Canadian Corrugated and Containerboard Association
Association canadienne du cartonnage ondulé et du carton-caisse

Corrugated Packaging Delivers

REUSABLE PLASTIC CONTAINERS REPORTED CLEANSING PROCEDURES FAIL INDUSTRY AND EPA STANDARDS; NEW INDEPENDENT RESEARCH FINDS THAT ONLY AUTOCLAVING WORKED TO RID CONTAINERS OF SALMONELLA

Second Study Tests on RPCs from the Distribution Stream Identified Harmful Cells Following Cleansing Procedures

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A new report from the University of Arkansas indicating sanitation concerns with Reusable Plastic Containers (RPCs) used to ship fresh produce has been released. It finds that RPCs used to package and store fresh produce, meats and eggs in grocery and retail stores harbour potentially harmful bacteria. Dr. Steven Ricke's work validates the need to reassess the sanitation process of RPCs.

The report complements findings from earlier studies out of the University of Arkansas (March 2015), University of California-Davis (December 2014) and two from the University of Guelph (October 2013 and 2014). For more information about these studies visit: www.cccabox.org.

The corrugated and containerboard industry is committed to providing food safe packaging that is also environmentally sound and cost effective. There is nothing to wash with a corrugated box, so there is no concern of returning bacteria to the distribution stream. In fact, the recycling process destroys any bacteria should it transfer from a tainted product.

- David Andrews, Executive Director, Canadian Corrugated and Containerboard Association

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(Oct. 27, 2015) — The newest research from the Center for Food Safety at the University of Arkansas' Department of Food Science documents that multiple hurdles continue to exist in ensuring reusable plastic containers (RPCs) are clean and lack microbial contamination above safe levels. Failure of cleaning procedures can lead to spoilage and promulgation of foodborne pathogens such as *Salmonella*, prior to packaging and storing fresh produce, meats and eggs.

Following the results of its independent study conducted in 2014, the Center for Food Safety under the leadership of Dr. Steven Ricke went beyond testing of biofilms attachment on multi-use RPCs and conducted a series of four new studies to test sanitizers outlined by the RPC industry in its recently published materials. To test sterilization, the new study also exceeded concentrations by 1,000 times and doubled exposure times deemed safe for consumable food contact by the Environmental Protection Agency (EPA), and were still unable to achieve recommended levels for sanitization.

This research is unique in that the Center for Food Safety studied RPCs previously used in the distribution stream, according to Dr. Ricke. "While we know biofilms cannot be removed with commercial and industrial methods, we wanted to see how many cells of the most common, *Salmonella*, actually could be removed, if any, by using and exceeding industry and regulatory agencies methods, testing four variances such as chemicals and exposure times," said Dr. Ricke.

After sanitization, the number of *Salmonella* cells remaining on the individual coupons consistently exceeded the 1,000 organism limit expected on clean RPC surfaces. None of the microbially contaminated RPC coupons treated with the EPA maximum allowable food-contact sanitizer concentrations resulted in residual counts less than 1,000. In fact, the residual number of *Salmonella* organism counts ranged from 2,700 to 5.1 million after sanitization, according to the study.

In pre-lab sterilization testing, Dr. Ricke also reports the researchers had great difficulty removing any remnants of microorganisms on the RPCs. Only RPC coupons that underwent sanitization and disinfection with 70 percent ethanol after autoclaving in pre-testing were able to pass acceptable levels. Autoclaving, Dr. Ricke notes, is only used

in laboratories, and the costly, pressurized, steam sterilization vessel is not typically found in commercial settings or are disinfectants used with consumable food products.

Actual Number of Live Cells Remaining After Sanitation is Quantified in Log Reduction

"While the RPC industry touted 99.5 percent removal after sanitization, which may sound impressive, the 0.5 percent actually holds a lot of cells that can cause a lot of trouble," said Dr. Ricke. "It depends on how many cells are there in the first place. Only one cell left behind can multiply, transfer, spoil product or ultimately, make someone sick."

