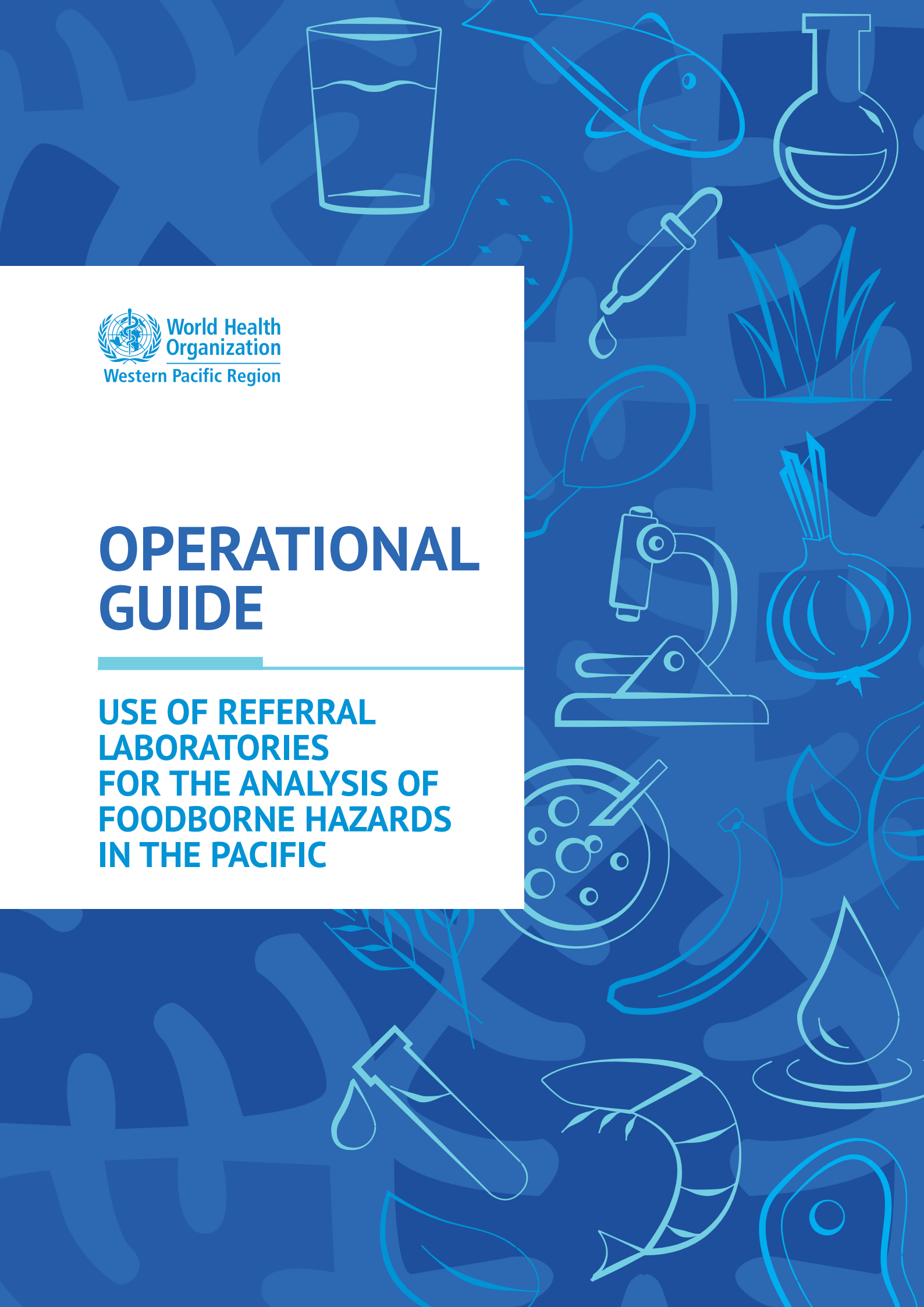

World Health Organization
Western Pacific Region

# OPERATIONAL GUIDE

## USE OF REFERRAL LABORATORIES FOR THE ANALYSIS OF FOODBORNE HAZARDS IN THE PACIFIC

# OPERATIONAL GUIDE

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World Health Organization
Western Pacific Region

The mention of specific companies or laboratories does not imply that they are endorsed or recommended by the World Health Organization (WHO) in preference to others of a similar nature that are not mentioned. Rather, it reflects the presence of pre-existing laboratory referral arrangements between Pacific island government authorities and said companies or laboratories.

**Operational guide: use of referral laboratories for the analysis of foodborne hazards in the Pacific**



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# ABBREVIATIONS

| | |
|---|---|
| **APHIS** | Animal and Plant Health Inspection Service (United States Department of Agriculture) |
| **BAF** | Biosecurity Authority of Fiji |
| **CAIRAP** | Centre d'Analyses Industrielle et de Recherche Appliquée pour le Pacifique |
| **CBP** | United States Customs and Border Protection |
| **CCSF** | Transportation Security Administration Certified Cargo Screening Facility |
| **CDC** | United States Centers for Disease Control and Prevention |
| **CDE** | Calédonienne Des Eaux |
| **CITES** | Convention on International Trade in Endangered Species of Wild Fauna and Flora |
| **COFRAC** | Le Comité Français d'Accréditation |
| **FSIS** | Food Safety and Inspection Service (United States Department of Agriculture) |
| **HSDOH** | Hawaii State Department of Health |
| **HTS** | Harmonized Tariff Schedule |
| **IANZ** | International Accreditation New Zealand |
| **IAS** | Institute of Applied Sciences in Fiji |
| **IATA** | International Air Transport Association |
| **ICAO** | International Civil Aviation Organization |
| **IEH** | Laboratories and Consulting Group of Washington State (United States of America) |
| **ILM LASEA** | Institut Louis Malarde Laboratory for Food and Water Safety in French Polynesia |
| **ILM LHBE** | Institut Louis Malarde Hygiene, Biosecurity and Environment Laboratory |
| **ILM-LMB** | Institut Louis Malarde Laboratory of Marine Biotoxins |
| **ISO** | International Organization for Standardization |

| | |
|---|---|
| **LNC** | Laboratoire de Nouvelle-Calédonie |
| **MDU PHL** | Microbiological Diagnostic Unit Public Health Laboratory |
| **NAHFTL** | National Animal Health and Food Testing Laboratory |
| **NARI** | National Agricultural Research Institute |
| **NATA** | National Testing Authority of Australia |
| **NATSL** | National Analytical and Testing Service Laboratory |
| **PAH** | polycyclic aromatic hydrocarbon |
| **PCBs** | polychlorinated biphenyls |
| **PCR** | polymerase chain reaction |
| **PICs** | Pacific island countries and areas |
| **SFA** | Singapore Food Agency |
| **SGS PHL** | SGS Philippines |
| **SROS** | Scientific Research Organisation of Samoa |
| **TSA** | Transportation Security Administration |
| **USAPI** | United States–affiliated Pacific Islands |
| **WHO** | World Health Organization |

# GLOSSARY

| | |
|---|---|
| **AS/NZS** | Standards produced by Standards Australia that apply in Australia and New Zealand. |
| **cultures** | The intentional propagation of a microorganism in a growth medium. |
| **infectious substances** | Substances that are known or are reasonably expected to contain pathogens. |
| **pathogens** | Microorganisms (including bacteria, viruses, rickettsia, parasites, fungi) and other agents such as prions, which can cause disease in humans or animals. |
| **patient specimens** | Human or animal materials, collected directly from humans or animals, including excreta, secretions, blood and its components, tissue and tissue fluid swabs, and body parts being transported for purposes such as research, diagnosis, investigational activities, disease treatment and prevention. |
| **United States–affiliated Pacific Islands (USAPI)** | Consists of three United States territories: American Samoa, the Commonwealth of the Northern Mariana Islands and Guam; and three independent countries in free association with the United States of America: the Federated States of Micronesia, the Marshall Islands and Palau. |

# EXECUTIVE SUMMARY

This guide supports the implementation of the *Regional Framework for Action on Food Safety in the Western Pacific*, which provides guidance on strategic actions and a stepwise approach to strengthen food safety systems to better manage food safety risks and respond to food safety incidents and emergencies. It recognizes the diversity and context of the Pacific subregion in terms of geography, demographics, culture, economy and health status and how food safety is affected.

The unique features of the Pacific make it vulnerable to food safety incidents and emergencies. The subregion is highly dependent on food imports, which requires a strong food monitoring and surveillance system to assure the safety of both locally produced and imported food. Understanding this context and recognizing the limitations of some food analysis laboratories in the subregion, this guide was prepared to support food safety authorities to identify and use referral food laboratories in the subregion.

This guide outlines key considerations to be applied in the selection of referral laboratories and in the submission of samples to those facilities. It makes use of the existing experiences of Pacific island authorities and shares these among authorities in other countries and areas to achieve continuous improvement of food safety systems, providing "safe food for all".

Additionally, this document highlights the analytical capacity of Pacific island authorities in detecting foodborne hazards and enhances that capacity by strengthening food safety networks through the identification of national and reference laboratories with the capacity to test for priority foodborne hazards so that food safety authorities have the ability to test foods (domestic and imported) for priority hazards.

The primary target audience for this guide includes health and food safety authorities in Pacific island countries and areas responsible for strengthening food safety systems in line with the Regional Framework.

# 1

# INTRODUCTION


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## Accurate and consistent information on foodborne hazards is critical to health decision-making and planning in responding to food safety emergencies and the facilitation of international trade in safe food.

Data obtained through food contaminant monitoring programmes, total diet studies, food contaminant surveys, regulatory-driven analyses and foodborne disease surveillance all contribute to an enhanced food safety risk assessment and management capacity. Food laboratories play a critical role in this, but the costs of establishing and operating food laboratories are relatively high. Considering the limited number of food samples tested in most Pacific island countries and areas (PICs), it is not practical for all countries to have sophisticated food laboratories. Therefore, strengthening the network and improving access to reference laboratories within and beyond the subregion may help overcome the need for extra testing facilities.

Food inspection is an important aspect of food safety. In the Pacific, routine testing primarily occurs with drinking water to ensure the safety of the water for public consumption. Several PICs have implemented routine sampling and testing of environmental water and fish and fishery products to facilitate the export of fish and fish products. Fiji and Solomon Islands were among the first to identify appropriate referral laboratories and undertake such routine analyses to meet European Union market requirements. In the decade from 2004 to 2014, the total value of food imports and exports in Asia and the Pacific increased by US$ 137 billion and US$ 131 billion, respectively, making these routine analyses increasingly important. Other instances where monitoring of food may occur is under the auspices of a research study such as the work undertaken at the University of the South Pacific on mercury levels in Fijian seafood.

While not ideal, food is rarely tested routinely for the same purpose of protecting the domestic consumers. Food is generally only analysed after it has become the potential source of a complaint or an illness. It is therefore crucial that appropriate laboratories have been identified prior to a food safety incident or emergency. Once consumers report becoming ill after eating a particular food, there is great urgency for officials to identify the agent responsible both for treatment purposes and also to limit the spread of illness. In this situation, it is preferable to have previously established systems in place, recognizing the capacity both domestically and of external referral laboratories, as is implemented in French Polynesia and New Caledonia through the regulatory process. It is not viable for this to be done in the wake of a food safety incident or emergency.

An urgent response to food safety incidents is important to ensure trust in domestic, imported and exported food. A melamine contamination of infant formula and various other foods such as White Rabbit candy in China caused great concern in the public and media in 2008. Many Pacific countries required urgent product testing in their countries and areas to reassure the public. There was a need for food safety authorities to identify referral laboratories with appropriate analytical capacity, thus slowing down the process.

Whether the intention is to implement continuous monitoring of the food supply to ensure compliance with appropriate standards or be prepared to manage an urgent situation and reduce the impact of safety incidents and emergencies, it is essential to have arrangements already in place with laboratories that have the capacity to undertake the appropriate analyses for a range of potential hazards. Establishing new laboratories requires the purchase of expensive equipment, staff training and lengthy laboratory accreditation processes. This can be avoided by complementing existing laboratory capacity with a guide facilitating better access to existing capacity within and beyond the subregion.

## 1.1

## What are foodborne hazards?

Foodborne hazards include biological, chemical and physical agents that can cause harm to humans upon the ingestion of contaminated food or water. The harm associated with these agents generally manifests itself as foodborne illnesses. While illnesses associated with the consumption of food or water that has been contaminated by physical hazards such as metal or glass can be significant to affected individuals, the impact is generally limited in its distribution. In contrast, the most common agents of foodborne illnesses are infectious or toxic in nature and caused by bacteria, viruses, parasites or chemical substances.

Foodborne pathogens can cause severe diarrhoea or debilitating infections including meningitis while chemical hazards can lead to both acute poisoning and chronic diseases, such as cancer. Diarrhoeal agents are the biggest cause of foodborne illness in the Western Pacific Region with norovirus, *Salmonella*,

*Campylobacter* and enterohaemorrhagic *Escherichia coli* among the most common foodborne pathogens, affecting millions of people annually – sometimes with severe and fatal outcomes. Non-typhoidal *Salmonella* infects people through contaminated food leading to gastrointestinal symptoms, rapid dehydration and possible death. Infectious viral foodborne agents including norovirus and hepatitis A can produce severe symptoms and, in the latter example, cause long-lasting liver disease. Parasites are a major concern, with the Region reporting the highest death rate globally as a result of foodborne parasites. Most common parasites in the Western Pacific, such as seafoodborne trematodes (a major contributor to foodborne disease in the Region), and the tapeworms *Echinococcus* spp. and *Taenia solium* are transmitted through food. Other parasites, such as *Ascaris*, *Cryptosporidium*, *Entamoeba histolytica* and *Giardia*, typically enter the food chain via water or soil and then go on to contaminate fresh produce.

In addition to the biological agents, naturally occurring toxins and environmental pollutants are the chemical agents of most concern for human health. These naturally occurring toxins include mycotoxins, marine biotoxins, cyanogenic glycosides and toxins. Aflatoxin, a toxin produced by mould that grows on grain, is responsible for the highest number of foodborne deaths in the Western Pacific Region. Environmental pollutants of concern include persistent organic pollutants (POPs), dioxins and polychlorinated biphenyls (PCBs), as well as heavy metals, such as lead, cadmium and mercury, which are known to cause neurological and kidney damage. Heavy metal contamination in food occurs primarily through polluted air, water and soil. Prions are also of concern, a type of protein spread by infected meat products and associated with specific forms of neurodegenerative disease.

## 1.2

## Importance of detecting and managing foodborne hazards

World Health Organization (WHO) studies of the global burden of foodborne diseases in 2010 estimated that just 31 of the many foodborne hazards associated with consumption of food and water, including the aforementioned viruses, bacteria, protozoa, helminths and chemicals, caused approximately 600 million foodborne illnesses globally and 420 000 deaths every year. The Western Pacific Region represented approximately 21% of all illness globally with 125 million people falling ill and 50 000 deaths annually. A significant proportion of deaths (7000) occur in children under 5 (Havelaar et al., 2015; World Health Organization, 2015).

Food safety risks cannot be eliminated, but they can be reduced. Governments have a responsibility to protect their citizens and promote health security. The importance of this role is highlighted by WHO studies and the cost of these illnesses to societies. In addition, it is clear that the globalization of the food trade facilitates the rapid national and international distribution of foodborne hazards. Governments, agriculture and food industries have a duty to ensure the safety of food for domestic populations as well as consumers in the international receiving markets.

While the demand and pressure for food safety grows, changes in technology, demographics and the way food is produced, consumed and distributed in the Region only increase difficulties in responding to incidents and emergencies or implementing food safety measures, thus increasing the need for routine sampling of food. The collection of accurate and up-to-date data is a prerequisite for informed risk assessment and for risk management decisions. This information, combined with reliable data on food consumption, enables risk assessors to determine likely consumer exposures to specific hazards. In addition, the data can help prove if steps being undertaken to reduce hazards are effective – for example, efforts to reduce cyanide levels in cassava, histamine levels in fish or *Salmonella* in poultry. Mechanisms of obtaining such data included general compliance monitoring, targeted surveys and total diet studies.

In addition to the monitoring of hazards in food, the collection of reliable and current information on the incidence of foodborne illness is also important. Collection of this information and linking it with food monitoring data enhances the capacity of the public health system, allowing epidemiologists and microbiologists to identify, track and respond to outbreaks of foodborne illnesses. It also strengthens the capacity of food safety systems to implement corrective actions to limit the spread of such outbreaks or chemical contamination incidents.

Not only does the monitoring of foodborne hazards in food and water samples promote better health but it also promotes trade opportunities. A broad range of markets can open for a country's or area's food exports if the governments and consumers in the importing countries have a greater level of confidence in the food safety associated with food imported into their marketplaces. Similarly, trade restrictions may be applied to countries identified as a source of contaminated or unsafe food.

The strengthening of food analysis laboratories also contributes to the work and goals of WHO both globally and in the Region – working towards implementation of the thematic priority of health security including antimicrobial resistance from *For the Future: Towards the healthiest and safest Region*, which is also the Region's implementation plan for the global WHO Thirteenth General Programme of Work (2019–2023).

## 1.3

## Strengthening food safety systems in the Pacific

PICs recognize the importance of protecting their citizens from both existing and emerging diseases arising from all sources, including unsafe food and water. Consequently, governments have acted to improve health protection through productive partnerships for preparedness planning, prevention, prompt detection, characterization, and the containment and control of infectious diseases in recent

years. However, in relation to foodborne diseases, there is still a need to enhance efforts to reduce the risk of them occurring and to strengthen early detection of, and responses to, outbreaks.

As part of strengthening public health systems, several PICs have taken action to develop a modern, science-based infrastructure that has resulted in the modernizing of food laws, regulations and standards and the enhanced training of inspectors. Still, the inspection and collection of food in the domestic markets for analysis is quite limited and most frequently undertaken retrospectively in response to consumer complaints or illnesses.

The desire to open and maintain trading relations for food exports has also been a real force for governments to strengthen food safety systems and implement intensified compliance monitoring studies. This is particularly so for those countries striving to be able to export tuna to the European market, a market that is perhaps the leading recipient of tuna from the Pacific. The approximately US$ 140 million that such a market is worth annually to Papua New Guinea (Pacific Islands Forum Fisheries Agency, 2015) contributes to the sustainability of producers, processors and their employees, as well as to government resources and subsequently to numerous economic and social benefits. To achieve these benefits, Fiji, Solomon Islands and Papua New Guinea have strengthened legislation, trained inspectors and enhanced routine contaminant monitoring of fish and fisheries products. Vanuatu has also recently recognized the importance of strengthening legislation and contaminant monitoring for export products such as kava and meat.

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# 2

# OVERVIEW OF CURRENT CAPACITY TO DETECT AND IDENTIFY FOODBORNE HAZARDS IN THE PACIFIC


## PICs have a varied capacity to detect and subsequently manage foodborne hazards.

The capacity to test drinking water for total coliforms and *E. coli* is generally available in the United States–affiliated Pacific Islands (USAPI). This includes United States territories (American Samoa, Guam and the Commonwealth of the Northern Mariana Islands) and independent countries in free association with the United States of America (the Federated States of Micronesia, the Marshall Islands and Palau). This capacity is also well established in French Polynesia and New Caledonia due to European Union regulatory requirements. Furthermore, Fiji, Samoa, Solomon Islands and Papua New Guinea also have laboratories capable of undertaking such tests with the Institute of Applied Sciences in Fiji and the Scientific Research Organisation of Samoa having international accreditation. Other countries and areas with this basic capacity to test water include Cook Islands, Kiribati, Nauru, Niue, Wallis and Futuna, and Tuvalu, with the latter relying on hydrogen sulfide as an indicator test.

No food (other than drinking water) testing capacity is present in American Samoa, Cook Islands, Kiribati, the Marshall Islands, Nauru, Niue, the Commonwealth of the Northern Mariana Islands, Tonga, Tuvalu or Wallis and Futuna.

The Federated States of Micronesia, the Commonwealth of the Northern Mariana Islands, Palau and Vanuatu each have a laboratory developing the capacity for food testing. The Federated States of Micronesia has recently acquired a multiplex polymerase chain reaction (PCR) system from the United States Food and Drug Administration, which integrates sample preparation, amplification, detection and analysis, and includes a gastrointestinal panel.

Fiji, French Polynesia, New Caledonia, Papua New Guinea, Samoa and Solomon Islands have significant laboratory capacity, being able to test food and water for a range of biological and chemical hazards. No Pacific island laboratories report the capacity to detect viral agents or foodborne parasites in food.

Annex 1 provides detailed information on the capacity of 20 PICs to analyse for foodborne hazards in food and water samples.

## 2.1

## Biological hazards

Capacity to test a broad range of bacterial hazards in food within the Pacific is limited to the Institute of Applied Sciences (IAS) in Fiji, the Centre d'Analyses Industrielles et de Recherche Appliquée pour le Pacifique (CAIRAP) in French Polynesia, the Laboratoire de Nouvelle-Calédonie (LNC) in New Caledonia, the National Animal Health and Food Testing Laboratory (NAHFTL) and the National Analytical and Testing Service Laboratory (NATSL) in Papua New Guinea, and the Scientific Research Organisation in Samoa (SROS).

LNC reported the capacity to culture *Clostridium botulinum* and to detect toxin by PCR via the mouse bioassay. The Institut Louis Malarde – Laboratory for Water and Food Safety (ILM LASEA) reports the capacity to detect *Staphylococcus aureus* toxin. Enteropathogenic, enterotoxigenic and verotoxigenic *E. coli* are able to be detected in varying degrees by IAS, CAIRAP, ILM LASEA and LNC. *Yersinia enterocolitica* is detectable in food in New Caledonia only. *Vibrio cholerae* is reportedly detectable in food only in Samoa.

## 2.2

## Chemical hazards

The most widespread chemical hazard testing capacity in food relates to determining the presence and level of histamine in fish and fish products. This capacity is reported in Fiji, French Polynesia, New Caledonia, Papua New Guinea and Samoa. Another marine toxin, ciguatoxin, is mandatorily reported in New Caledonia, but only the Institut Louis Malarde Laboratory of Marine Biotoxins (ILM-LBM) in French Polynesia reports the capacity to detect the toxin. Aflatoxin, a biological toxin, is reportedly able to be detected by CAIRAP in French Polynesia and the National Agricultural Research Institute (NARI) in Papua New Guinea. Cyanide is reportedly able to be detected in laboratories in Fiji, Papua New Guinea and Solomon Islands.

