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Allergy and Disease in Twins

An anamnestic study

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The immunological nature of allergic diseases is a recognized fact, but their pathogenesis is still largely unknown, representing one of the less understood areas of immune pathology.

Twin studies in allergic diseases have been carried out before (Gedda and Teodori, 1962), contributing to prove the great importance of heredity in the occurrence of allergic disease.

Yet, the nature and mode of inheritance of allergic hereditary factors is still unknown, thus representing further question marks in the mystery of allergic pathogenesis.

The present study has been extended to include allergic diseases within the wider scope of total pathological experience, through a comparison between a sample of twin pairs with a history of allergic disease and a control sample of nonallergic twins.

All our data have been derived from the records of the Twin Register of the Mendel Institute. These records have been coded and transferred onto IBM punched cards with the support of the Italian National Research Council (Gedda and Milani-Comparetti, 1966). A population of 500 twin pairs was selected for having been included in the Twin Register before 1955, so as to have a minimum age of 15 years. The case histories of all these pairs had been coded and punched independently, according to a coding system developed in our Institute, which listed the following items: (1) oculorhinitis; (2) asthma; (3) urticaria; (4) allergic eczema; (5) unspecified allergic disease.

As many as 76 of our 500 pairs were found to have a positive history for at least one of these classes of disease, representing an incidence of 15.02% in our material.

A control sample of 76 nonallergic pairs was drawn from the same twin population.

The analysis of the distribution of allergic diseases in the experimental population confirmed the importance of genetic factors for each pathological form and for " allergic diathesis " as a whole (Tab. I).

This finding represents a confirmation of similar previous reports.

A further step in the present study was the comparison of the incidence of other, nonallergic diseases in the two experimental populations: allergic and control. This comparison evidenced a significant excess of some classes of nonallergic diseases in

the allergic twin population. The most significant findings concerned migraine and diseases of the digestive apparatus.

While in our original classification migraine was not included among allergic diseases, the significance of the association between migraine and allergic diseases

Tab. I. Distribution of cases of allergic disease by classes of within-pair concordance and zygosity

	MZ	DZ	Total
Discordant	8	30	38
Concordant	28	10	38
Total	36	40	76

$\chi^2 = 21.110$; 1 df; $P \simeq 1.10^{-5}$ ***

Tab. II. Distribution of cases of migraine in allergic and control twin pairs

	Allergic	Control
Total affected	23	1
Total individuals	152	152

$\chi^2 = 10.95$; 1 df; $P \simeq 9.10^{-4}$ ***

Tab. III. Distribution of diseases of the digestive apparatus (excluding the mouth) in allergic and control twin pairs

	Allergic	Control
Total affected	56	28
Total individuals	152	152

$\chi^2 = 6.45$; 1 df; $P \simeq 1.10^{-2}$ **

(Tab. II) is so high as to justify the outright inclusion of migraine among allergic diseases in our future studies.

The significance of the association between allergic diseases and diseases of the digestive apparatus is also very high (Tab. III), justifying the formulation of a hypothesis to explain it.

The problem ought to be considered in the light of: (1) the increasing importance ascribed to the digestive apparatus in the initiation of immune response (Piazzi and Riparbelli, 1967; Kim and Watson, 1969); (2) the existence of different gut-associated

lymphoid populations (in the tonsils, Peyer's patches, appendix and lamina propria); (3) the responsibility of lamina propria lymphocytes in the production of reagins (Crabbé et al, 1965); (4) the role of the " thymus-independent " lymphocyte population (morphologically related to gut-associated structures) in the production of " desensitizing " antibodies.

A hypothesis is formulated, according to which the variability of immune responses among families and individuals may be related to the difference of the responses initiated in different sections of the intestine and to a corresponding variability of digestive enzymes. Different paths of macromolecule degradation, revealing or masking individual antigenic determinants at the various intestinal stations, may be related to the genetically controlled presence or absence of various digestive enzymes.

This hypothesis (obviously requiring experimental verification) might explain both the inheritance of allergic disease and the great variability of allergenic specificities that characterize entire families.

Further studies are being carried out.

References

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