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# Every Kitchen's Dirty Little Secret: Cardboard—Bacteria Superstore and Roach Motel

## Introduction

Great strides have been made with time, temperature, and basic food-handling practices. It is encouraging to see momentum growing and awareness broadening in the food service industry. This improvement is a tribute to the efforts and dedication of environmental health and food safety professionals. Through effective food safety training, methods of cross-contamination are revealed and overcome, one layer at a time. Each new layer will expose the more detailed “back alleys” of commercial kitchens.

Perhaps one of the most overlooked of these back alleys for cross-contamination and general filth is cardboard. Without question, the cardboard crates for produce are traveling interstate roach motels. Cardboard boxes, with diminished light, moisture, and a food source, are an excellent breeding ground for cockroaches—and next best homes for cockroaches are the kitchens to which the boxes are delivered. With a microscope, it has been revealed that cardboard is also an excellent host to nearly all of the pathogens that cause foodborne illnesses. A recent laboratory study (Marin Biologic & Weiss, 1998) confirmed that *E. coli*, *Salmonella*, *Listeria*, and *Shigella* grow and flourish in cardboard under normal kitchen environment conditions. A separate study (Food Development Centre & McRae, 1997) tested random samples of cardboard film and foil cutter boxes taken directly from use in commercial kitchens. This study revealed up to 27 million colony-forming units per

gram (CFU/g). That number is 27 times the amount of general bacteria and filth necessary to start food spoilage.

Examples of daily cardboard usage in most commercial kitchen food preparation areas include

- cutter boxes for plastic film and aluminum foil,
- pop-up dispensers for foil and wax sheets,
- food service food-handling-glove boxes,
- parchment paper boxes, and
- produce and meat boxes.

## Most-Overlooked Vehicle for Contamination

Probably one of the most overlooked vehicles for cross-contamination is the cardboard cutter box for plastic film and aluminum foil. The boxes, found in virtually every retail food establishment, are nothing more than shipping containers with a blade attached. The cutter box is used as a piece of equipment on food contact surfaces. In a normal day, the box may be splashed with raw egg; juices from chicken, fish, and other meat; sanitation chemicals; and virtually any moisture found on and around cutting boards and work surfaces. Cardboard is absorbent and cannot be washed. Recognizing these cardboard cutter boxes as a piece of equipment used on food contact surfaces makes them a direct violation of Chapter 4 and Annex 3 of the Food Code (Food and Drug Administration [FDA], 2001a, 2001b). Cardboard is a high-carbon medium. When combined with moisture at normal kitchen

temperatures, it is a prime breeding ground for bacteria growth. If pathogens are present in raw or undercooked meat juice and so forth, and absorbed into cardboard, their growth is virtually guaranteed.

In fact, in less than 24 hours, the various bacteria tested underwent a dense and vigorous growth. Any food service employee knows that the plastic film and foil boxes are carried by hand from work table to cutting board to shelf—or wherever—all day long, over and over again.

## Method of Cross-Contamination

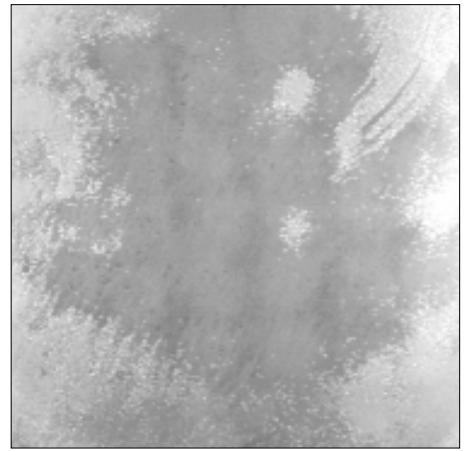
The following is a realistic scenario for an average day in a food service operation. Lacking an assigned space in any kitchen, the box usually starts its day where it was left the night before, on the prep table. The chef has a bucket with a stack of *cardboard* egg crates on the table. The cracking of 20 dozen eggs begins. The fast pace of this action inevitably creates splash and running of raw egg onto the table. Next to the chef, the prep cook has just sliced open the breakfast ham for steaks, and its juices are oozing onto the table. The plastic film is conveniently placed next to the cutting board so that the ham steaks can be wrapped. Next the prep cook grabs the cutter box with bare hands and places it on a shelf below the table to make room to butcher a case of chicken breasts. Is that shelf sanitary? Is that case of chicken breasts made of *cardboard* and filled with melting, bloody ice? The butchering, portioning, and pounding of the case of chicken

