

ACT HEALTH PROTECTION SERVICE

**MICROBIOLOGICAL
QUALITY OF
COOKED RICE**

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INTRODUCTION

Incidences of rice-associated food poisoning have been linked to the practice of preparing bulk rice in advance, in anticipation of subsequent need. Fried rice is a leading cause of *Bacillus cereus* emetic-type food poisoning in Australia. *B. cereus* is frequently present in uncooked rice, and heat-resistant spores may survive cooking. If cooked rice is subsequently held at room temperature, surviving spores will germinate into vegetative forms. The vegetative forms will multiply, these forms may then produce a heat-stable toxin and this low molecular weight toxin can survive brief heating, such as stir frying.^{1 3}

The purpose of this survey was to establish the microbiological quality of fried rice, sampled at the point of sale from a wide range of takeaway premises in the ACT. The tests *E. coli*, Coagulase positive *Staphylococcus*, *Listeria monocytogenes*, *Salmonella* sp. and *B. cereus* were performed to determine the microbial quantity of fried rice

STANDARDS

Food Standards Australia New Zealand Food (FSANZ) Guidelines for the microbiological examination of Ready-To-Eat (RTE) Foods², would consider Fried Rice as a Ready-to-eat Food and identify four categories of microbiological quality ranging from satisfactory to potentially hazardous for this food. Table 1 below details the Draft guideline categories. This reflects both the high level of microbiological quality that is achievable for ready-to-eat foods in Australia and New Zealand and indicates the level of contamination that is considered to be a significant risk to public health.

Table 1²

Test	Microbiological Quality (CFU per gram)			
	Satisfactory	Marginal	Unsatisfactory	Potentially Hazardous
Standard Plate Count (SPC)				
Level 1	<10 ⁴	<10 ⁵	≥10 ⁵	
Indicators				
<i>Escherichia coli</i>	<3	3-100	≥100	
Pathogens				
Coagulase positive staphylococci	<10 ²	10 ² -10 ³	10 ³ -10 ⁴	≥10 ⁴ SET +ve
<i>Bacillus cereus</i>	<10 ²	10 ² -10 ³	10 ³ -10 ⁴	≥10 ⁴

NOTE:

Pathogenic strains of *E. coli* should be absent.

Applies to ready-to-eat foods in which all components of the food have been cooked in the manufacturing process/preparation of the final food product and, as such, microbial counts should be low. Fried Rice is a "level 1" product in which all components have been cooked before consumption.

SET +ve: Staphylococcus enterotoxin positive.

SURVEY

This survey was conducted between the 04 July 2006 and 26 September 2006 with 63 samples being taken randomly from a range of 42 ACT retail outlets by Environmental Health Officers (EHO) and processed by the Microbiology Unit of ACTGAL. The SPC, *E. coli* and coagulase positive *Staphylococci* analyses assessed samples for overall hygiene quality and the *Listeria monocytogenes*, *Salmonella sp.* and *B. cereus* were tests for the specific bacterial pathogens. The survey generally collected single samples from multiple outlets with some outlets being tested more than once.

RESULTS / DISCUSSION

Standard Plate Counts (SPC)

The Standard Plate Count (SPC), also referred to as the aerobic plate count or the total viable count, is one of the most common tests applied to indicate the overall microbial quality of the food. Total count of viable microbes may be taken to indicate the type of sanitary control exercised in the production, transport, and storage of the food.

All 63, fried rice samples were assessed according to the level one satisfactory criteria of the food guidelines. The results ranged between <50 and 34,000,000 colony forming units/gram (cfu/g) with 5 (7.9%) samples giving marginal or unsatisfactory results. 92.1% of the samples tested passed satisfactorily. The unsatisfactory results are outside of the acceptable microbiological limits and are indicative of poor hygiene or food handling practices. No unsatisfactory samples were re-sampled.

Escherichia coli

All samples were tested for *E. coli*. Figure 2 below represents the results for the four categories. The presence of *E. coli* in RTE foods is undesirable because it indicates poor hygienic conditions, which have lead to contamination or inadequate heat treatment. Ideally *E. coli* should not be detected and as such a level of <3 cfu/g (the lower limit of the MPN test) has been given as the satisfactory criteria for this organism. 60 (95.2%) of the samples had <3 cfu/g *E. coli* and thereby met the satisfactory criterion. There were 3 (4.8%) samples in the marginal 3 –100 cfu category and no samples in unsatisfactory category. Levels exceeding 100 cfu per gram are unacceptable and indicate a level of contamination which may have introduced pathogens or that pathogens, if present in the food prior to processing, may have survived.¹

Coagulase positive *Staphylococci*

63 fried rice samples were tested for coagulase positive *Staphylococci*. 61 (96.8%) of the samples were satisfactory, 2 (3.2%) were marginal and there were no unsatisfactory samples. In this instance one of the samples that had a marginal coagulase positive *Staphylococci* result was also marginal for *E. coli*. Unsatisfactory levels of coagulase-positive *Staphylococci* indicate that time/temperature abuse of a food is likely to have occurred following improper handling during food preparation. Contamination of RTE foods such as fried rice with coagulase-positive *Staphylococci* is largely as a result of human contact. Contamination should be minimised through good food handling practices and growth of the organism prevented through adequate temperature controls.

Bacillus cereus

All 63 samples were tested for *B. cereus*. 63 (100%) of samples tested for were satisfactory eg the count for all samples was <100 cfu/g. There were no marginal, unsatisfactory or potentially hazardous results. Levels of $\geq 10^4$ cfu per gram are considered potentially hazardous as consumption of foods with this level of contamination may result in foodborne illness. An unsatisfactory level of *B. cereus* in cooked foods like fried rice generally occurs as a result of inadequate temperature control. Cooked foods should be held at or above 60°C or at below 5°C to prevent growth.

Listeria monocytogenes

Listeria monocytogenes was not detected in any of the 63 samples tested.

Salmonella sp.

Salmonella was not detected in any of the 63 samples tested.

CONCLUSION

This survey indicated that most of the fried rice sampled from various takeaway premises was of acceptable microbiological quality. Overall >92% of the samples tested satisfactory for the Standard Plate Count, >95% of samples were satisfactory for *E. coli* and none of the samples contained any of the pathogens *Bacillus cereus*, *Listeria monocytogenes* or *Salmonella sp.*.

BIBLIOGRAPHY

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2. Guidelines for the microbiological examination of ready-to-eat foods FSANZ – December 2001
3. Jenson I and Moir CJ. *Bacillus cereus* and other *Bacillus sp.*, In Foodborne Microorganisms of Public Health Significance, Sixth Edition, AIFST, 2003