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Serum lipoproteins in allergic children

Richard Edward Ellis
University of Nebraska Medical Center

SERUM LIPOPROTEINS IN ALLERGIC CHILDREN

Richard Edward Ellis

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TABLE OF CONTENTS

The objective of this research was to determine the levels of serum lipoprotein in allergic children and whether they are elevated, normal or depressed, either in total or in any specific fraction. In previous research on serum lipoproteins in children with cystic fibrosis, Dr. Gordon E. Gibbs found that these children have lowered serum cholesterol and lowered serum lipoprotein fraction S_f^o 0-12. In his control group one child who was asthmatic also had a significant depression of these constituents.

In this study eleven children were chosen at random from patients being treated in the University of Nebraska Pediatric Allergy Clinic by desensitization therapy. All of the children have bronchial asthma with one exception, subject No. 11 who has only hay fever. However, he also contracted poliomyelitis

one year prior to this time, and was left with minimal but wide-spread residual muscle weakness. The blood samples for the serum studies were collected in the morning before breakfast. The results are recorded in Table 2.

Levels of total cholesterols and serum lipoproteins for fourteen control subjects are shown in Table 1, along with weight and heighth expressed as a percentage of normal according to average normal standards in the tables of Meredith. (1) The blood samples for the serum studies were collected in the morning before breakfast. The various lipoprotein fractions obtained by the ultracentrifuge have been measured by the technique of Gofman. (2)

Recorded in Tables 3 and 4 are the results of skin tests on these subjects by scratch and intradermal methods for various pollens, house dust, and foods, commonly causing allergic reactions. The results are graded by a system of 1/ through 4/, with 1/ being only a very small wheal and flare reaction to the antigen and 4/ being a severe reaction with a large wheal and flare reaction.

The children in this study were found to have a weight which is better than the normal tables of weight percentile of normal for age, 108%. Their heighth compares almost equally to normal average tables, being 101%. Serum cholesterol was found to be higher than the control group with a mean value of 235 mg/100 ml compared to 217 mg/100 ml in the control group.

The largest faster floating serum lipoprotein S_f^0 16-44 has a mean value of 245 mg/100 ml in allergic children which compared to the control mean value of 293 mg/100 ml is 16% lower. However, the statistical signifance of the difference between the means expressed as a "t" value is 1.3 which is statistically insignificant.

The S_f^0 44-61 fraction of serum lipoproteins in allergic children had a mean value of 24 mg/100 ml, compared to a mean of 30 mg/100 ml in the control group. This is 20% lower than the control group or a "t" value of 0.72 which is statistically insignificant. The S_f^0 61-185 fraction is 32% higher than the control group with a "t" value of 0.63 which is statistically insignificant. The smallest of the low density lipoproteins is higher than the control group with a "t" value of 0.54 which is statistically insignificant.

It should be pointed out that there is no priori basis for assuming constancy of lipid composition of lipoproteins of a particular class from individual to individual in health or in disease. The major purpose of the various continuing lipoprotein studies is to determine the extent to which such constancy or lack thereof exists. Some generalizations as to the chemical composition of certain fractions can be made:

1. Phospholipid is the predominant lipid of the major high density lipoprotein group. (The concentration of HDL's are not being reported in this paper.)

2. Cholesterol ester is the predominant lipid constituent of the S_f^0 0-20 lipoproteins (comparable to the S_f^0 16-44 and S_f^0 44-61 lipoproteins reported in this paper.)

3. Unesterified cholesterol is quite high in the S_f^0 0-20 lipoproteins (comparable to the S_f^0 16-44 and S_f^0 44-61 lipoproteins reported in this paper.)

4. Glyceride is the predominant lipid constituent of the S_f^0 20-400 lipoproteins (comparable to the S_f^0 61-185 and S_f^0 185-802 lipoproteins reported in this paper.)