None of the laboratories reviewed in the Pacific islands reported the capacity to test for the following:

- chloropropanols;
- melamine;
- marine toxins – domoic acid, lipophilic shellfish toxins, lyngbyatoxin, saxitoxin and tetrodotoxin;
- dioxins, furans and PCBs; or
- antibiotic residues such as cephalosporins, fluoroquinolones, nitrofurans, sulfonamides and tetracyclines.

LNC reports the capacity to test for sulfonamides, avermectins, ethoxyquin and fluazuron as well as pesticide multi-residues. IAS in Fiji and SROS in Samoa are able to test for pesticide residues, while IAS can also test for persistent organic pollutants.

Arsenic, cadmium, lead and mercury can be detected in several countries. LNC can test for the latter three in various foods, but not arsenic. Fiji, French Polynesia, Papua New Guinea and the Calédonienne Des Eaux (CDE) in New Caledonia report the ability to test drinking water for arsenic, lead and mercury. The public health laboratory in Solomon Islands reports being able to test for arsenic and lead in water only.

## 2.3

## Referral laboratories

The limited capacity of countries and areas to detect common foodborne hazards means there is a heavy reliance on the capacity of suitable laboratories in other countries readily accessible to the Pacific.

Countries and areas with an association to the United States of America currently submit their clinical referral samples to the Hawaii State Department of Health (HSDOH) and United States Centers for Disease Control and Prevention (CDC) with the assistance of the Pacific Island Health Officers' Association and its Regional Laboratory Coordinator. These mechanisms are also said to only be applicable for the submission of food samples and cultures derived from food samples. Similarly, the French territories send their samples to laboratories recognized under appropriate legislation in France, with ILM LASEA also submitting samples to New Zealand.

Palau usually refers food samples to the Republic of Korea, the Philippines and the United States of America, while Papua New Guinea sends fish and fish product samples to Singapore. Cook Islands, Niue, Samoa and Tonga currently send clinical samples to New Zealand, a process that could also be used for food samples.

Environmental water, fish and fishery products are routinely sampled in Fiji and Solomon Islands to facilitate the export of fish and fish products to the European Union. These samples are then sent to the IAS at the University of the South Pacific in Fiji as well as AsureQuality and the Cawthron Institute in New Zealand. Kiribati and Vanuatu are also in the process of referring export samples to external laboratories. The Fisheries Authority of Papua New Guinea sends its export-related samples to laboratories within its own country but also sends samples to ALS Singapore, a referral laboratory. Tuvalu has reported sending samples to Fiji and New Zealand. Nauru has yet to refer a sample, but Australia would be the likely destination.

Annex 2 provides detailed information on the capacity of 10 referral laboratories outside of PICs which have extensive capacity to analyse for foodborne hazards in food and water samples.


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# 3

# IDENTIFYING APPROPRIATE REFERRAL LABORATORIES

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## There are a number of considerations for food and health authorities in Pacific island countries in assessing the suitability of overseas referral laboratories so that the authorities can optimize health decision-making and planning.

Referral laboratories may also serve as a technical resource not limited to analysing submitted samples. The role of a food laboratory also includes advising on appropriate samples to be taken from food and the environment and advising on sampling requirements, including volume of sample, storage and transportation. Public health laboratories may also offer specialized advice to support epidemiological and environmental investigations and also typing services for characterization of pathogens in the implicated food(s) to better understand how an outbreak occurred.

When assessing a referral laboratory to meet analytical needs, it is important that they can supply accurate and reliable results for priority foodborne hazards. The technical competence of a laboratory depends on a number of factors, including: the qualifications, training and experience of the staff; availability of suitable and properly calibrated equipment; and appropriate testing procedures. All these factors contribute to a laboratory being technically competent to undertake analyses and can avoid the dissatisfaction of trading partners, uncertainty in food emergency responses and expensive retesting. Confidence in food products is enhanced if both the public and clients (in the case of food in international trade) know they have been thoroughly evaluated by an independent, competent testing facility. This is particularly the case if the laboratory has been evaluated and accredited by a third party.

Laboratory accreditation uses criteria and procedures specifically developed to determine technical competence. The criteria are based on the internationally accepted standards ISO/IEC 17025, which are used for evaluating laboratories throughout the world. Laboratory accreditation provides formal recognition to competent laboratories, thus providing a ready means for food authorities to find reliable testing and calibration services able to meet their regulatory, foodborne disease surveillance and food contaminant monitoring requirements.

Accreditation is sometimes provided for a wide range of foods but also may be limited to analysis of a specific range of foods. In Tables 1–6, the term "food" generally means a laboratory is accredited for a particular test in a wide range of foods, including: meat, poultry and derived products; fish and fishery products; eggs and egg products; cereals and cereal products; edible oils, fats and derived products; nuts, fruits and vegetables; sauces, herbs, spices and condiments; sugar and sugar confectionery; and non-alcoholic beverages. It may also include food additives and animal feed. Sometimes, however, analyses are accredited for only a limited range of foods such as cassava for cyanide, fish and fishery products for certain marine biotoxins or for mercury contamination, or dairy products and nuts for aflatoxins. It is therefore important to get clarity from a referral laboratory as to what foods any specific analysis is accredited by a national or international accreditation body.

While not specifically detailed in this document the cost of analysing samples should also be considered. It is important that prospective clients are clear on payment options and receive a detailed quote from the laboratory. This permits the client to undertake a comparison of the costs of analyses and terms and conditions to contribute to the determination of which referral laboratory or laboratories to utilize.

## 3.1

## Laboratories within the Pacific subregion

Most analyses in the IAS and SROS laboratories are accredited under International Accreditation New Zealand (IANZ), the country's premier accreditation body, giving confidence in their processes. CAIRAP and ILM LASEA analyses are accredited under the French accreditation system Le Comité Français d'Accréditation (COFRAC). In New Caledonia, the LNC reports the ability to detect numerous foodborne hazards, but the laboratory reports that the methods it uses have neither national nor international accreditation. ILM-LBM is the only laboratory in the Pacific reporting the capacity to detect ciguatoxin. While not formally accredited, it has extensive research history in relation to this hazard that would give one confidence in their findings. Tables 1 and 2 summarize each laboratory's capacity for easy comparison between laboratories. Detailed methodologies and contact details are in Annex 1.

## Table 1. Comparative analytical capacities for microbial hazards in key laboratories within the Pacific

| Hazard | Fiji | French Polynesia | | New Caledonia |
|---|---|---|---|---|
| | **IAS** | **CAIRAP** | **ILM LHBE** | **LNC** |
| *Bacillus cereus* | FW* | F** | F** | F** |
| *Campylobacter* spp | FW* | NR | NR | F |
| *Clostridium botulinum* C/D and toxin | NR | NR | NR | T |
| *Clostridium perfringens* | NAU | F** | NAU | F** |
| *Escherichia coli* (Beta glucuronidase positive) | FW* | F** | NAU | F |
| *Listeria monocytogenes* | NAU | F** | F** | F** |
| *Salmonella* spp | FW* | FW** | F** | FW** |
| *Salmonella* Typhi | FW* | F** | NAU | NR |
| *Shigella* | NR | NR | NR | F |
| *Staphylococcus aureus* | FW* | F** | F** | F** |
| Pathogenic *Staphylococcus* | NR | W** | W** | W |
| *Staphylococcus* enterotoxin | NR | NAU | F** | NR |
| *Vibrio cholerae* | NR | NR | NR | NR |
| *Vibrio parahaemolyticus* | NAU | NR | NR | F |
| *Yersinia enterocolitica* | NR | NR | NR | F |

**Laboratories:**
CAIRAP: Centre d'Analyses Industrielle et de Recherche Appliquée pour le Pacifique; IAS: Institute of Applied Sciences; ILM LASEA: Institut Louis Malarde Laboratory for Food and Water Safety; LNC: Laboratoire de Nouvelle-Calédonie; SROS: Scientific Research Organisation of Samoa.

**Abbreviations:**
*: accredited by IANZ; **: accredited by COFRAC; F: food; FW: food and water; NAU: reports not accredited to undertake; NR: not reported; T: tissue; W: water.

## Table 2. Comparative analytical capacities for chemical hazards in key laboratories within the Pacific

| Hazard | Fiji | French Polynesia | | New Caledonia |
|---|---|---|---|---|
| | **IAS** | **CAIRAP** | **ILM LHBE** | **LNC** |
| Aflatoxin | NR | NAU | NR | NR |
| Arsenic | NAU | NAU | NAU | NR |
| Ciguatoxin[1] | NR | NR | FFP | NR |
| Histamine | FFP* | NAU | FFP** | NAU |
| Lead | FW* | NAU | NAU | FFP** and limited other food |
| Mercury | FW* | NAU | NAU | FFP** |
| Organochlorine pesticide residues | F* | NR | NR | NR |
| Pesticides (multi-residue) | NR | NR | NR | NAU |
| Persistent organic pollutants | W* | NR | NR | NR |

**Laboratories:**
CAIRAP: Centre d'Analyses Industrielle et de Recherche Appliquée pour le Pacifique; IAS: Institute of Applied Sciences; ILM LASEA: Institut Louis Malarde Laboratory for Food and Water Safety; LNC: Laboratoire de Nouvelle-Calédonie; SROS: Scientific Research Organisation of Samoa.

**Abbreviations:**
*: accredited by IANZ; **: accredited by COFRAC; F: food; FFP: fish and fish products; FW: food and water; NAU: reports not accredited to undertake; NR: not reported; T: tissue; W: water.

1. ILM-LBM is also able to detect the toxin using a neuroblastoma cell-based assay and a fluorescent version of the receptor binding assay.

## 3.2

## Referral laboratories beyond the subregion

Several laboratories beyond the subregion clearly have the capacity to support PICs as they are in ongoing partnership and, in some circumstances, contractual agreement with PICs. Some are even recognized by legislation present in French Polynesia and New Caledonia. The referral laboratories located in Australia and New Zealand and their analytical capacities are summarized in Tables 3 and 4, with Annex 2 providing their capacities in more detail. The referral laboratories located in the Philippines, Singapore and the United States of America and their analytical capacities are summarized in Tables 5 and 6, with Annex 2 providing their capacities in more detail.

## 3.3

## WHO collaborating centres

There are three WHO collaborating centres relating to food safety in the WHO Western Pacific Region: the WHO Collaborating Centres for Food Contamination Monitoring in Beijing, China and in Singapore and the WHO Collaborating Centre for Risk Analysis of Chemicals in Food in Hong Kong (China). These centres are available as a technical resource to PICs when they have no further options in the Region. They may offer technical advice, however, at the request of the WHO Regional Office for the Western Pacific, and can also provide food testing services when the country does not have national capacity or in the event of an emergency. It is recommended that they are engaged in conjunction with the Regional Office in the event of an emergency.


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## Table 3. Comparative analytical capacities for microbial hazards in key laboratories in Australia and New Zealand

| Microbial hazards | New Zealand | | | Australia |
|---|---|---|---|---|
| | **Asure Quality** | **Cawthron Institute** | **Hill Laboratories** | **National Measurement Institute** |
| Hepatitis A | NR | NR | NR | FrV |
| Norovirus | NR | NR | NR | NR |
| Rotavirus | NR | NR | NR | NR |
| *Bacillus cereus* | F* | F* | F* | F |
| *Bacillus cereus* enterotoxin | NR | NR | O | NR |
| *Campylobacter* spp | F* | F* | F* | NR |
| *Clostridium botulinum* | NR | NR | NR | F |
| *Clostridium perfringens* | F* | F* | F* | F$^{NATA}$ |
| Enteropathogenic *Escherichia coli* | F* | NR | NR | F$^{NATA}$ |
| Enterotoxigenic *Escherichia coli* | NR | NR | NR | NR |
| *Listeria monocytogenes* | F* | F* | F* | F$^{NATA}$ |
| *Salmonella* spp | F* | F* | F* | F$^{NATA}$ |
| *Salmonella* Typhi | NR | F* | NR | F$^{NATA}$ |
| *Shigella* | F* | F* | O | NR |
| *Staphylococcus aureus* | F* | F* | F* | F$^{NATA}$ |
| *S. aureus* toxin | NR | NR | O | NR |
| Verotoxigenic *Escherichia coli* | F* | NR | F* | NR |
| *Vibrio cholerae* | NR | F* | F* | FFP$^{NATA}$ |
| *Vibrio parahaemolyticus* | NR | F* | F* | FFP$^{NATA}$ |
| *Yersinia enterocolitica* | NR | NR | NR | NR |

**Abbreviations:**
*: accredited by IANZ; F: food; FFP= fish and fishery products; FrV: fruit and vegetables; FW: food and water; NATA: accredited by the National Testing Authority of Australia (NATA); NAU: reports not accredited to undertake; NR: not reported; O: outsourced to partner laboratory; W: water.

## Table 4. Comparative analytical capacities for chemical hazards in key laboratories in Australia and New Zealand

| Chemical hazards | New Zealand | | | Australia |
|---|---|---|---|---|
| | **Asure Quality** | **Cawthron Institute** | **Hill Laboratories** | **National Measurement Institute** |
| Arsenic (Inorganic) | NR | NR | NR | FFP$^{NATA}$ |
| Lead | FW* | F* | FW* | F$^{NATA}$ |
| Mercury | FW* | F* | FW* | F$^{NATA}$ |
| Cyanide | NR | NR | W* | F |
| Aflatoxin | DP* | NR | F | F$^{NATA}$ |
| Ciguatoxin | NR | NAU | NR | NR |
| Domoic acid | NR | FFP* | NR | FFP$^{NATA}$ |
| Histamine | FFP* | FFP* | NR | FFP$^{NATA}$ |
| Lipophilic shellfish toxins (Okadoic acid and related toxins) | NR | FFP* | NR | NR |
| Lyngbyatoxin | NR | FFP | NR | NR |
| Saxitoxin | NR | FFP* | NR | FFP$^{NATA}$ |
| Tetrodotoxin | NR | FFP* | NR | NR |
| Dioxins | NR | NR | NR | F$^{NATA}$ |
| Furans | NR | NR | NR | F$^{NATA}$ |
| PCBs | NR | NR | FW* | F$^{NATA}$ |
| Antimicrobial residues – nitrofuran | NR | NR | NR | F$^{NATA}$ |
| Organochlorine pesticide residues | NR | NR | FW* | F$^{NATA}$ |
| Organophosphorous pesticide residues | NR | NR | FW* | F$^{NATA}$ |
| Carbamate | NR | NR | NR | NR |
| Chloropropanol | NR | NR | NR | F$^{NATA}$ |
| Melamine | NR | F* | NR | F$^{NATA}$ |
| Cephalosporins, Sulfonamides, Tetracyclines, Flouroquinolones | NR | NR | Unspecified | Animal tissue/ meat, eggs, seafood, milk and dairy$^{NATA}$ |

**Abbreviations:**
*: accredited by IANZ; DP: dairy products; F: food; FFP: fish and fishery products; FW: food and water; NATA: accredited by NATA; NAU: reports not accredited to undertake; NR: not reported; W: water.

## Table 5. Comparative analytical capacities for microbial hazards in key laboratories in the Philippines, Singapore and the United States

| **Microbial hazards** | Philippines | Singapore | United States |
|---|---|---|---|
| | **SGS PHL** | **ALS SING** | **HSDOH** |
| Hepatitis A | FFP | NR | NR |
| Norovirus | NR | NR | NR |
| Rotavirus | | | NR |
| *Bacillus cereus* | F[AONS] | F* | |
| *Bacillus cereus* enterotoxin | NR | NR | |
| *Campylobacter* spp | | F* | NRF |
| *Clostridium botulinum* | | NAU | |
| *Clostridium perfringens* | F[AONS] | FW* | |
| Enteropathogenic *Escherichia coli* | NR | UD | |
| Enterotoxigenic *Escherichia coli* | | NAU | |
| *Escherichia coli* O157:H7 screen test | | | F[A2LA] |
| *Listeria monocytogenes* | F[AONS] | F* | |
| *Salmonella* spp | FW[AONS] | FW* | |
| *Salmonella* Typhi | NR | NR | NR |
| *Shigella* | F[AONS] | F* | |
| *Staphylococcus aureus* | FW[AONS] | FW* | |
| *S. aureus* toxin | NR | NR | NR |
| Verotoxigenic *Escherichia coli* | F | | |
| *Vibrio cholerae* | F[AONS] | F* | NR |
| *Vibrio parahaemolyticus* | | | NAU |
| *Yersinia enterocolitica* | NR | | NR |

**Laboratories:**
ALS SING: ALS Singapore; HSDOH: Hawaii State Department of Health; IEH: IEH Laboratories and Consulting Group of Washington State; SGS PHL: SGS Philippines.

**Abbreviations:**
*: accredited by Singapore's accreditation body (SAC-SINGLAS); A2LA: accredited by American Association for Laboratory Accreditation (A2LA); AONS: accredited but accreditation organization not specified; F: food; FFP: fish and fishery products; FW: food and water; NAU: reports not accredited to undertake; NR: not reported; NRF: reported for clinical but not food samples.

## Table 6. Comparative analytical capacities for chemical hazards in key laboratories in the Philippines, Singapore and the United States

| Chemical hazards | Philippines | Singapore | United States |
|---|---|---|---|
| | **SGS PHL** | **ALS SING** | **HSDOH** |
| Arsenic (Inorganic) | F[AONS] | NR[2] | W** |
| Lead | | FW* | W** |
| Mercury | | FW* | W** |
| Cyanide | NR | W* | NR |
| Aflatoxin | Nuts, nut products[AONS] | F* | NR |
| Ciguatoxin | NR | NR | NR |
| Domoic acid | NR | NR | NR |
| Histamine | FFP[AONS] | F* | NAU |
| Lipophilic shellfish toxins (Okadoic acid and related toxins) | NR | NR | NR |
| Lyngbyatoxin | NR | NR | NR |
| Saxitoxin | NR | NR | NR |
| Tetrodotoxin | NR | NR | NR |
| Dioxins | O | O | NR |
| Furans | O | O | NR |
| PCBs | W[AONS] | O | NAU |
| Antimicrobial residues – nitrofuran | FFP[AONS] | F* | NR |
| Organochlorine pesticide residues | F[AONS] | FW* | NAU |
| Organophosphorous pesticide residues | F[AONS] | FW* | NAU |
| Carbamate | O | NR | NAU |
| Chloropropanol | NR | F* | NR |
| Melamine | O | F* | NR |

**Laboratories:**
ALS SING: ALS Singapore; HSDOH: Hawaii State Department of Health; IEH: IEH Laboratories and Consulting Group of Washington State; SGS PHL: SGS Philippines.

**Abbreviations:**
*: accredited by SAC-SINGLAS; **: certified by the United States Environmental Protection Agency; AONS: accredited but accreditation organization not specified; DP: dairy products; F: food; FFP: fish and fishery products; FW: food and water; NAU: reports not accredited to undertake; NR: not reported; W= water.

2. Analysis for total arsenic only.

# 3.4

## Sample collection requirements for referral laboratories

Prior to initiating any sampling processes, it is important to consider a number of factors that influence the way food may need to be sampled. These include the purpose of sampling, the type and homogeneity of the hazard in the food or water being sampled, the capacity of the hazard to interact with sample equipment, the instability of the hazard over time, and the training of personnel collecting and packing the samples.

Referral laboratories should be consulted prior to sampling to ascertain sample volume requirements, storage temperature and conditions, time limits that may apply for certain samples and what information must be supplied with samples. Food samples that may be appropriate for collection and testing include raw foods and ingredients, leftover foods, prepared meals or unopened packaged foods. Consideration should be given to sample foods that are known to be associated with the pathogen of interest and foods that are expected to support the survival and/or growth of microorganisms. Environmental samples such as food containers or swabs may also aid in investigations; however, referral laboratories should be consulted prior to samples being collected. Consultation with referral laboratories prior to sampling is recommended to ensure correct sampling procedures are followed. Some laboratories may also offer technical assistance and guidance for food safety officers. International standards ISO/TS 17728:2015, ISO 17604:2015 and ISO 18593:2018 can also be referred to for technical guidance on food sampling and carcass and surface sampling, respectively. For information on water sampling, refer to ISO 19458:2006 for microbiological analysis or the ISO 5667 series for all other water sampling technical requirements.

### 3.4.1 The type and homogeneity of the hazard

The type and homogeneity of a particular hazard in food and water will impact on the sampling process. Some mycotoxins, for example, are not homogeneously distributed in food and it would require a very large sample size in order to obtain a reasonable estimate of their concentration. This fact is also reflected in some countries' regulations on sampling of aflatoxins. For example, the United States Department of Agriculture requires three 22-kilogram laboratory samples to be examined, while the European Union requires one 30-kilogram laboratory sample for finished peanuts sold for direct human consumption (Food and Agriculture Organization of the United Nations, 2004).

Not only is sample size important but it is also essential to determine what type of sample to collect. For example, if a Pacific food authority is concerned about fish deaths from poisoning, it is considered good practice to include not only dead fish but also samples from fish that are still living but showing signs of ill health. It is also useful to collect tissues that can be used to assess whether toxic contaminants are the cause of a fish kill. Tissues will vary between and within species, such as size

and colour. The primary tissues to be collected for marine toxins typically include the gills, liver, intestines and muscle as marine toxins concentrations are often highest in the gut and liver, lower in kidneys and gonads, and the lowest in muscle tissue (Drobac et al., 2013).[3]

However, when a food poisoning event associated with ciguatoxin occurs, it is also necessary to recognize that ciguatoxins are understood to be concentrated in the liver, roe, head and other viscera of the fish, so it may be useful to also include these samples where ciguatoxin is the suspect toxin.

