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with two parallel ski tracks and the difference in altitude 51 m, where a controlled setting simulating an arctic environment at -11°C (relative humidity 80–100%) could be arranged. Six male, nonsmoking military conscripts, aged 18–21 years (weight 60–90 kg, height 175–190 cm, and 12-min running test result 2200–2960 m), were recruited on a voluntary basis from the garrison of Kajaani, Finland.

The subjects were encouraged to ski at a submaximal speed. The heart rate means during the exercise were 140–158/min, as monitored with a wireless heart rate meter (Polar Electro). The nasal volume (at 0–5 cm from the nostril) was registered with acoustic rhinometry (Rhin 2000), and the nasal flow at the gradient pressure of 75 Pa with active anterior rhinomanometry (Rhinotest MP 500) with face mask and foam-rubber nose pieces. The nasal secretions were aspirated with a small plastic

Nasal function of skiers in cold weather

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Key words: acoustic rhinometry; cold exposure; nasal secretion; rhinomanometry.

● IN the literature, controversial results can be found concerning nasal congestion in reaction to cold exposure. An increase or no significant change in nasal resistance has been noted after breathing of cold air either through a face mask (1) or in a climate chamber (2, 3).

The nose maintains its patency during exercise in a cold environment.

We studied nasal reactions in a 1200-m-long ski-tunnel (Huurre Ski-Tunnel, Vuokatti, Finland),

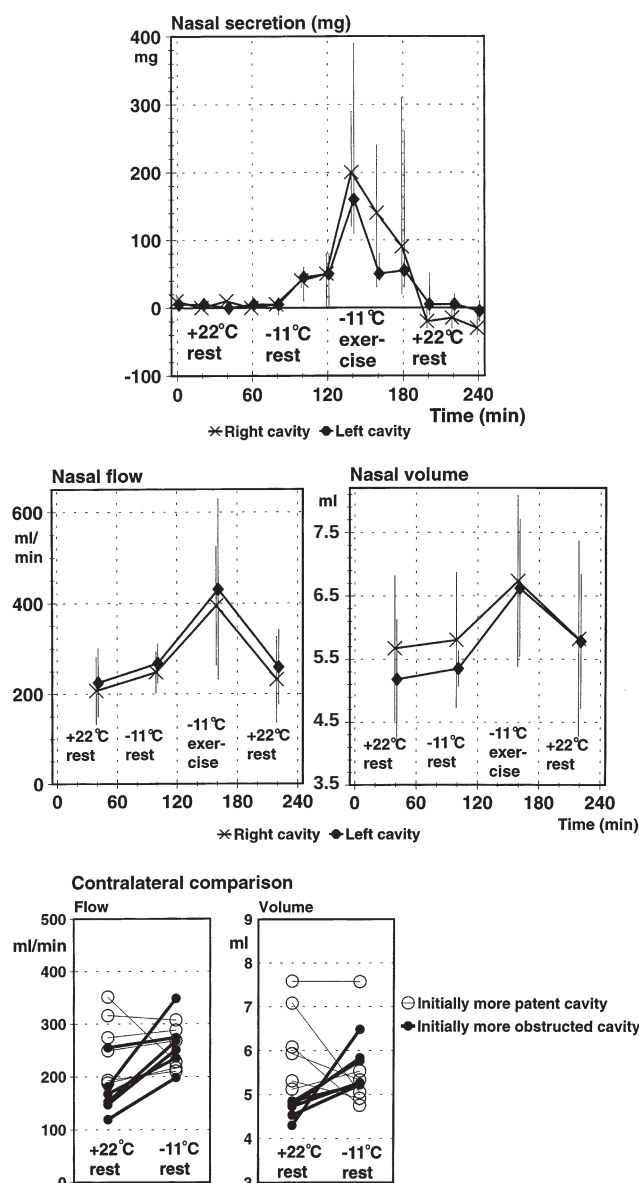


Figure 1. Nasal secretion response and changes in objective patency parameters after exposure to cold and skiing exercise.

suction tip from the lumen of the ostium internum in visual control with a head lamp and a nasal speculum (4). The subjective sensations of nasal patency were registered with a visual analog scale (VAS) from 0 (totally open) to 10 (totally obstructed). The measurements took place at 20-min intervals during short interruptions in the exposure.