5. Unesterified fatty acids are found in the major high density lipoprotein classes and in smaller amounts in the low density group (that is, S_f^0 16-802 lipoproteins.) (3)

The cholesterol determination in this study was done by a method using acetone-ethanol for extraction of cholesterol from serum. It is then precipitated by $FeCl_3$ and glacial acetic acid, then resuspended and read photometrically against a standard. (4) Generally considered normal values range between 150-300 mgm%.

A very brief description of the method used in the ultracentrifuge study of serum lipoproteins in this paper will be given.

A method was developed for ultracentrifugal analysis of all classes of serum lipoproteins, which requires a minimum of time, work, and materials. It utilizes the principal that lipoproteins experience flotation in a medium the density of which is greater than that of their own hydrated density. In this

procedure the isolation and analysis of lipoproteins are made in a sodium bromide medium of density 1.20 gm per ml.

The ultracentrifuge has thus far proved to be one of the most useful techniques for studying serum lipoproteins. There is no question as to the importance of serum lipoproteins in relation to lipid transport and metabolism. The first group to apply the basic principle of ultracentrifugal flotation to serum lipoprotein study was Gofman, Lindgren and Elliott. Many laboratories have adopted the procedures described by deLalla and Gofman, however, none has allowed the quantitative study of the complete serum lipoprotein system in one procedure requiring only 2 ml. of serum.

The exact technical procedure will not be described here, however, a brief description will be given.

The serum and sodium chloride and sodium bromide are mixed in specific amounts and densities and centrifuged at 40,000 rpm for 24 hours at 18-20 degrees centigrade. All the known classes of serum lipoproteins are concentrated in a 1-ml volume at the top of the preparative tube. This 1-ml portion is pipetted off and saved for running in the ultracentrifuge, to determine the concentrations and flotation rates of the various lipoproteins present. The final run in the ultracentrifuge is carried out at 42,040 rpm and at a temperature of 26± 0.5 degrees centigrade. The procedure requires the use of double-sectored analytical cells, one sector of which is loaded with a base line solution

equivalent to the background solution of a density 1.1965 gm per ml. The other sector is loaded with the prepared serum. The analytical ultracentrifuge film, therefore, is a simultaneous and superimposed plot of the refractive index gradient of the sodium bromide base line solution and the lipoprotein solution as a function of the distance from the center of rotation. Photographs are taken at timed intervals and these are later analysed by making a five times enlarged tracing of each frame, and the area under the base line is measured by planimetry. The area is converted to milligrams percent by a formula derived by Pickels.

In the film analysis the total serum lipoproteins spectrum has been subdivided into five flotation-rate classes: S_f (1.20) (185-802), (61-185), (44-61), (16-44), and (0-6). The subdivision of the first four faster-migrating low-density lipoprotein classes has been made to correspond very closely to the formerly used Gofman low-density lipoprotein classification of S_f^o (100-400) (20-100), (12-20), and (0-12). The S_f (1.20) (0-6) is a high density fraction which corresponds to the (HDL-2) and (HDL-3), and is not being reported in this study. (5)

The following are the very closely corresponding flotation rates, A being the method of Gofman, and B the method used in this paper, which also allows the measurement of the high density lipoproteins, if desired:

A		B
S°_{f} 0-12	=	S^{φ}_{I} 16-44
S^{φ}_{I} 12-20	=	S^{φ}_{I} 44-61
S°_{f} 20-100	=	S^{φ}_{I} 61-185
S^{φ}_{I} 100-400	=	S^{φ}_{I} 185-802

On the following pages are recorded brief history and physical examinations of each of the individual subjects in this study.

Name Subject No. 1 Hospital Chart No. 21398

Date of History 8-24-60 Age 6 yr. Sex F Race N

C.C. Frequent attacks of wheezing and difficult breathing mostly after playing, worse in winter. This started a year ago, accompanied by frequent colds and wheezing almost continuously during the winter. This caused her to miss most of her school during the winter.

