MICROBIOLOGICAL WATER QUALITY TESTING GUIDELINES[1]:

1 What to test

There are many different kind of pathogens and it would be too expensive and time consuming to test for each one. Instead, since most diarrhea-causing pathogens come from faeces, it is more practical to test for a sign of faeces in water. We can test for faecal contamination in drinking water by using indicator organisms.

There are several types of indicators, each with certain characteristics. E. coli and thermotolerant coliforms (TTC) are the two main bacterial indicators used for water quality testing.

Total Coliforms (TC)

- Broad class of bacteria, many are non-faecal.
- Not recommended for routine surveillance.

Thermotolerant coliforms (TTC)

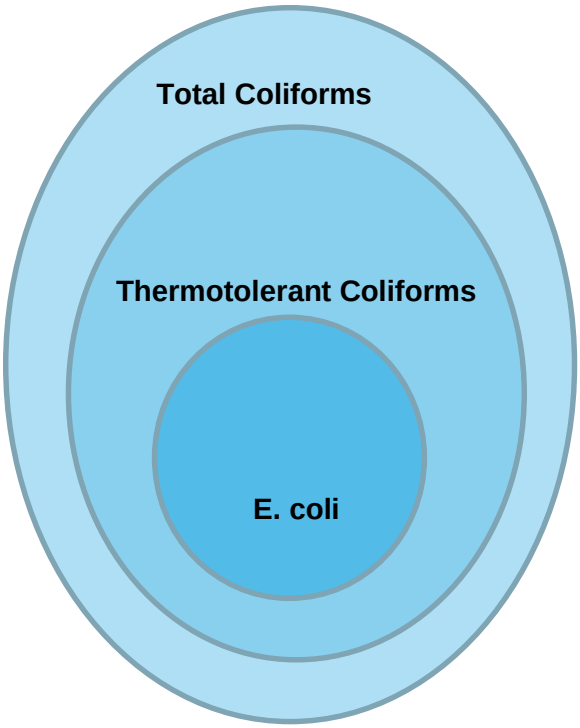
- Also known as faecal coliforms (FC).
- Alternate indicator of choice for faecal contamination.

E. coli (EC)

- In temperate zones, 95% of TTC are EC. But this can be less in tropical areas.
- Indicator of choice for faecal contamination.

Other indicators

- Fecal streptococci (FS) can persist longer in environment.
- Coliphages are proxies for viruses.



→ For the projects of the Water & Sanitation Consortium we chose the E.coli as indicator

Associated Risk for Feacal Contamination in Drinking Water

WHO Guideline for Fecal Contamination in Drinking Water =0 Fecal Contamination in Any 100 mL Sample
The WHO recognizes that zero fecal contamination can be difficult to achieve, especially in developing countries where many people rely on household and small community drinking watersystems. It is recommended that in these settings, the guideline values should be seen as goals for the future, rather than an immediate requirement (WHO, 2011).

[1] Based on the Drinking Water Quality Manual of CAWST

E.coli Level (CFU/100ml sample	Risk
0-10	Reasonable Quality
11-100	Polluted
101-1000	Dangerous
>1000	Very dangerous

2 Which test method to choose

There are several factors to be taken into consideration when choosing an appropriate microbiological test method, including:

- Objective of the result
  - Do the test have to be recognized officially and comply with national standards?
  - Is it for a baseline or for a monitoring system
  - Is it for internal use only
  - Monitoring project outcome
  - Use as project baseline
- Available resources:
  - Which financial resources do I have for the water quality testing?
  - Who will have to bear the cost in future?
  - What is the frequency of doing water tests?
- Required level of accuracy and precision
  - Do you need the quality test for internal use, demonstration use or for official recognition?
  - Do I need quantitative or only qualitative results?
  - Which water test are recognized by the government?
- Technical skill of staff
  - Do I have the qualified person to do the test depending on the method chosen?
  - Do we need further training?
- Geographical location
  - Are we working in an urban or rural setting?
  - Do I have access to electricity?
  - How far is the next laboratory?
  - Logistic involved in sample collection and transportation?
- Availability
  - Are there local distributors of the water test or the needed consumables locally available?
  - What are other NGO or organisation using for water tests?

