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system excitation and depression. The fever was probably due to suppression of sweating; this assumption is supported by the fact that hyperthermia is produced by atropine only in those animals whose thermoregulatory mechanisms include the secretion of sweat.[1] The pathogenesis of the skin lesions was obscure, but their distribution suggested that friction might have played a role.

This intoxication with massive overdosage is to be distinguished from those reactions due to idiosyncrasy to ordinary amounts of trihexyphenidyl; this idiosyncracy makes it impossible for 5 to 10% of patients to tolerate effective doses of this drug because of anhydrosis, xerostomia, stomatalgia, vertigo, agitation, disorientation, confusion and mild delirium.[2]

In addition to the treatment applied in this case, gastric lavage is recommended when the diagnosis is recognized in time, and stimulants or sedatives may be required for dangerous levels of depression or excitement, respectively. Pilocarpine or methacholine has been given to restore salivary flow; miotic agents are necessary in some cases to combat excessive mydriasis and cycloplegia. Darkening the room often relieves the discomfort due to photophobia.

SUMMARY

A case has been presented in which it was demonstrated that trihexyphenidyl (Artane) in massive overdosage may cause intoxication very similar to that caused by atropine, and may be treated in the same fashion.

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SHORT COMMUNICATION

Ventilatory Function in Normal Children

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AN assessment of ventilatory function is an integral part of the investigation of children with respiratory disease. In order to interpret such an assessment, however, it is essential to establish normal values for these measurements for children of the same age and body size. Although there are a number of reports of ventilatory measurements in normal children,[1-6] most deal with small numbers of subjects, and none assess the maximal mid-expiratory flow rate, which is a sensitive index of airway resistance. In addition, none of the measurements reported have been ascertained on children under 6 years of age.

This paper presents the normal values of ventilatory function obtained from 260 male and 261 female children whose ages varied from 3 to 17 years.

TABLE I.—FREQUENCY DISTRIBUTION AND RANGE OF HEIGHT AND WEIGHT OF SUBJECTS STUDIED

Age (years)	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
Males														
Number of subjects	10	14	17	26	32	18	14	31	35	15	20	10	15	3
Range of height (cm.)	75–105	95–113	102–118	100–130	105–145	102–145	120–140	125–165	125–148	138–170	140–168	163–175	128–180	155–168
Range of weight (lb.)	28– 45	33– 58	35– 60	30– 65	40– 83	43– 68	45– 89	57–143	57–110	78–143	51-145	82–148	68–150	112–142
Females														
Number of subjects	4	9	20	23	28	34	32	22	23	27	16	13	8	2
Range of height (cm.)	80– 95	88–120	93–115	108–130	115–130	102–139	120–148	123–150	130–163	125–163	143–165	143–168	150–165	153–160
Range of weight (lb.)	24– 31	31– 44	34– 49	38– 82	41– 80	42– 83	40– 94	51– 95	61–125	51–117	76–148	83–160	94–130	110–118

METHODS

The children had no clinical or radiological evidence of cardiorespiratory disease and were selected from the wards and outpatient department of the Children's Hospital of Winnipeg. The number of children in each age group and the range of heights and weights are presented in Table I.

Vital capacity, maximum breathing capacity and maximal mid-expiratory flow rate were determined with a nine-litre Warren E. Collins spirometer, from which all valves and the carbon dioxide

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TABLE II.—CORRELATION COEFFICIENTS OF VENTILATORY FUNCTION VERSUS VITAL STATISTICS

	Vital capacity	*Maximum breathing capacity*	*Maximal mid-expiratory flow rate*
Male:			
Age	0.851	0.842	0.714
Height	0.909	0.885	0.759
Weight	0.905	0.829	0.731
Female:			
Age	0.881	0.808	0.712
Height	0.904	0.825	0.730
Weight	0.886	0.781	0.679

absorber had been removed, and which was equipped with a fast-moving drum 32 mm./sec.). The vital capacity was performed with the subject in the sitting position; and the maximum breathing capacity, with the subject in the standing position. Maximal mid-expiratory flow rate was determined by the method of Leuallen and Fowler.[7] The maximum of at least three determinations of each measurement was recorded.

TABLE III.—REGRESSION EQUATIONS OF VENTILATORY FUNCTION

Test	*Sex*	*Regression equation*
Vital capacity (ml.)	M	51.342 (age) + 40.5304 (height—3654.62 in cm.)
	F	90.964 (age) + 27.858 (height—2554.47 in cm.)
Maximal breathing capacity (l./min.)	M	2.165 (age) + 1.0756 (height— 89.66 in cm.)
	F	2.725 (age) + 0. 772 (height— 57.84 in cm.)
Maximal mid-expiratory flow (l./sec.)	M	0.0259 (age) + 0.02792 (height— 1.75 in cm.)
	F	0.0647 (age) + 0.01982 (height— 1.08 in cm.)

In 44 children, whose ages ranged between 4 and 16 years, the ventilatory function studies were re-assessed on at least three occasions. The values obtained on the subsequent studies did not differ from the initial determination by more than ± 10%.

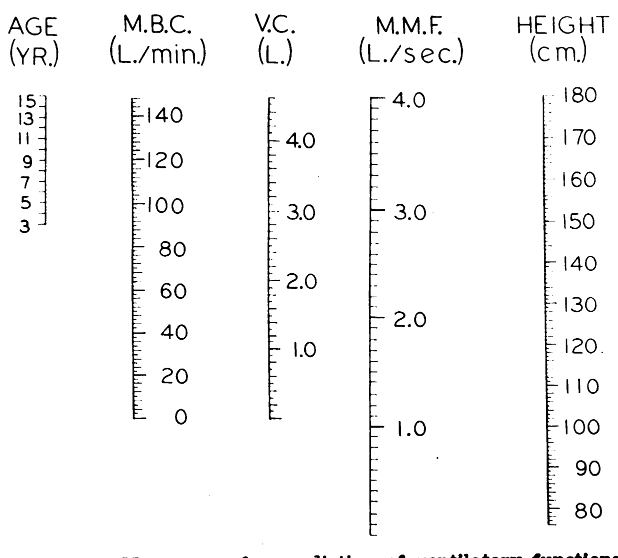

Fig. 1.—Nomogram for prediction of ventilatory functions in normal male children.

RESULTS

The ventilatory function varied with the age, height and weight of the subjects. The correlation coefficients between the measurements of ventilatory function and these vital statistics are shown in Table II.

Although the ventilatory measurements are influenced by the weight, the use of all three variables of the physical characteristics to obtain predicted values is cumbersome, and it was considered satisfactory to utilize their relationship to age and height, as is done in adults.[8, 9] The omission of the weight variable did not alter the predicted value by more than 10%.

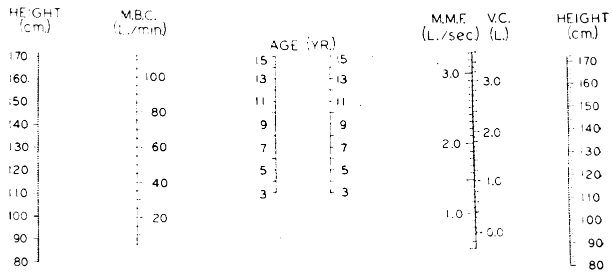

Fig. 2.—Nomogram for prediction of ventilatory functions in normal female children.

The regression equations relating the measurements of ventilatory function to age and height are presented in Table III. To facilitate further the prediction of these ventilatory measurements in children by pulmonary function laboratories, nomograms were constructed, and are presented in Figs. 1 and 2.

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