**TABLE 1****Microbiological Standard Plate Count of General Bacteria Found on Dry Cardboard**

| Client Identification Number | FDC Sample Number | SPC (CFU/g)* |
|------------------------------|-------------------|--------------|
| Item #1                      | 971156            | 94,000       |
| Item #2                      | 971157            | 350,000      |
| Item #3                      | 971158            | 7,400        |
| Item #5                      | 971159            | 27,000,000   |

\*CFU/g = colony forming units per gram of sample.

Note: Samples were taken from five randomly selected food service operations. The condition in which the samples were received was dry and sealed. SPC method SOPMICR104 was used. Reference: Health Protection Branch Method FHPB 8.



An image provided by Marin Biologic of Tiburon, California, shows that *E. coli* bacteria grow and flourish in the cardboard cutter boxes used to dispense plastic film and aluminum foil under normal kitchen environment conditions.

breasts is completed. Now the cutter box is picked up by hand from the shelf and placed back on the work table. One can assume that this table has a nice raw chicken juice layer ready to absorb into the cardboard. The prep cook then individually wraps the breasts as part of portion control procedures. The chef has prepared two pans of lasagna for a dinner special. The pans are on another prep table. The chef asks the dishwasher to bring the plastic film to the table so that the pans can be wrapped for refrigeration. The dishwasher grabs the box with his hands and places it on the table and goes back to sorting the silverware. Next the chef puts down a cutting board on which to filet a salmon. Is the cutter box moved away? No, it will be needed in a few minutes to wrap the individual salmon filets to preserve freshness. The usual raw fish juice runs along the cutting board to the table where the box naturally absorbs the moisture. The chef cleans up and of course performs a handwashing. He or she then grabs the cutter box and places it on a shelf, to be used later. Now the cardboard has sufficient moisture to stay moist all day. Not only will bacteria begin to grow rapidly, but also general filth will easily adhere to the moist cardboard surface.

This scenario continues on throughout the day and night until everything is carefully wrapped up for the next day. The same goes for aluminum foil. The cross-contamination potential is obvious.

### Eye-Opening Results

Is this scenario realistic? In fact, it is merely a snapshot of a typical day. A simple inspection of the bottom and sides of any cutter box used for more than one day in an average-volume kitchen will reveal moisture and

deteriorated fiber. Keep in mind that some of these boxes are used for weeks at a time before the roll inside is used up. These boxes are, however, a violation from the moment they are put into use. The older the box is, the more deterioration occurs. You will find decaying cardboard and holes. *Where do the dirty cardboard fragments go?* The cardboard exfoliates onto cutting boards, work tables, bare hands and food. Let's not forget that cardboard is produced with chemicals such as bleach and dyes.

Cardboard is an obvious physical hazard in a food preparation area. Plastic film and foil may also be found in dental offices, tattoo shops, and laboratories.

### Public-Health Significance

Elimination of cardboard from food preparation and service areas will greatly reduce the risk of cross-contamination and the transfer of general filth to consumer food products and prepared meals. Getting rid of cardboard also will contribute to the overall goals of the hazard analysis critical control point (HACCP) system and the dedicated efforts of food safety and environmental health professionals.

### Recommended Solution

Identify the following as food contact surfaces:

- plastic film/wrap, including continuous and perforated rolls;
- aluminum foil, including continuous rolls and pop-up sheets;
- individual wax and paper sheets used for portioning and wrapping;
- parchment paper; and
- food-handling gloves, including latex and nonlatex gloves.