### 3.4.2 Packaging requirements

It is particularly important that authorities make sure that the way in which they pack the sample ready for transportation to a referral laboratory is optimal in ensuring the sample arrives at the receiving laboratory in a state that is analysable and accurately reflects the food at the time of sampling. The basic principle that applies in sampling is that storage and transportation must not alter the sample in any significant way – whether through contamination, loss, deterioration or other means. This is particularly true where analyses are to be conducted for substances that may deteriorate or change with time, such as certain pesticides, microbial populations or sulfur dioxide levels. It may be that a particular laboratory will not accept a sample that has reached the laboratory after a significant delay because of these possible changes. This aspect of the sample collection process can be particularly challenging for certain PICs particularly if samples are to cross international borders or travel long distances. Samples must be packaged to current International Air Transport Association (IATA) requirements if they are to clear customs when entering another country.

The packaging material into which a sample is placed may itself impact on the level of hazard over time. For example, plastic containers can alter the polycyclic aromatic hydrocarbon (PAH) content of the sample as the hydrocarbon can absorb onto the surface of the container, resulting in a laboratory result identifying a lower level in the sample than was present at the time of sampling. It is therefore essential that the sample does not come in contact with plastic. This might mean using an alternative container, altogether or packing the sample in material such as aluminium foil to isolate it from any contact with plastic (Šimko et al., 2006).

The packaging of food samples is also critical in assessing the level of microbial contamination in the food from which the sample was drawn. Bacteria are particularly susceptible to environmental change during transport. Bacteria can grow during the period between sample collection and analysis, which would ultimately provide an overestimated result. Bacteria can also be susceptible to chlorine in water samples, producing an underestimated result due to die-off.

3. Detailed guidance on collection of species associated with a fish kill is provided by the Queensland Department of Environment and Heritage Protection (Australia) at: https://www.ehp.qld.gov.au/water/monitoring/sampling-manual/pdf/biological-assessment-fish-collection-and-the-dissection-for-the-purpose-of-chemical-analysis-of-tissues.pdf.

It is best to keep frozen food between 0 °C and –15 °C or chilled and fresh food between 1 °C and 8 °C. It is essential that sufficient ice packs and packing are included in a cool box to ensure these temperature ranges are maintained. To achieve this, chilled or frozen samples should be placed in cool boxes, gel ice should be placed between the inner and outer packaging, and, where necessary, gel ice should also be placed between the secondary and outer packaging. It is always good practice to monitor the temperature of the samples at all times during transport through the use of calibrated, measuring equipment such as a data logger. This avoids future problems regarding suggestions that the food decayed after being sampled.

In a situation where a hazard may decrease in levels due to inhibitory contaminants in the sample itself, such as the presence of chlorine in a water sample, a preservative should be added to the sampling container to neutralize the effects of the inhibitor. In water, added sodium thiosulfate (at a final concentration of 0.01%) neutralizes the microbiocidal effects of chlorine. For chemical parameters other chemicals can be added or the pH can be adjusted to aid in preserving samples. In some situations, well water samples can be salted with a pre-measured amount of table salt to prevent biodegradation of some chemical parameters. Also, when analysing for some pesticide compounds in food or water, the sample may require freezing at –10 °C or subfreezing temperatures to –70 °C (dry ice). In these cases, a polycarbonate, polypropylene or polyethylene bottle may be appropriate.

Samples must be packaged securely when they are shipped to a referral laboratory. This is even more important when sending the sample through a third party, such as a commercial carrier. Containers must be designed to protect samples against crushing forces, impacts and severe temperature fluctuations. Sufficient packaging should be used to prevent movement or breakage, and sample containers (for example, bottles, jars, cans, tubes, vials) should be watertight. Inner packaging, such as a strong sealed plastic bag, should be flexible and watertight and enclose each sample or group of samples of the same type, such as water or food, and outer packaging should be rigid and strong, for example, an ice box or cooler. Receiving laboratories will prescribe rejection criteria and may reject samples that are outside of these criteria, such as samples for microbiological testing that arrive outside of the specified temperature requirements.

### 3.4.3 Sample submission requirements

Some laboratories provide sample submission guidance online. Laboratories will also provide guidance on sample requirements such how they should be properly and legibly labelled with labels that resist being torn off sample containers and are easily read. It is relatively common for laboratories to refuse to accept samples with leaking or cracked packaging and illegible or incomplete accompanying information. Referral laboratories will generally not accept samples that are not part of the submission form. Referral laboratories will also provide guidance on what official paperwork should accompany the sample to facilitate importation and transportation to the laboratory. These requirements are also often reinforced by logistics service suppliers.

The completion of necessary paperwork is essential for a successful sample submission. This usually means that the sample is accompanied by: a description of the contents; details of the country of origin (not necessarily the country it was shipped from); contact details of the shipper; a letter regarding the presence of pathogens (if present); relevant import permits; and an invoice with a value for customs purposes or no commercial value samples for in vitro analysis. Copies of instructions, shipping manifest or container inventory, chain of custody and any other paperwork enclosed within a shipping container should be safeguarded by placing one copy inside the package and a second copy in a robust, clear plastic bag, marked "Attn. Biosecurity/Customs" and attached securely to the outside of the package.

It is important to note that laboratories will not accept responsibility for the safety or integrity of samples until they are received at the facility. Therefore, it is crucial to know a laboratory's routine hours of operation and whether they operate on weekends and on holidays.

## 3.5

## Sample transportation to referral laboratory

To maintain the integrity of food samples prior to analysis, they must be dispatched to a laboratory as soon as possible after collection. Therefore, a number of key transportation factors need to be considered when assessing the suitability of a referral laboratory, including:

- working hours for both authorities collecting samples and laboratories receiving samples;
- the optimum time for authorities to collect samples for better coordination with flight departures;
- the timing of departure and arrival of flights;
- the diversity of airlines servicing a particular location;
- the frequency of airlines servicing a particular location;
- flight duration and the number and timing of stopovers;
- the confidence of authorities in any airline's scheduling; and
- the ability to maintain the cold chain at all times, where necessary.

Where possible, food safety authorities need to be aware of the optimum time to collect a sample, and the likely time delay to transport it to a laboratory in any given country. Therefore, it is crucial to understand optimal transportation routes. To illustrate this, the Solomon Islands Competent Authority has chosen the IAS in Fiji to undertake selected water analyses and the Cawthron Institute and AsureQuality in New Zealand to undertake analyses of fish. As stated earlier, these analyses are undertaken to facilitate the export of tuna from Solomon Islands to the European Union. The Competent Authority collects water samples on a specific day determined by the schedule of flights, and facilitates the loading of the samples on a domestic flight from Munda (the site of sample collection) to Honiara. There, officers of the Competent Authority pick up the samples and transfer them to the next international

flight to Nadi, Fiji. The clearing of customs and border security is then facilitated by their logistics agent and transported across the island of Viti Levu to the capital Suva where they are received by the IAS the following morning, around 22 to 24 hours after the sample was collected. The sample is checked for temperature at the receiving point. The Competent Authority's fish samples are likewise collected in Munda, transferred in Honiara, transferred again in Nadi and then handled by their selected logistics agent in New Zealand, arriving at the particular laboratory in New Zealand generally within 48 to 72 hours, subject to no delays at biosecurity on arrival in New Zealand.

The IAS in Fiji is also well placed to act as a referral laboratory for Kiribati, Samoa, Tonga, Tuvalu and Vanuatu as flights service these destinations and often arrive while the laboratory is still open to receiving samples. In contrast, flights that arrive in the country of the referral laboratory in the evening mean the samples will not reach the laboratory until the next morning at the earliest in most situations. Because of regular flights departing from Nadi International Airport, the referral laboratories in New Zealand are also suitable for use by food safety authorities in Kiribati, Samoa, Tonga and Tuvalu. In addition, Cook Islands, Tonga and Vanuatu also have regular direct flights of 3 to 5 hours duration to Auckland via Air New Zealand and Air Vanuatu. The National Measurement Institute in Australia is also readily accessed by all these PICs through Nadi International Airport. Samoa's SROS is an alternative referral laboratory benefiting from direct flights between the gateway Nadi International Airport and Samoa. In addition, the airlines offer good links with American Samoa and Tonga.

In the Federated States of Micronesia, each state is linked to each other as well as Guam, the Marshall Islands and Hawaii by only one carrier, United Airlines. Flights from Pohnpei to Honolulu in Hawaii can take around 9 to 10 hours on some days, while on others it can take 23 to 40 hours. This illustrates the importance of timing the collection of samples to minimize the time between sampling and analysis. Despite this great variability, both Guam and Hawaii provide particularly useful transportation hubs for the USAPI. If samples are to be shipped to other American states, there will be additional transportation time required. However, there will also be additional carriers that might be worth considering.

### 3.5.1 Chain of custody from sampling through analysis

As there will be many individuals and organizations involved from the time of sampling to analysis it is important to ensure the integrity of the sample through these multiple contacts, a complete chain of custody (security, accountability and integrity) must be in place. This means that anyone with physical custody of the sample, from initial collection to final delivery to the laboratory, must sign the sample into custody and again upon relinquishment, with date and time in both instances. This will include the person sampling, the agent receiving the sample for transport, the person picking it up after transport, and the person receiving it at the laboratory. In addition, laboratories should have a chain of custody process that meets the needs of customers and includes a receipt that follows the sample through the laboratory. Discussions between the laboratory and the customer regarding chain of custody should occur prior to sampling.

As a general rule, all signatures should be made on the original form and no original signatures should be made on a copy of the original form.

In some instances, the chain of custody process may also require the samples to be secured with a security seal, providing tamper evidence. The security seal is placed on the inner layer of packaging, thus allowing transport and customs staff to access paperwork and also inspect the sample if necessary. Security seals are then checked at the referral laboratory and any evidence of tampering is recorded and must be reported immediately.

### 3.5.2 Utilizing customs brokers and a logistics supplier

Sending samples for analysis to overseas referral laboratories is more than just moving small quantities of cargo from the local airport to a receiving laboratory in another country as it is essential that the sample integrity is maintained along the chain of the relocation process. It is crucial that the agent offers a comprehensive range of services that include trucking, warehousing, refrigeration, collection and delivery services, and air freight forwarding, if necessary. To facilitate the movement of the samples with confidence, it is important to consider partnering with a logistics service supplier that has significant experience in the movement of samples or goods in general. In this regard, it is necessary to select a logistics service supplier that applies ISO-9001 quality management. This is one of the biggest challenge for PICs as resources are limited and the high cost of shipping can be a deterrent for referring samples. Also, logistics suppliers do not have a presence in all PICs.

When moving samples between countries, it is essential to utilize the services of a customs broker. Customs brokers are trained and licenced to facilitate the importation of goods into the receiving country under applicable laws for importers. In most countries, these are the only persons authorized by the tariff laws to act as agents for importers in the transaction of their customs business. Customs brokers are private individuals or firms licenced to prepare and file the necessary customs entries, arrange for the payment of duties, take steps to obtain the release of the goods in custody of customs and border protection agencies, and otherwise represent their clients in customs matters. To avoid costly delays, compromised samples and fines or penalties, it is beneficial if the logistics services supplier can also efficiently facilitate customs and security clearances.

Additional parameters to be considered in logistics supplier selection include the importance of the service provider being an IATA-accredited logistics service supplier with staff who are aware of regulations from all government agencies, ministries or bureaus that may apply to ensure the sample reaches the laboratory in a timely manner.

In the United States, the logistics service supplier should also be able to provide a Transportation Security Administration (TSA) Certified Cargo Screening Facility (CCSF). In other countries to which samples may be transported, the presence of approved screening or transitional facilities is also frequently an essential

requirement. Additionally, a logistics services supplier should be able to assist with the preparation and submission of any necessary post entry corrections to ensure accuracy and compliance and facilitate the samples moving as swiftly as possible to the receiving laboratory. Client confidence in the integrity and whereabouts of the samples is enhanced by the application of unique tracking numbers that allow the client to regularly track the location of the samples along the supply chain. Referral laboratories do not collect samples from the airport, and it is therefore essential that the partner agency is also able to provide efficiency and consistency in transporting clinical, food or water samples to the destination laboratory. For example, the selected partner agency of the Solomon Islands Competent Authority for referral laboratories in New Zealand is DSV Air and Sea Limited. DSV is able to facilitate customs and security clearance at Auckland International Airport and deliver samples locally to a laboratory in Auckland as well as forward by road or air other samples to a laboratory in Nelson. This network is essential to provide certainty to the samples' chain of custody and to minimize transportation costs.

Numerous IATA-accredited logistics suppliers that can be found online include Williams and Gosling (for Fiji); TTI SDV (based in New Caledonia for the French territories and France); and the more broadly known DHL Express Limited; DHL Global Forwarding Limited; DSV Air and Sea Limited, Marken and TNT Express Worldwide Limited. These and IATA-accredited alternatives can be found at: https://www.iata.org/en/publications/directories/cargolink/directory.

## 3.6

## Border control and biosecurity procedures for samples

Border control and biosecurity processes in the Pacific and surrounding areas may vary from country to country or area to area depending upon associated national laws, regulations and standards. It is therefore important to understand the individual border control procedural requirements for submitting samples to a referral laboratory overseas prior to submission.

While most countries' border control and biosecurity authorities will attempt to make the information regarding the national import and biosecurity requirements available to all importers, it can still be a complex process to identify how they apply to a food, water or other samples being transported internationally for analysis.

In relation to biosecurity requirements, many referral laboratories will facilitate a potential client's submission of samples by making their import permits available online, but some laboratories prefer to discuss with clients their specific needs regarding analyses prior to identifying the optimum import permit to be utilized by the laboratory for the import of specific samples. This may be necessary as the capacity of laboratories to import certain samples may differ based upon the laboratory's facilities and type of approval awarded to the laboratory by biosecurity authorities.

In addition to import permit requirements, it is also important to recognize that even with a permit there will be differences in how customs, border protection and biosecurity officers will treat samples upon arrival in different countries to ensure compliance with the conditions of the permit to import. These differences may be based upon legislation, various national regulatory priorities or upon risk analysis.

Generally, samples must be stored and used at the facility in accordance with a quality operating system approved by the relevant authority of the facility and must not leave the facility without further authorization from the appropriate authorities. Commonly, biosecurity requirements will also apply to any material remaining after analysis and it is likely obligatory that it be incinerated/autoclaved for disposal and not available to the client for subsequent analysis.

The diversity in biosecurity requirements is perhaps best illustrated with water samples. The Biosecurity Authority of Fiji (BAF) and authorities in the Philippines will allow the import of water samples properly labelled as being for analysis without a prior need to issue a permit for the samples, while the Singapore Food Agency (SFA) does not require a licence for water sample testing. The agency will release water samples to a referral laboratory based on a letter from the laboratory to the SFA identifying the purpose of the testing. In contrast, Australia's Department of Agriculture and New Zealand's Ministry for Primary Industries both require import permits to accompany water samples for analysis upon entry.

### 3.6.1 Submitting food samples to referral laboratories in Fiji and Samoa

In Fiji, plant and animal products are regulated by the Biosecurity Authority of Fiji (BAF). If samples are being submitted to the IAS in Fiji, the Institute does not have a standing import permit for food samples from various sources. It assists clients online by directing them to the BAF's website and will facilitate an import permit application, if necessary, and any fee for such an import permit application is added to the total laboratory charges. As stated previously, water samples may be directly sent to the Institute without an accompanying permit provided that they are labelled appropriately. Submitting food samples for analysis purposes only to Samoa must be submitted only after informing the SROS. Officers of the referral laboratory will then be able to ensure the timely movement of the samples across the border and their arrival at the laboratory for analysis.

### 3.6.2 Submitting food samples to referral laboratories in Singapore and the Philippines

In Singapore, food and water sample imports are regulated by the SFA. Laboratories such as ALS Singapore (ALS), must obtain a licence or permit for the import of each food sample consignment. While compliance with the Sale of Food Act and the Food Regulations is generally not required, the SFA may restrict or prohibit the import of any food from any country, territory or place, farm, or processing establishment, as appropriate. However, it is generally understood that a food sample will be analysed as required. The SFA may also, at any time, vary or

revoke the existing importation conditions on the permit holder. The laboratory will generally assist organizations submitting samples by making available a copy of their licence and will inform the SFA prior to the samples arriving in the country. Customs and the SFA also reserve the right to inspect the sample and its accompanying permit as required.

In the Philippines, it is important to note that different agencies regulate different foods. However, the Customs Modernization and Tariff Act permits, unless otherwise provided by law or regulation, all goods to be freely imported into the Philippines without need for import permits, clearances or licences. While it prohibits any adulterated or misbranded food or goods for human consumption, food samples for analysis are not prohibited and may be imported without a permit. Still, samples should, according to SGS laboratories in the Philippines, be accompanied by a label declaring on the outside of the package, in the airway bill and on the accompanying invoice: "SAMPLE FOR TESTING PURPOSE ONLY". The commercial invoice should also provide a commercial value of US$ 1.0. In addition, for most food samples being submitted for analysis, the Food and Drug Administration Philippines has a list of laboratories it accredits to undertake a wide range of analyses. SGS Philippines is one of these laboratories. SGS also reports that it has an officer who travels to Guam approximately every three months to collect samples from clients in Guam and hand-carries those samples back to the Philippines for analysis. This might prove helpful for USAPI.

### 3.6.3 Submitting food samples and cultures derived from food samples to referral laboratories in Australia and New Zealand

In New Zealand, plant-based foods and water are regulated by the Plant Imports and Exports Group of the Ministry for Primary Industries with animal-based food regulated by the Animal Imports and Exports Group of the same Ministry.

If samples of food or water are being submitted to AsureQuality Limited in New Zealand, the laboratory supports potential clients with copies of its Auckland and Wellington laboratories' permits online at: https://www.asurequality.com/our-services/laboratory-testing/sample-submission/. For one of these permits, the Auckland laboratory is approved as a transitional facility under the standard 154.02.17 (Transitional Facilities for Biological Products) under the New Zealand Biosecurity Act, 1993. This permit allows the importation of water samples and food samples such as fresh, dried, and frozen fruit and vegetables, plant-based processed foods, nuts (processed, unprocessed and raw), noodles, rice, herbs and spices. The Auckland laboratory also has permits to import restricted biological products of animal origin including, but not limited to, meat, chicken, fish, dead shellfish, dairy, and egg and egg products. Both the Cawthron Institute and Hill Laboratories prefer to communicate directly with potential clients to identify an appropriate permit for the sample analysis and therefore do not make permits available online.
In Australia, food and water samples are regulated by the Department of Agriculture.

If the sample is being submitted to the National Measurement Institute in Australia, the Institute has been awarded a permit issued under the Biosecurity Act 2015 of Australia to import conditionally non-prohibited food samples, in multiple consignments from various sources and countries, but these samples exclude submission of fresh fruit and vegetables, raw nuts, whole grains, raw meat and raw egg. In addition, the same permit addresses water samples for chemical analysis only. Similarly, the Microbiological Diagnostic Unit Public Health Laboratory (MDU PHL) and Queensland Health Forensic and Scientific Services have been awarded import permits under the Biosecurity Act 2015. As these permits are subject to change over time, all Australian laboratories prefer to communicate with a potential client before providing the appropriate permit.

In addition to import permit requirements, all fresh fruit and vegetables in Australia and New Zealand may be expected to undergo a 100% inspection. In addition, any material considered to be a fruit fly host may have to undergo treatment, which will potentially compromise future laboratory analyses. For example, in New Zealand, such samples must be frozen until the core temperature has been held at (or below) −18 °C for a minimum of seven days. Biosecurity officers may want to ensure from documentation review that frozen samples have remained frozen. It is recommended that from a public health and biosecurity perspective, the referral of all samples to Australia, whether to the National Measurement Institute or another laboratory, should be communicated to the Australian Government Department of Health's Office of Health Protection via email to Health.Ops@health.gov.au, which is the designated National Focal Point under the International Health Regulations (2005).

If there is any uncertainty regarding the sample that is to be submitted, Pacific island authorities should first engage in discussion with the selected referral laboratory but can also contact the appropriate section of the relevant biosecurity authorities as outlined in the information above.

### 3.6.4 Submitting food samples for analysis to referral laboratories in the United States of America

When submitting samples of food for analysis to a referral laboratory located in the United States, it is important to understand that different agencies regulate the importation of different foods. The first agency with responsibility in the importation process is Customs and Border Protection (CBP) in the United States Department of Homeland Security. When entry is made with CBP, importers or their customs brokers (entry filer) will include the Harmonized Tariff Schedule (HTS) code among the other declarations in the entry. The HTS codes are flagged with indicators for guidance if the importation requires the involvement of the Food Safety and Inspection Service (FSIS) of the Department of Agriculture, the Animal and Plant Health Inspection Service (APHIS) or the Food and Drug Administration.

The FSIS regulates the import of meat, poultry and egg product samples destined for laboratory examination. This applies even if the food contains small amounts of meat, poultry and egg products. It is necessary to provide prior notification of the arrival of such samples, but these are not subject to FSIS import inspection requirements. The referral laboratory to which the sample will be submitted must, prior to importing the samples, notify FSIS using Form 9540-5 "Notification of Intent for the Importation of Meat, Poultry or Egg Product Samples for Laboratory Examination, Research, Evaluative Testing, or Trade Show Exhibition". The form should be submitted to FSIS, Recall Management and Technical Analysis Division Import Operations at importinspection@fsis.usda.gov.

Similarly, if the food sample is fish, seafood, a dairy product, a shell egg, fruit, vegetable, a food or feed ingredient, a food or feed additive, infant formula, a beverage (including alcoholic beverages and bottled water), a bakery good, snack food, candy, or canned food, the importer needs to provide the Food and Drug Administration prior notification of the arrival of such samples. Prior notice can be provided in one of two ways: (i) via the CBP Automated Broker Interface of the Automated Commercial System or (ii) the Prior Notice System Interface, which is available to individuals or companies who cannot, or choose not to, file through CBP.

Another concern arises if the sample originates in countries for which APHIS is applying animal health restrictions. Samples originating in countries with animal health restrictions will therefore require an APHIS permit prior to importation. If the samples are cooked beef products from a country where foot and mouth disease or rinderpest exists, and are accompanied with an APHIS Veterinary Services import permit, they will be subject to a CBP inspection only. If that import permit is not present, then the samples will be subject to FSIS import inspection requirements.