F.H. Of Allergy Father negative. Mother negative.

P.H. Infancy - Patient had diarrhea and vomiting and formula changes. No history of rhinitis, bronchitis, or eczema.

S.R. E.E.N.T. - Frequently plugged nose.

Chest - Very frequent colds. Patient has a slight cough quite often. Asthma started a year ago.

G.I. - No bowel upsets or diarrhea. No known food allergies.

Effects of: Cold - causes wheezing and difficult breathing.

Play - causes wheezing

Outdoor Dust - causes wheezing

House Dust - causes wheezing

Insecticides - cause sneezing and wheezing

Physical Exam Heighth 47" Weight 48# Age 6 years

E.E.N.T. - Negative

Chest - Clear, no rales or wheezes

Heart - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 2 Hospital Chart No. 8107

Date of History 11-4-57 Age 11 yr. Sex M Race N

C.C. Patient has a clear or purulent nasal discharge and partially blocked nose from August to September or October. This is intermittant and is always worse at night. In 1953 patient had a severe asthmatic attack with vomiting. He has had this difficulty since 6 years of age.

F.H. of Allergy Father negative. Mother has hay fever and asthma.

P.H. Patient has rheumatic heart disease which apparently started around age 6 years followed by chorea at age 7 years and acute exacerbation of rheumatic fever with myocarditis at age 8 years. Since then patient has been on Bicillin. He has had allergy symptoms also during this period and up to present.

S.R. E.E.N.T. - History of many ear infections and earaches in early childhood. Nose symptoms of rhinorrhea as in C.C. Throat - many sore throats in early childhood.

Chest - Only one or two colds per season, but frequent coughing.

Heart - In P.H.

G.I. - Negative

G.U. - Negative

Effects of: Patient denies any relation of symptoms to physical factors.

Physical Exam Heighth 69" Weight 139# Age 14½ years

E.E.N.T. - N.S.A.

Chest - Clear to A. & P.

Heart - Grade I systolic murmur at the apex.

Diagnosis 1. Old Rheumatic H.D.

2. Hay Fever

3. Bronchial Asthma

Name Subject No. 3 Hospital Chart No. 2958

Date of History 1-12-59 Age 11 yr. Sex F Race N

C.C. Wheezing attacks worse in April and May and again in August, September and October. Approximately 5 years in duration. Worse when patient gets chilled, especially at night. Patient occasionally runs a temperature and vomits during attacks.

F.H. of Allergy Father negative. Mother negative. Siblings negative.

P.H. Lobar pneumonia at age 9 years. History of eczema during infancy.

S.R. E.E.N.T. - Rhinorrhea in spring and fall

Chest - Only infrequent colds

Heart - N.S.A.

G.I. - Allergic reactions of hives to tomatoes and strawberries.

Effects of: Change of weather - wheezing is worse

Dampness - wheezing is worse

Exercise - wheezing is worse

Physical Exam Heighth 61" Weight 112# Age 13½ years

E.E.N.T. - N.S.A.

Chest - N.S.A.

Heart - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 4 Hospital Chart No. 36531

Date of History 8-3-60 Age 4 yr. Sex M Race N

C.C. Wheezing every night with shortness of breath since age of 3 weeks, with periods of remission. But recently he wheezes every night without exception. Treated by one physician for allergy to wool and house dust. Had eczema in infancy. Child eats very poorly.

F.H. of Allergy Father negative. Mother asthmatic. Grandmother asthmatic. Grandfather asthmatic. Older sibling asthmatic.

P.H. Patient had eczema in early infancy. Also history of chronically blocked nose. Otherwise normal birth and development.

S.R. E.E.N.T. - History of chronic blocked nose, rhinitis.

Chest - Infrequent colds. Chronic cough at night.