Nasal secretion: The median amounts of the nasal secretions from both nasal cavities began to increase during the resting period in the cold (Fig. 1), the increase being statistically significant ($P=0.031$, Wilcoxon test for paired comparisons). During the exercise in the cold, the secretions further increased ($P=0.031$).

Nasal volume and flow. Slight, statistically nonsignificant average increases in the total nasal flow and volume were noted during the resting period in the cold when compared with the pre-exposure values (Fig. 1). During the exercise, the increases were statistically significant both in the flow ($P=0.046$) and in the volume ($P=0.021$).

Contralateral comparison of flow and volume changes. The flow and volume changes between the pre-exercise resting periods at $+22^{\circ}\text{C}$ and -11°C were compared in the initially more open and less open cavities (Fig. 1). Statistically significant increases in the less open cavities were noted both in the flow ($P=0.006$) and in the volume ($P=0.015$). In the more open cavities, nonsignificant average decreases in flow and volume were noted.

Subjective sensations of nasal patency. All subjects evaluated their noses as patent (VAS 0–3) throughout the experiment. No significant average patency changes could be noted in the cold exposure, either during the resting periods or during the exercise.

We conclude that in a cold environment unilateral adjustments in nasal congestion take place, maintaining the total nasal patency. Therefore, the lower airways are protected better than if oral breathing were to take place in these circumstances. The

nasal secretory reaction in exposure to cold seems to be physiological, as it was noted in all study subjects.

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IgE antibody to parasite induced in mice

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Key words: BALB/c mice; *Brama raii*; ELISA; fish; *Gymnorhynchus gigas*; IgE; seafood.

• THE eggs of *Gymnorhynchus gigas*, a Trypanorhynchidea cestode, are passed in the feces of the final host and hatch in the water. The larva then penetrates through the gut wall of a copepod host and develops in the body cavity to the proceroid stage. If this stage of the larva is ingested by a fish, it encysts in the musculature, where it develops to the plerocercoid stage. The life

cycle is completed if the host fish is eaten by a final host (an elasmobranch fish), in the intestines of which the cestode develops to maturity (1). *G. gigas* plerocercoids are often found in the ray's bream (*Brama raii*), massively invading the muscles of the fish. Spaniards eat 78.2 g of fish (including 0.48 g of ray's bream) per head a day (2).

In the present study, larvae of *G. gigas* were collected from naturally infected *B. raii*. Crude extracts of parasite and host were obtained by homogenization and extraction in PBS (3). BALB/c mice were immunized with either crude *B. raii* or *G. gigas* extract as multiple doses of 1 ml of antigen in FCA (1 mg of protein/ml in final volume) given weekly for 3 weeks by the intramuscular route. The mice were bled weekly. Plates (Nunc-Immuno Plate Poly Sorp™) were coated with *B. raii* or *G. gigas* antigen. Serum samples diluted 1/10 were incubated at 37°C for 2 h. A goat, horseradish peroxidase-conjugated antibody specific to mouse IgE (The Binding Site, Birmingham, UK) was added. Substrate (*o*-phenylene-diamine, SIGMA) with hydrogen peroxide was added.

Both immunizations produced a highly specific IgE response. When sera from animals injected with *G. gigas* extract were tested against its homologous antigen, specific IgE was first detected by 5 weeks post-immunization (p.i.), with the maximum response at 10–14 weeks p.i. When we calculated the ratio between the optical density resulting from the test sera and the optical density of the control sera, we observed indexes situated between 4 and 7 during the entire experiment. No detectable levels of IgE were observed when these sera were tested against *B. raii* antigen (Fig. 1). Sera from mice injected with *B. raii* antigen showed a strong IgE response only against its homologous antigen with values seven

***Gymnorhynchus gigas* and its host, *Brama raii*, are allergenic.**