## 3.7

## Transporting infectious substances and viable cultures

As stated elsewhere in this guide, the capacity of PICs to identify cultures isolated from food, water and from patient specimens is relatively limited based upon information available at the time of the guide's development (with some important exceptions). However, some PICs have the capacity to isolate cultures from food and water and may wish to submit related samples for further identification to overseas referral laboratories. It is therefore important to also understand that different international and national regulations and fee structures for the transportation, importation and analysis apply to food and water samples and to viable cultures of pathogens.

The international regulations for the transport of infectious substances by any mode of transport are based upon the Recommendations made by the Committee of Experts on the Transport of Dangerous Goods, a committee of the United

Nations Economic and Social Council. These are reflected, for example, in the IATA Dangerous Goods Regulations that incorporate the International Civil Aviation Organization (ICAO) provisions and may add further restrictions. The ICAO rules and IATA Dangerous Goods Regulations provide significant guidance related to the storage, packaging, labelling and transportation of infectious substances, cultures and patient specimens during air transportation. Similarly, there is guidance on the movement of such samples via road, rail, sea and post. A comprehensive guidance on the movement of infectious substances is provided in the WHO publication *Guidance on Regulations for the Transport of Infectious Substances 2017–2018*. This guide for the PICs does not set out to reproduce that guidance but rather relies on health and food safety authorities accessing such information independently.

National regulations also differ in how food and water samples are treated compared to cultures isolated from food and water samples. For example, in New Zealand, the import permit for bacterial cultures isolated from food and drink samples is subject to special conditions addressed under the Hazardous Substance and New Organisms Act 1996. In Australia, there is specific legislation referring to standard laboratory microorganisms (including viruses) and an associated list. Here too, there are specific conditions laid out, including that organisms are in a pure culture; that IATA and domestic requirements concerning the safe handling, transport and labelling of biological material and AS/NZS 2243 Safety in Laboratories standards are met; and that the Office of the Gene Technology Regulator requirements are complied with.

One import permit is provided for the chemical analysis of these food samples subject to a particular import health standard while the other is provided for microbiological analysis to a laboratory approved as a containment facility under the standard 154.03.02 (Facilities for Microorganisms and Cell Cultures) under New Zealand's biosecurity legislation.

## 3.8

## CITES requirements related to specific food samples

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments with the aim of ensuring that international trade in specimens of wild animals and plants does not threaten their survival, with 183 parties having signed the agreement to date. While the Convention refers to international trade of certain species, the term "trade" includes export, re-export, import and "introduction from the sea", which means "the transportation into a State of specimens of any species which were taken in the marine environment not under the jurisdiction of any State". Thus, a species collected within the marine environment under the jurisdiction of a given state would not fall under CITES regulations unless it was exported from that state, whereas CITES would apply if it had been taken in a marine environment not under the jurisdiction of a given state. In the former situation, national legislation would be the principal

legislation applied to the legality of harvesting and consuming any listed species within a state. In the latter situation, the Convention and any additional national legislation would apply.

If a health or food safety authority takes a sample from any fauna or flora addressed under the Convention for analysis purposes, it is essential that the authority is aware of and understands the requirements of CITES. While it may seem unlikely that such a sample needs to be collected and sent for analysis, it should be recognized that there are animals (and perhaps even flora) mentioned under this agreement that are commonly consumed in the Pacific. For example, sea turtles (of the Cheloniidae spp.) remain prestigious, desirable and ceremoniously important delicacies for human consumption in many parts of the Pacific. Similarly, fruit bats such as Pteropus mariannus may be considered a delicacy in some Pacific communities. Both animals are included in the CITES list of species that are the most endangered among CITES-listed animals and plants and the Convention prohibits international "trade" in specimens of these species and regulates the movement of "any recognizable part or derivative of" the specimen for research purposes.

To illustrate a situation where a health or food safety authority may need to submit such samples to an overseas referral laboratory, there have been several reports where the consumption of turtle meat has been associated with chelonitoxism in general and lyngbyatoxin poisoning more specifically. For example, in 2010, the sudden death of six people and 95 cases of people becoming ill on Murilo Atoll in Chuuk State in the Federated States of Micronesia was associated with the mass consumption of a soup and other foods derived from a hawksbill turtle (Eretmochelys imbricata), which is a critically endangered sea turtle belonging to the Cheloniidae spp. (Pavlin et al., 2015). Another example is provided by French Polynesia where a 2007 report noted that one person had died, and 18 other family members had been involved in a mass poisoning after the consumption of turtle meat (Fussy et al., 2007). A third example is provided by a 2013 outbreak in the Philippines where four people died and 64 others became ill after consuming turtle meat (Ventura et al., 2015). In such situations, there is an urgency for samples of any remaining food, turtle body parts and clinical specimens to be submitted overseas for analysis to better identify the toxic agent. Consequently, it is optimal if health and food safety authorities are aware of and understand any CITES requirements related to the collection, documentation, transportation and submission of samples for analysis. The three appendices to the CITES agreement prescribe different levels of approval by both authorities in the country or area where the samples are collected and where the sample is to be analysed. For example, if the specimen is listed in Appendix I of the CITES agreement, it is expected that the following export and import requirements are complied with:

- An export permit is required in which it is at least clear that: (a) a scientific authority of the state of export has advised that such export will not be detrimental to the survival of that species; and (b) a management authority of the state of export is satisfied that the specimen was not obtained in contravention of the laws of that state for the protection of fauna and flora.
- An import permit is required in which it is at least clear that: (a) a scientific

authority of the state of import has advised that the import will be for purposes which are not detrimental to the survival of the species involved; and (b) a management authority of the state of import is satisfied that the specimen is not to be used for primarily commercial purposes.

Article VII of the Convention provides for a number of exemptions to the general prohibition but none appear relevant to food samples for analysis. It is unclear if the sample being submitted does not constitute "a recognizable part or derivative of the specimen" and what permit requirements are needed.

The relevant scientific authorities and management authorities of each participating state are listed under https://cites.org/eng/cms/index.php/component/cp.

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# ANNEXES

# ANNEX 1

## Pacific islands analytical capacity

*Please note: Contract details provided in the section were correct at the time of reporting; however, they are subject to change.*

# 1. American Samoa

## 1.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | Environmental Protection Agency | Colilert-18™ | United States EPA certified |
| Faecal coliforms | | | | |

## 1.2 Capacity to detect microbiological hazards

No capacity at time of review

## 1.3 Capacity to detect chemical hazards

No capacity at time of review

## 1.4. Laboratory identification

| | |
|---|---|
| **Environmental Protection Agency** | **Laboratory Address:** P.O. BOX PPA, Pago Pago, AS 96799 |
| | **Contact Point:** Daystar Parker, Laboratory Chief |
| | **Email:** daystar.parker@epa.as.gov |
| | **Phone:** (684) 633-2304 |
| | **Generic Contact Point:**info@epa.as.gov |
| | **Alternative Phone:** (684) 6331200 / (684) 6331222 ext. 630 |

## 1.5 Food sampling and testing

Drinking water testing is routinely undertaken by the EPA. Food testing is not conducted.

## 1.6 Current referral system for samples related to foodborne hazards

Samples associated with public health concerns are referred to the United States of America via Hawaii Department of Health or Centers for Disease Control and Prevention (CDC).

# 2. Cook Islands

## 2.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms and *Escherichia coli* | Drinking water | TTV headquarters | Quanti tray (Colilert) | Not accredited |
| Heterotrophic plate count | | | SimPlate | |

## 2.2 Capacity to detect microbiological hazards

No capacity at time of review

## 2.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Chlorine (Total and free) | Drinking water | TTV headquarters | Hach Method 10245, 8167, 10069, 8370, 10070, 10014 | Not accredited |
| Aluminium | | | Hach Method 8012, 10215 | |
| Manganese | | | Hach Method 8149 | |
| Iron | | | Hach Method 10249 | |
| Chloramine | | | Hach Method 10200 | |
| Nitrogen | | | | |
| Ammonia (Free) | | | | |
| Copper | | | Hach Method 10238 | |

## 2.4 Laboratory identification

| | |
|---|---|
| **2.4.1 Public Health and Water Authority Department (To Tatou Vai)** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** P. O. Box 965, Rarotonga, Cook Islands |
| | **Contact Point:** Naomi Coatsworth – Taripo, Water Treatment Manager |
| | **Email:** naomi.taripo@cookislands.gov.ck |
| | **Phone:** (682) 57227 |
| | **Alternative Contact Point:** Karalaini Lomaiviti, Laboratory and Inventory Supervisor karalaini.lomaiviti@cookislands.gov.ck |

## 2.5. Food sampling and testing

No routine food sampling and testing is currently undertaken except for drinking water.

# 3. Fiji

## 3.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | Institute of Applied Sciences | Most Probable Number (MPN) and Membrane Filter | Accredited (by IANZ) |
| | | Mataika House | MPN and Membrane Filter | Not accredited |
| | | National Water Quality Laboratory | Standard Methods for the Examination of Water and Wastewater, 23rd Edition; Methods 9222B | Accredited (by IANZ) |
| Faecal coliforms | Drinking water | Institute of Applied Sciences | MPN and Membrane Filter | Accredited (by IANZ) |
| | | Mataika House | MPN and Membrane Filter | Not accredited |
| | | National Water Quality Laboratory | Standard Methods for the Examination of Water and Wastewater, 23rd Edition; Methods 9222D. | Accredited (by IANZ) |

## 3.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Bacillus cereus* | Food and water | Institute of Applied Sciences | Laboratory utilizes enrichment, isolation, enumeration and confirmatory procedures | Accredited (by IANZ) |
| *Campylobacter* spp *(jejuni* or *coli)* | | | | Accredited (by IANZ) |
| *Clostridium perfringens* | | | | Can detect in food and water but no controls |
| Enteropathogenic *Escherichia coli* | | | | Accredited (by IANZ) |
| *Listeria monocytogenes* | | | | Can detect with control cultures |
| *Salmonella* spp | | | | Accredited (by IANZ) |
| *Salmonella* Typhi | | | | Accredited (by IANZ) |
| *Staphylococcus aureus* | | | | Accredited (by IANZ) |
| *Vibrio parahaemolyticus* | | | | Can detect with control cultures |
| *Escherichia coli* | Drinking water | National Water Quality Laboratory | Standard Methods for the Examination of Water and Wastewater, 23rd Edition; Methods 9222H | Accredited (by IANZ) |

## 3.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Arsenic | Water | Institute of Applied Sciences | Not specified | Not specified |
| Histamine | Fish and fishery products | | High Performance Liquid Chromatography | Accredited (by IANZ) in fish and fishery products |
| Lead | Food and water | | Graphite Atomic Absorption Spectrophotometry | Accredited (by IANZ) in fish and fishery products |
| Mercury | | | Hydride – Atomic Absorption Spectrophotometry | Accredited (by IANZ) in fish and fishery products |
| Organochlorine pesticide residues | Food | | Gas Chromatography – nitrogen phosphorus detection/electron capture detection | Accredited (by IANZ) |
| Organophosphorous pesticide residues | | | Gas Chromatography nitrogen/phosphorus detection | Accredited (by IANZ) |
| Persistent organic pollutants | Water | | Gas Chromatography | Accredited (by IANZ) |

## 3.4 Laboratory identification

| | |
|---|---|
| **3.4.1 Institute of Applied Sciences** | **Laboratory Address:** Institute of Applied Sciences Faculty of Science and Technology Private Bag, Laucala Campus, Suva, Fiji |
| | **Primary Contact Point:** Vincent Lal |
| | **Email:** vincent.lal@usp.ac.fj |
| | **Phone:** (679) 323-2965 |
| | **Fax:** (679) 323-1534 |
| | **Alternative Contact Points:** Arun Pande – arun.pande@usp.ac.fj; Mereoni Gonelevu – mereoni.gonelevu@usp.ac.fj; Karalaini Rabo – karalaini.rabo@usp.ac.fj |
| **3.4.2 Mataika House** | **Laboratory Address:** Building 30, Tamavua Hospital P.O. Box 1634, Suva, Fiji |
| | **Contact Point in Water Laboratory:** Taina Tamanitokula, Laboratory Technician |
| | **Email:** taina.tamanitokula@govnet.gov.fj |
| | **Phone:** (679) 332-1066 |
| **3.4.3 National Water Quality Laboratory** | **Laboratory Address:** Water Quality Monitoring Laboratory and Environment Unit Kinoya, Fiji |
| | **Contact Point:** Mr Sher Singh, Supervisor |
| | **Email:** ssingh@waf.com.fj |
| | **Phone:** (679) 705-2018 |
| | **Authority Mailing Address:** Water Authority of Fiji (WAF), Nasinu Road, Suva, GPO Box 1272 |

## 3.5 Food sampling and testing

Food sampling and testing is currently being undertaken routinely for fish and fishery products and drinking water only and in response to complaints and outbreaks.

## 3.6 Current referral system for samples related to foodborne hazards

### 3.6.1 Food Unit, Ministry of Health

| | |
|---|---|
| **Hazards and Matrices Routinely Submitted to Referral Laboratories** | • Dioxins – water<br>• Histamine – fish<br>• PAH – water<br>• PCBs – water<br>• Microbiological tests – water and ice |
| **Commonly Used Referral Laboratories** | • Institute of Applied Sciences, University of the South Pacific, Private Mail Bag, Laucala Campus, Suva, Fiji (Microbiological tests for water and ice)<br>• AsureQuality Limited, 131 Boundary Road, Blockhouse Bay, Auckland, P.O. Box 41, Shotland Street, Auckland, New Zealand, 1140<br>• Cawthron Institute, 98 Halifax street East Nelson, New Zealand, 7010 |
| **Availability of IATA Certified Shipper(s)** | Existing samples do not require it |
| **Courier Commonly Used in Sample Referral** | DHL (on contract to the Food Unit) |
| **Airline(s) Commonly Used in Sample Referral** | • Air New Zealand<br>• Fiji Airways |
| **Availability/Type of Refrigerant(s) in Transport** | Ice box with adequate gel ice |

# 4. French Polynesia (Polynésie Française)

## 4.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | CAIRAP | Standard Produced by the French Association for Standardization (NF) EN ISO 9308-1 BRD 07/20-03/11 | COFRAC 1-1426 |
| *Escherichia coli* | | ILM-LHBE | NF EN ISO 9308-1 (T 90-414) | COFRAC 1-1610 |
| Total coliforms | Food | CAIRAP | NF V 08-050 | COFRAC 1-1426 |
| | | ILM- LHBE | 3M 01/02-09/89 A | COFRAC 1-1610 |
| Faecal (thermo-tolerant) coliforms | | CAIRAP | NF V 08-060 | COFRAC 1-1426 |
| | | ILM- LHBE | NF V 08-060 | COFRAC 1-1610 |

## 4.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Presumptive *B. cereus* | Food | CAIRAP | NF ENISO 7932 French Standard Related To *Bacillus cereus* (BKR) 23/06-02/10 | COFRAC 1-1426 |
| | | ILM- LHBE | NF ENISO 7932 BKR 23/06-02/10 AES 10/10-07/10 | COFRAC 1-1610 |
| *C. perfringens* | | CAIRAP | NF EN ISO 7937 | COFRAC 1-1426 |
| | | ILM- LHBE | Not accredited to undertake | COFRAC 1-1610 |
| *Escherichia coli* (Beta glucuronidase positive) | | CAIRAP | NF ISO 16649-2 | COFRAC 1-1426 |
| | | ILM- LHBE | Not accredited to undertake | COFRAC 1-1610 |
| *L. monocytogenes* | | CAIRAP | NF EN ISO 11290-1/2 BKR 23/02-11/02 BKR 23/05-12/07 | COFRAC 1-1426 |
| | | ILM- LHBE | BIO[4] 12/11-03/04 | COFRAC 1-1610 |
| *Salmonella* spp | | CAIRAP | NF EN ISO 6579BRD 07/11-12/05 | COFRAC 1-1426 |
| | | ILM- LHBE | BIO 12/32-10/11 | COFRAC 1-1610 |
| *S.* Typhi | | CAIRAP | NF EN ISO 6579BRD 07/11-12/05 | COFRAC 1-1426 |
| | | ILM- LHBE | Not accredited to undertake | COFRAC 1-1610 |
| Coagulase positive *Staphylococcus* | | CAIRAP | NF EN ISO 6888-2 Nordval n°049 | COFRAC 1-1426 |
| | | ILM- LHBE | BIO 12/28-04/10 | COFRAC 1-1610 |
| *Staphylococcus* enterotoxin | | CAIRAP | – | |
| | | ILM- LHBE | VIDAS®AOAC 2007/06 | COFRAC 1-1610 |
| *Salmonella* spp | Water | CAIRAP | NF EN ISO 6579BRD 07/11-12/05 | Not accredited |
| | | ILM- LHBE | BRD[4] 07/06-07/04 | COFRAC 1-1610 |
| Pathogenic *Staphylococcus* | | CAIRAP | NF T 90-412 | COFRAC 1-1426 |
| | | ILM- LHBE | XP T[4] 90-412 | COFRAC 1-1610 |

4. A European standard reference.

## 4.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | CAIRAP (Methodology) | National/International Accreditation |
|---|---|---|---|---|
| Aflatoxins | Food | CAIRAP | Neogen kit | Not accredited |
| | | ILM-LHBE | Not specified | |
| Histamine | Fish and fishery products | CAIRAP | Reveal Neogen | Not accredited |
| | | ILM-LHBE | AOAC 977-13 modified | COFRAC 1-1610 |
| Arsenic | Water | CAIRAP | NF EN 26595 | Not accredited |
| | | ILM-LHBE | Not accredited to undertake | |
| Lead | | CAIRAP | FD T 90-112 | Not accredited |
| | | ILM-LHBE | Not accredited to undertake | |
| Mercury | | CAIRAP | Atomic Absorption Spectroscopy (AAS) COLD VAPOR | Not accredited |
| | | ILM-LHBE | Not accredited to undertake | |
| Ciguatera | Fish, micro-algae, cyanobacteria, various species of marine invertebrates, and blood | ILM-LBM | Neuroblastoma cell-based assay and a fluorescent version of Receptor Binding Assay | There is currently no accredited methodology for this toxin group. The laboratory is a distinguished research laboratory with many publications on ciguatoxins[5,6,7] |

## 4.4 Laboratory identification

| | |
|---|---|
| **4.4.1 CAIRAP – Centre D'analyses Industrielles et de Recherche Appliquée pour Le Pacifique** | **Laboratory Address:** BP 14169, 98701, ARUE, Tahiti, French Polynesia |
| | **Contact Point:** Nathalie Charleux, Director |
| | **Email:** ncharleux@cairap.pf |
| | **Phone:** (689) 40 54 19 19 |
| | **Generic Email:** cairap@cairap.pf |

| | |
|---|---|
| **4.4.2 ILM – Institut Louis Malarde – Laboratory of Marine Biotoxins (LBM)** | **Laboratory Address:** B.P. 30, 98713 Papeete, Tahiti, French Polynesia |
| | **Contact Point:** Mireille Chinain, Dr.Sc.Head of Laboratory of Marine Biotoxins (ILM-LBM) |
| | **Email:** mchinain@ilm.pf |
| | **Phone:** (689) 40 41 64 58 |
| | **Fax:** (689) 40 41 64 06 |

| | |
|---|---|
| **4.4.3 ILM – Institut Louis Malarde – Hygiene, Biosecurity and Environment Laboratory (LHBE)** | **Laboratory Address:** B.P. 30, 98713 Papeete, Tahiti, French Polynesia |
| | **Contact Point:** Philippe Branaa, Head of Laboratory for Water and Food Safety (ILM-LHBE) |
| | **Email:** pbranaa@ilm.pf |
| | **Phone:** (689) 40 41 64 58 |
| | **Fax:** (689) 40 41 64 06 |

5. Hardison DR, Holland WC, McCall JR, Bourdelais AJ, Baden DG, Darius HT, et al. (2016). Fluorescent Receptor Binding Assay for Detecting Ciguatoxins in Fish. PLoS One. 11(4), e0153348. (https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0153348, accessed 1 December 2022)
6. Darius HT, Roué M, Sibat M, Viallon J, Gatti CM, Vandersea MW, Tester PA, Litaker RW, Amzil Z, Hess P, Chinain M. (2018). Tectus niloticus (Tegulidae, Gastropod), as a novel vector of ciguatera poisoning. Detection of Pacific ciguatoxins in toxic samples from Nuku Hiva Island (French Polynesia). Toxins. 10(1), 2 (1-22). ( https://www.mdpi.com/2072-6651/10/1/2, accessed 1 December 2022)
7. Viallon J, Chinain M, Darius HT. (2020). Revisiting the neuroblastoma cell-based assay (CBA-N2a) for the improved detection of marine toxins active on voltage gated sodium channels (VGSCs). Toxins. 12(5), 281. (https://www.mdpi.com/2072-6651/12/5/281, accessed 1 December 2022)

## 4.5 Food sampling and testing

Food sampling and testing, other than routine water sampling and testing, is currently undertaken for research and regulatory purposes in response to outbreaks and complaints only.

## 4.6 Current referral system for samples related to foodborne hazards

In relation to the analyses considered in this review, LHBE is authorized to refer samples to:

1. Hill Laboratories including Hill Laboratories – Hamilton site for chemistry; and Christchurch for drinking water chemistry, both accredited by IANZ;
2. Departmental Laboratory 31, Water-Veterinary-Air (LD31 EVA), from Haute-Garonne in Launaguet in France, accredited by COFRAC under the number 1-1104;
3. SAS LABEXIA in Quimper in France, accredited by COFRAC under the number 1-1410; and
4. Service Commun des Laboratoires – Massy, France, accredited by COFRAC under the number 1-0527.

In relation to the analyses considered in this review, CAIRAP is authorized to refer samples to:

1. EUROFINS IPL EST, accredited by COFRAC under number 1-0685; and
2. CARSO – Health Environment and Hygiene Laboratory, Lyon, France, accredited by COFRAC under the number 1-1531.

