FRESH AIR IN PEDIATRIC PRACTICE *

ROWLAND GODFREY FREEMAN, M.D.

NEW YORK

There is an agent of wonderful power and value to the pediatrician, the use and action of which is little appreciated even by the more prominent in the pediatric community. It has, therefore, seemed to me worth while to speak of its method of action and of its application to the uses of the pediatrician. I refer to fresh air.

By fresh air as a therapeutic agent I mean moving and cool outdoor air. The still air of the hot, humid dogdays of summer is little better than that of the crowded, hot room in winter. Fresh, moving, cool, outdoor air stimulates the appetite, induces quiet sleep, brings color to the cheeks, and increases the resistance of the organism to infection.

In seeking an explanation of the action of fresh air on the human body we find the claim that fresh, cold air raises materially the blood pressure. This claim, however, has not been confirmed by subsequent investigation, and we seem driven to the position that the favorable action of fresh air on the organism is due to the absence of the deteriorating effects of closed rooms. In fresh air the body has the advantage of normal conditions, while any modification of these, from a room with the windows partially open to a closed room, or to the conditions in the Black Hole of Calcutta, furnishes increasingly serious results from air stagnation.

The idea that air which had been breathed by other people was unhealthful probably arose from the unpleasant odor of closed and crowded rooms, and from symptoms elicited by extremes of this sort. The symptoms produced by closed places are depression, headache, dizziness, nausea, perspiration, thirst and difficult breathing. The elements producing these results were supposed to be a diminution of the oxygen and an increase of the carbon dioxid, with the possible appearance in such an atmosphere of a really poisonous product from the expired air. Experiments, however, have for the most part discredited this theory. The amount of oxygen in crowded, closed rooms is not depleted to a danger point, nor is the amount of carbon dioxid increased to such a point. Efforts to find a poisonous element in such air have

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been made from time to time with negative results. In 1911 Rosenau and Amoss¹ carried out a series of experiments on guinea-pigs to demonstrate this, but subsequent work by Weisman failed to confirm their results, and Lee² states "that it may be regarded as finally settled that expired air contains no volatile, toxic, organic constituent."

In 1883 Hermans³ of the Hygienic Institute in Amsterdam became convinced of the error of the oxygen and carbon dioxid theory, and found that his own temperature was raised in crowded assemblages from three-fifths to more than a degree Fahrenheit; he concluded that the discomfort of crowded places was due to inability of the body to cool itself in a hot, moist atmosphere.

Flugge's⁴ experiments in 1905 really showed the condition that produced the symptoms elicited by enclosure. He put a subject in a closed box until symptoms appeared and then allowed him to breathe, through a tube, air from the outside, without any relief of his symptoms. Another subject, outside the box, on breathing the air from the inside had no symptoms. This showed that the discomfort of a closed place has nothing to do with the air we breathe, but with conditions of the skin brought about by such confinement. We suffer in crowded, unventilated places through lack of function of the skin, rather than through respiratory embarrassment. Recent experiments have demonstrated more directly the nature of this embarrassment, for if an electric fan is placed in the corner of the box and air in the box is put in motion the symptoms disappear immediately.

These symptoms then are due to stagnant, hot, moist air surrounding the body. They may be produced in such an enclosed experimental box; they may be produced in an auditorium, overheated and crowded with people, or in a tightly closed living-room with few people, but no moving air, and such symptoms will be accentuated in people wearing heavy, impervious clothing that prevents access of moving air to the skin. It is evident, then, that we should wear as little clothing as is consistent with comfort. Most of us could wear much less clothing than we are accustomed to wearing.

The result of these elaborate observations is in brief that fresh air is good, not because it supplies oxygen, not because it is not overloaded with carbon dioxid, not because it contains no poisonous element, but because it allows the body to exist under such circumstances that it can control its moisture and temperature.

In the application of these newly developed facts to our daily work in pediatrics we have to combat the traditional fear of drafts and the

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1. Rosenau and Amoss: *Jour. Med. Research*, 1911, xxv, 35.
 2. Lee: *Jour. Am. Med. Assn.*, 1914, lxiii, 1625.
 3. Hermans: *Arch. f. Hyg.*, 1883, L, 1.
 4. Flugge: *Ztschr. f. Hyg.*, 1905, xlix, 363.

habit of many people of living in close, hot rooms. It is only on account of the general acceptance of the brilliant results obtained in certain diseases, notably pneumonia and tuberculosis, by the use of fresh air, that we are able oftentimes to obtain the fresh air for our children which they need for the preservation of health and their proper development. Equally brilliant results possible in other diseases are not known by many physicians.

I believe that the cold air of winter is much more stimulating and produces better results in children than the mild air of spring and autumn.