There are three main test methods to determine the presence of indicator bacteria in drinking water:

1. Presence /absence (P-A)
2. Most probable number (MPN
3. Membrane filtration

Traditionally, membrane filtration using international standard methods was recommended to test for indicator bacteria in drinking water. The relatively high cost of membrane filtration made it difficult, impractical or impossible to perform these test in many parts of the world. Therefore on-site testing using portable kits and the development of alternative and simplified methods, such as P-A or MPN tests have contributed to overcoming these constraint.

3 Options

3.1 Presence absence tests

Presence absence test is a qualitative test that depends on a colour change to indicate the presence of contamination. The P-A test will not tell you about the quantity of indicator bacteria in the water sample.

P-A test are not appropriate for testing water that is known or likely to be contaminated, such as surface water and untreated small community supplies. It is also not recommended for testing the effectiveness of household water technologies.

P-A test are easy to use during sensitisation activities in the community and are cheap (0.5$/test).

Advantages	Limitations
• Simple to understand and use (requires minimal training) • Achieves results rapidly (within 24 hours) • Some test do not require extra equipment (e.g. incubator) • Portable and durable in the field • Inexpensive for a limited number of tests	• Only provides qualitative results; does not indicate the quantity of bacteria • Not recommended by WHO for testing surface water and untreated small community supplies • Not able to determine the removal effectiveness of the HWT technologies

Recommended products:

Presence Absence test from ENPHO

Hach Pathoscreen H2S field kit or pillows

More information in Annex 1

3.2 Most Probable Number Water Tests

The most probable number test method estimates the number of indicator bacteria that is most likely to be present in the water sample.

This method has become more popular for testing E.coli in the field, especially with academic researchers. It uses a lower incubation temperature. Another advantage is that it can test turbid water.

It can become quite expensive if you have to do a lot of tests (1-2$/test)

Advantages	Limitations
• Provides semi-quantitative results • Relatively simply to understand and use • Relatively inexpensive for occasional testing • Can be used with turbid water	• Results are a statistical estimate • More labour intensive than P-A testing • Requires some training • Requires more equipment than P-A testing • Not practical if needed to test many

Recommended products

Product name: Aquagenx Compartement Bag Test

More information in Annex 2

3.3 Membrane filtration

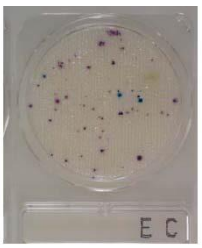
Membrane filtration is the most accurate method to determine the number of indicator bacteria in a water sample and is internationally recognized as a standard method for water quality testing. Membrane filtration can be done in a laboratory or by using a portable test kit.

Advantages	Limitations
• Provides quantitative results • Most accurate method to determine the number of indicator bacteria, results are obtained directly by counting the number of indicator bacteria colonies • Many sample can be tested at once • Internationally recognized test method	• More labour intensive than P-A and MPN testing • More complicated to understand and read results; requires more training • Requires more equipment than P-A and MPN testing (e.g. power source, incubator, pipettes, filter paper, petri dishes) • More difficult to test turbid water (i.e. dilution is required) • Cost of consumables can be expensive • High initial investment

Recommended Products

One way test

Nissui Compact Dry



More information in annex 3

Portable test kits:

- DelAgua Water Testing Kits (various)
- Potakit of Wagtech

DelAgua www.delagua.org

Coliforms, chlorine, pH, turbidity, temp.

•Lightweight (6 kg, 16 tests)
•Single incubator (10 kg, 16 tests)
•Double incubator (19 kg, 32 tests)

•Prices: ~£1400, ~£1500, ~£2000

Wagtech www.wagtech.co.uk

Coliforms, pH, turbidity, EC, arsenic, color disks (NH_3, Chlorine, F, NO_3, NO_2)

•Potalite, Potakit, Potalab, Potaflex

•Prices: ~£1200 - £2000

More information in Annex 4 & 5

3.4 Collaboration with national certified laboratories

You can send your sample to a certified laboratories for testing. These laboratories are usually located in larger cities and have dedicated facilities, trained technicians and specialized equipment. Laboratories use international standards for testing and can provide more consistent, accurate and precise results. Using the laboratories can be useful if you are taking a small number of samples and you are closed to the city. The relatively high cost for the tests, makes it difficult or impossible to use them.

