a range of 55 to 60 percent relative humidity and 72 to 80 F temperature. The work just cited reported that 68 to 70 F effective temperature not only furnished comfort for the operating room workers, but apparently prevented exhaustion of the patient as evidenced by rapid convalescence in the recovery ward. Additional heat may be furnished to the patient 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[37] without replenishment. The removal of bacteria by the process of air cooling and condensation of moisture out of air, merits further study.[38]

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.[39]

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.

Central system air conditioning plants and unit air conditioners prove satisfactory in operating rooms when producing between 8 and 12 air changes per hour of filtered and properly conditioned air, without recirculation, during the course of anesthesia. A separate exhaust fan system is usually necessary to confine and remove the gases and odors. Double windows are desirable and often necessary to prevent condensation and frosting on the glass in cold weather, and to minimize drafts. The air flow of 8 to 12 air changes in operating rooms should: (1) reduce the concentration of the anesthetic to well below the pharmacologic threshold in the vicinity of the operating personnel; (2) remove the great amounts of heat and sometimes moisture, from sterilizing equipment if inside the operating room, from the powerful surgical lights, from solar heat, and from the bodies of the operatives; and (3) provide extra capacity for quickly preparing the room for emergency operations. Much can be gained by thermal insulation of sterilizing equipment, and by thorough exhaust ventilation of sterilizing rooms adjoining the operating 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[40] 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 of equal or greater importance. When the premature nurseries at the Children's Hospital were kept at relative humidity between 25 and 50 percent for two weeks or longer, the body temperature became unstable, gain in weight diminished, the incidence of gastro-intestinal disturbances increased, and the mortality rose. On the other hand, continuous exposure to air conditions with 55 to 65 percent relative humidity gave satisfactory results over a period of years. The initial physiologic loss of body weight (loss occurring within first four days of life) was found to vary inversely with the humidity. In the old nurseries with natural humidity it averaged 12.4 percent of the birth weight; in the conditioned nurseries it was 8.9 percent with 25 to 49 percent relative humidity, and 6.0 percent with 50 to 75 percent relative humidity. The number of days required to regain the birth weight was correspondingly maximum in the old nursery, and minimum in the conditioned nurseries under high humidity.

Maximum gains in body weight occurred in the conditioned nurseries under high humidity (55 to 65 percent) in infants weighing less than 5 lb. The gains were less under low humidity (25 to 50 percent) in the same nurseries, and in the old nurseries prior to the installation of air conditioning apparatus.

The incidence and severity of digestive syndromes, with diarrhea, persistent vomiting, diminishing gain or loss of body weight, and other symptoms, were generally from two to three times as high under low as under high humidity.

Summarizing, the best chances for life in premature infants are created by maintaining a relative humidity of 65 percent in the nursery, and by