Dr. Ellsworth Huntington of Yale,⁵ in a very careful and interesting study of the influence of climate on civilization, concludes that spring and autumn are the periods of greatest mental and physical activity. This is contrary to the inferences I have drawn from my experiences with the influence of outdoor air and I find that his results are obtained from activities which are housed during the winter, that is to say, college students, factory workers, etc. These people are all housed in winter and live in warm air and thus are little affected by the tonic action of cold outdoor air. In spring and autumn, on the other hand, the windows are opened. If he had used outdoor occupations for his studies I believe his results would have been different.

The best results from fresh air are obtained by keeping the children out of doors day and night, and we have no healthier children than those who, having suffered in early life from tuberculous infection, have been kept for years out of doors. These children are not subject to colds which others have during the winters; they have good color, good appetite and a normal, robust development.

Many of our pediatricians have confused fresh air with cold air, and one may see in hospitals cold wards and warm wards. Such cold wards are probably better than warm wards, but they lack altogether the free, moving air which is the great advantage of the outdoor ward, and often the sunshine, which we know to be one of the most potent of our therapeutic agents.

Outdoor sleeping porches enclosed on three sides and roofed, but open to the south, furnish the best fresh air at night, while in the daytime balconies and rooms without heat and windows wide open supply the air we need.

It is evidently not enough, however, that we should have this fresh air, but we should also look to the clothing to see that our children are not sealed in with heavy, impervious covering so that the skin is unable to rid itself of the heat and moisture.

5. Huntington, Ellsworth: *Civilization and Climate*, Yale University Press, 1915.

The experiments I have reviewed show us how it might not be impossible for a child out of doors, in cold weather, to be embarrassed by such clothing.

Where it is impossible to obtain such complete outdoor exposure, the best substitute in cold weather has seemed to me to be in rooms with cheesecloth screens in the windows. Such cheesecloth screens should cover all the space available when the windows are opened. They allow a moderate access of air without the presence of the much-feared drafts. The objection is that they allow less sunlight than glass, but this disadvantage is more than counteracted by the quality of the air of the room.

Other methods of ventilation consist in patent ventilators put under the lower sash. These, however, allow more movement in the air of the room, but less open space, and some of them furnish no filtration of the dust from the air.

The greatest blight on the fresh air movement of the day is the vogue of elaborate, mechanical ventilating systems, which obtain the air from the basement, pump it through flues into and out of the rooms. Such systems are very expensive, occupy a great deal of space, and while the air furnished may be sufficient for the preservation of life, it often lacks the freshness and invigorating character of the air obtained from open windows or through cheesecloth screens. The worst phase of the current ventilating systems is when they prohibit the opening of the windows. Under intelligent operation they may prove efficient. Closed rooms favor the conveyance of disease from one person to another, and our ventilating systems make practically no provision for carrying off germ-laden dust. There is little conveyance of disease in outdoor school classes or outdoor hospital wards.

The danger of housing is not alone in the bad air of a closed room, but to a susceptible organism it consists also in the sudden change from a temperature of 70 or 80 in a dry room all night to a temperature perhaps of zero, with a cold north wind blowing out of doors, then to a heated auditorium, with a saturated, moist temperature of 80, and again out into zero weather. It is only during the existence of marked changes of temperature between indoors and outdoors that epidemics of colds exist, for during the summer we have practically an immunity to colds and colds occur only when our houses are closed.

In New York our epidemics of colds usually begin in November and December, while in New Hampshire, where I often spend my summers, cold weather inducing people to heat their houses often occurs in September, and it is not uncommon for the neighboring town to have a severe epidemic of colds at such a time. In the summer

time the air is less invigorating, but there is the advantage of less sudden change from cold to hot or from dry to moist air.

Much is heard of the superiority of country air over city air, but recent investigations have shown but little difference in its chemical composition, and if the children are kept in the open air, as they should be in the city, they are much healthier than most country children.

Night outdoor air, while it is not so good as day air because it lacks the beneficent effect of sunlight, is far superior to night air in the house, and the advantage of fresh air treatment is reduced by half if children are housed at night.

A statement as to the diseases to which fresh air treatment is applicable is much more difficult than a statement of the diseases to which it is not applicable. I will, therefore, first enumerate the conditions to which fresh, cold air has not been demonstrated as practicable.

Premature infants who show a subnormal temperature in cool air should be kept at an air temperature that will preserve the normal body temperature. This warm air, however, must be a freely moving warm air, rather than the dead air found at the bottom of a box. On this account, for such babies, a properly constructed incubator is far superior to the substitutes that are often adopted.

I am not sure whether such cold, fresh-air treatment is applicable to children with kidney lesions or with severe heart lesions, although I have seen children with severe endocarditis who preferred to be out of doors in winter rather than in closed rooms, and I have seen no injury from such exposure.