→ As the price can vary much from laboratory to laboratory and from country to country it is important to ask for a quote for the tests you want to do and their conditions for the sampling.

Advantages	Limitations
• Results are recognized by the government • Controlled environment • More samples can be processed in a shorter time • If needed additional quality test also on chemical and physical parameters can be done	• Water test are often very expensive • Usually located in urban areas, long transport time of the water samples, when working in rural area • Often laboratories are not so well equipped and have limited options of tests methods

3.5 Planning water testing

3.5.1 Develop Objectives

The objectives of your water quality testing should meet your project needs and consider de needs of other stakeholders, such as a government regulator or a community water user group. This discussion is important so that the scope of the testing matches the resources available and the expectations

3.5.2 Identify test methods

Based on the objectives of the water quality testing and the parameters you want to test you will have to choose the Method.

3.5.3 Design sampling plan

Sampling size

- Project with less than 100 households or locations
  - At minimum 30% of the households should be chosen.

- Project with more than 100 households or location

Project size	Sample size
500	41-83
1'000	43-91
2'000	43-95
3'000	44-97
4-6'000	44-98
7-15'000	44-99
>20'000	44-100

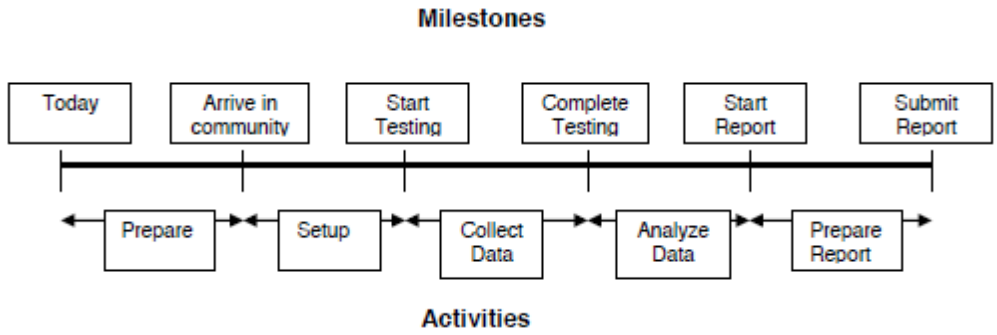
Note: Sample size for a 10% and 15% precision levels where confidence level is 95% (adapted from http://edis.ifas.ufl.edu/)

Sample selection

Geographical location and socioeconomic status can also be considered during the sample selection. It is best to choose a random sample so that there is no bias in your results.

- ***Simple Random sampling***: For example, your sample size is 50 from a total population of 200 households. Write the name of each household in a separate piece of paper and put it into a container. Randomly select 50 names from the container.
- ***Systematic Random sampling:***
  - Your sample size is 100 households from a total population of 1,000 households
  - 1,000 divided by 100 = 10 households
  - From a list of the 1,000 households, begin at a random household on the list, and select every 10th household to be sampled

Determine key miles stones and the activities



3.5.4 Develop Time and cost estimates

Normally, the cost and time is estimated, or at least agreed to. Water quality testing is often more complex and takes longer than we originally estimate, especially for the first time. It is best to give yourself some extra time in your plan.

3.5.5 Interpret the data in relation to the objectives

The objectives of the overall project and the water quality testing program need to be kept in mind when you are interpreting your test results. Different objectives can result in a different interpretation of the same test data. The following are some examples of objectives for water quality testing:

- Identify an appropriate drinking water source
- Identify the source of an outbreak of a drinking water-related disease
- Investigate seasonal changes in drinking water quality
- Increase user awareness on water quality issues
- Assess the effectiveness of household water treatment and safe storage (HWTS) in reducing turbidity and pathogens
- Provide troubleshooting as part of an ongoing monitoring program
- Monitor project outcomes
- Use it a as project baseline
- Monitor compliance with standards or guidelines
- Evaluate the effectiveness of a safe water project

Project implementers often carry out water quality testing to bring awareness in the community about the difference between contaminated water and treated water (for example, using a simple presence-absence test to indicate microbiological contamination). In such situations, results may be presented immediately to the community without complete interpretation of the overall data. This situation can sometimes go wrong if you generate a negative test result in front of the community without the ability to explain the result or perform any quality control to verify the test. This can easily create a negative impression about the project implementation and should be avoided if possible. If it is necessary to distribute early results, it is important to emphasize that they are incomplete and full results will be available after the data has been interpreted.