After inoculation and sanitation at maximum allowable EPA food contact levels, three studies of RPCs taken from the distribution stream recorded only a 2- to 3.48-log reduction out of 5-log required. Scientists use log reductions, rather than percentages, to represent the actual number of living cells after sanitization. The surviving cells after a log reduction have the potential to transfer to products or surfaces.

To sanitize the RPCs, both sodium hypochlorite and peracetic acid were tested, which have been approved for food contact surface sanitization at up to 200 parts per million by the EPA and the U.S. Food Safety and Inspection Service (FSIS) specifying a 5-log reduction in the number of disease-causing microorganisms within 30 seconds of exposure.

Follow the Science, Avoid Identified Risks

"Recent marketing literature from RPC manufacturers at Pack Expo in Las Vegas notes biofilms are present in the washing process, and that's a real concern for a safe food supply. Scientists know soap is just soap when fighting harmful bacteria and using big words or scary sounding chemicals doesn't change that," said Dr. Ricke. "Retailers, when making packaging decisions with suppliers, need to understand that multi-use packaging can be a potential source for contamination from either coming in contact with tainted food product and returning to the distribution stream, or contaminating new product from packaging which contains live cells that cannot be removed from cleaning processes."

Scanning Electron Microscope (SEM) technology used by researchers also shows that the process of cleaning multi-use RPCs resulted in compromising surface structures and caused cracks and crevices from repeated and aggressive cleaning of the RPCs that were tested and taken from the distribution stream. Dr. Ricke likened the RPCs appearance in testing to "lunar landscapes" and said biofilms can hide and cause additional hurdles for sanitizers to reach.

"Any promises to remove pathogens or microorganisms from reusable products carrying food items are not based on data," said Dr. Ricke. "The only guarantee that's valid from a scientific standpoint is these cells cannot be removed using commercial methods or materials, which is why in the lab during testing we had to autoclave the RPC coupons taken from the distribution stream to void any microorganisms."

To eliminate contamination risk, Dr. Ricke recommends shippers and retailers choose single-use packaging. While some retailers demand growers and packers use RPCs, others prefer corrugated. Dr. Ricke, along with several other food safety experts, encourages retailers to follow the science and avoid risks identified in recent research involving RPCs.

The initial study conducted by The Center for Food Safety under the leadership of Dr. Ricke was peer-reviewed by the Journal of Food Research in January 2015, reported that once biofilms attach to multi-use RPCs no amount of cleaning could erase. The study tested three pathogens, *Salmonella*, *Listeria* and *E. Coli*, and five different commercial and industrial sanitizing methods, including hot water, alkaline detergent, quaternary ammonium, chlorine and scrubbing.

Corrugated Packaging Delivers is a North American organization that supports single-use corrugated as the best choice for food packaging. The mission of Corrugated Packaging Delivers is to raise awareness of science, data and research used by the corrugated industry to present the facts about packaging in the food industry, and set the record straight about misinformation that has been used to influence users away from corrugated. For more information, visit corrugateddelivers.com.

About Dr. Ricke

Dr. Steven C. Ricke, Director, University of Arkansas Center for Food Safety, and Wray Endowed Chair in Food Safety. He also is a faculty member of the Department of Food Science and the Cellular and Molecular Graduate program. In addition, he served as co-founder and former President of the Arkansas Association of Food Protection. Dr. Ricke's research program is primarily focused on virulence and pathogenic characteristics of foodborne *Salmonella spp.* with emphasis on the growth, survival and pathogenesis of the organism under conditions encountered during food production and processing.

Prior to his current position, Dr. Ricke worked with North Carolina State University and Texas A&M University, rising to the rank of full professor in 2004. He received the Poultry Science Association National Research Award in 1999, and the title of Faculty Fellow of the Texas Agricultural Experiment Station in 2003.

Dr. Ricke holds bachelor's and master's degrees from the University of Illinois, and a Doctorate from the University of Wisconsin with a co-major in animal science and bacteriology. He also was a USDA-ARS post-doctorate in the Microbiology Department at North Carolina State University.

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