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Community-wide insights at Manikaran hot springs located atop the Himalayan range using metagenomics approach

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Metagenomic diversity analysis across microbial mats deposited surrounding thermal discharges of Manikaran hot springs located atop the Himalayan ranges in Himachal Pradesh, India (with surface temp. > 95°C) highlighted the genetic predominance of novel *Bdellovibrio bacteriovorus* genotypes as the primary bacterial predator and *Enterobacter cloacae* as the eco-genetically adapted host. While *B. bacteriovorus* has been characterized from mesophilic environments (soil, marine and freshwater, etc.) these communities are not amenable to metagenomic re-assembly of predator and prey genotypes due to high taxonomic diversity and community evenness. Here, we present the first metagenomic analysis of the microbial mats of an arsenic rich (140 ppb) hot spring in which these predator-prey genotypes were characterized. The microbial mats were enriched with Bdellovibrio and several Gram negative bacteria including Bordetella (16%), *Enterobacter* (6.8%), *Burkholderia* (4.8%), *Acinitobacter* (2.3%) and *Yersinia* (1%). A high quality (53 contigs, 25X coverage; 3.5 Mbp) draft genome of *B. bacteriovorus* (strain 'ArHS') was reassembled, which lacked the marker gene *bd0108* associated with the established method of prey interaction and invasion, while still maintaining genes coding for the hydrolytic enzymes necessary for prey assimilation. By filtering microbial mat samples (<0.45 µm) to enrich for small predatory cell sizes we observed Bdellovibrio-like cells attached side-on to E. coli. Furthermore, a draft pan-genome of the dominant host taxon, *Enterobacter cloacae* ArHS, (4.8 Mb), along with three of its viral genotypes (n=3; 42, 49 and 50 kb) was assembled. These data were used to construct a theoretical model describing potential predator avoidance strategies, whereby the E. cloacae strains can move between anaerobic and aerobic niches by quorum sensing population size, which is modulated by a 'kill the winner' viral mechanism and predation by the obligate aerobe; *B. bacteriovorus*.

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Deaths in human due to rabies and public health significance of rabies antigens in brain tissues of dogs slaughtered for human consumption in Nigeria

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Rabies is a viral zoonotic disease that affects all warm blooded mammals, transmitted primarily by bites from rabid dogs. Rabies has the highest case fatality rate of most infectious disease in humans. Dog meat processing constitutes a great public health risk to dog handlers and butchers who may be exposed to rabies infection. This research takes a look at recorded cases of human deaths due to rabies across various health care institutions in Nigeria and a cross sectional study to detect the presence of rabies antigen in brain tissues of dogs slaughtered for human consumption in Aba, Abia state Nigeria. A total of 185 dog brains were tested for rabies antigen by direct fluorescent antibody technique, out of which 13 samples (7.0%) were positive for rabies antigen. The detection of rabies antigen in the brain tissue of apparently healthy dogs slaughtered for human consumption in Abia state and other states in Nigeria has given an indication of the endemicity of the disease and the public health risk it poses. Result of human deaths due to rabies obtained from 10 states in Nigeria, gave a total of 78 deaths due to rabies. Under-reporting and misdiagnosis are a major factor that contributes to poor records of the devastating effect of the disease to humans in Nigeria. The relative high dog to human ratio and low vaccination coverage of owned dogs' population pose public health concerns requiring adequate public health education and proper anti-rabies vaccination coverage of dogs in the country to control the disease within the dog population.

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