

## Are natural hot springs and spas potential source for health-threatening free-living amoebas (FLAs)?

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### Dear Editor,

Natural hot springs and spas have been used for medical purposes and relieving chronic pains such as arthritis, neuritis and sport damages over the years. Today, using natural hot springs has turned into a popular way for treatment, preventive therapy and recreational purposes all over the world particularly in Europe, Japan and Thailand [1]. Despite remedial and economic profits, the natural hot springs and spas can be a potential source of microbial contaminations particularly a source of FLAs. Even though the diseases created by FLAs are scarce, they can be extremely serious or even fatal [1,2]. FLAs are thermophilic organisms and can live at 37–45°C, so they have been found in most hot springs throughout the world. The waterline of hot springs and spas are suitable place for living and the propagation of microflora. *Naegleria* and *Acanthamoeba*, two most medically important genera of FLAs, can also grow in hot springs in the form of a tenacious biofilm and survive there for years [3]. *Naegleria fowleri* causes fulminate and fatal meningitis named primary amoebic meningoencephalitis (PAM). PAM infection mostly occurs by contaminated water contact with nasal mucosa which instantly leads to death within 3–7 days. Due to high fatality, the disease is considered as a serious concern for public health systems worldwide. The numbers of cases of the disease have been reported from North America, Europe, Asia and Australia. *N. fowleri* has also been isolated from 24.6% and 35% of hot springs from the United States and Thailand, respectively. Even

in some cases the relation between disease and the presence of the amoeba in hot springs has been proved [4].

The members of *Acanthamoeba* genus are ubiquitous amoeba and some of them are the causative agents of chronic and fatal disease called GAE (granulomatous amoebic encephalitis). As well as, they can cause a severe and painful keratitis in human being. On the other hand, *Acanthamoeba* can be act as a reservoir host for human important pathogens such as *Legionella*, *Pseudomonas* and *Helicobacter* and preserve them from harsh environmental conditions and even increase their virulence. This could increase the importance of *Acanthamoeba* as a threat to human health [2]. *Acanthamoeba* spp. has been isolated from 13% of hot springs in Thailand [3]. The two researches carried out in northwest of Iran have shown the presence of *Acanthamoeba* in 3.6% and 20% of hot springs and spas [2,5]. There are numerous hot springs in Iran, particularly in northwest part of the country which are the host to millions of tourists each year. Since the existence of FLAs is a potential risk to the health of people who use these natural hot springs and spas, periodically screening of them, efficient washing the spas with appropriate disinfectants such as sodium hypochlorite is recommended. It is also advised to take educational measures such as affixing danger signs to forbid the diving and wearing the contact lenses during use of hot springs and spas.

## References

- [1] Sukthana Y., Lekkla A., Sutthikornchai C., Wanapongse P., Vejajiva A., Bovornkitti S. 2005. Spa, springs and safety. *Southeast Asian Journal of Tropical and Medicine Public Health* 36: 10-16.
- [2] Badirzadeh A., Niyyati M., Babaei Z., Amini H., Badirzadeh H., Rezaeian M. 2011. Isolation of free-living amoebae from sarein hot springs in ardebil province, iran. *Iranian Journal of Parasitology* 6: 1-8.
- [3] Lekkla A., Sutthikornchai C., Bovornkitti S., Sukthana Y. 2005. Free-living amoeba contamination in natural hot springs in Thailand. *Southeast Asian Journal of Tropical and Medicine Public Health* 36: 5-9.
- [4] Tung M-C., Hsu B-M., Tao C-W., Lin W-C., Tsai H-F., Ji D-D. et al. 2013. Identification and significance of *Naegleria fowleri* isolated from the hot spring which related to the first primary amebic meningoencephalitis (PAM) patient in Taiwan. *International Journal of Parasitology* 43: 691-706. <https://doi.org/10.1016/j.ijpara.2013.01.012>
- [5] Solgi R., Niyyati M., Haghighi A., Taghipour N., Tabaei S.J.S., Eftekhar M. et al. 2012. Thermotolerant *Acanthamoeba* spp. isolated from therapeutic hot springs in northwestern Iran. *Journal of Water Health* 10: 650-656. <https://doi.org/10.1515/ap-2016-0108>

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