G.I. - Negative

Effects of: Wind - makes asthma worse

Dampness - makes asthma worse

Night - wheezes most nights

Fatigue and exercise - starts wheezes

Outdoor Dust - starts wheezes

House Dust - causes wheezing

Physical Exam Heighth 38½" Weight 29# Age 4 years

E.E.N.T. - Nasal mucosa is pale and running clear fluid.

Chest - Scattered rhonchi present, no wheezes

Heart - R.S.R. with no murmurs

Abdomen - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 5 Hospital Chart No. 6496

Date of History 11-4-59 8-31-60 Age 8 yr. Sex M Race N

C.C. Patient has had hay fever since age 2 years, worse in March, April and August to September. For the past two years he has had wheezing particularly with upper respiratory infections.

F.H. of Allergy Father unknown. Mother hay fever and asthma. Grandparents hay fever and asthma.

P.H. Patient has had recurrent draining ear infections over the past two to three years. This again recurred in July and August, 1960. T. & A. 1958.

S.R. E.E.N.T. - Has had eye infections several times. Frequent ear infections, both medial and external. Nose is always running.

Chest - Several colds per season.

G.I. - Negative

Effects of: Wind - aggravates wheezing

Dampness - aggravates wheezing

Morning and Evening - wheezing

Fatigues easily

House Dust - Sneezes and wheezes when house is cleaned.

Physical Exam Heighth 52½" Weight 58# Age 8 years

E.E.N.T. - Ears yellow drainage bilaterally.

Chest - N.S.A.

Abdomen - N.S.A.

Diagnosis Bronchial Asthma and Hay Fever

Name Subject No. 6 Hospital Chart No. 22737
11-10-58
Date of History 5-3-60 Age 5 yr. Sex M Race W

C.C. Wheezing, Asthma since age two years. Worst period seems to be spring time. Allergic to milk and house dust. Patient has recently had some wheezing reactions to desensitization shots. 8-31-60 Occasional asthma last winter. Hypo reduced this spring. No asthma since then. Mild nasal congestion since August 7, 1960 with rhinorrhea.

F.H. of Allergy Father negative. Mother negative. Two brothers have had eczema.

P.H. Infancy eczema at 4 days of age and on until cleared rapidly on Mullsoy within one week at 6 months of age. At age 2 years patient developed marked diarrhea and nasal discharge. History of Perthes' Disease age 3 years and still in healing process. History of Duodenal ulcer age 3 years. Frequent otitis (chronic), mastoiditis and some hearing loss.

S.R. E.E.N.T. - Trouble hearing, frequent otitis. Occasional nasal discharges.

Chest - Nearly constant colds. Chronic cough. Asthma for two years.

G.I. - Negative at present (See P.H.)

Effects of: Windy weather with dust causes wheezing

House Dust causes allergic reaction

Physical Exam Heighth 43" Weight 42½# Age 6 years

E.E.N.T. - Nose shows very blue edematous mucous membranes.

Chest - Mild expiratory bilateral wheezes.

Heart - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 7 Hospital Chart No. 19502

Date of History 7-20-60 Age 12½ yr. Sex F Race N

C.C. Asthma attacks since 5 years of age occurring year around, but more so in the winter. Attacks last two to three days. Patient has used Amesec suppositories for the last three years. Sometimes these fail to alleviate the attacks. Attacks start with sneezing and croupy cough then later wheezing. Patient usually has temperature of 102° with winter attacks. Sore throats and otitis media frequently occur. Rhinorrhea with summer attacks and purulent in the winter attacks.

F.H. of Allergy Father negative. Mother negative. One sister gets skin rash from milk.

P.H. Patient was colicy during infancy for several months. She has had numerous attacks of bronchitis and asthma. Had skin rash with orange juice in infancy. Whooping cough at age 3 years. Pneumonia once.

S.R. E.E.N.T. Frequent headaches, mostly frontal. Occasional blurring of vision, but normal vision by tests. Occasional earaches in winter. Blocked nose and sore throat occasionally. Six to eight colds a year and these nearly always go on to chest colds.

