respect to numbers of species, the distribution of pteridines is unknown. However, it seems quite certain that as more species are studied, more pteridines occurring as pigments will be revealed. It is no longer proper, therefore, to make the tacit assumption that bright pigmentation of amphibians is due only to presence of carotenoids. Actually, from preliminary results in our laboratory, there is still another class of compounds, the flavins, that contribute to bright pigmentation.

MASATAKA OBIKA
JOSEPH T. BAGNARA
*Department of Zoology,*
*University of Arizona, Tucson*

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## Effect of Cold on the Presence of Staphylococcus aureus in the External Nares of the Rat

Abstract. *There is an increase in the recovery from the external nares of rats exposed to cold of colonies of* Staphylococcus aureus *that ferment mannitol and produce coagulase.*

Many factors influence the establishment and maintenance of the carrier state of *Staphylococcus aureus*. The influence of external environment is one of these factors. However, conflicting reports exist in the literature concerning its importance in altering the relation between host and parasite. Mayyasi, Birkeland, and Dodd (*1*) report that the normal bacterial flora of the nasal cavity of mice is markedly reduced by low humidity. Marcus, Miya, Phelps, and Spencer (*2*) note an effect of acute and chronic low-temperature stress on the survival of mice challenged with *S. aureus*. Furthermore, Dooley and Davis (*3*) state that the external environmental factors of ambient temperature and humidity influence the staphylococcal nasal carrier state of man undergoing acclimation to heat. On the other hand, Miles, Williams, and Clayton-Cooper (*4*) state that the nasal carrier state varies not with the environment of the host, but with the host himself.

The correlation of changes in such factors as environmental temperature with alterations in the carrier state does not necessarily establish a cause and effect relationship. However, when one considers the delicate nature of the balance between host and microbe immediately prior to the appearance of overt disease, it is difficult to understand how the outcome of this interaction could be independent of the influence of external environment. This is especially true when such factors are known to produce physiological changes in the host associated with the stress phenomenon (*5*).

In this study two groups of Sprague-Dawley rats were exposed to different environmental conditions. The experimental group, consisting of 19 animals, was continuously exposed for 6 weeks to an ambient temperature of 5°C at a humidity of 90 percent. The control group of eight animals was maintained for a similar length of time at 25°C and 40-percent humidity. All animals were housed in individual metal cages and received Purina Laboratory Chow and water as desired.

Nasal cultures were obtained on each animal three mornings a week, on Monday, Wednesday, and Friday. The cultures were made by inserting a sterile flattened wire loop into the external nares, and then streaking the surface of prepared agar plates with the wire. The medium was coagulase agar (Difco), to which human plasma had been added in the ratio of one part plasma to nine parts agar (v/v). The plates were incubated for 24 hours at 37°C. Colonies of the *S. aureus* that fermented mannitol and produced coagulase were easily detected. The collecting loop was periodically streaked onto mannitol salt agar (Difco) to check results. In such instances, coagulase production was determined by the slide technique as described in the Difco manual (1958).

Table 1. The recovery of mannitol-fermenting and coagulase-producing colonies of *S. aureus* from rats exposed to cold for 6 weeks and those kept at room temperature.

| Group | Total animals | Increased | Decreased | No change | Significance |
|---|---|---|---|---|---|
| Cold-exposed | 19 | 15 | 1 | 3 | $<0.002$ |
| Control | 8 | 1 | 4 | 3 | $>0.05$ |

The number of cultures yielding mannitol-fermenting and coagulase-producing colonies to the total cultures taken was calculated for each individual rat. The number recovered for the first 3 weeks was compared with that of the last 3 weeks. There was an increase in the recovery of these potentially pathogenic colonies in 15 of the 19 animals exposed to cold and in only one of the eight control animals (Table 1). The increase for the cold group was highly significant by the Sign Test (*6*). There was only one animal from which mannitol-fermenting and coagulase-positive colonies were not recovered. This animal was one of the experimental group.

The results of this study would indicate that there is an effect of external environment upon the maintenance of the staphylococcal carrier state which should not be overlooked as a factor in the host-parasite relationship.

ROBERT H. POE*
CARL C. HICKS
ELMO S. DOOLEY†
*U.S. Army Research Institute of Environmental Medicine, Natick, Massachusetts*

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* Present address: Department of Internal Medicine, Cincinnati General Hospital, Cincinnati, Ohio.
† Present address: Army Combat Development Command, Fort McClellan, Alabama.

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