# 5. Guam

## 5.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | EPA | Colilert-18™ | US EPA certified |
| | | WERI | | |
| | | GWA | | |
| | | Guam Environmental Public Health | Not yet established testing programme | Not applicable |
| Faecal coliforms | Drinking water | EPA | Colilert-18™ | US EPA certified |
| | | WERI | | |
| | | GWA | | |
| | | Guam Environmental Public Health | Not yet established testing programme | Not applicable |
| Heterotrophic plate count | | WERI | SimPlate | US EPA Certified |

## 5.2 Capacity to detect microbiological hazards

No capacity at time of review (currently under development)

## 5.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Chlorine (Free and Total) | Drinking water | WERI | DPD / SM4500Cl.G | Not Accredited |
| Chloride | | | SM4500Cl-E/EPA 325.2 | Not Accredited |
| Nitrate | | | EPA 353.2 / SM4500-NO3.I | US EPA Certified |
| Nitrite | | | | US EPA Certification Pending |
| Orthophosphate | | | EPA 365.5 / EPA 365.1 / SM4500 P.G | Not Accredited |
| Silver | | | SM3111B | Not Accredited |
| Calcium | | | SM3111B | Not Accredited |
| Cadmium | | | SM3111B | Not Accredited |
| Copper | | | SM3111B | US EPA certified |
| Iron | | | SM3111B | Not Accredited |
| Manganese | | | SM3111B | Not Accredited |
| Magnesium | | | SM3111B | Not Accredited |
| Zinc | | | SM3111B | Not Accredited |
| Lead | | | SM3111B | Not Accredited |

## 5.4 Laboratory identification

| | |
|---|---|
| **5.4.1 Guam Environmental Protection Agency Laboratory** | **Laboratory Address:** 17-3304, Mariner Avenue Tiyan, Barrigada, Guam 96913-1617 |
| | **Contact Point:** Rudy Paulino |
| | **Email:** rudy.paulino@epa.guam.gov |
| | **Email:** rosemarytek@gmail.com |
| | **Phone:** (671) 300-4751 / 300-4752 |
| | **Staffing:** 8 laboratory staff who are all certified IATA shippers |
| **5.4.2 Water and Environmental Research Institute of the Western Pacific (WERI)** | **Laboratory Address:** University of Guam WERI,303 University Drive, UOG Station Mangilao, Guam, 96923 |
| | **Contact Point:** Mallary Nicole Duenas, Laboratory Manager |
| | **Email:** mnduenas@triton.uog.edu; weri.invoice@triton.uog.edu |
| | **Phone:** (671) 735-2688 |
| | **Fax:** (671) 734-8890 |
| **5.4.3 Guam Waterworks Authority Laboratory** | **Laboratory Address:** P.O. Box 3010 Hagatna, Guam, 96910 |
| | **Laboratory Administrator:** Jennifer Cruz, Utility Compliance Laboratory Administrator |
| | **Email:** jocruz@guamwaterworks.org |
| | **Phone:** (671) 300-6361 |
| **5.4.4 Guam Environmental Public Health Laboratory** | **Laboratory Address:** Environmental Public Health Laboratory, Division of Environmental Health Department of Public Health and Social Services, 123 Chalan Kareta, Mangilao, Guam 96913-6304 |
| | **Contact Point:** Thomas Nadeau, Chief Environmental Public Health Officer |
| | **Email:** masatomo.nadeau@dphss.guam.gov |
| | **Phone:** (671) 735-7221 |
| | **Fax:** (671) 734-5556 |
| | **Laboratory Staff:** Marilou O. Scroggs; Katherine U. Delmundo |
| **5.4.5 Guam Central Public Health Laboratory** | **Bureau of Communicable Disease Control (BCDC) Department of Public Health and Social Services (DPHSS) Address:** 123 Chalan Kareta Mangilao, Guam 96913 |
| | **BCDC Administrator:** Josephine O'Mallan |
| | **Email:** josephine.omallan@dphss.guam.gov |
| | **Phone:** (671) 735-7154 |
| | **Fax:** (671) 734-2104 |
| | |
| | **PPHSN LABNET Laboratory Designation Level:** Level 2 |
| | **Laboratory Administrator:** Anne Marie G. Santos, H, MT(ASCP) |
| | **Email:** annemarie.santos@dphss.guam.gov |
| | **Phone: (**671) 735-3601 |
| | **Fax:** (671) 734-2104 |

## 5.5 Food sampling and testing

Food sampling, other than routine drinking water testing, is currently undertaken in response to outbreaks and complaints only.

## 5.6 Current referral system for samples related to foodborne hazards

Samples associated with public health concerns are referred to the Hawaii Department of Health or US CDC.

# 6. Kiribati

## 6.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | Kiribati Medical Laboratory[8] | Quantitative Membrane Filtration | Not Accredited |
| | | Kiribati Public Health Laboratory | Qualitative Colilert-18™ | Not Accredited |
| Faecal coliforms and *E. coli* | Drinking water/ fresh water | Kiribati Medical Laboratory | Quantitative Membrane Filtration | Not Accredited |
| | Environmental with relevance to fish for export | | | Not Accredited |

## 6.2 Capacity to detect microbiological hazards

No capacity to detect microbiological hazards in food.

## 6.3 Capacity to detect chemical hazards

No capacity to detect chemical hazards in food. Public Health Laboratory is testing environmental samples for nitrates and nitrites using spectrophotometry.

## 6.4 Laboratory identification

| | |
|---|---|
| **6.4.1 Kiribati Health Laboratory** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** Services, Ministry of Health & Medical Services, P. O. Box 268, Bikenibeu, Tarawa, Kiribati |
| | **Contact Point:** Ms. Rosemary Tekoaua – Chief of Laboratory Services, Ministry of Health & Medical Services |
| | **Email:** rosemarytek@gmail.com |
| | **Phone:** (686) 28100 ext 234 |
| | **Fax:** (686) 28568 / 28152 |
| | **Staffing:** 8 laboratory staff who are all certified IATA shippers |
| **6.4.2 Kiribati Public Health Laboratory** | **Laboratory Address:** Environmental Health Block |
| | **Contact Point:** Tebikau Tibwe, Environmental Health Services, Public Health Division, Ministry of Health and Medical Services |
| | **Email:** tnoran@gmail.com |
| | **Phone:** (686) 28100 ext 280 |
| | **Fax:** (686) 28152 |
| | **Alternate Contact Point:** Bungiia Kaitaake, Environmental Health Services, Public Health Division, Ministry of Health and Medical Services |
| | **Email:** bkirata87@gmail.com |

8. The Kiribati Medical Laboratory has achieved a 55–60% overall laboratory quality management system assessment score (Assessment 2018) by its Secretariat of the Pacific Community counterpart. The laboratory also participates in the external quality assessment programme with Pacific Paramedical Training Centre of New Zealand and is applying a stepwise laboratory quality improvement process towards international accreditation.

## 6.5 Food sampling and testing

Food sampling and testing is currently being undertaken routinely for drinking water in response to complaints and outbreaks and when requested by other government agencies.

## 6.6 Current referral system for samples related to foodborne hazards

### 6.6.1 Ministry of Health

The Ministry of Health has experience in referring water samples to New Zealand for analyses related to indicator organisms and chemical parameters. At the time of reporting the Kiribati Medical Laboratory has eight staff who are certified IATA shippers.

### 6.6.2 Competent Authority, Ministry of Fisheries and Marine Resources Development

| | |
|---|---|
| **Contact Point** | Tereere Tioti |
| **Email** | tereeret@mfmrd.gov.ki |
| **Hazards Routinely Submitted to Referral Laboratories** | Dioxins; Histamine; PCBs; Microbiological tests; Chemical hazards |
| **Commonly Used Referral Laboratories** | • IAS – Institute of Applied Sciences, University of the South Pacific, Private Mail Bag, Laucala Campus, Suva, Fiji (Microbiological tests on water for total coliforms and *Escherichia coli*)<br>• AsureQuality Limited, 131 Boundary Road, Blockhouse Bay, Auckland, P.O. Box 41, Shotland Street, Auckland, New Zealand, 1140<br>• Cawthron Institute, 98 Halifax street East Nelson, New Zealand, 7010 |
| **Availability of IATA Certified Shipper(s)** | Not utilized as samples do not require it |
| **Airline(s) Commonly Used** | • Air New Zealand<br>• Fiji Airways |

| Samples | Test | Frequency | Laboratory | Methods of Analysis |
|---|---|---|---|---|
| Fish samples | Histamine | 3 times a year | IAS | Official methods of analysis of the AOAC International (2012) 19th edition, Official method 977.13 (modified) |
| | | | AsureQuality | Leatherhead Food RA, 2nd edition |
| | Heavy metals (cadmium, lead, mercury) | 2 times a year | AsureQuality | AsureQuality method (ICP – MS) |
| | | | IAS | Cadmium and Lead – Official methods of analysis of the AOAC international (2012) 19th edition, official method 999.11Mercury – EPA 821-R-01-13, appendix to method 1631 |
| | PCBs and Dioxins | Once a year | AsureQuality | USEPA Methods 1613B and 1668C Gas Chromatography (GC – HRMS) |
| Water and ice samples | Heterotrophic plate count<br>Enterococci<br>*E. coli* | 4 times a year | IAS | American Public Health Association APHA – 9215A, B for heterotrophic plate count<br>APHA – 9230 C Enterococci<br>APHA – 222G E. coli |
| | Ammonia<br>Chloride<br>Nitrate | Once a year | | Ammonia – APHA method 4500-$NH_3$<br>Chloride – APHA method 4500-Cl<br>CNitrate – APHA method 4500- $N0_s^-$I |
| | pH<br>Conductivity | 4 times a year | | pH – APHA method 4500-$H^+$BConductivity – APHA method 2510 B |

# 7. Marshall Islands, Republic of the

## 7.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms<br>Faecal coliforms | Drinking water | Abraham Hicking | Colilert-18 ™ | US EPA certification |

## 7.2 Capacity to detect microbiological hazards

No capacity at time of review

## 7.3 Capacity to detect chemical hazards

No capacity at time of review

## 7.4 Laboratory identification

| | |
|---|---|
| **7.4.1 Abraham Hicking Laboratory, Republic of the Marshall Islands Environmental Protection Agency (RMIEPA)** | **Laboratory Address:** Environmental Protection Authority, P.O. Box 1 322 Majuro, Marshall Islands |
| | **Head of Environmental Health Unit:** Linda Chutaro |
| | **Email:** lindachutaro@hotmail.com |
| | **Laboratory Contact:** Tuvuki Ketedromo, Laboratory Supervisor |
| | **Email:** ketedromo@gmail.com |
| | **Phone:** (692) 625 3035 |
| | **Fax:** (692) 625 5202 |
| | **Laboratory Staff:** Paul and Richardo Jarom |
| | **Email:** taraulpaul@gmail.com |

## 7.5 Food sampling and testing

Food sampling, other than routine water sampling and testing, is currently undertaken in response to outbreaks and complaints only.

## 7.6 Current referral system for samples related to foodborne hazards

When samples are taken they are referred to the US via Hawaii Department of Health or US CDC.

# 8. Micronesia, Federated States of

## 8.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms and *Escherichia coli* | Drinking water | National Food Safety Laboratory | COLILERT* (IDEXX test kit) | Not accredited |
| | | Pohnpei State EPA[9] | Colilert-24™ | US EPA certified |
| *Enterococcus faecalis* & *E. faecium* | | National Food Safety Laboratory | COLILERT* (IDEXX test kit) | Not accredited |
| Aerobic plate count | Food and environmental swabs | National Food Safety Laboratory | 3M Petrifilm aerobic count plates | Not accredited |
| Coliforms and *Escherichia coli* | Food and environmental swabs | National Food Safety Laboratory | 3M Petrifilm *E.coli*/ Coliform count plates | Not accredited |

## 8.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Pseudomonas aeruginosa* | Bottled water | National Food Safety Laboratory | PSEUDALERT (IDEXX test kits) | Not accredited |

## 8.3 Capacity to detect chemical hazards

No capacity at time of review

## 8.4 Laboratory identification

| | |
|---|---|
| **8.4.1 National Laboratory Coordinator** | **Laboratory Address:** FSM-DHSA, Capitol Suite, P. O. Box PS-70, Palikir, 96941, Fed. States of Micronesia |
| | **Contact Point:** Lisa Barrow |
| | **Email:** lbarrow@fsmhealth.fm |
| | **Phone:** (691) 320-8300 |
| **8.4.2 National Food Safety Laboratory** | **Laboratory Postal Address:** P. O. Box PS-70, Food Safety Unit, Capitol Suite, Palikir, 96941, Fed. States of Micronesia. |
| | **Laboratory Physical Address:** Second Floor, EPA Building, Kolonia, Pohnpei State. 96941 |
| | **Contact Point:** National Laboratory Coordinator |
| | **Contact Point in Laboratory:** Margaret May Baekalia, National Laboratory Biosafety Officer/microbiologist |
| | **Email:** MBaekalia@fsmhealth.fm |
| | **Phone:** (691) 320-3135 |
| | **Laboratory Staffing:** 2 |

9. It has been reported that Chuuk and Yap States also have EPAs with similar capacity and Kosrae State has the capacity to test through its environmental health office. All are US EPA certified.

| | |
|---|---|
| **8.4.3 Pohnpei State Environmental Protection Agency Laboratory** | **Laboratory Postal Address:** Pohnpei State Government Kolonia, Pohnpei 96941 FM |
| | **Laboratory Physical Address:** EPA Building, Kolonia, Pohnpei State. 96941 |
| | **Contact Point:** Mr Henry Susaia. Director |
| | **Email:** hsusaia@gmail.com |
| | **Contact Point in Laboratory (cc Director):** Quinton Lawrence |
| | **Email:** saudelninsei@gmail.com |
| | **Phone:** (691) 320-1780 / 1210 |
| | **Laboratory Staffing:** 3 |

## 8.5 Food sampling and testing

Food samples purchased once every quarter from ready-to-eat food outlets. Also food samples brought in by people for testing if they have complaints on any food products.

## 8.6 Current referral system for samples related to foodborne hazards

Systems are in place to refer samples to Hawaii State Public Health Laboratory. To date we have not referred samples for further testing.

# 9. Nauru

## 9.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | RON Hospital | MPN | Not accredited |
| Faecal coliforms | Drinking water | RON Hospital | MPN | Not accredited |

## 9.2 Capacity to detect microbiological hazards

No capacity at time of review

## 9.3 Capacity to detect chemical hazards

No capacity at time of review

## 9.4 Laboratory identification

| | |
|---|---|
| **9.4.1 Nauru Public Health Laboratory** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** RON Hospital Laboratory, Department of Health, Nibok, Nauru |
| | **Contact Point:** Ms Shanyko Benjamin |
| | **Email:** Shanyko.benjamin@nauru.gov.nr |
| | **Phone:** (674) 444-3160 / 557-3068 |
| | **Fax:** (674) 444-3199 |
| | **Current Acting OIC (at time of review):** Ms Jodana Goya |

## 9.5 Food sampling and testing

Food sampling, other than some limited water testing, is currently undertaken in response to outbreaks and complaints only.

## 9.6 Current referral system for samples related to foodborne hazards

No samples have historically been referred for analysis outside the country.

# 10. New Caledonia (Nouvelle-Calédonie)

## 10.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Food | LNC | NF ISO 4832 | COFRAC |
| | | | NF ISO 4831 | Not accredited |
| | Drinking water | LNC | ISO 9308-01<br>ISO 9308-03 | Not accredited |
| | | CDE | Not specified | Not specified |
| Faecal coliforms | Food | LNC | NF V08-060 | COFRAC |
| *Escherichia coli* | Food | LNC | ISO 16649-2 | COFRAC |
| | | | ISO 16649-3 | Not accredited |
| | Water | | ISO 9308-01/02/3 | Not accredited |

## 10.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Bacillus cereus* | Food | LNC | NF EN ISO 7932 | COFRAC |
| *Campylobacter* spp (*jejuni* or *coli*) | | | NF EN ISO 10273 | Not accredited |
| *Clostridium perfringens* | | | NF EN ISO 7937 | COFRAC |
| Enteropathogenic *Escherichia coli* | | | ISO 16654 | Not accredited |
| *Escherichia coli* O157 | | | NF EN ISO 16654 | Not accredited |
| *Listeria monocytogenes* | | | NF EN ISO11290-1/2 | COFRAC |
| *Salmonella* spp | | | ISO 6579 Bio Rad™ 07/11-12/05 | COFRAC |
| *Shigella* spp | | | NF EN ISO 21567 | Not accredited |
| *Staphylococcus aureus* | | | NF EN ISO 6888-1/2 | COFRAC |
| *V. parahaemolyticus* | | | ISO 21872-1 | Not accredited |
| *Y. enterocolitica* | | | NF EN ISO 10273 | Not accredited |
| *Salmonella* spp | Water | | NF EN ISO 19250 | Not accredited |
| Pathogenic *Staphylococcus* | | | Filter Membrane | Not accredited |
| *Clostridium botulinum* C/D and its toxin | Animal tissue | | Enrichment in FCMM medium and detection by PCR toxinogenic *Clostridium botulinum* and mouse inoculation test | Not accredited |

## 10.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Ciguatoxin | Marine species | Not specified | Not specified | Not specified |
| Arsenic | Drinking water | CDE | Not specified | Not specified |
| Lead | | | | |
| Mercury | | | | |
| Histamine | Fish | LNC | High-Performance Liquid Chromatography (HPLC) (internal method according to JAOAC 79/1-1996) | Not accredited |
| Cadmium | Animal product, fishery product | | AAS-channel mineralization (internal method according to ANSES CIME02) | COFRAC |
| Lead | | | | COFRAC |
| Mercury | Fish, shrimp | | AAS-cold vapor (internal method according to ANSES CIME01) | COFRAC |
| Sulfonamides | Animal tissue, egg | | Thin Layer Chromatography (TLC) (internal method according to ANSES UCM/92/01) | Not accredited |
| Avermectins | Animal product, fishery | | HPLC (internal method according to ANSES LMV/98/03) | Not accredited |
| Pesticides (multi-residue) | Fruit and Vegetable | | Quechers extraction-LC-MS/MS | Not accredited |
| Ethoxyquine | Shrimp | | HPLC (internal method according to JAOAC 93/1-2010) | Not accredited |
| Fluazuron | Bovine muscle | | TLC (internal method ) | Not accredited |

## 10.4 Laboratory identification

| | |
|---|---|
| **10.4.1 LNC – Laboratoire De Nouvelle-Calédonie** | **Laboratory Address:** Laboratoire de Nouvelle-Calédonie, Port Laguerre 37, route de la quarantaine BP 42, 98890 Païta |
| | **Contact Point:** Dr Denise DESOUTTER |
| | **Email:** denise.desoutter@gouv.nc |
| | **Phone:** (687) 35 31 34 |

| | |
|---|---|
| **10.4.2 DAVAR – Direction Des Affaires Vétérinaires Alimentaires et Rurales**[10] | **DAVAR Address:** 2 rue Russeil, BP 256, 98845, Nouméa Cedex, Nouvelle-Calédonie |
| | **Contact:** Dr vet. Pauline Gomel |
| | **Email:** pauline.gomel@gouv.nc |
| | **Phone:** (687) 24 37 45 |

10. A complete range of testing capacities and mandatory referral tests is found on: https://davar.gouv.nc/actualites/02-02-2018/laboratoire-liste-des-analyses.

| | |
|---|---|
| **10.4.3 CDE- La Calédonienne Des Eaux**[11] | **Laboratory Address:** Nouméa, Dumbéa, Mont-Dore, Païta, La Foa, Boulouparis |
| | **Laboratory Address in Noumea:** 13, rue Edmond Harbulot, BP 812 - 98845 Nouméa Cedex Nouvelle-Calédonie |
| | **Email:** clientele@cde.nc |
| | **Phone:** (687) 41 37 37 |
| | **Fax:** (687) 41 37 96 |

## 10.5 Food sampling and testing

DAVAR undertakes food testing in response to samples submitted routinely as part of a mandated testing programme or in response to an outbreak or contamination event.

## 10.6 Current referral system for samples related to foodborne hazards

When assessing hazards that cannot be determined in New Caledonia, samples are mandatorily referred to specific laboratories. For the following tests of interest to this review the following provides the analyses referred and the laboratories to which they are referred:

- Mycotoxins – LABOCEA Ploufragan
- Dioxins and PCBs – LABERCA, Nantes
- Fluoroquinolones – INOVALYS (France)
- Nitrofurans – INOVALYS (France)

11. If water analysis is required by la Direction Des Affaires Sanitaires et Sociales (DASS), they commonly employ this private company's laboratories.

# 11. Niue

## 11.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms<br>Faecal coliforms | Drinking water | Niue Foou Hospital | Not specified | Not accredited |

## 11.2 Capacity to detect microbiological hazards

No capacity at time of review

## 11.3 Capacity to detect chemical hazards

No capacity at time of review

## 11.4 Laboratory identification

| | |
|---|---|
| **11.4.1 Niue Foou Hospital Laboratory** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** Niue Health Department P. O. Box 33, Alofi, Niue |
| | **Food Safety Contact Point:** Alicia Hipa, Public Health Officer |
| | **Email:** Alicia.Hipa@mail.gov.nu |
| | **Email:** health.pathology@mail.gov.nu |
| | **Phone:** (683) 4100 |
| | **Fax:** (683) 4265 |

## 11.5 Food sampling and testing

Water samples are taken and either sent directly to New Zealand for analysis or undergo preliminary culturing before being referred to a New Zealand laboratory. Food sampling would be undertaken in response to an associated outbreak only. Samples would be sent to New Zealand for analysis.