3.5.6 Safe waste disposal

Bacteria cultures must be disposed of safely and properly as each colony is made up of millions of individual bacteria. Contaminated material (e.g., Petri dishes, test bottles, test tubes, absorbent pads, filter paper) must be disinfected before disposal or reuse. This can be done by using one of the following options:

- Add liquid chlorine (bleach) to each Petri dish (about 2 mL) or test bottle until full. After 10 minutes of contact time with the bleach, pour the liquid down the drain and flush with plenty

of water to dilute the bleach. Burn the solid waste materials, if possible; otherwise dispose of the solid waste in the garbage.

- Place contaminated material (e.g., Petri dishes, absorbent pads, filter paper) into boiling water for at least 10 minutes. You may wish to do this outside as the smell may become unpleasant. Burn the solid waste materials, if possible; otherwise dispose of the solid waste in the garbage. Use a designated garbage bag and try not to mix the waste with common municipal waste.
- Place open test bottles, Petri dishes, absorbent pads and filter papers into a bucket which contains at least a 70 mL of bleach mixed with 2 litres of water. Allow at least 1 hour contact time, then boil the Petri dishes for 10 minutes to fully disinfect them and to wash off the bleach. Burn the solid waste materials, if possible; otherwise dispose of the solid waste in the garbage. Use a designated garbage bag and try not to mix the waste with common municipal waste.

Always wash your hands thoroughly with soap after handling the contaminated waste and before touching clean and sterilized equipment. If possible, you should wear disposable gloves.

4 Annexes

4.1 Annex 1

Product Name: Presence-Absence Test

Test Type: Presence-Absence (P-A)

Indicator: H_2S

Product Description: This test is used to detect thermotolerant coliform contamination of drinking water. It shows whether the bacteria is present or absent by turning the solution in the vial black within 48 hours. False positives may occur due to sources other than fecal contamination (i.e., water containing sulphate-reducing bacteria, groundwater with naturally high sulphide levels). This test is not recommended for testing water that is known or likely to be contaminated, such as surface water and untreated small community supplies. It is also not recommended for testing the effectiveness of household water treatment technologies.

Manufacturer: Environment and Public Health Organization (ENPHO)
110/25 Adarsa Marg-1, Thapagaon, New Baneshwor,
G.P.O Box No: 4102
Kathmandu (East), Nepal
Tel: + 977-1-4468641, 4493188
Fax: + 977-1-4491376
E-mail: enpho@enpho.org
Website: www.enpho.org/research-and-development/analysis.html

Distributors: None

Availability: ENPHO is willing to ship the product from Nepal to other countries. Seeds of Hope International Partnerships also manufacture the test in Zambia using ENPHO's method.

Cost: Rs.45.00 or approximately US$0.47 per test

Storage: No specific requirements identified.

Maintenance: No maintenance required. Bottles are disposed after use.

Other Necessary Products: Permanent marker

ENPHO presence-absence test bottles showing negative (clear) and positive (black) results (Credit: ENPHO)

Product Name: PathoScreen™ Field Test Kit (Product #2859100)

Test Type: Presence-Absence (P-A)

Indicator: H_2S

Product Description: This test kit is used to detect thermotolerant coliform contamination of drinking water. The Pathoscreen culture media comes in pillows (like sachets) with enough powder to test 100 mL of water. The sample water is put in sterilized bottles, and the contents of PathoScreen powder pillow is added and left for 24 hours. The change in colour indicates the safety of the water. False positives may occur due to sources other than fecal contamination (i.e., water containing sulphate-reducing bacteria, groundwater with naturally high sulphide levels). This test is not recommended for testing water that is known or likely to be contaminated, such as surface water and untreated small community supplies. It is also not recommended for testing the effectiveness of household water treatment technologies. This test kit provides for 100 P-A tests and 20 most probable number (MPN) results. Includes Pathoscreen powder pillows, bleach solution, and carrying case.

