranking risks might be—

| High risks | Moderate risks |
|---|---|
| • Kitchen work surface/utensil contamination during food preparation | • Difficult to clean damaged or porous surfaces |
| • Unhygienic cleaning materials and appliances | • Cross contamination from kitchen sink |
| • Poor personal hygiene in kitchen and toilet | • Poor water quality |
| • Unhygienic or inadequate food storage | • Inadequate cleaning/disinfection in bathroom/toilet |
| • Surface, floor and hand contamination from pets | • Damp floors and towels in bathrooms |
| • Insects | |
| • Handling/washing soiled clothes | |
| • Exposure to respiratory allergens (mould spores, dust etc) | |
| • Unhygienic waste disposal/bins | |

sources of microorganisms in the home, routes of cross contamination and appropriate hygiene measures. In some cases, changes in practice are sufficient to minimise the risk (e.g. storage of foods at correct temperatures); in other cases (e.g. decontamination of utensils and work surfaces after processing raw meat) effective hygiene products are recommended as the most effective way of achieving the required hygiene standards. That current cleaning practices in the domestic kitchen may not be adequate to deliver satisfactory hygiene standards, has been shown by a surface ATP monitoring study (Worsfold and Griffith, 1996).

In an industrial HACCP study, once risk control points have been identified, it is normal practice to establish a monitoring system, define corrective actions that need to be taken when critical limits are not met, establish record keeping and a verification protocols. Griffith and Worsfold (1994) have discussed how, at least for some food hygiene CCPs, simple monitoring by the householder is possible but it is unlikely that record keeping would be acceptable except to the ultra-fastidious. Verification is the responsibility of those conducting the HACCP study but there have been few attempts to demonstrate that adoption of a particular set of hygiene guidelines actually leads to a change in microbial numbers or incidence of pathogens in the home. To this end we have recently initiated further in-home studies to compare different kitchen and bathroom cleaning regimes on microbial surface loads.

## 5. Conclusions

The HACCP approach has been useful defining hazards and ranking risks in the home. This was a limited and generalised study and the list of hazards identified is certainly not exclusive. Many gaps in our knowledge have been identified which need further experimental investigation. Additionally, more detailed studies are warranted which might focus on particular groups (e.g. families with infants, pensioners). Such information could be valuable in drawing up hygiene codes of practice and for forming the basis of hygiene educational material aimed at different target groups. However, before devoting resources towards persuading people to modify their practices it is encumbent on the scientist to show that such changes actually deliver benefits in terms of reduced risks in the home as well as in the laboratory. It should be recognised that, unlike many products which provide a quantifiable and visible benefit (e.g. removing stains from fabrics, improving skin dryness), hygiene products offer family health benefits which are not directly demonstrable by consumer or clinical trials. We can measure the numbers and types of microorganisms in the home, we know which of these cause disease, we can demonstrate which products kill or remove these germs but we cannot directly show that using a particular hygiene product reduces the incidence of illness in the family.

Improving hygiene in the home is dependant on educating the public about the health risks in the home,

offering them the means to manage those risks in an acceptible way and motivating them to permanently change their habits. The latter might well prove the greatest challenge.

## Appendix: Hygiene risk analysis by activity and room function[1]

### *Kitchen*

Activities

*Preparing Food (cleaning, chopping, cutting, mincing etc.)*

Raw meat

**High risk of contamination of sink, tap handles, work surfaces, utensils, equipment and hands with pathogens. Scraps fed to pets may introduce gut pathogens.**

Vegetables/fruit

Moderate risk of salads/fruit eaten raw becoming cross contaminated from kitchen surfaces, hands of cook, kitchen sink or from water.

Bread, pastries, cake

Very low risk for products to be cooked.

Fish

Cross contamination risk, low but moderate risk of direct food poisoning from seafoods.

Desserts/ice cream

Low risk if raw materials good bacteriological quality. Some ingredients have moderate risk (raw eggs, dairy products).

Cooking

Very low risk except where inadequate internal temperatures are reached e.g. cooking from frozen

*Serving/finishing cooked foods*

Low risk if food eaten immediately. **High risk if food left warm and contaminated from addition of raw materials or cross contaminated from hands or kitchen surfaces.**

Storage

**High risk if time/temperature limits for cooked or unpreserved fresh foods abused.**

**Moderate to high risk of cross-contamination of cooked food from raw in 'fridge.**

Low to moderate risk with long term storage of dry goods if sufficient moisture to allow moulds to grow. Low to moderate risk of contamination by vermin/insects.

Eating

Main meals for adults/older children—low risk

Babies—**Moderate to high risk if baby feeding utensils, crockery, bottles etc. not hygienically clean or cross contaminated from adults' hands, kitchen surfaces etc.**

Snacking

Moderate risk if prepared by children/teenagers with less regard to hygiene than normal.

