The Expose E. coli Swab



A simple Citizen Science tool to measure the degree of E. coli contamination of water

The **Expose E. coli swab** is a product of Micro Food Lab. This user manual was produced as part of WRC research project K5/2350.











Contents

1.	Intro	oduction and Background	2
	1.1	What is E. coli?	2
	1.2	Why should we monitor <i>E. coli</i> ?	2
	1.3	What causes E. coli contamination of water?	2
	1.4	The <i>E. coli</i> swab and how to use it	2
2.	How	to use the <i>E. coli</i> swabs	2
3.	Wha	It does a positive result mean?	4
4.	Ackr	nowledgements	5
		-	

List of Figures

Figure 2.1	Collecting the sample from an area of still water and replacing the swab in the test tube \dots 3			
Figure 2.3	Judging the swabs according to the expose <i>E. coli</i> swab result colour scale			
Figure 3.1	Results of <i>E. coli</i> swabs – Blue colouration showing <i>E. coli</i> bacteria. Please note that the colours			
are a rough guide to the extent of (CFU refers to the measure of "colony forming units")				

1. INTRODUCTION AND BACKGROUND

1.1 What is E. coli?

Escherichia coli (which is part of the coliform group of bacteria) is normally found in the intestines of warm blooded animals (including humans), as well as in animal waste material. Most *E. coli* are harmless and are important in the intestinal system. However, some *E. coli* are pathogenic and can cause illness, such as diarrhoea. These types of *E. coli* can be spread through contaminated water or food, or through contact with animals or people. In water, *E. coli* have no taste, smell, or colour. Traditionally, they can only be detected through a laboratory test.

1.2 Why should we monitor *E. coli*?

The occurrence of *E. coli*, particularly in large quantities, is an indicator of sewage or faecal contamination in water. *E. coli* indicates the likely presence of other disease-causing pathogens (e.g. certain bacteria, viruses and parasites). The presence of *E. coli* in a water body may also have direct negative impacts, as certain strains of *E. coli* can cause illness to humans, with symptoms such as diarrhoea, vomiting, stomach cramps and fever. Scientific monitoring of *E. coli* in water bodies used for drinking water or recreation, especially when considering that coliform bacteria are colourless, odourless and tasteless and thus cannot be detected without specialised equipment, is vital.

1.3 What causes *E. coli* contamination of water?

Pathogens in water are generally introduced through contamination from human or animal faecal waste. This can be brought about by various circumstances such as septic tank and sewage discharges which are improperly managed, leaching of animal manure, run-off from storm water, and the presence of domestic and wild animals near to water bodies.

2. THE E. COLI SWAB AND HOW TO USE IT

EXAMPLE The *E. coli* swab was developed by Micro Food Labs as a rapid assessment to detect the presence or absence of *E. coli* bacteria. The swab provides an indication for the user to determine if further testing is required, based on the outcome of the test.

The swab works on the principal that a sample is collected, and incubated for a period of between 18 - 24 hours, to allow any *E. coli* present to reproduce to determine if there is *E. coli* present or not.

2.1 How to use the E. coli swabs

- 1. Remove the swab from the sheath, twisting the swab whilst removing it.
- 2. When testing the water, ensure that the swab moved around so as to 'saturate' the swab with liquid.
- 3. The swab should not be allowed to touch anything other than the liquid which is being tested (i.e. it must not touch rocks or plants).
- 4. The sample should be taken from an area where the water is still (e.g. behind a rock or in a place where an eddy has formed) rather than an area of flowing water (Figure 2.1).
- 5. Return the swab to the sheath (Figure 2.1), ensuring that it makes adequate contact with the media/gel at the bottom of the swab container (it may be necessary to move the swab up and down a few times in the media to achieve this).
- 6. It is vital that the swab is NOT REMOVED from the sheath once it has been placed back in it.





Figure 2.1

Collecting the sample from an area of still water and replacing the swab in the test tube

- 7. Number and date the samples that are collected, so that you can identify them after incubation.
- 8. The swab must now be incubated, which is a process of maintaining the swab at a controlled temperature in order to provide the best growing conditions for *E. coli* growth. Place the swab into the incubator, which must be plugged into a power source, and switched on.
- 9. 18-24 hours after placing the swab into the incubator the swab can be "read". If a negative result (no *E. coli* present) is achieved after this time, re-incubate the swab for another 18-24 hours (giving a 48-hour result) to ensure that the result really is negative (that means no *E. coli* present).



Figure 2.2 Judging the swabs according to the expose *E. coli* swab result colour scale

- 10. The middle hole of the incubator (the 'control' hole) should be left open, allowing excess heat to escape in order to keep the temperature within the correct range.
- 11. Once the result has been recorded, dispose of the swab in the disposal box provided (once this box is full, contact the provider of the swabs in order to safely dispose of them).

A swab can only be used once, and has a shelf life (from date of manufacture) of 2 months, provided that it is kept at 2-8°C

3. WHAT DOES A POSITIVE RESULT MEAN?

A positive result means that there is *E.coli* bacteria present in the water, and the water is thus not safe to drink. The chart below (Figure 3.1) gives a rough indication of the level of contamination, based on the blue colouration that appears in the swab after incubation. Contaminated water can only be consumed if it is boiled or treated with chlorine to destroy the pathogens in the water. In addition to this, ensure that unboiled/un-treated water used for household purposes is not consumed (e.g. while bathing). Swimming in contaminated waters is also dangerous as chances of acquiring illnesses are high. Secondary effects should also be kept in mind, such as build-up of bacteria in plumbing systems and wells.

The presence of *E. coli* also suggests that there may be other pathogens in the water. In order to deal with possible threats, the source of the bacteria should be investigated and corrective measures taken.



Figure 3.1 Results of *E. coli* swabs – Blue colouration showing *E.coli* bacteria. Please note that the colours are a rough guide to the extent of (CFU refers to the measure of *"colony forming units"*)

4. ACKNOWLEDGEMENTS

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