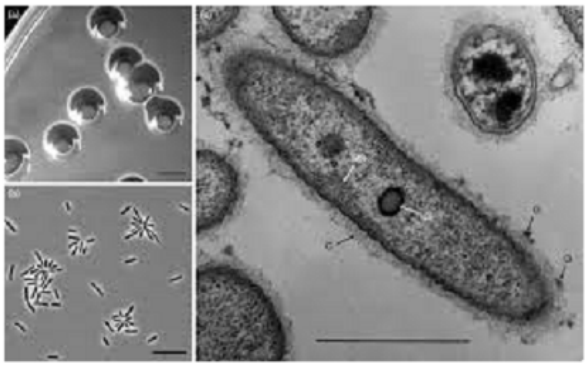
Concrete is known to be the world's most common building material as it shapes our buildings, bridges and runways, sidewalks and more – and at first glance, one would assume that it is not a hospitable environment for living organisms. Freshly poured concrete for instance, has a pH level of 12.5 which is the same level as bleach. Once the concrete hardens, it becomes dry and salty and further, the temperature of concrete drops and rises drastically with respect to their environment. Despite this inhospitable setting however, there are a variety of types of microbes that do in fact survive on and in concrete. This discovery may be the key to unlocking a new method for early detection of structurally unsafe concrete.

Julia Maresca, a microbiologist at the University of Delaware, thought that concrete would be an interesting place to look for microbes and to observe what their coping mechanisms are and to identify the various groups of microbes that exist in such a dire environment.

The lab cultivated a number of bacterial species, including microbes in the Actinobacteria family within the concrete, as well as from the Geodermatophilaceae family – microbes commonly founds on rock surfaces and in deserts. There was also some bacteria found in and on the concrete samples that are found in soda lakes with high pH levels, saline lagoons or on rock surfaces; environments that share characteristics with concrete.



Actinobacteria

Geodermatophilaceae

Source: Shaye-Lynne Dodd

The researchers also discovered that the same groups of bacteria were found growing both in and outside of the concrete which indicates that weather and atmospheric deposition has little influence on the microbial communities. Instead, concludes Maresca, the chemical

makeup of the concrete itself is what drives community composition.

The second experiment that Maresca then set forth was to test whether microbial communities shift as concrete degrades. Preliminary results indicated that microbial communities do in fact change over time and that the community that is found in ASR-prone concrete – concrete that has compositionally changed due to a reaction between the concrete components known as the Alkali-silica reaction, differs from those found in "healthy" concrete.

"There are a lot of chemical changes that precede visible structural damage," Maresca states. "If the microbial community in or on concrete changes in response to these chemical changes, we might be able to use them as an early warning indicator."

Source: http://phys.org/news/2016-09-tough-microbe-settlers-concrete-jungle.html