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THE FACTORS Gm(1), Gm(2), Gm(4), Gm(5)
AND Inv(1) IN THE SERA OF
PATIENTS WITH ALLERGIC DISEASES

By

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Two independent genetic marker systems of human immunoglobulins are known: Gm and Inv. The Gm system is associated with the heavy polypeptide chains of the IgG class. To date, over 20 factors or specificities Gm¹ are known (see 1, 2, 5, 7, 10, 11, 12 for review). The Gm(1), Gm(2) and Gm(4) factors are present in the subclass We, while Gm(5) in the subclass Vi (3, 6, 8, 14). But for a few exceptions (4, 9) in Caucasians Gm(4) and Gm(5) are inherited together. In the Inv system 3 factors associated with the light polypeptide chains of IgG, IgA, IgM are known.

In this paper, the distribution of the Gm and Inv phenotypes in the sera of patients with allergic diseases is described and compared with normal individuals.

MATERIAL AND METHODS

Sera of Allergics and Control Sera

A total of 363 unrelated adult patients with allergic diseases were investigated: 272 cases of hay fever and 91 cases of other allergic diseases (70 bronchial

¹ The notation for genetic factors of human immunoglobulins used in this paper is that recommended by the expert committee of the World Health Organization in: Bull. Wld Hlth Org. 33, 721-724, 1965.

asthma, 12 urticaria and angioneurotic oedema, 6 vasomotor rhinitis, 3 allergy due to bee toxin).

As controls, 513 normal sera from blood donors of Brno were investigated.

Gm and Inv Determinations

The tests were performed by the haemagglutination-inhibition technique. Each factor was investigated with the aid of 2 specific typing systems: anti-Gm or anti-Inv agglutinators (SNagg) reacting with the O Rh₀(D) positive erythrocytes sensitized by corresponding anti-D sera (Table 1). The specificity of the typing systems was controlled with the Reference panel sera (WHO International Reference Centre for Genetic Factors of Human Immunoglobulins, Rouen—Bois-Guillaume). The anti-Gm(4) Kou. and anti-Gm(5) sera were provided by Dr. P. Herzog, Prague.

TABLE 1
Typing Systems.

	Agglutinator	Anti-D
Gm(1)	Ond.	Nov. or Val.
	Kop.	Nov. or Val.
Gm(2)	For.	Nov. or Val.
	Cho.	Nov. or Val.
Gm(4)	Kou.	Koz. or Kra.
	Ka.	Kra.
Gm(5)	Ho.	Cid.
	Krs.	Kra.
Inv(1)	Ry.	Ce., Nov. or Val.
	Sv.	Nov. or Val.

0.05 ml of anti-Gm or anti-Inv serum were mixed in test tubes with 0.05 ml of tested serum diluted with saline solution in the ratio 1:5. After 10 minutes of incubation at room temperature, 0.05 ml of 1 per cent suspension of Rh sensitized cells O were added. After 2 to 3 hours at room temperature the results were read macroscopically: agglutinations meant absence and lack of agglutination the presence of the respective Gm or Inv factor in the investigated serum. Controls were carried out where anti-Gm or anti-Inv serum was replaced by saline solution.

In the sera from the Hr. family the inhibitory activities were investigated: the tested serum was titrated in twofold dilutions in saline solution. Each dilu-

tion was mixed with anti-Gm serum and investigated as described above. The immunoglobulin content was controlled immunoelectrophoretically according to Škvařil (13) using rabbit antisera specific for human IgG, IgA, and IgM (Institute of Sera and Vaccines, Prague).

RESULTS

The incidence of factors Gm(1), Gm(2), Gm(4), Gm(5) and Inv(1) was found to be similar in patients with hay fever and those with other allergic diseases (Table 2). The differences in the frequency of the above mentioned factors between the allergic individuals and normal subjects was found to be not statistically significant ($P > 0.1$).

TABLE 2

Frequency of Gm(1), Gm(2), Gm(4), Gm(5) and Inv(1) Factors in Patients with Allergic Diseases and Comparison with the Normal Population of Brno.

