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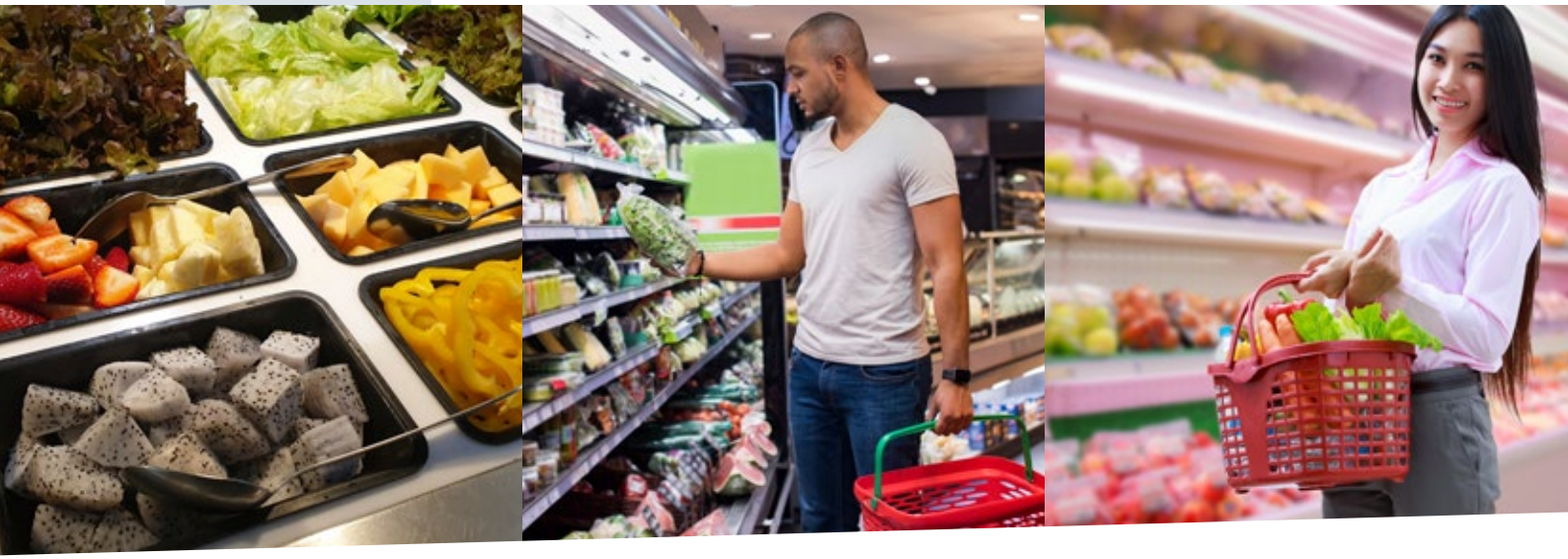

news digest #005

Microbial Testing of Ready-to-Eat Food

Fast and effective safety screening for the ready-to-eat meal industry

The global ready meals market was valued at USD 159 billion in 2019 and is expected to grow by 5.5% from 2020 to 2027.[1] Ready-to-eat (RTE) meals, i.e. foods that do not need to be cooked before consumption, is a fast growing category because of their convenience and perceived health benefits. This growth is set to continue, with a forecast of 7.2% upturn by 2026 to a value of USD 195 billion.[2] This rapid growth is caused by the global preference for ready-to-eat food products, because of busy work schedules and lifestyles that no longer include time for cooking. Moreover, the growing demand for minimally processed and additive-free food products with an extended shelf life is expected to fuel growth.

Ensuring safe and nutritious RTE meals depends on the microbiological evaluation of food, to protect both the consumer and the manufacturer.

The ready meal, or TV dinner, has come a long way since the concept became mainstream in the 1970s. In America in the 1950s, after Thanksgiving a surplus of turkey was brought to market as individually portioned meals in single-serve aluminum trays, a good example of what really took off on the market two decades later. Domestic freezers became the norm, women entered the workplace en masse and had less time for domestic chores, single person households became more commonplace, and the advent of the package holiday turned our eating habits towards more adventurous choices.[3] In this perfect storm, the ready meal thrived.

Once the province of highly processed foods, the ready meal sector today offers a diverse, healthy and aspirational option – whether for a quick office lunch or an alternative to dining out. But the nutritional content of ready meals has also attracted negative publicity. One study published in the British Medical Journal[4] found that not one out of 100 supermarket ready meals fully complied with the nutritional guidelines set by the World Health Organization.

Microbiological criteria set by the European Union give guidance on the acceptability of foodstuffs and their manufacturing processes.[5] Commission Regulation (EC) No 2073/2005[6] on microbiological criteria for foods lays down food safety criteria for relevant foodborne bacteria, their toxins and metabolites, such as *Salmonella, Listeria monocytogenes, Enterobacter sakazakii*, staphylococcal enterotoxins and histamine in specific foods.

According to the European Food Safety Authority, Salmonellosis was the second most reported disease in the EU in 2019, affecting about 88,000 people.[7] Of the 66,113 samples of RTE foods analysed, 0.3% tested positive for *Salmonella*.

Table 1 illustrates a selection of microbial criteria for RTE fruits, vegetables, and juices.