Manufacturer:
Hach Company
Loveland, Colorado
USA
Tel: 1-800-227-4224
Fax: +1-970-669-2932
Email: orders@hach.com

Outside the USA:
Tel: +1-970-669-3050
Fax: +1-970-461-3939
Email: int@hach.com
Website: www.hach.com

Distributors: Various distributors worldwide
Website: www.hach.com/global-distributor-support

Availability: USA and international

Cost: US$48.00

Storage: No refrigeration required for media.

Other Necessary Products: Permanent marker

Illustrations Top: Complete test kit, Bottom: Extra Pathoscreen pillows (Credit: HACH)

4.2 Annex 2

Product name: **Aquagenx Compartement Bag Test**

Test type: MPN of E.coli in 100 ml

Product despcription:

The Compartment Bag Test (CBT) is a portable, self-contained water quality test kit to determine if drinking water contains *E. coli*.

A water sample is collected in a 100 mL bottle, and a chromogenic *E. coli* growth medium is added to the sample. After the medium dissolves, the sample is poured into the bag that contains five compartments of different volumes totaling 100 mL. The bag is sealed shut and the sample incubates at ambient temperature at 25ºC and above for 24 hours. For temperatures below 25ºC, an insulated container or portable incubator is recommended, as well as a longer incubation period. The sample turns colors. A blue or blue-green color indicates a positive presence of *E. coli*. A yellow or yellow-brown color indicates absence of *E. coli.* The concentration of fecal bacteria is estimated from the combination of positive and negative compartments, giving a Most Probable Number estimate of *E. coli* per 100 mL. After scoring test results, chlorine tablets are added to the sample for decontamination and safe disposal.

An instruction sheet, including an MPN Table for scoring test results and specific incubation times and temperatures, comes with the CBT Kit. There is also a video on the Aquagenx website that demonstrates how to use the test.

The Aquagenx CBT Kit includes complete supplies for 10 tests:

- 10 compartment bags
- 10 100 mL sample bottles
- 10 Aquagenx *E. coli* chromogenic culture medium test buds
- 30 chlorine tablets for sample disinfection and safe disposal
- 1 reusable sealing clip for safe transport of bags

Left: Positive (blue/blue green) and negative (yellow/yellow brown) compartments indicate *E. coli*

Right: CBT Kit includes complete supplies for 10 tests (Credit: Aquagenx)

Manufacturer:	Aquagenx Tel: +1-919-590-0343 Email: info@aquagenx.com Website: www.aquagenx.com
Availability:	USA and can be shipped internationally
Cost:	Aquagenx provides volume-based pricing for CBT Kits. Contact Aquagenx for details. Shipping fees are added to the invoice.
Storage:	The culture media does not need to be refrigerated. Shelf life of the CBT Kit is one year from the date of manufacture.
Maintenance:	Product is disposed after single use.
Other Necessary Products:	Insulated container or portable incubator is recommended if ambient temperature is below 25ºC.

4.3 Annex 3

Analysis of E.coli

1. Introduction

The detection of E.coli bacteria are generally used for the determination of the microbiological quality of water. A well equipped laboratory and trained staff are required for such tests. However, such conditions are often not available in the field. Therefore, a simple method is described hereafter using material adapted for the field such as:

- water of 70 ^{0}C to disinfect ("pasteurize") the tools
- E.coli plate to cultivate the colonies
- ambient temperature of 25 - 35 ^{0}C for the incubation

2. Inoculation of the E.coli plate

	**Material** 1 permanent marker 2 forceps 3 syringe 4 filter paper holder 5 pipette 6 sterile filter paper 7 E coli plate 8 glass 9 water samples A vessel with hot water B vessel for discharge
	**"Sterilization" of material** - wash hands well with soap - fill/wash tools with water of 70 ^{0}C from vessel A - discard the water into vessel B
	**2.1. Analysis of 1 ml water sample** - use a 1 ml sterilized pipette and fill it with the water to be analyzed
	**Inoculation of the 1 ml water sample** - remove the lid of the E. coli plate and place it face up on a clean surface. Do not touch the inside of the lid with anything. - distribute the 1 ml water sample over the E.coli plate