Heart - N.S.A.

G.I. - N.S.A.

Effects of: Wind - wheezing is worse

Dampness - wheezing is worse

Seasons - Patient feels better in summer

Fatigue - wheezing is worse

Exercise - Wheezing is worse

House Dust - Wheezing is worse

Dogs and Cats - Cause wheezing

Feathers - Cause wheezing

Physical Exam Heighth 63" Weight 105# Age 12½ years

E.E.N.T. - N.S.A.

Chest - Few expiratory wheezes

Heart - N.S.A.

Abdomen - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 8 Hospital Chart No. 25475

Date of History 11-10-58 Age 11 yr. Sex M Race N

C.C. Patient has had asthma for the past three summers. It starts in August and ends in September. This year, however, he continued to sneeze, cough and wheeze on into the late fall. No history of frequent colds, but a chronic cough. No food intolerance.

F.H. of Allergy Mother negative. Father negative. Sister had eczema as a baby. Cousin has asthma.

P.H. Patient had allergy to prune juice and orange juice as a baby and broke out with rash. No other allergic history. At about age 8 years he started sneezing and wheezing during August and September. Patient had usual childhood diseases with no complications. No history of eczema.

S.R. E.E.N.T. - N.S.A.

Chest - As in C.C.

Heart - N.S.A.

G.I. - N.S.A.

Effects of: Exercise - Patient gets short of wind easily

Physical Exam Heighth 61" Weight 137# Age 12½ years

E.E.N.T. - Tonsillar hypertrophy

Chest - Hyperresonant to percussion

Heart - N.S.A.

Abdomen - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 9 Hospital Chart No. 23071

Date of History 7-18-58 Age 13 yr. Sex M Race N

C.C. Two day history of shortness of breath. Patient has had this trouble before, with sniffles, severe coughing and vomiting, with some wheezing. Attacks worse in the summer and not necessarily accompanied by colds.

F.H. of Allergy Father negative. Mother has hay fever.

P.H. Usual childhood diseases. Trauma to head in April, 1958 which was diagnosed as concussion.

S.R. E.E.N.T. - N.S.A.

Chest - 3 year history of attacks (shortness of breath) frequent colds, 6 to 9 per year.

Heart - N.S.A.

G.I. - N.S.A.

Effects of: Rain - Wheezing is worse

Dampness - Wheezing is worse

Summer - Wheezing is worse

Physical Exam Heighth 71" Weight 146# Age 15 years

E.E.N.T. - N.S.A.

Chest - Clear to A. & P.

Heart - N.S.A.

Abdomen - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 10 Hospital Chart No. 8013

Date of History 8-3-60 Age 11 yr. Sex M Race N

C.C. Patient has had wheezing spells for as long as he can remember. They are always worse in the winter, November to May and occasionally after swimming in the summer. In the winter they are usually associated with colds, may last for one to seven days with complete clearing between attacks. No history of rhinorrhea, sneezing or itching but has perennial nasal congestion.

F.H. of Allergy Father negative. Mother negative. Brother 19 years old has asthma.

P.H. Patient has had intermittant asthma since early childhood. Also had rickets and was operated upon for correction in 1951. Later he had osteomyelitis in the left tibia. He has had a T. & A. He has had measles and mumps.

S.R. E.E.N.T. - Wears glasses. Has a chronically stuffed up nose.

Chest - Several colds per year, number not known.

G.I. - Negative.

Effects of: Cold air - Causes wheezing

Dampness - Causes wheezing

Outdoor dust - Causes wheezing

House dust - Causes wheezing

Physical Exam Heighth 58" Weight 89# Age 11 years

E.E.N.T. - Nasal edema. Tonsils surgically absent

Chest - Wheezes inspiratory and expiratory

Heart - R.S.R. with no murmurs

Abdomen - N.S.A.

