

Scabicial effect of heat on the *in vitro* survival of scabies mites and their eggs: Optimal temperature and exposure time

Sir,
Scabies, caused by *Sarcoptes scabiei* var. *hominis*, is a common, highly contagious skin disease which spreads through direct skin contact.¹ Classical scabies is not readily transmitted via fomites but patients with crusted scabies who harbour millions of mites may transmit them through their

apparel.^{1,2} Outside the human body the mites can survive for 24 to 36 hours at normal room temperature of 21°C and 40 to 80% relative humidity.³

This experimental study, conducted at Siriraj Hospital, Thailand, aimed to identify the optimal heat and exposure

time needed to destroy scabies mites and their eggs. Because this study did not involve human subjects, certificate of approval from the Institutional Review Board was not required. Skin scrapings obtained from one patient with untreated severe crusted scabies were promptly put on petri dishes and divided into two groups- control and experimental groups (in total of 12 specimens). The control group was again divided into two groups. One of them was incubated at room temperature (25°C) and the other at external body temperature (35°C) while the experimental group was kept at 50°C in the incubator.⁴ Mite survival score was assessed once in every 5 minutes for a duration of 35 minutes using stereoscopy and microscopy. The survival score ranged from 0 to 4 (0 meant no movement and no gut peristalsis; 4 meant actively gross linear movement).⁵ Similarly for egg viability analysis, different group of specimens were incubated at 25°C for 35 minutes, 35°C for 35 minutes and 50°C for 30 and 35 minutes. Then all of them were brought back to 25°C. After that, the cumulative number of eggs that have hatched were counted once in two days. Statistical analysis was performed using Chi-square to compare survival score at a specific time and to evaluate the different number of hatched eggs between each specimen. *P* value < 0.05 indicated statistical significance.

Initially, the mean number of mites in the control group was 14.5 mites per dish while that of the experimental group was 12.5 mites per dish. In the beginning, the control group had 277.5 eggs per dish while the experimental group had 254.7 eggs per dish. There was statistically significant difference in the survival score between the experimental and control groups after incubating for over 15 minutes [*P* < 0.001; Figure 1]. All mites in the experimental group were found dead (survival score was 0) after incubating at 50°C for at least 30 minutes which was statistically different from the control group [*P* < 0.001; Figure 1]. Regarding egg viability, none of the eggs in the experimental group hatched after incubating at 50°C for 35 minutes while seven eggs were hatching after incubating at 50°C for 30 minutes. Conversely, eggs

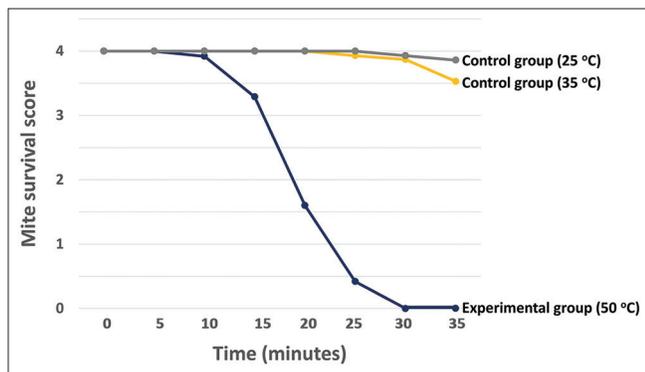


Figure 1: Curve showing the relationship between the mean *Sarcoptes scabiei* mite survival score and heat exposure time after incubating at 25°C, 35°C and 50°C

continued to hatch in the control group [25°C and 35°C incubator; *P* < 0.001; Figure 2].

Studies on optimal time and temperature affecting the survival of scabies mite and egg have shown wide-ranging results. The experiment from Arlian *et al.* found that all scabies mites were dead after being incubated at 45°C for 4 to 20 hours.⁶ Another previous study demonstrated that all scabies mites were found dead after incubating at 50°C for 10 minutes to 2 hours when incubating at 50°C.⁵ However, this study demonstrated that almost all mites were still alive after incubating at 50°C for 10 min. Therefore, at 50°C, the shortest time that all mites were dead was 30 minutes which should be the optimal time for a scabicial effect of heat.

Studies on the viability of eggs are limited. Our study found out that all scabies mites were destroyed and eggs became non-viable after incubating at 50°C for 35 minutes. This can be utilised to give practical advice to patients on the use of hot water and cloth dryers to disinfest their apparels suitably.⁷

Our study did not take into consideration the differential effect of heat on male and female adult mites and the effect of relative humidity on the survival of mites. In conclusion, our study highlights that a temperature of at least 50°C for 35 minutes is sufficient to destroy the itch mites and their eggs.

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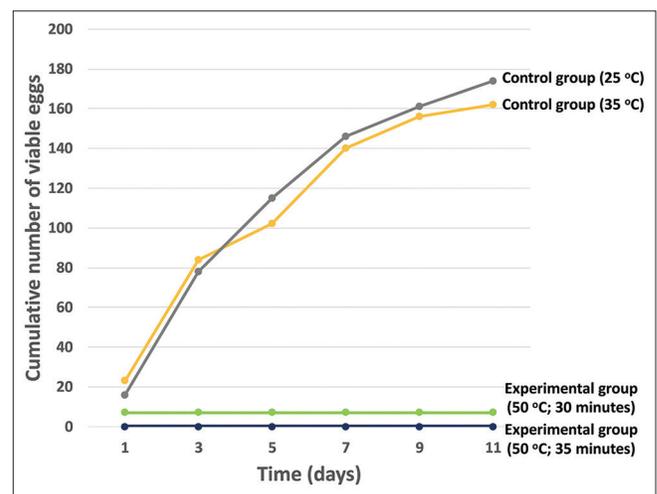


Figure 2: Curve showing the number of viable eggs after incubating at 25°C for 35 minutes, at 35°C for 35 minutes and at 50°C for 30 minutes and 35 minutes

Conflicts of interest

There are no conflicts of interest.

**Charussri Leeyaphan, Narakaj Pluetrattanabha,
Pichaya Limphoka, Sumanas Bunyaratavej**

Department of Dermatology, Faculty of Medicine, Siriraj Hospital,
Mahidol University, Bangkok, Thailand

Correspondence: Dr. Sumanas Bunyaratavej,
Department of Dermatology, Faculty of Medicine, Siriraj Hospital,
Mahidol University, 2 Wanglang Road, Bangkoknoi,
Bangkok 10700, Thailand.
E-mail: consultskin@yahoo.com

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