Indeed, film, foil, and wax paper all are used in direct contact with raw and cooked foods for storage and cooking uses. Their respective dispensing devices must provide a sanitary environment. Fortunately, plastic dispensers are available to replace the cardboard cutter boxes. It should be noted that not all of them are NSF approved. Still, NSF-approved film and foil dispensers that work very well and cost less than \$50 are readily available. They may be found at many restaurant supply companies and food service distributors. The Internet is also a good source for such products.

### Savings

Many cardboard cutter boxes completely deteriorate before a roll of film or foil is used up. A more common problem with these products is loss due to tangles, attributable to inferior cutter box dispensers. Industry estimates state that, on average, 10 percent of all film and foil is thrown out so that a new box can be opened. A good dispenser allows for the entire roll to be used. If basic pride and professionalism are not enough to prompt a food service operator to take action about the problem, money savings often are. A health inspector may simply ask a food service operator how much the establishment spends on film and foil per year to determine loss. As stated earlier, these cutter boxes are nothing more than shipping containers with a blade attached. NSF-approved dispensers are perhaps the only food safety equipment solution for dispensers that saves an operator money and solves the sanitation issue.

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## Other Areas of Cross-Contamination

Equipment solutions are also available for other areas of cross-contamination.

Like cardboard, oven mitts, aprons, hot pads, and kitchen towels are blatant vehicles for cross-contamination. An article regarding oven mitts as a vehicle for cross-contamination appeared in the July/August 2001 issue of the *Journal* (Weklinski, 2001); a very compelling case was presented. Standard cotton textiles absorb moisture and grease. They rarely retain their integrity, leaving exposed dirty cotton and wool to spread across kitchen surfaces and onto bare hands. Only one brand available to the industry has received NSF certification. Unlike standard apparel, these products retain their integrity after dozens of machine wash cycles. The fabric has a proprietary coating that is impervious to liquid, steam, and grease, therefore inhibiting the growth of bacteria.

Proper sanitation of portioning scales also is often overlooked. Scales are not easily cleaned. Plastic film and wax paper sheets are often abused, if they are used at all with the scales. Color-coded snap-on lids are now available for scales; they are easy to remove and clean, NSF certified, and very inexpensive. These lids also prevent the scale platform surface from becoming scratched, exposing bare metal to food.

The storage of knives wedged between pieces of equipment such as steam tables, sandwich prep tables, and so forth, is a widely accepted practice. The general public would not want to look in these crevices with a flashlight. A solution is NSF-certified knife racks that are also color coded for the comprehensive HACCP program. These racks are dishwasher safe.

## Equipment Solution Availability

The restaurant equipment supply arena has become extremely competitive. As in any business, innovation, keeping up with market trends, and addressing the needs of customers are imperative to growth and success. To their credit, equipment manufacturers have been very effective in providing the industry with NSF- or UL-approved solutions for food safety issues. The distributors and dealers have been very slow, however, to embrace food safety equipment solutions as a product group. As a result, placement of these products on showroom shelves and in catalogs is limited. Environmental health professionals would do well to work with restaurant supply stores and the large distributors. Their opinions would command more respect than those of a factory representative trying to increase a manufacturer's bottom line.

In the past few years, attendees at national and state environmental health conferences have noticed the small number of equipment manufacturers who provide the bulk of

HACCP-related products. At the 2002 NEHA conference in Minneapolis, only one equipment dealer featured a broad line of food safety solutions that attendees could refer to. Fortunately that dealer has an extensive food safety section on its Web site.

## Conclusion

Bottom line: The cardboard cutter boxes for plastic film and aluminum foil are every kitchen's dirty little secret, a virtual superstore for bacteria and pathogens. Along with oven mitts, these boxes are some of the most overlooked vehicles for cross-contamination. Thanks to the hard work and dedication of our health departments and food safety trainers, sanitation awareness and training are bringing to the forefront the "back alleys" of commercial kitchens.

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