Diagnosis Bronchial Asthma

Name Subject No. 11 Hospital Chart No. 3134

Date of History 9-7-60 Age 8 yr. Sex M Race N

C.C. Onset of symptoms was at age 6 years, i.e., two years ago with eyes mattering and tearing and itching. Nasal congestion and rhinorrhea, usually purulent. Possibly mild dyspnea at night. Symptoms worse from early spring to late autumn, but some mild symptoms in the winter, too.

F.H. of Allergy Father negative. Mother negative.

P.H. No past allergic history until that mentioned in the above C.C. Patient had polio in August 1959 with mild widespread residual muscle weakness of neck flexors, arms, forearms and hands bilaterally, the abdominal recti, hip extensors, and quadriceps bilaterally.

S.R. E.E.N.T. - Frequent tonsillitis

Chest - N.S.A.

G.I. - Negative

Effects of: Has been previously treated with repository injections for house dust, trees, grasses and weeds.

Physical Exam Heighth 49½" Weight 50# Age 8 years

E.E.N.T. - Edematous nasal mucosa with clear exudate.

Tonsils present and enlarged.

Chest - Clear to auscultation and percussion.

Abdomen - N.S.A.

Diagnosis Hay Fever

DISCUSSION

In this study carried out on eleven allergic children, selected at random, all of whom have bronchial asthma with the exception of No. 11, it was found that their serum lipoproteins were not significantly elevated or depressed in any fraction. Certain individuals did have wide variations from the mean values, however, this was also the case in the control group of children. Their serum cholesterol levels were all within normal range, excepting Subject No. 10 with 305 mg/100 ml, who is 114 % of normal standard weight for age tables, and Subject No. 9 with 145 mg/100 ml whose weight is also above normal standard tables of weight for age. Both of these subjects' serum cholesterol levels are very near the borderline normal range, however, of 150-300 mg/100 ml.

Subject No. 4 shows a 79% of normal weight for his age. His history reveals that he has had asthma almost continuously since birth and he also has a poor appetite. Subject No. 11 who is 83% of normal weight for age has only hay fever. However, his history reveals that he had poliomyelitis in August, 1959, and was left with widespread minimal residual muscle weakness, which would account for some muscle atrophy and weight loss.

The skin tests to foods are recorded in Table No. 3. Subject No. 3 moved out of the city before completion of her tests. Subject No. 6 was scratch tested and although results

were negative, he was not given intradermal tests because historically he wheezes with consumption of milk and wheat. It is a well established fact that skin tests for foods are inaccurate, as was brought out in this study by the fact that several of the children who showed positive reactions to certain foods, on questioning, do eat the foods with little to no allergic reaction ensuing. Table No. 4 records the results of skin testing to several common local pollen allergens and house dust.

SUMMARY

The serum lipoprotein fractions S_f (16-44) (44-61) (61-185) (185-802) and serum cholesterol have been determined in eleven allergic children all but one of whom have bronchial asthma symptoms, the exception having only hay fever. There was no statistically significant deviation from the normal control group of subjects.

I wish to express my sincere gratitude to Dr. Yook Ng of the Department of Biochemistry for his many hours of work enabling me to accomplish the serum lipoprotein study by means of the ultracentrifuge.

