

It is generally reported that dry-bulb temperatures of 76 to 78 F with 55 percent relative humidity not only furnished comfort for the operating room workers, but apparently prevented exhaustion of patients as evidenced by rapid convalescence in the recovery ward. Additional heat may be furnished to patients locally or by suitable covering, according to body temperature in individual cases.

In the control of airborne infection in the operating room, the prevention of dispersal of infectious materials into the air, control of dust, and proper ventilation supersede attempts to remove or kill pathogenic organisms. The bacterial content of conditioned operating rooms is generally lower than that of non-conditioned rooms.

Bacterial counts aboard an air-conditioned submarine were found to be exceptionally low and not cumulative with time, although all of the air was recirculated for more than 12 hours<sup>38</sup> without replenishment. The removal of bacteria by the process of air cooling and condensation of moisture out of air, merits further study.<sup>39</sup>

The degree of air contamination can be reduced by proper ventilation if velocity of air over the floor does not exceed 50 fpm. Research is in progress on the use of filtered air flowing through a system of mechanical cleaners which protect the patient against infection from attendants, and from bacteria-containing air in the corridor or ward.<sup>40</sup>

Operations are frequently postponed on allergic patients during asthmatic manifestations through fear of complications. The removal of airborne allergens, therefore, is in some cases an important function of the air conditioning system in preparing patients for operation.

The best practice in air conditioning hospital operating rooms is the use of all outside air with arrangements for preheat, reheat, and the control of humidity, coupled with a mechanical exhaust system that removes the air from both the high and low levels of the operating room. However, there is some evidence regarding the lack of any cumulative effect on bacteria count through the recirculation of air through an air conditioning unit in operating rooms. This consideration and the fact that relief cooling frequently provides improved, if not ideal conditions, has lead to the use of central systems employing 50 percent recirculated air. Also, perhaps as a recognition of practice, the *NBFU* Pamphlet No. 56 outlines the conditions under which room air conditioners may be used in operating rooms. These conditions are so written in the pamphlet that the recommendation of separate mechanical ventilation of such rooms is clearly inferred.

Stated in the reverse order, room air conditioners for relief cooling of mechanically ventilated rooms are now considered permissible when used with the necessary precautions. These precautions are not generally assured by the use of standard room air conditioners as produced by the manufacturers, and are frequently costly of accomplishment in the field. The use of larger systems employing 50 percent recirculated air is a recognized practice. It is certain that such a system must have the necessary precautions (regarding the electrical and air moving equipment) against the hazard of gross spillage of the anesthetics. Systems using 100 percent outside air and adequate air removal means are regarded as following the best practice. The choice between the systems is usually made on the basis of first costs. As compared with the other daily usage costs of an operating room, the differences between the operating costs of the various systems is not a significant item.

Good thermal construction of the operating rooms is a recommended practice. Much can be gained by thermal insulation of sterilizing equip-

ment, and by through exhaust ventilation of sterilizing rooms adjoining the operating rooms. Glass surface should be kept to a minimum, particularly in walls exposed to the sun. Double windows are desirable and often necessary to prevent condensation on the glass in cold weather. The equipment capacity and control methods must be properly selected for the type of system employed, and for the thermal loads encountered. The resulting air flow rates are usually in the range of 8 to 12 changes per hour. The method of air introduction should be selected to keep air movement in the operating area under 50 fpm. Where all outside air or a large percentage of outside air is used, the air introduction and exhaust arrangements should be designed to provide a thorough air change in all parts of the room. This may be accomplished by introducing the air at one side and exhausting it from the other side of a small room or by introducing the air at the center and exhausting from the sides of a large room. The supply and exhaust arrangements can be exchanged in the case of large rooms. An air conditioned recovery ward in connection with the air conditioned operating room, is of great value in stabilizing peripheral circulation, and in reducing excessive loss of fluids on hot humid days.

### NURSERIES FOR PREMATURE INFANTS

One of the most important requirements in the care of premature infants is the stabilization of body temperature. This is necessary because the infant's heat regulatory system is not fully developed, with the resultant tendency for environmental temperature to influence body temperature. The younger the premature infant, the greater is the tendency. As the infant's metabolism is low, heat production is not adequate to maintain a normal body temperature in a cool environment. The resistance to infection is low, and the mortality rate is high. In general, the younger the age of the premature infant, the higher the mortality rate.

Nurseries constructed for metabolic research should be air conditioned so that conditions are reproducible. Results of such studies may be invalid if environmental conditions are not identical, since fluid and electrolyte loss may vary greatly with change in environmental conditions.

#### Air Conditioning Requirements

The optimum air conditions for growth and development of premature infants were determined by extensive research<sup>41</sup> at the Children's Hospital, Boston, Mass., using four valid criteria, namely, stability of body temperature, gain in weight, incidence of digestive syndromes, and mortality. Individual temperature requirements varied widely (from 72 to 100 F) according to the constitutional state of the infants and body weights. The optimum relative humidity was about 65 percent, and the air movement less than 20 fpm.

A single nursery conditioned to 77 F and 65 percent relative humidity was found to fulfill satisfactorily the requirements of the majority of premature infants. Additional heat for weak (or debilitated) infants may be furnished in the cribs or by means of electric incubators placed inside the conditioned nursery, and the temperature adjusted according to individual requirements. In this way multiplicity of chambers and of air conditioning apparatus is obviated; the infants in the heated beds derive the benefit of breathing cool humid air, and the nurses and doctors need not expose themselves to extreme conditions.

*Importance of Humidity:* Although external heat is an important factor in the maintenance of normal body temperature, humidity appears to be