*Cleaning—difficulties in cleaning adequately*

Washing up

Very low risk from machine dish wash. Moderate risk from hand dish wash if heavily soiled, contaminated items difficult to clean. Kitchen sink bowl often contaminated.

Equipment

Moderate risk from poorly designed equipment which is difficult to clean and dry (mincers, slicers, food processors) or which have damaged/cracked surfaces.

Surfaces

**Moderate to high risk if surfaces rough, damaged, porous etc. Food contact surfaces which remain damp after cleaning are potentially high risk. Kitchen sink is a high risk surface which becomes rapidly recontaminated after cleaning.**

Drains

Low risk unless flow rates low or blockages occur. **High risk if back flooding into sink or onto kitchen floor.**

*Cleaning—unhygienic cleaning*

Cleaning aids/cloths/mops etc.

**Very high risk of kitchen surface contamination from reusable cloths, mops, brushes etc.**

Cleaning materials

Water—Moderate if water not of potable quality.

Chemicals

Low risk unless detergents/disinfectants etc. diluted and stored by householder.

Waste disposal

Moderate risk from hand contact with waste bins. Risk of attracting flies, insects, vermin especially if ambient temperatures high and odours develop.

*Laundry*

Machine wash

Normal and soiled wash low risk especially if water temperature $> 50°C$.

Hand wash

Normal wash low risk. Moderate risk of contaminating kitchen surfaces, hands, other clothes if hand washing soiled fabrics in kitchen.

Nappies (Diapers)

Moderate risk if nappies soaked in bucket in kitchen. **Disposal of nappy soak water liable to create bacterial aersols.**

[1] Excludes direct or aerosol droplet person-to-person routes of transmission.

Drying
Low risk activity but adds to humidity/dampness problems.
Ironing
No risk, can kill microbes on fabrics.
Storage
Low risk. Damp storage will assist survival of skin pathogens and moulds.

*Pets*

Handling/presence in kitchen
**Moderate to high risk of cross contamination from pets to food/food preparation surfaces directly or via hands. Specific diseases via direct ontact (pet-hand-mouth etc.)**
Fouling/cleaning
**High risk if floors/surfaces not adequately disinfected. Young children at high risk.**
Feeding
Low to moderate risk of cross contamination between feeding bowls and kitchen worksurfaces, cutlery, sink etc. Low to moderate risk of certain animal feeds attracting insects/vermin into kitchen or food store area.c

*General activities and leisure*
Low risk

***Bathroom***

Activities

General
Moderate risk of hand contamination with enteric bacteria/viruses from door handle, toilet seat, toilet handle. Risks increased in families with young children as hand hygiene is often poorer. **High risk if enteric illness present in members of household. High risk of dermatophyte infection from infected skin squamules or hair if other members of household infected.**

*Personal hygiene*

Washing at sink
Low to moderate risk of infection from soaps, flannels, sponges. Low risk from sink surface.
Bathing
Low to moderate risk of infection from soaps, sponges, flannels. Low risk from bath surface.
Showering
Low risk except where plumbing system favours growth of Legionella.
Drying
Moderate risk of dermatophytes from wet bathmat/floor. Damp towels are a potential source of pathogenic microorganisms.
Shaving
Low risk
Using toilet
Moderate risk of hand contamination with faecal organisms. **High risk if members of household have enteric illness.** Lower risk if toilet water disinfected at each flush. Disposal of nappy soaking water can create aerosols of enteric bacteria and contaminate hands.
Cleaning teeth
Low to moderate risk from bacteria growing/surviving on wet brushes/brush holder.

*Cleaning*

Surfaces
Low risk during general hard surface cleaning.
Toilet
Moderate risk of hand contamination and microbial aerosol generation during toilet cleaning. **Toilet brush high risk item if not regularly disinfected.**

*Living rooms and bedrooms*

Activities

Sitting, sleeping, writing, reading, watching television, general socialising etc.
Low risk except when periods of relative inactivity increase chance of insect bites. Close association with bedding or furnishing for extended periods of time increase chance of respiratory irritation due to dust mites and animal fur. Risk of respiratory problems in damp housing subject to mould.
Cleaning and housework
Low to moderate risk due to dispersal of dust and skin bacteria (especially during bedmaking) of respiratory infection or allergenic response.
Direct contact with surfaces
Low risk from hand contact with door handles, stair rails chair arms etc. Moderate risk if illness and other susceptible persons (e.g. children) in home.
Using telephone
Low to moderate risk of respiratory infection. Communal 'phones pose higher risk.

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