Table 1
Serum lipoprotein, cholesterol, etc., in control subjects

Subject	Sex	Age yrs	Wt % of normal for age	Ht % of normal for age	Serum total cholesterol mg/100 ml	Control Subjects serum lipoprotein fractions mg/100 ml			
						S_f0-12	S_f12-20	S_f20-100	S_f100-400
R.G.	F	7	118	106	253	447	73	24	6
A.F.	M	9	78	107	147	196	14	6	0
C.L.	M	9	87	97	220	278	35	41	15
C.A.	F	9	108	103	241	454	51	18	5
B.A.	M	10	98	98	229	236	5	17	0
D.A.	M	10	102	99	153	227	37	55	3
T.R.	F	10	102	103	224	199	8	29	5
E.G.	M	11	103	100	183	291	22	34	20
S.B.	F	11	98	100	270	246	11	15	3
J.F.	F	12	109	106	276	305	31	48	6
W.G.	F	15	107	101	159	239	42	54	3
A.G.	F	16	100	101	197	326	14	0	0
M.S.	F	17	109	100	254	410	41	6	0
R.F.	M	24	101	102	234	235	29	12	0
Mean		12.2	102	102	217	293	30	25	4.3
Standard deviation					£43	£89	£18	£19	£6.8

Table 2
Serum lipoprotein, cholesterol, etc., in allergic children

Subject	Sex	Age yrs	Wt % of normal for age	Ht % of normal for age	Serum total cholesterol mg/100 ml	Serum lipoprotein fractions mg/100 ml			
						S$_f$16-44	S$_f$44-61	S$_f$61-185	S$_f$185-802
4	M	4	79	94	210	245	18	43	5
1	F	6	104	103	256	165	38	22	6
6	M	6	88	93	210	235	1	0	0
5	M	8	99	103	241	243	4	40	2
11	M	8	83	97	259	232	67	135	53
10	M	11	114	102	305	439	49	49	3
7	F	12½	112	105	294	337	31	38	6
8	M	12½	154	102	262	269	26	20	0
3	F	13½	108	97	182	285	23	20	0
2	M	14½	122	106	226	157	0	0	0
9	M	15	122	107	145	93	3	0	0
Mean		10.1	108	101	235	245	24	33	7
Standard deviation					±47.3	±92.7	±21.7	±38.2	±15.5
"t" (difference between the means/standard error of the difference						1.3	0.72	0.63	0.54

Table 3

Food Skin Tests In Allergic Children

Subject No.		1	2	3	4	5	6	7	8	9	10	11
Control	S	-	-		-	-	-	-	-	-	-	-
	ID	-	-			-		-	-	-	-	-
Beef	S	-	-		1+	-	-	-	-	-	-	-
	ID	2+	2+			1+		2+	1+	2+	-	2+
Carrot	S	-	-		1+	-	-	-	-	-	-	-
	ID	-	2+			1+		-	-	1+	1+	2+
Egg	S	-	-		1+	-	-	-	-	-	-	-
	ID	-	1+			-		2+	2+	2+	-	1+
Cow Milk	S	-	-		2+	-	-	-	-	-	-	-
	ID	-	1+			-		-	-	-	2+	-
Peas	S	-	-		1+	-	-	-	-	-	-	-
	ID	1+	3+			1+		2+	1+	1+	3+	1+
Wheat	S	-	-		2+	-	-	-	-	-	-	-
	ID	2+	3+			2+		2+	-	2+	2+	1+

S=scratch test
ID=intradermal test

Table 4

Skin Tests in Allergic Children

Subject No.		1	2	3	4	5	6	7	8	9	10	11
Pollen Control	S	-	-	-	-	-	-	-	-	-	-	-
Alternaria	S	-		3/	3/	2/	-	1/	-	3/	-	-
Giant Ragweed	S	-	4/	4/	1/	-	-	2/	1/	1/	-	3/
Hormodendrum	S	-		4/	2/	1/	-	-	-	2/	-	-
House Dust	S	-	-	4/	1/	-	-	1/	-	3/	-	1/
June, Kent. Blue	S	-		1/	-	-	1/	1/	-	1/	-	-
Kochia, Mexfire	S	-	2/	1/	-	-	1/	-	-	-	-	-
Short Ragweed	S	-	4/	4/	2/	1/	1/	4/	1/	1/	-	2/
Timothy	S	-		4/	2/	1/	-	1/	-	-	-	-

S=scratch test
1/ = weakly positive wheal and flare, through 4/ = strongly positive wheal and flare

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