# 12. Northern Mariana Islands, Commonwealth of the

## 12.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms / *Escherichia coli* | Drinking water | BECQ | Colilert-18™ and MPN for well water | EPA certified and accredited under NELAC |
| | | CUC | Colilert-18™ | |
| | | QWL | | |

## 12.2 Capacity to detect microbiological hazards

The Commonwealth Health Centre laboratory has a Bactec™ and a Vitek™ analyser on site for bacterial identification and antibiotic sensitivity. Serotyping is also possible for *Salmonella* and *Shigella*. The laboratory has a Certificate of Compliance (Centers for Medicine and Medicaid Services).[12]

## 12.3 Capacity to detect chemical hazards

No capacity at time of review

## 12.4. Laboratory identification

| | |
|---|---|
| **12.4.1 BECQ – Bureau of Environmental – Coastal Quality** | **Laboratory Address:** Gualo Rai Center, Chalan Pale Arnold - Middle Road, P.O. Box 501304, Saipan, MP 96950 |
| | **Contact Point:** Charito Bautista, Laboratory Manager |
| | **Email:** charito.bautista@becq.gov.mp |
| | **Phone:** (670) 664-8500 |
| | **Fax:** (670) 664-8540 |
| **12.4.2 CUC – Commonwealth Utility Corporation** | **Physical Address:** 3rd Floor Dandan Building, Saipan, MP 96950 |
| | **Mailing Address:** Commonwealth Utilities Corporation, P. O. Box 501220, Saipan, MP 96950 |
| | **Contact Point:** Heidi Yelin, Laboratory Manager |
| | **Email:** heidi.yelin@cucgov.org |
| | **Phone:** (670) 322-5140 |
| | **Fax:** (670) 235-5131 |
| | **Generic Contact:** http://www.cucgov.org/contact-us/ |
| **12.4.3 QWL – Quality Waters Laboratory** | **Laboratory Physical Address:** 2nd Floor Saipan Computer Building, Garapan |
| | **Laboratory Mailing Address:** P. O. Box 501220, Saipan, MP 96950 |
| | **Primary Contact Point:** Rose Gamier, Laboratory Manager |
| | **Email:** rosegamier@qwlab.com |
| | **Phone:** (670) 233-8002 |
| | **Fax:** (670) 233-8003 |

12. Such certification within the US and associated territories is reported by the laboratory to be approximately equivalent to ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories.

| | |
|---|---|
| **12.4.4 Commonwealth Health Centre** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Physical Address:** 1 Lower Navy Hill Road, Saipan, MP 96950 |
| | **Laboratory Mailing Address:** P. O. Box 500409 CK, Saipan, MP 96950 |
| | **Primary Contact Points:** Philip Dauterman, MD (Lab Director); Christopher Boone (Microbiologist) |
| | **Email:** chclab@gmail.com |
| | **Phone:** (670) 234-8950 |
| | **Fax:** (670) 236-8612 |

## 12.5 Food sampling and testing

Food sampling, other than routine water sampling and testing, is currently undertaken in response to outbreaks and complaints only.

## 12.6 Current referral system for samples related to foodborne hazards

All Commonwealth of the Northern Mariana Islands Public Water Systems send their water samples for chemical analysis to Eurofins Eaton Analytical, Monrovia, California. No food samples have been referred to a laboratory outside of the Commonwealth of the Northern Mariana Islands. Clinical samples for isolation of enteric organisms, outside those regularly isolated by the Commonwealth Health Centre, are sometimes referred to the State Department of Health, Hawaii or the US CDC.

# 13. Palau

## 13.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms<br>Faecal coliforms | Drinking water | EQPBL | Colilert-18 ™ | Accredited |

## 13.2 Capacity to detect microbiological hazards

The Division of Environmental Health, Bureau of Public Health reports that their food safety laboratory has "adequate capacity" to undertake a range of analyses related to microbial hazards in food.

## 13.3 Capacity to detect chemical hazards

No capacity at time of review

## 13.4 Laboratory identification

| | |
|---|---|
| **13.4.1 Bureau of Public Health** | **Laboratory Address:** P.O. Box 6027 Koror, Republic of Palau 96940 |
| | **Contact Person:** Ms. Eden Ridep Uchel, MPH Acting Chief/Senior Environmental Health Officer (EHO) Division of Environmental Health Bureau of Public Health Ministry of Health |
| | **Email:** lead@palaunet.com; edenuchel@gmail.com |
| | **Phone:** (680) 488-6073 / 6345 |
| | **Fax:** (680) 488-6194 |

| | |
|---|---|
| **13.4.2 Environmental Quality Protection Board Laboratory (EQPBL)** | **Laboratory Address:** P.O. Box 8086, Bureau of Public Works Bldg., Koror, Republic of Palau 96940 |
| | **Email:** eqpb@palaunet.com |
| | **Phone:** (680) 488-1639/3600 |
| | **Fax:** (680) 488-2963 |

## 13.5 Food sampling and testing

Food sampling, other than routine water testing, is currently undertaken in response to outbreaks and complaints only.

## 13.6 Current referral system for samples related to foodborne hazards

Food samples are currently referred to Republic of Korea and the Philippines.

# 14. Papua New Guinea

## 14.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms and faecal coliforms | Drinking water | CPHL | MPN | Not accredited |
| | | NATSL | Not specified | ISO/IEC 17025 |
| | | NAHFTL | MPN 9221[13] | Not accredited |
| *Escherichia coli* | Drinking Water | NAHFTL | ISO 16649-2 | Not accredited |

## 14.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Listeria monocytogenes* | Food | National Animal Health and Food Testing Laboratory | Bacteriological Analytical Manual (BAM)[14] Chapter 10 | Not accredited |
| *Salmonella* spp | | | ISO 6579-1 | |
| *Staphylococcus aureus* | | | BAM[14] Chapter 12 | |
| *Vibrio cholerae* | | | BAM[14] Chapter 9 | |
| *Clostridium perfringens* and *Verotoxigenic Escherichia coli* 0157 | | | Under development | Not applicable |
| All microbiological tests[15] | Food, feed and water | National Analytical and Testing Laboratory | No details | Reportedly has ISO/IEC 17025 Accreditation |

## 14.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Aflatoxins | Peanuts | NARI National Agricultural Chemistry Laboratory | Not specified | PNGLAS |
| Arsenic, Lead and Mercury | Drinking water | | | |
| Cyanide | Cassava | | | |
| Histamine | Fish | National Animal Health and Food Testing Laboratory | HPLC In-house Method<1mg/Kg | Not accredited |
| | | | Fluorometry <10mg/Kg[16] | |
| Arsenic and Lead | Water | UAS - UNITECH Analytical Services, Department of Agriculture, University of Technology | Inductively Coupled Plasma - Optical Emission Spectrometer | Not specified |
| Cyanide | Water and sediment | | UV/Vis Spectrophotometer and discrete analyser | |
| Cyanide, Heavy Metals | Soil | National Analytical and Testing Service[17] | Not specified | ISO/IEC 17025 Accreditation |
| Cyanide | Water | | | |

13. Standard Methods for the Examination of Water and Waste Water, 20th Edition.
14. Bacteriological Analytical Manual (BAM) FDA.
15. Unconfirmed based on http://www.unitech.ac.pg/sites/default/files/NATSL%20Brochure%20final.pdf.
16. Reference Method Histamine in Seafood, Fluorometric Method, Chapter 35, pp. 17–19, Official Methods of Analysis of Association of Official Analytical Chemists International, 21st edition, 2019, AOAC International, U.S.A.
17. Unconfirmed – Information extracted from website.

## 14.4 Laboratory identification

| | |
|---|---|
| **14.4.1 CPHL – Central Public Health Laboratory** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** Central Public Health Laboratory, National Department of HealthBox 807, Waigani, Papua New Guinea |
| | **Clinical Laboratory Contact Point:** Willie Porau, Laboratory Manager |
| | **Email:** porauw@gmail.com |
| | **Phone:** (675) 324-8199 |
| | **Fax:** (675) 325-6342 |
| | **Food and Water Analysis Section Contact:** Temas Ikanofi, Officer-in-Charge, Food & Water Microbiology |
| | **Email:** tikanofi@gmail.com |

Capacity to detect, sample types and methods were not detailed at the time of the review as analyses were not being undertaken either on demand or routinely at that time.[18]

| | |
|---|---|
| **14.4.2 NAQIA – National Animal Health and Food Testing Laboratory** | **Laboratory Address:** NAQIA, National Animal Health and Food testing Laboratory P. O Box 741, Port Moresby, NCD, PNG |
| | **Contact Point:** Rose Lisania, Laboratory Quality Manager |
| | **Email:** rlisania@naqia.gov.pg |
| | **Phone:** (675) 340-4209 |
| | **Generic Email:** vetlab@naqia.gov.pg |
| | **Laboratory Staffing:** 10 |

| | |
|---|---|
| **14.4.3 NARI – National Agricultural Research Institute - National Agricultural Chemistry Laboratory[19]** | **Laboratory Address:** P.O Box 8277 BOROKO National Capital District Papua New Guinea |
| | **Contact Point:** Morris Oromu, Laboratory Manager |
| | **Email:** morris.oromu@nari.org.pg |
| | **Phone:** (675) 320-1516 / 321-2690 / 320-2345 |
| | **Fax:** (675) 320-2411 |

| | |
|---|---|
| **14.4.4 NATSL – National Analytical and Testing Services Limited[20]** | **Laboratory Address:** PO Box 79, Unitech Post Office, Lae – 411, Morobe Province, Papua New Guinea |
| | **Contact Point:** Unknown |
| | **Email:** nal.png@global.net.pg |
| | **Phone:** (675) 473-4571 |
| | **Fax:** (675) 473-4578 |

| | |
|---|---|
| **14.4.5 UAS – Unitech Analytical Services** | **Laboratory Address:** UNITECH Analytical Services, Department of Agriculture, University of Technology, Morobe Province, Papua New Guinea |
| | **Mailing Address:** Private Mail Bag, Lae 411, Morobe, Papua New Guinea |
| | **Contact Point:** Mr Tata Telawika |
| | **Email:** tata.telawika@pnguot.ac.pg; macquin.maino@pnguot.ac.pg |
| | **Phone:** (675) 473-4451 |
| | **Fax:** (675) 473-4477 |

18. Reference was made to the use of API™ identification kits and biochemical sugars; and for S. aureus reference was also made to the coagulase test.
19. From – http://www.nari.org.pg/sites/default/files/Lab_Profile2013.pdf.
20. Unconfirmed.

## 14.5 Food sampling and testing

Food sampling, other than routine water testing, is currently undertaken in response to outbreaks and complaints only by health authorities. Veterinary facilities, agricultural authorities and NATSL undertake analyses when testing is requested by commercial agricultural companies, industry, individuals, government agencies, or for projects. Fisheries authorities undertake routine sampling of environmental water, fish processing water and fish and fishery products intended for export to the European Union.

## 14.6 Current referral system for samples related to foodborne hazard

### 14.6.1 National Fisheries Authority

| | |
|---|---|
| **Hazards and Matrices Routinely Submitted to Referral Laboratories** | • Dioxins – water<br>• Histamine – fish<br>• PAH – water<br>• PCBs – water<br>• Microbiological tests on water and fish |
| **Commonly Used Referral Laboratories** | • ALS Singapore, Singapore (Dioxins, PAH, PCBs, histamine)<br>• NAQIA (microbiology and histamine)<br>• NARI (chemicals)<br>• NATSL (miscellaneous) |
| **Availability of IATA Certified Shipper(s)** | Not utilized as samples do not require it |
| **Airline(s) Commonly Used in Sample Referral** | Air Niugini to Singapore (flies Mon – Thur and Sat) |

# 15. Samoa

## 15.1 Capacity to detect and enumerate indicator organisms[21]

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | SROS | Water | APHA Method 9222B | IANZ accredited |
| Faecal coliforms | | | APHA Method 9222D | |
| *Escherichia coli* | | Water and food | APHA Method 9222G APHA Ch. 8.935 (Petrifilm™) Method | |

## 15.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Campylobacter* spp *(jejuni* or *coli)* | Food and water | SROS | Detection FDA Bacteriological Analytical Manual (BAM) 2001, Ch. 7 (online edition) | IANZ National/ International accreditation for dairy, fish, meat, poultry and their products, fresh foods (salads) |
| | | | Enumeration MPI Animal Products National Microbiological Database (NMD) Specifications Notice 12 | IANZ National/ International accreditation for whole raw chicken |
| *Listeria monocytogenes* | | | Detection FDA BAM 2017, Ch. 10 (online edition) | IANZ National/ International accreditation for dairy, fish, meat, poultry and their products, fresh foods (salads) |
| *Salmonella* spp | | | Detection Reference Method ISO6579-1:2017 | IANZ National/ International accreditation for dairy, fish, meat, poultry and their products, fresh foods (salads) |
| *Staphylococcus aureus* | | | Enumeration AOAC 20th Edition (2016) method 2003.07, 2003.11 | Not accredited |
| *Vibrio cholerae* | | | Detection FDA BAM 2004, Ch. 9 (online edition) | IANZ National/ International accreditation for water only |
| *Vibrio parahaemolyticus* | | | Detection FDA BAM 2004, Ch. 9 (online edition) | Internationally accredited (by IANZ) for Fish and fishery products |

21. Reported that agriculture, fisheries and health all utilize SROS.

## 15.3 Capacity to detect chemical hazards

| Chemical Hazard | Type of Analysis | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Histamine | Food and water | SROS | In-house method (TCA extraction followed by HPLC-UV detection) | Internationally accredited (by IANZ) for fish, fish products and shellfish. |
| Lead | | | In-house method (Acid digestion followed by AAS determination) | Non-accredited |
| Mercury | | | US EPA Method 245.6 (Cold-vapour AAS) | Internationally accredited (by IANZ) for fish, fish products and shellfish. |
| Organochlorine pesticide residues | | | In-house method (GC.MS) | Non-accredited |
| Organophosphorous pesticide residues | | | | |

## 15.4 Laboratory identification

| | |
|---|---|
| **15.4.1 SROS – Scientific Research Organisation of Samoa** | **Address:** Nafanua, Vailima,PO Box 6597, Apia, Samoa |
| | **Contact Point: Chemistry –** Pousui Dr Fiame Leo, Quality Manager & Technical Leader, Technical Services Division |
| | **Email:** fiame.leo@srosmanagement.org.ws |
| | **Contact Point: Microbiology –** Luanda Epa-Ainuu, Principal Technical Scientist & Key Technical Personnel |
| | **Email:** luanda000epa@gmail.com |
| | **Phone:** (685) 20664 |
| | **Fax:** (685) 20884 |

## 15.5 Food sampling and testing

Food sampling is currently under development in the Ministry of Health as a result of recent legislative developments.

## 15.6 Current referral system for samples related to foodborne hazards

Samples are currently referred to either the SROS or to laboratories in New Zealand such as LabPlus and ESR (Institute of Environmental Science and Research).

# 16. Solomon Islands

## 16.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/ International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water/ food | National Public Health Laboratory | Coliert-18 (Methods 9223B and 9230D)/Petrilfilm[22] | Not accredited |
| Faecal coliforms | | | | |
| *Enterococci* | | | | |
| *Escherichia coli* | | | | |
| Heterotrophic plate count | | | Petrifilm and Pour Plate Method | |

## 16.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/ International Accreditation |
|---|---|---|---|---|
| *Salmonella* spp | Seafood, meat, food, water, and swabs | National Public Health Laboratory | ISO 6579-1:2017 | Not accredited |
| *Staphylococcus aureus* | Food | | AOAC Official method 2003.08 | |
| *Escherichia coli* | Bivalve molluscan shellfish and fish samples and food | | Compendium 5th Edition 2015, Ch 9[23] | |
| Yeasts and Moulds | Food/water | | Pour Plate: British Pharmacopoeia Current (Online) | |

## 16.3 Capacity to detect chemical hazards

| Chemical Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/ International Accreditation |
|---|---|---|---|---|
| Arsenic | Water | National Public Health Laboratory | Photometry (AOAC 920.205) | Not accredited |
| Cyanide | | | Photometry (4500-CN E)[22] | |
| Lead | | | Photometry (AOAC 974.27) | |
| Magnesium | | | | |
| Cadmium | | | | |
| Chromium | | | | |
| Copper | | | | |
| Iron | | | | |
| Manganese | | | | |
| Zinc | | | | |
| Silver | | | | |
| Mercury | | | Photometry (AOAC 977.22) | |
| Calcium | | | Photometry (5500 Ca-D)[22] | |
| Nitrate | | | Photometry (4500-NO3- B)[22] | |
| Nitrite | | | Photometry (4500-NO2- B)[22] | |

22. Standard Methods for the Examination of Water and Waste Water, 20th Edition.
23. Compendium of Methods for the Microbiological Examination of Foods.

| | | | | |
|---|---|---|---|---|
| Ammonium | Water | National Public Health Laboratory | Photometry (Spectroquant® Merck) | Not accredited |
| pH | | | Electrochemical Probe (AOAC 973.41) | |
| Dissolved Oxygen | | | Electrochemical Probe (4500-O G)[22] | |
| Electrical Conductivity | | | Electrochemical Probe (AOAC 973.40) | |
| Total Dissolved Solids | | | Electrochemical Probe (1030-F)[22] | |
| Salinity | | | Electrochemical Probe (2520-B)[22] | |
| Hydrocarbons | | | Immunoassay, Calorimetry (HACH Method 10050) | |
| Hardness | | | Titrimetry(2340-C)[22] | |
| Chloride | | | Argentometry (4500-Cl B)[22] | |
| Chemical Oxygen Demand | | | Titrimetry (AOAC 920.193) | |
| Total Suspended Solids | | | Gravimetry(2540 D)[22] | |
| Turbidity | | | Nephelometry(2130 B)[22] | |
| Biological Oxygen Demand | | | Manometry(AOAC 973.44) | |
| Histamine | Food | | Fluorometry (AOAC 977.13) | |
| Moisture Content | | | Gravimetry (AOAC 925.10) | |
| Mercury in Fish | | | Photometry (AOAC 977.15) | |
| Hydrocyanic Acid | Crops | | Titrimetry (AOAC 915.03) | |
| Sugar (Brix) | Fruit juices | | Refractometry (Digital Palette Refractometer PR-101) | |
| Radioactivity | Surfaces (soil, air) | | Alpha Scintillation Counter (7030 B)[22] | |

## 16.4 Laboratory identification

| | |
|---|---|
| **16.4.1 National Public Health Laboratory** | **Laboratory Address:** Ministry of Health and Medical Services, P.O. Box 348, Honiara, Solomon Islands |
| | **Contact Point:** Dickson Manongi, Director |
| | **Email:** dmanongi@moh.gov.sb; dsnmanongi@gmail.com |
| | **Phone:** (677) 38871 |
| | **Laboratory Staffing:** 7 technical; 3 auxiliary |

## 16.5 Food sampling and testing

Food sampling and testing is currently being undertaken in response to outbreaks and routinely for fish and fishery products and drinking water.

## 16.6 Current referral system for samples related to foodborne hazards

### 16.6.1 Competent Authority, Ministry of Health and Medical Services (EHD)

| | |
|---|---|
| **Hazards and Matrices Routinely Submitted to Referral Laboratories** | • Dioxins – fish<br>• Histamine – fish<br>• PCBs – fish<br>• Heavy metals<br>• Microbiological and chemical tests – water |
| **Commonly Used Referral Laboratories** | • Institute of Applied Sciences, Suva, Fiji (Microbiological and chemical water tests)<br>• AsureQuality Limited, 131 Boundary Road, Blockhouse Bay, Auckland, New Zealand, (Testing for dioxins and PCBs)<br>• Cawthron Institute, 98 Halifax street East Nelson, New Zealand (histamine and cadmium, lead and mercury tests) |
| **Availability of IATA Certified Shipper(s)** | Not utilized as samples do not require it |
| **Customs Clearing Agents and Deliveries for Samples Set Abroad** | • Williams & Gosling (for samples sent to Fiji)<br>• DSV Air and Sea Proprietary Limited and DHL (for samples sent to New Zealand) |
| **Airline(s) Commonly Used in Sample Referral** | • Air New Zealand<br>• Fiji Airways<br>• Solomon Airways |
| **Availability and Type of Refrigerant(s) in Transport** | Styrofoam box with gel ice packages |

# Tonga

## 17.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Faecal coliforms | Drinking water | Vaiola Hospital | IDEXX Colilert | IDEXX Colilert |

## 17.2 Capacity to detect microbiological hazards

No capacity at time of review

## 17.3 Capacity to detect chemical hazards

No capacity at time of review

## 17.4 Laboratory identification

| | |
|---|---|
| **17.4.1 Vaiola Hospital Laboratory** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** Vaiola Hospital, P. O. Box 59 Nukualofa, Tonga |
| | **Contact Point:** Telesia Apikotoa, Principal Medical Scientist |
| | **Email:** t.apikotoa@gmail.com |
| | **Phone:** (676) 23 200 ext 1515 or (676) 740 0470 |
| | **Fax:** (676) 28 964 |

## 17.5 Food sampling and testing

No food sampling and testing is currently being undertaken.

## 17.6 Current referral system for samples related to foodborne hazards

No samples are currently referred outside of the country.

# 18. Tuvalu

## 18.1 Capacity to detect and enumerate indicator organisms

| Indicator | Sample Type(s) | Detection Methodology | National/International Accreditation |
|---|---|---|---|
| Indicator | Drinking water | $H_2S$ test Field test by environmental health personnel based at Princess Margaret Hospital | Not accredited |

## 18.2 Capacity to detect microbiological hazards

No capacity at time of review

## 18.3 Capacity to detect chemical hazards

No capacity at time of review

## 18.4 Laboratory identification

| | |
|---|---|
| **18.4.1 Princess Margaret Hospital Laboratory** | **Laboratory Address:** Princess Margaret Hospital, Ministry of Health-Health Department<br>P. O Box 41, Funafuti, Tuvalu |
| | **Contact Point:** Vine Sosene |
| | **Email:** vine.sosene@gmail.com |
| | **Alternate Contact Point:** Pauke Maani |
| | **Email:** pauke01@gmail.com |
| | **Phone:** (688) 20480 |

## 18.5 Food sampling and testing

No food sampling and testing is currently being undertaken other than for drinking water using the qualitative technique specified.

## 18.6 Current referral system for samples related to foodborne hazards

No samples are currently referred outside of the country.