	**2.2 Analysis of a 100 ml or 10 ml water sample** If the water is thought to be highly contaminated (> 1000 cfu/100 mL) there is no need to analyze a 100 mL or 10 mL sample or to use filter paper – the 1 mL sample is adequate. If the water is highly turbid, use a 10 mL syringe to avoid clogging the filter paper. Otherwise, use a 100 mL syringe. - sterilize the syringe by sucking hot water in the syringe
	- after at least 10 seconds discard the hot water into the discharge vessel
	- pasteurize the filter paper holder by submerging its upper part in the hot water
	- and drain the hot water of the filter paper holder into the discharge vessel
	- and do the same with a clean glass

	- fill the pasteurized glass with the water to be analyzed
	- take a sterile filter paper with the pasteurized forceps. Hold the filter paper by the edge.
	- place the sterile filter paper on the pasteurized filter paper support - place the forceps on a clean surface.
	- close the filter paper support with the cap
	- take care that the cap is in its correct and tight position in order to avoid leakages during filtration

	- Pull the syringe handle to draw 100 ml water from the water sample to be analyzed into the syringe. note: in case the water sample is rather turbid use a 10 ml syringe.
	- fix the filter paper support on the syringe - slowly press the syringe handle to filter the 100 ml or 10 ml water sample through the filter paper - discard the filtered water into the discharge vessel
	- open the filter paper support by removing its cap
	- carefully remove the filter paper from the filter holder with the pasteurized forceps
	- place the filter paper carefully on the E.coli plate. Avoid air pockets between the nutrient path and the filter paper - place the E. coli plate cover on top of the plate and close tightly - write on the E.coli plate with the permanent marker the following information: • type and location of the water sample (water from a river/pond/well/household or water treated by SODIS) • volume of water (1ml, 10 ml or 100 ml) • date of the analysis

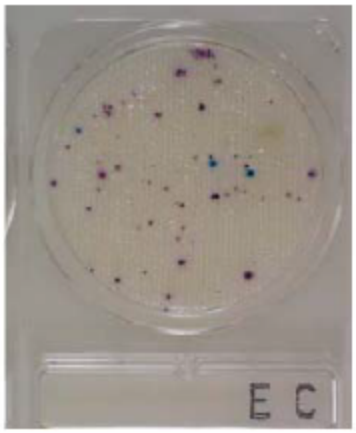
3. Cleaning of the tools

- at the end of the water analysis clean all the tools with hot water

- store the equipment in a dry and clean place

4. Incubation of the E.coli plates

- place the E.coli plates on upside down position (filter paper under the nutrient pad)
- store the E.coli plates on a dry and dark place at a temperature of 25 - 35 °C for 24 hours



5. E.coli counts

- the blue spots are E.coli colonies

(- the red spots are coliform colonies, these are only counted when measuring total coliform levels)

- count the number of blue spots and record the E.coli concentration for 100 ml of water by multiplying
  - the count of a 1 ml sample by 100
  - the count of a 10 ml sample by 10
  - the count of a 100 ml sample by 1

6. Providers of the material

Most of these materials are standard and can be readily obtained through laboratory suppliers (e.g. VWR, Whatman, Hach). As an example, some items and suppliers are listed below. Actual prices and part numbers will vary from supplier to supplier.

Item	Supplier/Part number	Approximate Price
BD Plastipak polypropylene 100 mL syringe with Luer adapter	VWR 613-3920	2–3 USD per piece
Swin-Lok polycarbonate filter holder, 47 mm, female Luer slip-lock cap	VWR 515-2362	40–80 USD per piece
Pall GN-6 Metricel cellulose filters, 0.45 µm pore size, 47 mm diameter, sterile, gridded	VWR 514-4180	1–2 USD per filter
Nissui Compact Dry EC plates	HyServe 1.000.168	1–2 USD per plate

4.4 Annex 4

Product: DelAgua Water Testing Kits

Test Type: Microbiological, chemical, and physical parameters

Product Description: The DelAgua Water Testing Kit was developed by scientists at the University of Surrey in collaboration with colleagues at Oxfam. The kit is designed for water quality testing in difficult situations or remote areas where laboratory facilities do not exist. The kit is designed for use in the field, but may also be used in a laboratory or other permanent location.

