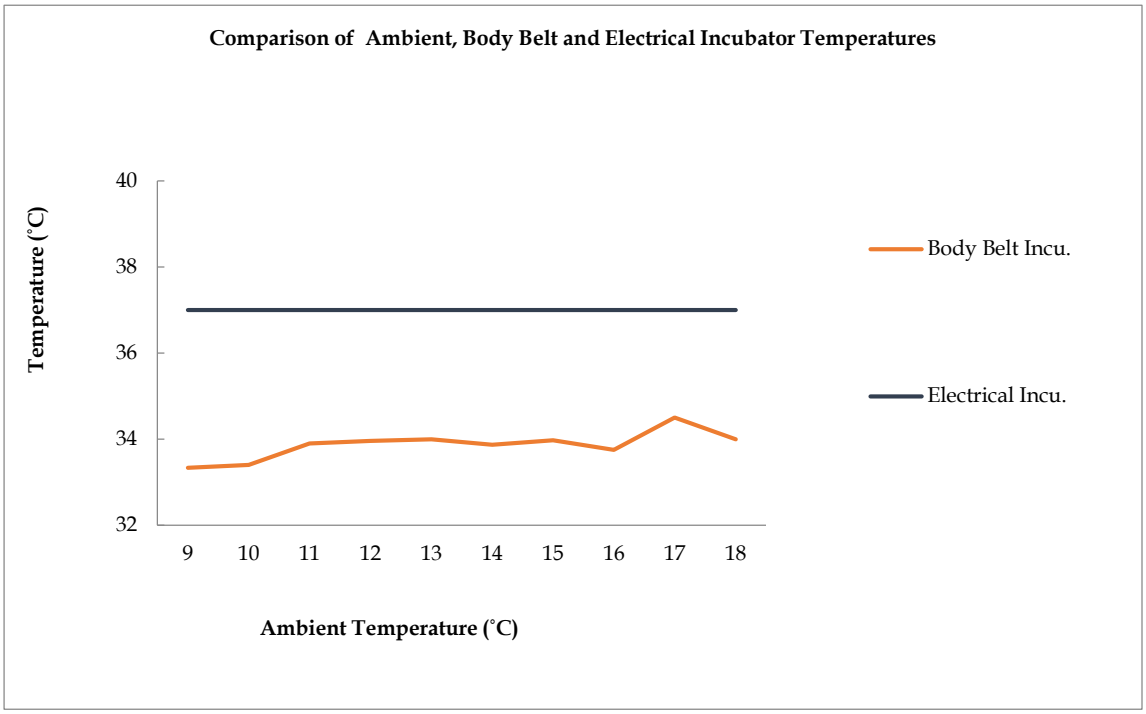
Body Belt Incubator – a low cost, easy-to-use and non-electric incubator

ENPHO Laboratory has recently developed an easy-to-handle, portable, low cost and reusable incubator for microbiological water quality field testing. This incubator can be a substitute for electrical incubators in areas where lack of access to electricity or in places where continuous access to electricity may not be available. The incubator, named as "***Body Belt Incubator***", is worn round the waist and uses the body heat in order to maintain a relatively constant incubation condition (i.e. $>25^0$ and $<40^0$), regardless of ambient temperature.

Portable Body Belt incubator developed at ENPHO ; shown along are two media plates with coliform growth and a thermometer on the right

Generally, during microbiological testing of environmental samples, media plates for microbes are incubated in an electrical incubator maintaining constant temperatures to facilitate growth of microorganism. However, in lack of access to electricity, media plates can also be incubated at room temperature depending upon the ambient temperature. In context of Nepal, with diverse topography and various climatic conditions, different regions have different temperatures. Further, the ambient temperatures might not be consistent throughout a day. Moreover, in Nepal, when samples have to be tested in remote areas, it might also be possible that the sites may not have access to electricity for use of electrical incubators. And fluctuating low or high

incubation temperatures can lead erroneous results of the microbial tests. Hence, Body Belt Incubator has been designed in order to tackle this problem by using body heat instead of electricity to maintain incubating temperature.



Body Belt Incubator is being used in Nepal Multiple Indicator Cluster Survey (NMICS) 2014, an international household survey programme developed by UNICEF and has been conducting in Nepal in collaboration with Central Bureau of Statistics (CBS, Nepal). The survey includes drinking water quality test from households and sources of drinking water schemes in Nepal as one of its components. In NMICS, water quality is being tested in field for *Escherichia coli* (*E. coli* or EC) and other coliforms using portable EAWAG-Millipore bacteriological test kit. Based on satisfactory performance of *Body Belt Incubator* in this survey in Nepal, UNICEF has shown interest in using it in other countries like Congo under the same programme.

Performance of the Incubator has been studied by ENPHO in different climatic zones in Nepal; Himalayan, Hill and Terai with field tests and laboratory tests in controlled conditions to verify the incubation temperature inside the belt and coliform counts obtained by using it. The study indicated that the temperatures in the Incubator is consistently within 33-35˚C regardless of ambient temperature when properly worn as per the instructions. Furthermore, the comparison of counts of *E. coli* using *Body Belt Incubator* and electrical incubator in different climatic zones revealed that there was no significant variation between the results, and that the performance of *Body Belt Incubator* was consistent along different climatic regions. Hence, this study implied that the *Body Belt Incubator* can be used instead of electrical incubator for analysis of *E. coli* in

field. The temperatures noted inside the belt against different ambient temperatures is indicated in the figure above.

Body Belt Incubator has been tested for incubation of *E. coli* since it is a commonly used indicator bacteria. *E. coli* normally resides in intestinal tract of warm-blooded animals and its presence indicates potential presence of faecal contamination and hence, the presence of harmful enteric pathogens in the sample. Since *E. coli* thrives in gut environment it is known that *E. coli* grow best at normal body temperature i.e. 37°C. If the temperature drops too low, growth is slower and if it rises too high, *E. coli* might die. Therefore, incubation is one of the crucial aspects in testing of *E. coli* or other bacteria. In this aspect, Body Belt Incubator serves as an appropriate temperature for growth of *E. coli* during water quality testing.