		Gm(1)	Gm(2)	Gm(4)	Gm(5)	Inv(1)
Hay fever	No.	121	32	254	255	34
total: 272	%	44.49	11.76	93.38	93.75	12.50
Other allergic diseases*	No.	34	10	86	86	13
total: 91	%	37.36	10.99	94.51	94.51	14.29
Control (Normal sera)	No.	205	79	490	490	49
total: 513	%	39.96	15.40	95.52	95.52	9.55
X ² (d.f. = 2)		3.495	2.637	1.638	1.174	2.742
		P > 0.1				

* See text.

Table 3 shows the distribution of the Gm phenotypes in patients with allergic diseases. Not even here were there any significant differences between the frequencies in allergics and the normal population ($X^2 = 6.829$; $P > 0.1$). In one case, patient J. Hr. (Hr. family) with hay fever, the rare phenotype Gm(1, —2, —4,5) was found. The serum of

TABLE 3

Frequency of Gm Phenotypes in Patients with Allergic Diseases and Comparison with the Normal Population of Brno.

		Gm phenotypes					
		(1, 2, 4, 5)	(1, 2, -4, -5)	(1, -2, 4, 5)	(1, -2, -4, 5)	(1, -2, -4, -5)	(-1, -2, 4, 5)
Hay fever	No.	28	4	75	1	13	151
total: 272	%	10.29	1.47	27.57	0.37	4.78	55.52
Other allergic diseases*	No.	7	3	22	0	2	57
total: 91	%	7.69	3.30	24.17	0.0	2.20	62.64
Control (Normal sera)	No.	68	11	114	0	12	308
total: 513	%	13.26	2.14	22.22	0.0	2.34	60.04

$$X^2 = 6.829; \text{d.f.} = 6; P > 0.1$$

* See text.

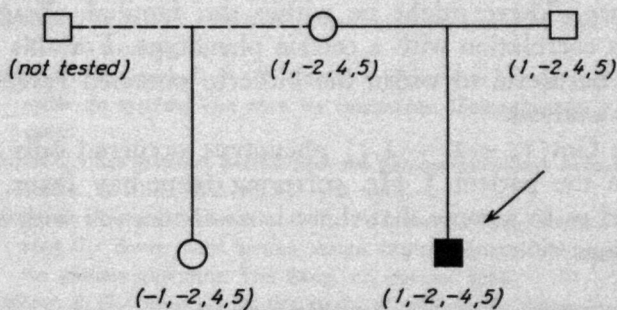


Fig. 1.

Gm phenotypes in the Hr. family.

J. Hr., when mixed with the anti-Gm(4) agglutinator, did not display any inhibitory activity even in the undiluted state. In the parents and the step-sister of the patient J. Hr., this phenotype did not occur (Fig. 1). The sera from the Hr. family exhibited the same inhibitory titre as normal individuals, when mixed with anti-Gm(4) and anti-Gm(5) agglutinators. Immunoelectrophoretically, no changes in the immunoglobulins IgG, IgA, and IgM were found.

DISCUSSION

The patients and the normal individuals came from the same population. We suppose the total number of investigated sera was sufficient for determining the frequency of the Gm and Inv factors. The fact that in the distribution of phenotypes there were no statistically significant differences leads to the conclusion that the investigation of the Gm(1), Gm(2), Gm(4), Gm(5) and Inv(1) factors in the sera of unrelated individuals cannot be used in the investigation of allergic diseases. It was not possible to include the testing of the other Gm and Inv factors in the work, because the respective agglutinators, which are rare, were not available.

It is a well-known fact that allergic diseases display family incidence. There might be within the familial allergic diseases a correlation with a certain phenotype. For this reason it will be useful to widen the hitherto obtained results by a family analysis.

The Gm(1, —2, —4,5) phenotype occurred only in one case in the patient J. Hr. suffering from hay fever, which induced us to assume that there is no connection with allergic affections.

SUMMARY

No significant differences were found in the distribution of Gm and Inv phenotypes between allergics and the normal population. In a patient with hay fever the rare phenotype Gm(1, —2, —4,5) occurred.

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