# 19. Vanuatu

## 19.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water | UNELCO Engie | Not specified | Not accredited |
| Faecal coliforms | | | | |
| *Escherichia coli* | | | | |
| Total coliforms | | National Water Quality Laboratory | Membrane filtration – m-coliblue | |
| *Escherichia coli* | | Food Technology Development Centre and Analytical Unit | Not specified | |

## 19.2 Capacity to detect microbiological hazards

| Microbial Hazard | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| *Salmonella* spp | Food | Food Technology Development Centre and Analytical Unit | Not specified | Not accredited |
| *Listeria* spp | | | | |

## 19.3 Capacity to detect chemical hazards

No capacity at time of review

## 19.4 Laboratory identification

| | |
|---|---|
| **19.4.1 Ministry of Lands and Natural Resources – National Water Quality Laboratory** | **Laboratory Address:** PMB 9007, George Pompidou Road, Port-Vila, Vanuatu |
| | **Contact Point:** Erie Sammy |
| | **Email:** esamivanuatu.gov.vu |

| | |
|---|---|
| **19.4.2 Food Technology Development Centre and Analytical Unit – Vanuatu Bureau of Standards (VBS), Ministry of Tourism, Trade, Commerce, Industry and Ni Vanuatu Business** | **Laboratory Address:** P.O. Box 6532, Port Vila, Vanuatu. |
| | **Contact Point:** Tina Soaki Laau |
| | **Email:** tsoaki@vanuatu.gov.vu |
| | **Phone:** (678) 25978 |

## 19.5 Food sampling and testing

No food sampling and testing, other than for drinking water, is currently being undertaken on a routine basis.

## 19.6 Current referral system for samples related to foodborne hazards

No samples are currently referred. However, the Department of Agriculture, Forestry and Fisheries has allocated funding as they move to exporting fish to the European Union to send samples to the Institute of Applied Sciences in Fiji. The sampling and referral programme will be determined by any importing country accepting Vanuatu products. Fisheries personnel report that the hazards most likely to be of concern will include:

- Enteropathogenic *Escherichia coli*;
- *Staphylococcus aureus*;
- Ciguatoxin;
- Cyanide;
- Histamine;
- Lead; and
- Mercury

At the moment, there is no export from the country; however, the Fisheries Department has included in their future budget the possibility of expenses for sending specimens overseas should any export or request from the tuna factory recently established in Port Vila occur.

# 20. Wallis and Futuna (Wallis-et-Futuna)

## 20.1 Capacity to detect and enumerate indicator organisms

| Indicator Organisms | Sample Type(s) | Laboratory | Detection Methodology | National/International Accreditation |
|---|---|---|---|---|
| Total coliforms | Drinking water[24] | Within the Department of Environment | Not specified for review | Not specified |
| Faecal coliforms | | | | |

## 20.2 Capacity to detect microbiological hazards

No capacity at time of review

## 20.3 Capacity to detect chemical hazards

No capacity at time of review

## 20.4 Laboratory identification

| | |
|---|---|
| **20.4.1 Laboratoire Agence de Santé de Wallis et Futuna Agence de Santé** | **PPHSN LABNET Laboratory Designation Level:** Level 1 |
| | **Laboratory Address:** Laboratoire Agence de Santé de Wallis et Futuna Agence de Santé, B.P. 4G UVEA |
| | **Contact Point:** Laboratory Manager |
| | **Email:** sante@adswf.fr |
| | **Phone:** (681) 72 07 00 / 72 07 21 |
| | **Fax:** (681) 72 23 99 |

## 20.5 Food sampling and testing

No food sampling and testing, other than for drinking water, is currently being undertaken on a routine basis.

## 20.6 Current referral system for samples related to foodborne hazards

If samples need analysis, in response to an outbreak, clinical and food samples would likely be referred to New Caledonia.

24. Web review only – https://www.pecc.org/resources/infrastructure-1/1077-the-wallis-and-futuna-case-1/file.

# ANNEX 2

## Referral laboratories in use by Pacific countries and areas

## ALS, Singapore

### Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address:** | 121 Genting Lane, #04-01, ALS Building, Singapore 349572 |
| **Laboratory Postal Address:** | ALS Technichem (S) Pte Ltd, 121 Genting Lane, #04-01, ALS Building, Singapore 349572 |
| **Initial Contact Point:** | Ken Lam, Assistant General Manager |
| **Phone:** | (65) 6589-0118 |
| **Email:** | ken.lam@alsglobal.com |
| **Fax:** | (65) 6283-9689 |
| **Other Contact Points:** | Jasper Tan – Jasper.tan@alsglobal.com<br>Jeanette Wong – Jeanette.wong@alsglobal.com<br>Kai Wen Yao – kaiwen.yao@alsglobal.com |

### Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| *Bacillus cereus* | Food | Standards Associated with the Singapore Laboratory Accreditation Scheme (ATS QWI) MIC24<br>FDA BAM Online Ch14 ISO 7932-2004 Confirmation using Real Time PCR | SAC-SINGLAS |
| *Campylobacter* spp *(C. jejuni, C. coli)* | | ATS QWI MIC77<br>FDA BAM Online Ch7 | SAC-SINGLAS |
| *Clostridium perfringens* | Food and water | ATS QWI MIC25 (food)<br>FDA BAM Online Ch16 (food) ISO 7937-2004 (food)<br>ISO 14189:2013 (water) | SAC-SINGLAS |
| *Clostridium botulinum* | Food | Not specified | N/A |
| Enteropathogenic *Escherichia coli* | | Under development | N/A |
| Enterotoxigenic *Escherichia coli* | | Not specified | N/A |
| *Listeria monocytogenes* | | ATS QWI MIC23<br>FDA BAM Online Ch10<br>ISO 11290-1:2017<br>ATS QWI MIC 93A-B<br>PCR in food | SAC-SINGLAS |
| *Salmonella* spp | Food, water | ATS QWI MIC20<br>FDA BAM Online Ch5 (food)<br>ISO 6579-1:2017 (food)<br>SOLUS Technology (food)<br>APHA 9260B (water) | SAC-SINGLAS |
| | Milk, milk products | ATS QWI MIC114<br>ISO 6785:2001 | Not specified |

| | | | |
|---|---|---|---|
| *Shigella* spp | Food | ATS QWI MIC21<br>ISO 21567:2004 | SAC-SINGLAS |
| *Staphylococcus aureus* | Food and water | ATS QWI MIC19 (food)<br>FDA BAM Online Ch12 (food)<br>ISO 6888-1:1999 (food)<br>APHA 9213B (water) | SAC-SINGLAS |
| *Vibrio cholerae* | Food | ATS QWI MIC22<br>FDA BAM Online Ch9 | SAC-SINGLAS |
| *Vibrio parahaemolyticus* | | ATS QWI MIC78<br>FDA BAM Online Ch8 | SAC-SINGLAS |
| *Yersinia enterocolitica* | | ATS QWI MIC78 FDA BAM Online Ch8 | SAC-SINGLAS |

| **Chemical Hazards** | **Sample Type(s)** | **Detection Methodology** | **National/ International Accreditation** |
|---|---|---|---|
| Aflatoxin | Food, bean, nut | ATS QWIFD FC51/HPLC | SAC-SINGLAS |
| | Milk, milk products | ATS QWIFD FC70/HPLC<br>ATS QWIFD FC98 | SAC-SINGLAS |
| Arsenic (Total) | Food and food ingredients | ATS QWIFDFC 25 | SAC-SINGLAS |
| Cyanide | Water | APHA 4500CN C USEPA 9010C<br>APHA 4500 CN N<br>APHA 4500 CN E ATS QWIENV INORG 16 | SAC-SINGLAS |
| Histamine | Fish, fisheries products and meat | ATS QWIFD FC149/HPLC-MS/MS | SAC-SINGLAS |
| Lead | Food, water | ATS QWI FDFC 25 (food)<br>ATS QWI FDOF 08 (oil)<br>APHA 3120B (water)<br>US EPA 200.8 (water)<br>US EPA 6010D (water) | SAC-SINGLAS |
| Mercury | | ATS QWIFD FC26 (food)<br>ATS QWI PP32 (food)<br>AOAC 971.21 Section 9.2.22 (2010) (food)<br>ASTS QWI ENV INORG 10 (water)<br>US EPA 7471 B (water) | SAC-SINGLAS |
| Dioxins | Water | Outsourced to alternative ALS | Accredited with relevant country's body |
| Furans | | | |
| PCBs | | | |
| Chloramphenicol | Milk, honey, seafood | ATS QWIFD FC90, 83 and 89/ LC–MS/MS | SAC-SINGLAS |
| Nitrofurans | Fish, fisheries products and meat | ATS QWIFD FC84/ LC–MS/MS | SAC-SINGLAS |
| Cyclamate | Food | ATS QWIFD FC99/HPLC | SAC-SINGLAS |
| Organochlorine pesticide residues | Food and water | ATS QWI ENV ORG 22 (GC/MS) (food)<br>ATS QWI ENV 0RG 33 (GCMSMS) (food)<br>ATS QWI FDFC 168 (LCMSMS) (food)<br>EPA 8270E (water) | |
| Organophosphorous pesticide residues | | | SAC-SINGLAS |
| Chloropropanols | Food, sauce, oil | ATS QWIFD FC56/GCMS ATS QWIFD FC27/GCMS<br>AOCS Cd 29b-13 (2017)/GCMS (MCPD Ester and Glycidyl Ester) | SAC-SINGLAS |
| Melamine | Food, milk | ATS QWIFD FC85/USFDA Lib No. 4421-2/ LC–MS/MS | SAC-SINGLAS |

# ASUREQUALITY LTD, New Zealand

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address:** | AsureQuality Limited, Auckland Laboratory, 131 Boundary Road, Blockhouse Bay, Auckland, 0600 |
| **Laboratory Postal Address:** | AsureQuality Limited, Auckland Laboratory, PO Box 41, Shortland Street, Auckland, 1140 |
| **Initial Contact Point:** | Vijaya Naidu |
| **Email:** | Vijaya.Naidu@asurequality.com |
| **Phone:** | (64) 9 626-8288 |
| **Fax:** | (64) 9 626-8282 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| *Bacillus cereus* | Dairy products | ISO21871:2006 | IANZ |
| | Food | iSO21871:2006 | IANZ |
| *Campylobacter* spp including *C. jejuni* or *C. coli* | Meat, meat product, poultry, honey, general food | Meat Industry Microbiological Methods (MIMM) 7.3 | IANZ |
| *Clostridium perfringens* | Meat, meat product, poultry and honey | mIMM 7.10 | IANZ |
| | Dairy products | ISO7937:2004 | IANZ |
| | Food | bAM 16 | IANZ |
| Enteropathogenic *Escherichia coli* | Meat, meat product, poultry and honey | US OMAR | IANZ |
| | Food | solus ELISA | IANZ |
| *Listeria monocytogenes* | Meat, meat product, poultry, honey, general food | mIMM 7.5<br>Gene-Up® Biomerieux<br>Solus[25] ELISA | IANZ |
| | Fish, fisheries products | fDA BAM Ch. 10<br>Gene-Up® Biomerieux<br>Solus ELISA | IANZ |
| | Dairy products | fDA BAM Ch. 10<br>Gene-Up® Biomerieux<br>Solus ELISA and several other methods | IANZ |
| *Salmonella* spp | Meat, meat product, poultry, honey, general food | iSO 6579-1:2017<br>MIMM 7.7<br>Gene-Up® Biomerieux | IANZ |
| | Fish, fisheries products and dairy products | iSO 6579-1:2017<br>FDA BAM Ch. 5<br>MIMM 7.7<br>Gene-Up® Biomerieux<br>Solus ELISA<br>and several other methods | IANZ |
| *Shigella* spp | Meat, meat product, poultry, honey, general food | aPHA 37 | IANZ |
| *Staphylococcus aureus* | Meat, meat product, poultry and honey | MIMM 7.8 (count) | IANZ |
| | Fish, fisheries products | fDA BAM Ch. 12 (count) | IANZ |
| Verotoxigenic *Escherichia coli* | Meat, meat product, poultry and honey | US OMAR | IANZ |

25. Solus Scientific.

| Chemical Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| Aflatoxin | Dairy Products | UHPLC GB 5009.24 – 2016 Method II (modified) RIDASCREEN (ELISA) | IANZ |
| Histamine | Fish, Fisheries Products | HPLC and Leatherhead methodology | IANZ |
| Lead | Fish, Fisheries Products and Potable Water | Inductively Coupled Plasma Mass Spectrometry (ICP-MS) APHA 3125 B | IANZ |
| Mercury | Potable Water | ICP-MS APHA 3125 B | IANZ |
| | Fish, Fisheries Products | ICP-MS Acid digest | IANZ |

# Cawthron Institute, New Zealand

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address:** | Cawthron Institute, 98 Halifax Street East, Nelson 7010, New Zealand |
| **Laboratory Postal Address:** | Private Bag 2, Nelson 7042, New Zealand |
| **Initial Contact Point:** | General enquiries – (64) 3 548-2839 |
| **Generic Email:** | lab@cawthron.org.nz |
| **Pacific Islands Point of Contact:** | Quotes: toni.deas@cawthron.org.nz<br>Other enquiries: sam.murray@cawthron.org.nz |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| *Bacillus cereus* | Food (generally) | Not specified | IANZ |
| *Campylobacter* spp including *C. jejuni* or *C. coli* | | FDA BAM online | IANZ |
| *Clostridium perfringens* | | ISO 7937:2004 | IANZ |
| *Listeria monocytogenes* | | AOAC 2016-08<br>AOAC 2016-07<br>ISO 11290-2:1998<br>FDA BAM online<br>Biocontrol VIP | IANZ |
| *Salmonella* spp | | ISO 9579:2017E<br>AOAC 2016.01 | IANZ |
| *Salmonella* Typhi | | ISO 9579:2017E<br>Preliminary confirmation using biochemical tests | IANZ accreditation to spp level only |
| *Shigella* spp | | APHA Ch 37 | IANZ |
| *Staphylococcus aureus* | | ISO 6888-1:1999 (2003 Amendment)<br>AOAC 2003.07<br>AOAC 2003.11 | IANZ |
| *Vibrio cholerae* | | FDA BAM online | IANZ |
| *Vibrio parahaemolyticus* | | FDA BAM online | IANZ |

| Chemical Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| Ciguatoxin | Fish and fisheries products | UPLC-MS/MS<br>In-house method developed. Manuscript in preparation | Not Accredited |
| Domoic Acid | Shellfish | UPLC-UV<br>JAOAC (1995), 78(2), 543-554 (modified) | IANZ |
| Histamine | Fish and fisheries products | UPLC (modified) | IANZ |
| Lead | Food (in general) | ICP-MS In-house digestion and APHA 3125 B | IANZ |
| Lipophilic shellfish toxins (okadaic acid and dinophysis toxins) | Shellfish | UPLC-MS/MS<br>JAOAC (2005), Int 88:761-772 (modified) | IANZ |
| Melamine | Food (in general) | UPLC-MS/MS<br>In-house developed based on USFDA Library no 4421, Vol. 24, October 2008 | IANZ |
| Mercury | | ICP-MS In-house digestion and APHA 3125 B | IANZ |
| NSP (Brevotoxin) | Shellfish | JAOAC (2005), Int 88:761-772 (modified)<br>Confirmation: In-house by LC-MS | IANZ |
| PSP (Saxitoxin) | Shellfish | UPLC-MS/MS<br>JAOAC (2015), Int 98(3) 609-621 | IANZ |
| PSP (Tetrodotoxin) | | UPLC-MS/MS<br>JAOAC (2015), Int 98(3) 609-621 | IANZ |
| PSP | Lobster and abalone | JAOAC (2015), Int 98(3) 609-621 (modified) | IANZ |

# Hawaii State Department of Health, United States of America

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address:** | 2725 Waimano Home Road, Pearl City, Hawaii 96782 |
| **Initial Contacts:** | Edward Desmond, Administrator, State Laboratories Division<br>Email: edward.desmond@doh.hawaii.gov<br>Phone: (808) 453-6652<br>Fax: (808) 453-6662 |
| | Wanda Chang, Environmental Health Analytical Services Branch Chief<br>Email: wanda.chang@doh.hawaii.gov<br>Phone: (808) 453-6671<br>Fax: (808) 453-6685 |
| **Section Contacts:** | Orlando Tirado-Ramirez, Food Chemistry Section Supervisor<br>Email: orlando.tirado-ramirez@doh.hawaii.gov<br>Phone: (808) 453-6673<br>Fax: (808) 453-6685 |
| | Richard Saiki, Drinking Water Section Supervisor<br>Email: richard.saiki@doh.hawaii.gov<br>Phone: (808) 453-6679<br>Fax: (808) 453-6685 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| *Escherichia coli* O157:H7 Screen Test | Food (in general) | BAM Online Ch. 4A<br>FERN-MIC.0012.00 Recirculating Immunomagnetic Separation (RIMS) Method for Detection and Isolation of E. coli O157:H7 from Foods | Not specified |
| *Listeria monocytogenes* Screen Test | | BAM Online Ch. 10<br>LIS: AOAC OMA 18th ed. Online, Sec 17.10.09, Method 999.06 (VIDAS® LIS)<br>LMO2: AOAC OMA 18th ed. Online, Sec 17.10.11, Method 2004.02 (VIDAS® LMO2) | Not specified |
| *Salmonella* spp | | BAM Online Ch. 5<br>AOAC OMA 18th ed. Online, Sec 17.9.33, 2004.03 (ELFA) | Not specified |
| *Vibrio parahaemolyticus* | Clinical, food and water | Not specified | Not specified |
| *Yersinia enterocolitica* | Clinical and food | Not specified | Not specified |

| Chemical Hazards | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| Arsenic (inorganic) | Water | EPA 200.8 Rev 5.4 & 200.9 Rev2.2 | US EPA |
| Lead | | | US EPA |
| Mercury | | EPA 200.8 Rev 5.4 & 245.1 Rev 3.0 | US EPA |
| Histamine | Fish and fisheries products | AOAC method 35.1.32 (977.13) | Not specified |
| PCBs | Water | Not specified | Not specified |
| Organochlorine pesticide residues | Food (in general) | AOAC Method 2007.01 | Not specified |
| Organophosphorous pesticide residues | | | Not specified |
| Carbamate | | Not specified | Not specified |

# Hill Laboratories, New Zealand

## Laboratory contact information:

| | |
|---|---|
| **Laboratory Address Christchurch:** | R J Hill Laboratories Limited 101c Waterloo Road PO Box 16607, Hornby Christchurch 8441, New Zealand |
| **Laboratory Address Hamilton:** | R J Hill Laboratories Limited 28 Duke St, Hamilton 3240 Private Bag 3205 Hamilton 3240, New Zealand |
| **Laboratory Address Blenheim:** | R J Hill Laboratories Limited Grovetown Park SH1, Blenheim Private Bag 1007 Blenheim 7240, New Zealand |
| **Email:** | mail@hill-labs.co.nz mail |
| **Phone:** | (647) 858-2000 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| *Campylobacter* spp including *C. jejuni* or *C. coli* | Food (in general) | Enrichment and Charcoal Cefoperazone Desoxycholate Agar with biochemical confirmation |
| *Clostridium perfringens* | | TSC agar with biochemical confirmation |
| *Listeria monocytogenes* | | Enrichment and PCR |
| *Salmonella* spp | | Enrichment and PCR |
| *Shigella* spp | | Outsourced |
| *Staphylococcus aureus* | | TEMPO® automated MPN |
| Verotoxigenic *Escherichia coli* | | Enrichment and PCR with confirmation testing done by ESR |
| *Vibrio cholerae* | | Enrichment and TCBS with biochemical confirmation |
| *Vibrio parahaemolyticus* | | Enrichment and TCBS with biochemical confirmation |

| Chemical Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Lead | Food (in general) | Acid digest ICP-MS |
| Mercury | | Acid digest ICP-MS |
| Aflatoxin | | Solvent extraction, clean-up and LC-MS/MS |
| Organochlorine pesticide residues | | Solvent extraction, clean-up and LC-MS/MS plus GC-MS/MS |
| Organophosphorous pesticide residues | | Not reported |

# IEH, Washington State, United States of America

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address 1:** | IEH Laboratories & Consulting Group<br>15300 Bothell Way NE, Lake Forest Park, WA 98155 |
| **Laboratory Physical Address 2:** | IEH Analytical Laboratory, 3927 Aurora Ave. N<br>Seattle, WA 98103 |
| **Contact Point:** | Sergio Sanchez, Ph.D., Sr. Vice President Analytical Services |
| **Email:** | ss@iehinc.com |
| **Phone:** | +1 (206) 522-5432 |
| **Phone for Analytical Laboratory:** | +1 (206) 632-2715 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Hepatitis A | Reported as Food (in general) | Reported as: "a mix or classical, molecular and whole genome sequencing" at the Lake Forest Park laboratory. |
| Norovirus | | |
| Rotavirus | | |
| *Bacillus cereus* | | |
| *Bacillus cereus* enterotoxin | | |
| *Campylobacter spp* | | |
| *Clostridium botulinum* | | |
| *Clostridium perfringens* | | |
| Enteropathogenic *Escherichia coli* | | |
| Enterotoxigenic *Escherichia coli* | | |
| *Listeria monocytogenes* | | |
| *Salmonella* spp | | |
| *Salmonella* Typhi | | |
| *Shigella* | | |
| *Staphylococcus aureus* | | |
| *S. aureus* toxin | | |
| Verotoxigenic *Escherichia coli* | | |
| *Vibrio cholerae* | | |
| *Vibrio parahaemolyticus* | | |
| *Yersinia enterocolitica* | | |

| Chemical Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Arsenic (Inorganic) | Reported as Food (in general) | Reported to be: "using HPLC/UHPLC, LCMSMS, GCMS and ICPMS technology" at the Seattle laboratory. |
| Lead | | |
| Mercury | | |
| Cyanide | | |
| Aflatoxin | | |
| Ciguatoxin | | |
| Domoic acid | | |
| Histamine | | |
| Lipophilic shellfish toxins (Okadoic acid and related toxins) | | |
| Saxitoxin | | |
| Dioxins | Food (in general) and water | Outsourced |
| Furans | | |
| PCBs | | |
| Antimicrobial residues – nitrofuran | Reported as Food (in general) | Reported to be: "using HPLC/UHPLC, LCMSMS, GCMS and ICPMS technology" at the Seattle laboratory. |
| Organochlorine pesticide residues | | |
| Organophosphorous pesticide residues | | |
| Carbamate | | |
| Chloropropanol | | |

