

Viable but non - culturable (VBNC)

[Bacteria](#) refers to bacteria that are in a state of very low metabolic activity and do not divide, but are alive and have the ability to become culturable once resuscitated. Bacteria in a VBNC state cannot grow on standard [growth media](#), though [flow cytometry](#) can measure the viability of the bacteria. Bacteria can enter the VBNC state as a response to [stress](#), due to adverse [nutrient](#), [temperature](#), [osmotic](#), [oxygen](#), and [light](#) conditions. The cells that are in the VBNC state are morphologically smaller, and demonstrate reduced nutrient transport, rate of respiration, and synthesis of macromolecules. Sometimes, VBNC bacteria can remain in that state for over a year. It has been shown that numerous pathogens and non-pathogens can enter the VBNC state, and therefore it has significant implications in [pathogenesis](#), [bioremediation](#), and other branches of [microbiology](#).

The existence of the VBNC state is controversial. The validity and interpretation of the assays to determine the VBNC state have been questioned.^[2]

VBNC pathogens

- [E.M.S](#)
- [Aeromonas salmonicida](#)
- [Agrobacterium tumefaciens](#)
- [Burkholderia cepacia](#)
- [Burkholderia pseudomallei](#)
- [Brettanomyces bruxellensis](#)^[4]
- [Campylobacter coli](#)
- [Campylobacter jejuni](#)
- [Campylobacter lari](#)
- [Cytophaga allerginae](#)
- [Enterobacter aerogenes](#)
- [Enterobacter cloacae](#)
- [Enterococcus faecalis](#)
- [Enterococcus hirae](#)
- [Enterococcus faecium](#)
- [Erwinia amylovora](#)
- [Escherichia coli](#) (including [EHEC](#))
- [Francisella tularensis](#)
- [Helicobacter pylori](#)
- [Klebsiella aerogenes](#)
- [Klebsiella pneumoniae](#)

- *Klebsiella planticola*
- *Legionella pneumophila*
- *Listeria monocytogenes*
- *Micrococcus luteus*
- *Mycobacterium tuberculosis*
- *Mycobacterium smegmatis*
- *Pasteurella piscicida*
- *Pseudomonas aeruginosa*
- *Pseudomonas syringae*
- *Ralstonia solanacearum*
- *Rhizobium leguminosarum*
- *Rhizobium meliloti*
- *Salmonella enterica*
- *Salmonella typhi*
- *Salmonella typhimurium*
- *Serratia marcescens*
- *Shigella dysenteriae*
- *Shigella flexneri*
- *Shigella sonnei*
- *Streptococcus faecalis*
- *Vibrio anguillarum*
- *Vibrio campbellii*
- *Vibrio cholerae*
- *Vibrio harveyi*
- *Vibrio mimicus*
- *Vibrio parahaemolyticus*
- *Vibrio shiloi*
- *Vibrio vulnificus* (types 1 and 2)
- *Xanthomonas campestris*
- *Xanthomonas axonopodis* pv. citri
- *Yersinia pestis*^[5]