THE Gm AND Inv FACTORS IN RHEUMATOID ARTHRITIS

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The Gm(1), Gm(2), Gm(4), Gm(12), and Inv(1) factors were studied in the sera of 56 patients suffering from rheumatoid arthritis and 26 from various rheumatic diseases, by the hemagglutination inhibition test, using optimally reacting mixtures of Ragg and Nagg sera. The distribution of these factors was found to agree with that of healthy Greeks. No correlation was found between hypergammaglobulinemia and the discovery of the Gm(1) and Inv(1) factors. The presence of the rheumatoid factor was independent of the Gm and Inv phenotypes.

The distribution of several Gm factors among patients suffering from various rheumatic diseases was the subject of some investigations carried out in the latest few years (Grub 1958, Podliachouk et al. 1958, Harboe 1960, Tiilikainen 1960 and 1965, Deicher and Schupp 1963, Strejcek and Herzog 1966). Most authors failed to find differences with the general population, though some of them reported a higher frequency of Gm(1) and Gm(2) factors in rheumatoid arthritis (R.A.) (Tiilikainen 1960 and 1965). On the other hand, Strejcek and Herzog (1966) reported an overrepresentation of the Gm(1) factor in lupus erythematosus patients. Nevertheless, Tiilikainen (1965) postulated that the observed differences could be false, because " Ragg sera seem capable of giving false positive or intermediate results, especially in testing sera of patients with an abnormal (increased) gamma globulin production. "

As far as we know, no publication concerning Inv(1) and Gm(4) factors distribution among rheumatic disease patients has appeared, though such a study could prove to be of some interest, inasmuch as anti-Inv(1) and anti-Gm(4) antibodies are not encountered in R.A. patients (Grubb 1970).

This study was undertaken in order (*a*) to investigate the distribution of the Gm(1), Gm(2), Gm(4), Gm(12), and Inv(1) factors in Greek patients suffering from R.A. using optimally reacting mixtures of Ragg and Nagg sera; (*b*) to determine the effect of hypergammaglobulinemia on the discovery of the Gm(1) and Inv(1) factors; and (*c*) to examine the relationship, if any, between the various Gm and Inv phenotypes with the discovery of the rheumatoid factor (R.F.).

Sera from 84 patients suffering from various rheumatic diseases were studied. The samples consisted of (A) 58 sera from patients suffering from classical or definite R.A. according to the criteria of the A.R.A., and (B) 26 sera from patients suffering from various rheumatic diseases (ankylosing spondylitis, 13; osteoarthrosis, 6; collagen diseases, 7). A total of 256 previously examined subjects from the general population of Greece (Archimandritis et al. 1975) served as a control sample. The determinations were carried out by the hemagglutination inhibition test on Kline's tiles with specific Behringwerke antisera in accordance with the manufacturer's instructions. The antisera were optimally reacting mixtures of Ragg and Nagg sera.
Before the determinations the sera were diluted 1 : 20 with saline and heated at 63°C for 15 minutes (Grubb and Laurell 1956, Laurell and Grubb 1958). Two sera from sample A were excluded because they gave hemagglutination reaction with saline.
The detection of R.F. was carried out by the Latex fixation test (Hyland) in accordance with the manufacturer's instructions.

As shown in Table 1, the distribution of the various Gm and Inv factors in the patients does not significantly differ from that of controls. This finding is in close agreement with the results of other investigations (Grubb 1958, Podliachouk et al. 1958, Harboe 1960, Deicher and Schupp 1963) and differs from that reported by Tiilikainen (1960, 1965).

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Table 1. *Distribution of Gm and Inv factors in the examined material*

Material	N	Gm factors						Inv factors		
		Homozygous Gm		Heterozygous Gm						
		4,12	1	1,4,12	1,2,4,12	1,4	1,2	+1	—1	Total
(1) Healthy Greeks	254	173	6	66	5	2	2	32	224	256
(2) Sample A	56	33	1	18	3	0	1	13	43	56
(3) Sample B	26	16	0	8	2	0	0	2	24	26

χ^2 *analysis*:

Homoz. vs. Heteroz. $\{1-2\} = 1.603$; $p > 0.2$
Homoz. vs. Heteroz. $\{1-3\} = 0.517$; $p > 0.4$
Homoz. vs. Heteroz. $\{2-3\} = 0.029$; $p > 0.8$

Gm(+1) vs. Gm(—1) $\{1-2\} = 1.347$; $p > 0.2$
Gm(+1) vs. Gm(—1) $\{1-3\} = 0.213$; $p > 0.6$
Gm(+1) vs. Gm(—1) $\{2-3\} = 0.000$; $p > 0.99$

$\chi^2\{1-2\} = 3.449$; $p > 0.05$

On the other hand, the distributions of Gm(1) and Inv(1) factors among hypergammaglobulinemic and nonhypergammaglobulinemic R.A. patients did not significantly differ (Table 2). Therefore, it should be concluded that the possibility of false positive reactions concerning the discovery of Gm(1) and Inv(1) factors in hypergammaglobulinemic patients is meaningless, when the antisera are optimally reacting mixtures of SRagg and SNagg.

The relatively high incidence of the Gm(2) factor in our material, though without any statistical credibility because of the small "expected" values, may have resulted from the heating of the specimens (Harboe 1960).

The incidence of the Inv(1) factor among R.A. patients, though no significantly greater, is suprisingly higher than in controls. Nevertheless, such a high incidence has been recorded in Greeks (Ritter et al. 1966). Concerning the

Table 2. *Gm(1) and Inv(1) factors and gammaglobulin levels in patients with rheumatoid arthritis*

Phenotypes	Normal gammaglobulin level	Increased gammaglobulin level	Total
Gm (+1)	16	7	23
		$\chi^2 = 0.043$, $p > 0.8$	
Gm (—1)	25	8	33
Inv (+1)	6	7	13
		$\chi^2 = 0.814$, $p > 0.3$	
Inv (—1)	28	15	43

Table 3. *Rheumatoid factor in the various Gm and Inv phenotypes*

Phenotypes	RF (+)	RF (—)	Total
Inv (+1)	8	5	13
		$\chi^2 = 0.06$, $p > 0.9$	
Inv (—1)	27	16	43
Homozygous Gm	24	10	34
		$\chi^2 = 1.617$, $p > 0.2$	
Heterozygous Gm	11	11	22
Gm (+1)	12	11	23
		$\chi^2 = 1.106$, $p > 0.2$	
Gm (—1)	23	10	33

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Inv(1) frequency in sample B, it should be mentioned that, though lesser than in sample A, it is not that much different from controls. On the other hand, the small expected number makes the statistical analysis between samples A and B unreliable.

As shown in Table 3, the discovery of the R.F. was independent of the Gm and Inv phenotypes. This finding agrees quite well with that reported from Podliachouk et al. (1958) concerning the Gm(1) factor.

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