The kit comes in different versions (e.g., Bacteriological Kit #1, Kit #2, Kit#3, Single Incubator, Dual Incubator, Lightweight Incubator) that are suitable for various contexts and budgets. The kits can be supplied with a range of equipment and products that will increase the scope of testing for chemical and physical parameters.

The Single Incubator Kit (Product # DWT 10098) is designed to carry out five water quality tests including membrane filtration for microbiological quality, turbidity, free chlorine, total chlorine, and pH. The kit can test for different indicator organisms including thermotolerant coliforms, *E. coli*, cholera, and salmonella. The incubator is built with an internal battery and is capable of up to 5 incubation cycles between recharges. Additional equipment can be included on request to test for chemicals that may be of local importance. The kit includes consumable products needed for 200 tests.

Manufacturer:
DelAgua Water Testing Limited
Unit 2, The Old Dairy
Church Lane
Lower Fyfield
Marlborough
SN8 1PX, United Kingdom

Tel : +44 (0) 1672 861 198

Fax: +44 (0) 1672 861 724

Email: info@delagua.org

Distributors: Various distributors worldwide, contact sales@delagua.org

Availability: UK and international

Cost: Single Incubator Kit: £2,312 (approximately US$3,710) (excluding VAT). Contact Delagua for quotes in Euro and US dollars.

Storage: The kit and components must remain dry.

Maintenance:

Weekly:

1. Wash, rinse and dry the filtration apparatus
2. Apply a smear of silicone grease to the black rubber O-ring
3. Charge the internal battery fully at the end of each week

Monthly:

Weekly maintenance, plus:

1. Check the incubator temperature and recalibrate if necessary
2. Clean all components of the kit, including the case
3. Check all components for damage that may affect operation

Other Necessary Products: Sterlization capability for microbiological waste disposal. Heat source able to sustain high heat to prepare culture media.

DelAgua Portable Test Kit (Credit: Delagua)

4.5 Annex 5

Product: Potakit® + Basic Portable Water Quality Laboratory

Test Type: Microbiological, chemical, and physical parameters

Product description: Designed for routine testing in the field, the Potakit®+ includes a combination of visual and digital test instruments that offer an affordable yet accurate testing solution.

The key features include:

- Intuitive field microbiological analysis – simple-to-use incubator with unique audible prompts for ease of operation and USB connection for data download
- Complete physico-chemical analysis – visual testing apparatus for turbidity, Ammonia, Arsenic, Free and Total Chlorine, Fluoride, Nitrite and Nitrate plus Pocket Sensors for pH and conductivity
- Ergonomic kit layout – all key components laid out logically and conveniently to guide users through the test protocol
- The Potakit® + provides cost-effective drinking water testing for a wide range of circumstances and is an ideal resource for WASH programme implementation.

Wagtech Incubator with standard test protocols and audible prompts, petri dish racks, high performance Lead Acid battery with capacity for at least 5 cycles per charge, mains charger with international adaptors, vehicle socket battery power lead, crocodile clip power leads;

Membrane Filtration assembly, bronze disc, pistol grip vacuum pump with no-kink silicone tubing, 5 Media Measuring Devices (MMDs), 38.1g Membrane Lauryl Sulphate Broth, 5 Pasteur pipettes, hand lens, forceps, 20 Aluminium re-usable petri dishes, 200 sterilised and sealed membrane filters, 200 absorbent pads, absorbent pad dispenser, steel sampling cup, sampling cable

Polypropylene 250ml beaker, quick start prompt cards, sterilisable integrated work surface. Contour Comparator and discs, 4 comparator cuvettes, comparator reagents for 200 tests for Free and Total Chlorine, Ammonia, Fluoride, Nitrite and Nitrate

Visual Arsenic Detection Kit with consumables for 200 tests. Double length Turbidity Tube. Pocket pH Sensor and pH calibration buffers. Pocket Conductivity Sensor with conductivity calibration standard, Cuvette brush, 2 Dilution tubes, crush/stir rods, De-ion pack, instructions

Manufacturer:	www.wagtech.co.uk
Distributors:	Various distributors worldwide, contact: http://www.wagtech.co.uk/contact-us/new
Availability:	England and international
Cost:	£ 1200-2000
Maintenance:	same like Delaqua
Storage:	The kit and components must remain dry