# Microbiological Diagnostic Unit – Public Health Laboratory, Australia

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address 1:** | MDU PHL, Department of Microbiology and Immunology, The University of Melbourne<br>The Peter Doherty Institute for Infection and Immunity, 792 Elizabeth Street, Melbourne VIC 3000 Australia |
| **Contact Point:** | Professor Benjamin Howden, Director |
| **Email:** | bhowden@unimelb.edu.au |
| **Phone:** | (613) 8344-5701 |
| **Alternative Contacts:** | Karolina Mercoulia – dimovski@unimelb.edu.au<br>Susan Ballard Batt – susan.ballard@unimelb.edu.au |

## Detection capacity

| Biological Hazard | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| Heterotrophic Colony Count | Food and water | AS 5013.5:2016<br>AS/NZS 4276.3.1:2007 | NATA |
| Coliforms, Thermotolerant Coliforms & *E.coli* | Food, water and swabs | AS 5013.9:2009<br>AS/NZS 4276.5:2007<br>AS 4276.6:2007<br>AS 4276.7:2007 | NATA |
| Faecal *Streptococci* and *Enterococci* | Food, water and swabs | APHA/AWWA/WEF 9230<br>AS/NZS 4276.9:2007 | NATA |
| *Bacillus anthracis* | Food | LRN CDC | NATA |
| *Bacillus cereus* | Food | AS 5013.2:2007 | NATA |
| *Brochothrix thermosphacta* | Food | AS 5013.22:2004 R2016 | NATA |
| *Campylobacter* spp | Food, water and swabs | AS 5013.6:2015<br>AS 4276.19:2014 | NATA |
| *Clostridium botulinum* and botulinum toxin detection | Food | LRN CDC | NATA |
| *Clostridium perfringens* | Food and water | AS 5013.16:2006 (R2016) AS 4276.17.1:2016 | NATA |
| Coagulase-Positive *Staphylococci* | Food and water | AS 5013.12.1:2004 (R2016)<br>AS 4276.20-2003 (R2013) | NATA |
| *Cronobacter sakazakii* | Milk powders | AS 5013.13 Int-2010 | NATA |
| Hepatitis A | Berries | ISO 15216-2:2019 | Not accredited |
| *Legionella* spp | Water and soils | AS/NZS 3896:2017 | NATA |
| *Listeria* spp | Food, water and swabs | AS 5013.24.1:2020<br>AOAC 2004.06<br>In-house | NATA |
| Non Tuberculous *Mycobacterium* | Water | PHE Method | Not accredited |
| Norovirus | Berries | ISO 15216-2:2019 | Not accredited |
| *Pseudomonas aeruginosa* | Water | AS 4276.13:2008 | NATA |

| | | | |
|---|---|---|---|
| *Salmonella* spp | Food, water and swabs | AS 5013.10:2009<br>AFNOR BIO 12/16-09/05<br>AS 4276.14:2014 | NATA |
| Shiga-toxin producing *E. coli* (STEC) | Food, water and swabs | In-house | NATA |
| *Shigella* spp | Food, water and swabs | AS 5013.25:2009 | Not accredited |
| *Staphylococcus* enterotoxin II (SET2) | Food | AOAC 2007.06 | NATA |
| *Vibrio* spp | Food, water and swabs | AS 5013.18:2010<br>AS 4276.15:2014 | NATA |
| Yeasts and moulds | Food and water | AS 5013.29:2009<br>AS 4276.1:2020 | NATA |
| *Yersinia* spp | Food | PHE Method | NATA |

| Chemical Hazard | Sample Type(s) | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| pH | Food | AS 2300.1.6:2010 (R2019) | NATA |
| Water Activity | Food | AquaLab, Meter Group Inc. | NATA |

# National Measurement Institute (NMI), Australia

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address:** | 1/153 Bertie Street, Port Melbourne, Victoria, Australia, 3207 |
| **Initial Contact Point:** | Anne Coyle, Customer Service Manager, Analytical Services Branch |
| **Email:** | anne.coyle@measurement.gov.au |
| **Phone:** | (613) 9644-4888 |
| **Fax:** | (613) 9644-4999 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Hepatitis A | Fruit, vegetables | PCR |
| *Bacillus cereus* | Food (in general) | |
| *Clostridium botulinum* | | Initial screen, confirmation outsourced |
| *Clostridium perfringens* | | Cultural plate-based |
| Enteropathogenic *Escherichia coli* | | BAX® PCR |
| *Listeria monocytogenes* | | VIDAS®UP and ALOA plates |
| *Salmonella enterica* | | VIDAS®UP and culture plates |
| *Salmonella* Typhi | | VIDAS®UP and culture plates |
| *Staphylococcus aureus* | | Petrifilm™ and culture plates |
| *Vibrio cholerae* | Fish and fishery products | BAX® PCR and culturing |
| *Vibrio parahaemolyticus* | | |

| Chemical Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Arsenic (inorganic) | Fish and fishery products | ICP MS |
| Lead | Food (in general including cassava and cassava products for cyanide analyses) | |
| Mercury | | |
| Cyanide | | Discrete analyser |
| Aflatoxin | | HPLC |
| Domoic acid | Fish and fishery products | HPLC |
| Histamine | | |
| Saxitoxin | | HPLC FLD |
| Dioxin | Fat, fish, meat and meat products, Milk and milk products, and oils | High Resolution Gas Chromatography (HR GC) MS |
| Furans | | |
| PCB | | |
| Nitrofuran | Honey, pork muscle and prawns | MIT; confirmation by LC MS-MS |
| Organochlorine pesticide residues | Food (in general) | GC MS/MS and LC MS/MS |
| Organophosphorous pesticide residue | | |
| Chloropropanol | Soy products | GC MS |
| Melamine | Food and pet food | LC MS/MS |
| Cephalosporins, Sulfonamides, Tetracyclines, Flouroquinolones | Animal tissue/meat, eggs, seafood, milk and dairy | LC MS/MS |

# SGS, Philippines

## Laboratory contact information

| | |
|---|---|
| **Laboratory Address:** | 2nd floor Alegria Bldg. 2229 Chino Roces Avenue, Makati, Metro Manila, Philippines, 1231 |
| **Initial Contact Point 1:** | Erika Robel, Key Account Manager |
| **Email:** | erika.robel@sgs.com |
| **Phone:** | (632) 8288-8798 loc. 837 |
| **Mobile:** | (63) 917 871-7169 |
| **Initial Contact Point 2:** | Jinelle Picones, Sales Manager – Food |
| **Email:** | jinelle.picones@sgs.com |
| **Phone:** | (632) 784-9400 loc. 818 |
| **Mobile:** | (63) 917 838-9611 |

## Detection capacity

| Biological Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Hepatitis A | Fish and fisheries products | RT-PCR |
| *Bacillus cereus* | Food in general but commonly cereals and cereal products | Spread plate culture |
| *Cl. perfringens* | Food in general | Pour plate culture |
| *Listeria monocytogenes* | | Qualitative culture |
| *Salmonella* spp | | |
| *Shigella* | | |
| *Staphylococcus aureus* | | Spread plate culture |
| *Escherichia coli* O157:H7 | | RT-PCR |
| *Vibrio cholerae* | | Qualitative culture |
| *Vibrio parahaemolyticus* | | Most probable number |

| Chemical Hazards | Sample Type(s) | Detection Methodology |
|---|---|---|
| Arsenic (Inorganic) | Food and environmental | AAS-Hydride Vapor |
| Lead | | Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) |
| Mercury | | AAS-Hydride Vapor |
| Aflatoxin | Nuts and nut products | Rapid Screen |
| Histamine | Fish and fisheries products | Not specified |
| Dioxins | Food and environmental | Outsourced |
| Furans | | |
| PCBs | Water | Not specified |
| Antimicrobial residues - nitrofuran | Fish and fisheries products | |
| Organochlorine pesticide residues | Food and environmental | |
| Organophosphorous pesticide residues | | |
| Carbamate | Not specified | Outsourced |
| Melamine | | |

# Queensland Health Forensic and Scientific Services, Australia

## Laboratory contact information

| | |
|---|---|
| **Laboratory Physical Address 1:** | Queensland Health Forensic and Scientific Services, Health Support Queensland, Department of Health, 39 Kessels Road, Coopers Plains QLD 4108, Australia |
| **Contact Point: Inorganic Chemistry** | Dr Tatiana Komarova, A/Chief Chemist |
| **Email:** | Tatiana.Komarova@health.qld.gov.au |
| **Contact Point: Organic Chemistry** | Stewart Carswell, Chief Chemist |
| **Email:** | Stewart.Carswell@health.qld.gov.au |
| **Phone:** | (617) 3096-2811 |
| **Alternative Contacts:** | Lee Smythe, Managing Scientist – Lee.Smythe@health.qld.gov.au |

## Detection capacity

| Inorganic Chemical Hazard | Type(s) of Sample | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| Arsenate; arsenite; arsenobetaine (AB); dimethylarsenate (DMA); monomethyl arsenate (MA) | Waters for potable and domestic purposes; fish; seafood; shellfish | HPLC-ICP-MS | NATA ISO/IEC 17025 |
| Methyl mercury; ethyl mercury, inorganic mercury | Waters for potable and domestic purposes; fish; seafood; shellfish | HPLC-ICP-MS | NATA ISO/IEC 17025 |
| Arsenate; arsenite; arsenobetaine (AB); dimethylarsenate (DMA); monomethyl arsenate (MA) | Cereal/rice | HPLC-ICP-MS | No accreditation |
| Calcium; potassium; magnesium; sodium; phosphorus (sulfur*) | All food | ICP-OES | NATA ISO/IEC 17025 *No accreditation for sulfur |
| Arsenic; cadmium; calcium; copper; iron; lead; magnesium; mercury; phosphorus; potassium; selenium; sodium; tin; zinc | Alcoholic beverages; canned fruit; cereal products; cocoa and cocoa products; confectionery; crustaceans; dairy products; edible oils; eggs and egg products; fish; fruit juice concentrates; fruit juices; fruit products; grain products; grains; herbs; jams; margarine; meat and meat products; molluscs; nuts and nut products; preserved fruit; spices; sugar and sugar products; vegetables and vegetable products | ICP-OES/ICP-MS | NATA ISO/IEC 17025 |
| Aluminium; antimony; barium; beryllium; bismuth; boron; bromine; caesium; chromium; cobalt; iodine; lithium; manganese; molybdenum; nickel; silver; strontium; thallium; thorium; titanium; tungsten; uranium; vanadium; zinc | All food | ICP-MS/ICP-QQQ | No accreditation |

| | | | |
|---|---|---|---|
| Aluminium; antimony; arsenic; barium; beryllium; bismuth; cadmium; chromium; cobalt; copper; iron; lead; manganese; mercury; molybdenum; nickel; selenium; silver; thallium; thorium; tin; uranium; vanadium; zinc | Sea water | ICP-MS | NATA ISO/IEC 17025 |
| Aluminium; antimony; arsenic; barium; beryllium; bismuth; boron; cadmium; chromium; cobalt; copper; iron; lead; lithium; manganese; mercury; molybdenum; nickel; platinum; selenium; silver; sodium; strontium; thallium; thorium; tin; titanium; uranium; vanadium; zinc | Bore waters; fresh waters; ground waters; industrial waters – treated; irrigation and stock waters; recycled waters; saline waters; sediments; sewage; sludges; steam-raising waters; swimming pool and spa waters; trade wastes; waters for potable and domestic purposes | ICP-MS | NATA ISO/IEC 17025 |
| Aluminium; antimony; arsenic; barium; beryllium; boron; cadmium; calcium; chromium; cobalt; copper; iron; lead; magnesium; manganese; mercury; molybdenum; nickel; phosphorus; potassium; selenium; silica; silver; sodium; strontium; tin; vanadium; zinc | Bore waters; fresh waters; ground waters; industrial waters – treated; irrigation and stock waters; recycled waters; saline waters; sediments; sewage; sludges; soils; solid wastes; steam raising waters; surface waters; swimming pool and spa waters; trade wastes; waters for potable and domestic purposes | ICP-OES | NATA ISO/IEC 17025 |
| Cyanide – total | Bore waters; ground waters; industrial waters – treated; irrigation and stock waters; leachates; liquid wastes; saline waters; sewage; steam-raising waters; surface waters; trade wastes; waste waters | Colourimetry | NATA ISO/IEC 17025 |
| Chloramines; chlorine – free; chlorine – total | Waters for potable and domestic purposes; fresh waters; industrial waters – treated; recycled waters; Saline waters; sewage; surface waters; swimming pool and spa waters | UV-vis spectro-photometry | NATA ISO/IEC 17025 |
| Nitrogen – ammonia; nitrogen – nitrate; nitrogen – nitrite; nitrogen – total; phosphorus – reactive; phosphorus – total; silica – molybdate reactive | Bore waters; fresh waters; ground waters; industrial waters – treated; irrigation and stock waters; recycled waters; saline waters; steam-raising waters; surface waters; swimming pool and spa waters; trade wastes; treated effluent; waters for potable and domestic purposes | Flow injection analyser (FIA) | NATA ISO/IEC 17025 |
| Chloride; fluoride; nitrate; sulfate | Bore waters; fresh waters; ground waters; industrial waters – treated; irrigation and stock waters; recycled waters; saline waters; sewage; steam-raising waters; surface waters; swimming pool and spa waters; trade wastes; waters for potable and domestic purposes | Ion chromatography (IC) | NATA ISO/IEC 17025 |
| Bromate; bromide; chlorate; chlorite; fluoride; iodide; nitrite; perchlorate; phosphate; thiosulfate | Bore waters; fresh waters; ground waters; industrial waters – treated; irrigation and stock waters; recycled waters; surface waters; swimming pool and spa waters; trade wastes; waste waters; waters for potable and domestic purposes | Ion chromatography (IC) | NATA ISO/IEC 17025 |

| Organic Chemical Hazard | Type(s) of Sample | Detection Methodology | National/ International Accreditation |
|---|---|---|---|
| 13C/12C Stable isotope ratios | Honey; sugar and sugar products | IRMS | NATA ISO/IEC 17025 |
| Alcohol; ethanol | Alcoholic beverages; beer; brewed tea; carbonated alcoholic beverages; cider; fermented drinks; fortifieds; kombucha; sparkling wine; spirits; wine | GC | NATA ISO/IEC 17025 |
| Benzoic acid; sorbic acid | Alcoholic beverages; carbonated drinks and cordials; cereal products; dairy products; fruit and fruit products; meat and meat products; sugar and sugar products; vegetables and vegetable products | HPLC | NATA ISO/IEC 17025 |
| BHA/BHT | Foods | GCMS | Not Accredited |
| Carbamates; fungicides; organochlorine pesticides; organophosphate pesticides; synthetic pyrethroids | Fruits; vegetables | GCMS LCMSMS | NATA ISO/IEC 17025 |
| Ciguatoxins | Fish | LCMSMS | Not Accredited |
| Cyanotoxins | Water | LCMSMS | Not Accredited |
| Disinfection by-products Trihalomethanes Haloacetic acids Nitrosamines | Water | GCMS | NATA ISO/IEC 17025 |
| Endocrine disrupting compounds (EDC) | Water | GCMS | NATA ISO/IEC 17025 |
| Fat | Fish products; fresh fish; meat and meat products | Soxhlet | NATA ISO/IEC 17025 |
| | Cereal products; dairy products; fruit and fruit products; vegetables | Mojonnier | NATA ISO/IEC 17025 |
| Fatty acid methyl esters (FAME) | Crustacean products; cured fish; fats and fat products; fish products; fresh crustaceans; fresh fish; fresh molluscs; frozen crustaceans; frozen fish; frozen molluscs; meat and meat products; mollusc products; oils | GC | NATA ISO/IEC 17025 |
| GMO Screening | Foods | | Not Accredited |
| Herbicides; organochlorine pesticides; organophosphate pesticides | Eggs and egg products | GCMS LCMSMS | NATA ISO/IEC 17025 |
| | Honey and molasses | | Not Accredited |
| Hydrocarbons VOCs PAHs PCBs | Water | GCMS | NATA ISO/IEC 17025 |
| Nitrogen – total volatile | Crustacean products; fish products; fresh fish; meat and meat products; mollusc products | Distillation | NATA ISO/IEC 17025 |
| Paraquat, diquat | Water | GCMS | Not Accredited |
| Per- and poly-fluoroalkyl substances (PFAS) | Vegetables; water; seafood | LCHRMS | NATA ISO/IEC 17025 |
| Peroxide value and free fatty acids | Cereal products; fats and fat products; flours; oils | Titration | NATA ISO/IEC 17025 |

| | | | |
|---|---|---|---|
| Pesticides, herbicides, and fungicides<br>Carbamates<br>Endothal<br>Phenoxy acid herbicides<br>Glyphosate and ampa<br>Organochlorine (OC) pesticides<br>Organophosphate (OP) pesticides<br>Synthetic pyrethroids<br>Chlorothalonil | Water | LCMSMS<br>GCMS | NATA<br>ISO/IEC 17025 |
| Pesticides, herbicides, and fungicides<br>Organochlorine (OC) pesticides<br>Organophosphate (OP) pesticides<br>Synthetic pyrethroids | Seafood | GCMS | Not Accredited |
| Pharmaceuticals and personal care products (PPCP) | Water | LCMSMS | NATA<br>ISO/IEC 17025 |
| Phenol compounds | Water | GCMS | NATA<br>ISO/IEC 17025 |
| Propionic acid | Bread; cereal products; cured meats; fruit and fruit products; meat and meat products; sugar and sugar products; vegetables and vegetable products | GC | NATA<br>ISO/IEC 17025 |
| Pyrrolizidine alkaloids | Honey | LCMSMS | NIL |
| Sodium | Cereal products; cocoa and cocoa products; coffee; cordials; herbs; meat and meat products; soft drinks; spices; sugar and sugar products; tea | Flame photometry | NATA<br>ISO/IEC 17025 |
| Species by DNA Sequencing | Foods | DNA Sequencing | NIL |
| Species by PCR | Foods | PCR | NIL |
| Sulfur dioxide | Alcoholic beverages; cereal products; cured meats; fruit and fruit products; juices; meat and meat products; vegetables and vegetable products | Titration | NATA<br>ISO/IEC 17025 |
| Volatiles | Foods | GCMS | NIL |

# ANNEX 3

## WHO collaborating centres for food safety in the Western Pacific Region

### WHO Collaborating Centre for Food Contamination Monitoring

| | |
|---|---|
| **Laboratory Name:** | China National Center for Food Safety Risk Assessment (CFSA), NHC Key Lab of Food Safety Risk Assessment, Chinese Academy of Medical Science Research Unit (2019RU 014 Food Safety) |
| **Laboratory Address:** | Building 2, Guangqu Road 37, Chaoyang District, Beijing 100022 China |
| **Website:** | http://https//www.cfsa.net.cn/ |
| **Contact Point:** | Professor & Dr Yongning Wu, Director |
| **Email:** | wuyongning@cfsa.net.cn |
| **Alternative Contacts:** | Prof Dr Yang Dajin – yangdajin@cfsa.net.cn<br>Prof Dr Li Fengqin – lifengqin@cfsa.net.cn<br>Prof Dr Zhao Yunfeng – zhaoyf@cfsa.net.cn<br>Prof Dr Zhou Shuang – zhoush@cfsa.net.cn |
| **Phone:** | (86-10) 13 911 049 472 |
| **Fax:** | (86-10) 5216-5589 |

### WHO Collaborating Centre for Food Contamination Monitoring

| | |
|---|---|
| **Laboratory Name:** | Department of Food Safety Monitoring & Forensics Department, National Centre for Food Science, Singapore Food Agency |
| **Laboratory Address:** | 10 Perahu road, 718837 Singapore |
| **Website:** | http://www.sfa.gov.sg/ |
| **Contact Point:** | Dr Calvin Yeo |
| **Email** | Calvin_YEO@sfa.gov.sg |
| **Phone:** | (65) 6276-9530 |
| **Other Contact Points:** | Mr Gerald Chung – Gerald_CHUNG@sfa.gov.sg<br>Mr Johnny Yeung – Johnny_YEUNG@sfa.gov.sg<br>Dr Wu Yuansheng, Director (Food Safety Monitoring & Forensic Branch) – WU_Yuan_Sheng@sfa.gov.sg |

### WHO Collaborating Centre for Risk Analysis of Chemicals in Food

| | |
|---|---|
| **Laboratory Name:** | Centre for Food Safety, Food and Environmental Hygiene Department |
| **Laboratory Address:** | 45/F Queensway Government Offices, 66 Queensway, Hong Kong SAR China |
| **Website:** | http://www.cfs.gov.hk/ |
| **Contact Point:** | Dr Edwin Lok-kin TSUI |
| **Email:** | edwintsui@fehd.gov.hk |
| **Phone:** | (852) 2867-5500 |
| **Fax:** | (852) 2536-9731 |

# ANNEX 4

## Basic equipment required to undertake food sampling

### Sterile sample containers

- Disposable plastic bags
- Wide-mouth jars (100–1000 ml) with screwcaps
- Bottles for water samples
- Foil or heavy wrapping paper
- Metal cans with tightly fitting lids

### Sterile and wrapped instruments for sample collection

- Spoons, scoops, tongue depressors
- Butcher's knife
- Forceps, tongs, spatula
- Drill bits
- Metal tubes (1.25–2.5 cm in diameter, 30–60 cm in length)
- Pipettes, scissors
- Moore swabs (compact pads of gauze made of 120 x 15 cm strips, tied in the centre with a long, sturdy twine or wire for samples taken from sewers, drains, pipes, etc.)
- Sponges

### Sterilizing agents

- 95% ethanol
- Propane torch

### Refrigerants

- Refrigerant in plastic bags or ice bricks
- Heavy-duty plastic bags or bottles that can be filled with water and frozen
- Heavy-duty plastic bags for ice

### Food temperature measurement

- Bayonet-type thermometers (–20 °C to 110 °C), between 13 and 20 cm length
- Bulb thermometer (–20 °C to 110 °C)

### General

- Marking pen (waterproof)
- Adhesive tape
- Cotton
- Peptone or buffered distilled water (5 ml in screw-capped tubes)
- Electric drill (if frozen foods to be sampled)
- Distilled water
- Insulated chest or polystyrene box


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