

The predominance of microbes throughout Earth's geological history is in part due to their simple structures, size, and metabolic diversity (9). These attributes enable them to resist various environmental conditions, such as pH, salinity, and temperature, that are otherwise lethal or toxic to vulnerable species, like ourselves (9). Unlike humans, prokaryotes have very few structures and mainly consist of DNA, RNA, lipids, and/or proteins (9). Some microbes also have a rigid cell wall that protects them from environmental trauma or engulfment by prey. Over evolutionary time, microorganisms have also kept their size relatively small (9). This property allows for efficient uptake of nutrients and release of wastes, which by comparison, energetically outcompetes eukaryotes (9). Furthermore, microbes can exploit various energy sources and utilize a range of electron acceptors for metabolism (9). For instance, about 2.5–2.3 Ga ago, atmospheric oxygen accumulated rapidly, causing previously insoluble uranium to dissolve into different bodies of water (7). Despite the high abundance of radioactive uranium, it was determined that some bacteria were found capable of sustaining such conditions by oxidizing uranium and using it as an electron acceptor during respiration (7). Given their structural simplicity, small physical size, and metabolic diversity, it is evident that microbes are adaptable to many environmental perturbations and undeniably capable of living without us.

Without microbes? Surviving, but not thriving

If all microbes on Earth were to suddenly disappear, would human life still exist? Yes. This hypothetical scenario has been previously investigated by Gilbert and Neufeld (10). In the absence of microbes, specifically *Rhizobia*, the fixation of atmospheric dinitrogen to form nitrate needed by plants, would disappear (10, 11). However, humans can address this issue by producing nitrate in the form of fertilizer through the Haber-Bosch process (10). This practice is currently being used across modern agriculture, given the already limited amount of fixed nitrogen produced by bacteria (11). In fact, with our growing demand for food, the Haber-Bosch process is currently responsible for approximately 45% of the total fixed nitrogen produced annually on Earth (12). Nonetheless, this example clearly demonstrates that humans are capable of manipulating systems, such as global biogeochemical cycling, and creating the necessary technology to fulfill our needs when microbes cannot.