The most important application of this fresh-air treatment is to build up the vitality and resistance to disease of frail children, and in this sphere, I think, it shows perhaps its most brilliant results. This is true in early life, for children with marasmus and malnutrition who are impossible to feed so as to obtain an increase in weight will often gain promptly, with no change in food, on being kept out of doors or in front of an open window in winter. I have seen many children who have reached that stage of malnutrition that usually precedes death, with a dusky hue of the face, react to such treatment and recover entirely.

Another condition of early life, rachitis, is, I believe, entirely a disease of housing. It exists, not in tropical climates where people live out of doors, but in colder climates where people house themselves in winter. The symptoms develop in winter only and the severe cases that we see are entirely confined to the children of races that have been accustomed to warm climates where the families do not house themselves in winter. This susceptibility is not confined to human beings, but exists equally in the lower animals. Animals brought here

from tropical climates develop a disease that is in many respects similar to our rachitis and which is known in zoological gardens as cage-disease, and this is the fatal disease that all zoological gardens have to combat and from which none will be free until greater care is taken to supply these animals with fresh, cool, moving air in winter. On account of this susceptibility Italians and colored people and other people accustomed to tropical climates should be warned that they must give their children fresh air in winter if they would have them survive and develop properly.

In all the acute infectious diseases I think there is now a general acceptance of the advantage of fresh air, excepting perhaps in measles and scarlet fever. In tuberculosis there is now no question of its advantage. In pneumonia the results from this treatment have exceeded those from any other method of treatment, including specific treatment with serums and vaccines. There are still many men, however, who, while allowing that fresh air is beneficial in an inflammation of the lung, doubt its efficacy in bronchitis, pharyngitis, laryngitis, rhinitis and otitis. The only reason why such men doubt its efficacy is because they have not sufficiently tried it. I have used it in all these conditions and I believe that it is of direct benefit and that it diminishes materially the mortality.

I have convinced myself also that measles and scarlet fever are no exceptions to the rule, and I have put patients during a severe measles epidemic complicating scarlet fever out of doors in winter without a single fatality, although some of the scarlet fever patients were exceedingly sick when the change was made. The change to outdoor air seemed to help them all. Among these cases was one of scarlet fever in which from a breaking down of the lymph nodes there was a large ulcer extending from one side of the neck to the other. Under the influence of the cold air the neck healed with a linear scar. It is equally unnecessary in measles to darken the room. We should let children with this disease have all the sunlight that their eyes will bear, as well as cold, fresh air.

In connection with the healing of this surgical condition complicating scarlet fever, the statements made by H. S. Soutter⁶ are of interest. He says that they received wounds that were soiled by earth, manure and fragments of cloth covered with mud and that there was one way by which all such infections may be defeated, by plenty of fresh air or oxygen. In several cases, in which the wounds were so horribly foul that it was impossible to tolerate them in the wards, the patient was put in the open air with the wounds covered only by a thin piece of gauze. The results were almost magical. The wounds lost their

6. Soutter, H. S.: A Surgeon in Belgium. 1915.

odor and began to look clean, while the patient lost all signs of the poisoning which had been so marked before. He thinks this treatment may account for the fact that they had no case of tetanus.

J. W. Markoe states his experience with open-air treatment in sepsis at the Lying-In Hospital in New York. Of fifty-seven patients treated indoors, two left the hospital and fifty-five died; that is, all the patients who remained in the hospital died; while of fifty-three patients who were put out of doors, twenty-two, or 41 per cent., recovered.

The common colds of winter are favorably influenced by cold, fresh air, as are other forms of infections.

In diseases characterized by abnormal conditions in the blood, such as simple anemia, von Jaksch's anemia and leukemia, I believe there is a large field of usefulness for this treatment, and I have myself, in a very limited number of cases, obtained quite brilliant results.⁷ These observations must, however, be confirmed by many more before one can consider this claim as proved. Markoe, however, states that patients with anemia from severe hemorrhage are greatly benefited by fresh air.

Before closing, it would seem that some explanation is due as to why, if all these statements are true, children are still housed and many adults have a panic if a breath of cold air strikes the back of their necks or their bald heads, while children who are brought up without fear of cold enjoy it wherever it strikes.

The supposed production of catarrhal inflammations in adults by exposure to cold air, if it really exists, exists only on account of suggestion. These people have been brought up to such a fear of fresh air that every infection of the upper air passages to which they succumb they attribute to this health-giving influence. It is sincerely to be hoped that many of the coming generation may be brought up under different ideas and may be less dependent on hot, offensive, stagnant air for the supposed comforts of life.

There is evidence enough to show that many diseases are favorably influenced by this simple and safe measure. Why do you not use it? Some are afraid, some will not take the trouble. Many children are allowed to become sick from housing and children may be seen dying in closed wards of many of our best hospitals who might have been saved had they been put out of doors.

211 West Fifty-Seventh Street.

7. Freeman, R. G.: *Am. Jour. Med. Sc.*, 1916, cli, 1.