	Matrices	Point of Testing	Satisfactory	Acceptable limits
Salmonella	Precut fruit and vegetables, unpasteurised fruit, vegetable juices and sprouted seeds	Products placed on the market during their shelf life	Absence in 25 g	
E. coli	Precut fruit and vegetables, unpasteurised fruit and vegetable juices	Manufacturing process	0-100 cfu/g	100-1000 cfu/g (max. 1 or 2 samples out of 5)*
***E. coli:* Shiga toxin producing *E. coli* (STEC) O157, O26, O111, O103, O145 and O104:H4**	Sprouts	Products placed on the market during their shelf life	Absence in 25 g	
L. monocytogenes	RTE foods able to support the growth of *L. monocytogenes*	Before the food has left the immediate control of the food manufacturer	Absence in 25 g	
L. monocytogenes	RTE foods able to support the growth of *L. monocytogenes*	Products placed on the market during their shelf life		100 cfu/g**
L. monocytogenes	RTE foods intended for infants and ready-to-eat foods for special medical purposes	Products placed on the market during their shelf life	Absence in 25 g***	
L. monocytogenes	All RTE foods manufacturer, which may pose a risk	Processing areas and equipment	Monitoring	

Notes: **E. coli* criteria: Results are unsatisfactory, if one or more of the values observed are > 1000 cfu/g or more than 2 out of 5 values are between 100 and 1000 cfu/g. ***L. monocytogenes* criteria: The operator may fix intermediate limits during the process that must be low enough to guarantee that the limit of 100 cfu/g is not exceeded at the end of shelf life. ****L. monocytogenes* in infant food: Results are unsatisfactory in RTE foods intended for infants and for special medical purposes, if the presence of the bacterium is detected in any of the sample units. (microbiology term: cfu = colony forming unit)

Table 1: Selection of microbial criteria in the EU for Ready-to-Eat food with a focus on fruits, vegetables, juices and salads with sprouts. Ready-to-Eat food means food intended by the manufacturer for direct human consumption without the need for cooking or other processing effective to eliminate pathogenic microorganisms.

A complete food safety solution

The Bruker MALDI Biotyper® system offers a rapid and effective solution for food safety testing. It provides specific and reliable identification of microorganisms within minutes, starting from colony material. The benchtop system is used for fast and reliable confirmation of foodborne pathogens.

It is validated as a completed food microbiology solution by the Official Method of Analysis program (OMA) of the AOAC International and by MicroVal according to ISO 16140-part 6:2019 for confirmation of:

- *Cronobacter* spp.
- *Salmonella* spp.
- *Campylobacter* spp.
- *Listeria* spp. and *Listeria monocytogenes*

Examples

1. Food samples are 1/10 diluted in buffered peptone water (BPW), widely used in the enrichment of *Salmonella* in pathogen detection assays, and incubated in Stomacher bags for this non-selective step at 37°C.
2. After 18h follows a split into two selective incubation samples, e.g. in RVS (at 41,5°C) and MKTTn (at 37°C) buffer, respectively, for another incubation of 24h.
3. Typical red XLD agar plates are inoculated and incubated for 24h at 37°C.
4. In the case of a positive *Salmonella* sample, typical colonies on XLD agar can be observed, after which additional steps are needed, including confirmation of up to 5 colonies with another 24h-incubation on nutrient agar and biochemical or serological confirmation. This additional 24h-incubation can be omitted when using the MALDI Biotyper® as a complete solution for the confirmation of *Salmonella* spp. starting from the colonies on XLD agar plates, but not limited to XLD (see range of agars in our certificates).

   The MALDI Biotyper® has been validated and revealed to be at least equivalent to the reference method ISO 6579. The obligatory 5 colonies can be analyzed in one single run, in 10 minutes.
5. Relevant serovars can be differentiated more closely using further methods such as the IR Biotyper®.

For more information on Bruker's certified food safety testing solutions visit:
https://www.bruker.com/content/bruker/int/en/applications/microbiology-and-diagnostics/food-beverage-microbiology/maldi-biotyper-for-food-microbiology.html

Further reading

- "*Salmonella,* Food Safety and Food Handling Practices", Technological University Dublin, doi:10.3390/foods10050907
- "Bacteriological safety of sprouts: A brief review", State University of Rio de Janeiro – UERJ, doi:10.1016/j.ijfoodmicro.2021.109266
- "Systematic Review and Meta-analysis: *Salmonella* spp. prevalence in vegetables and fruits", Fundación Universitaria Agraria de Colombia, doi:10.1007/s11274-021-03012-7

References

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2. Ready to eat food inudstry statistics, trends & analysis, Brandon Gaille, April 2019 https://brandongaille.com/18-ready-to-eat-food-industry-statistics-trends-analysis/
3. The rise of the ready meal, BBC News Magazine, February 2013 https://www.bbc.co.uk/news/magazine-21443166
4. Nutritional content of supermarket ready meals, BMJ 2012; 345. BMJ 2012; 345:e7607 doi: https://doi.org/10.1136/bmj.e7607
5. European Commision: Food Safety – Microbiological Criteria https://ec.europa.eu/food/food/biological-safety/food-hygiene/microbiological-criteria_en
6. EUR-Lex: Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs. ELI: http://data.europa.eu/eli/reg/2005/2073/2014-06-01
7. European Food Safety Authority (EFSA): Salmonella https://www.efsa.europa.eu/en/topics/topic/salmonella

Not for use in clinical diagnostic procedures. Please contact your local representative for availability in your country.

As of May 2021, Bruker Daltonik GmbH is now Bruker Daltonics GmbH & Co. KG.

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