

## Microbial zonation observed on travertines: a case in northern Sumatra

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Travertines, carbonate developed in calcareous hot springs, often exhibit laminated structures of the ancient stromatolites. Cyanobacteria play a central role to form laminated structures (e.g., Okumura et al. 2013), other microbial groups can be associated with the travertines. An example is the case in Dolok Tinggi Raja in northern Sumatra. Distinct microbial zonation was observed along the flow passage of the two major spring sites. At proximal locations besides the hot spring at 60 degrees, sulfur turf inhabited a high concentration of hydrogen sulfide. Purple sulfur bacteria become dominant from several meters below the spring. The sulfur bacteria that form a biofilm of 1 mm thick have potential to develop laminated structure. Water chemistry indicates that aragonite precipitation was activated from this location. In the lower portion of the flow passage where the temperature is declined below 50 degree, microbial community was replaced by cyanobacteria that formed a biofilm of similar thickness. Decreases in hydrogen sulfide and temperature are responsible factors for this microbial zonation.