

Concentration of IgG, IgA, and IgM in terms of international units in the sera of healthy individuals

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Abstract

This paper describes experiments on the determination of the level of IgG, IgA, and IgM in normal human sera, using an international reference preparation for comparison.

The concentration of immunoglobulins (Ig) in human serum has been studied extensively. However, very different results are obtained by different authors (Hein, 1969). Among the reasons for this diversity are the general tendency to express immunoglobulin concentrations in weight units per millilitre and the lack of a unified reference preparation for comparison (Rowe et al., 1970, 1972). In order to remedy this situation, WHO developed an international reference preparation for expressing the immunoglobulin concentration in international units per millilitre and recommended it for use in radial immunodiffusion (Rowe et al., 1970; Europ. J. Immunol., 1971).

This communication describes experiments to determine the level of IgG, IgA, and IgM in normal human sera, the WHO reference preparation serving for comparison.

Materials and methods

Sixty healthy individuals (30 men and 30 women) from Sofia, Bulgaria, aged between 21 and 50 years, were included in the study.

The experiments were carried out by the method of Mancini et al. (1965), with monospecific anti-IgG (Wellcome), anti-IgA (Behringwerke), and anti-IgM (Institute of Haematology, Sofia) sera. A pH 8.6 buffer (barbital plus barbital sodium) was used in the agar. The rings obtained were read after standing at 37°C for 24 h, washing, drying, and finally staining with amido black 10B. The concentration was plotted against the diameter of the precipitation rings.

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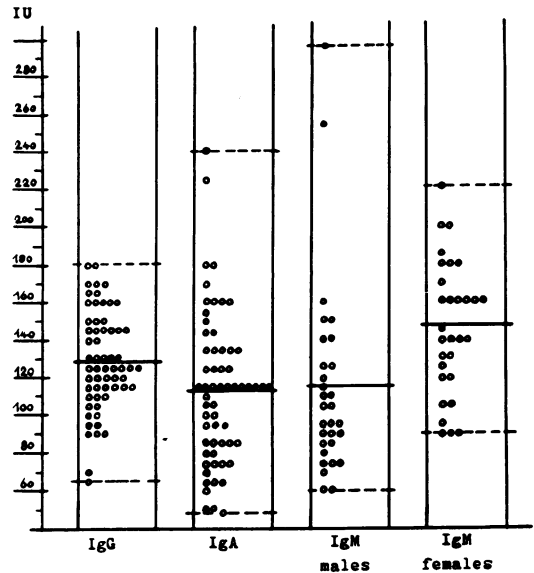


Fig. 1. Distribution of the individual values of IgG, IgA, and IgM.

Table 1. Concentration (in IU) of IgG, IgA, and IgM in the sera of healthy individuals

| Ig | Sex ^a | No. | Mean value (IU) | Standard deviation | Individual values |
|-----|------------------|-----|-----------------|--------------------|-------------------|
| IgG | M+F | 60 | 129.4 | 28.6 | 64-180 |
| IgA | M+F | 60 | 114.3 | 40.5 | 48-240 |
| IgM | M | 30 | 114.7 | 51.5 | 60-295 |
| | F | 30 | 147.0 | 34.4 | 90-220 |
| | M+F | 60 | 130.8 | 46.6 | 60-295 |

^a M = males; F = females.

Table 2. Concentration (in IU) of IgG, IgA, and IgM in the sera of healthy individuals, according to various workers

| Place | No. | Age (years) | IgG | IgA | IgM |
|--|-----|-------------|-----------------|-----------------|-----------------|
| Sofia, Bulgaria ^a | 95 | 19-21 | 119±80 | 148±62 | not tested |
| Skopje, Yugoslavia ^b | 100 | | 136±50 | 249±113 | 96±40 |
| Lausanne, Switzerland ^c | 100 | 20-29 | 135 (87-208) | 136 (56-334) | 178 (81-380) |
| Offenbach, F. R. of Germany ^c | 45 | 20-29 | 124 (86-187) | 108 (48-244) | 133 (59-298) |
| Utrecht, Netherlands ^c | 100 | 20-29 | 116 (65-206) | 94 (40-228) | 127 (48-334) |

^a Toškov & Abrašev, 1972 (arithmetic means).

^b Dejanov & Bojadžiev, 1972 (arithmetic means).

^c D.S. Rowe, personal communication (geometric means).

A reference preparation (67/97) was supplied by the WHO International Reference Centre for Immunoglobulins, Lausanne. Five dilutions of the preparation (1 : 4-1 : 64) were used for plotting the standard curves for IgG; for IgA and IgM, the preparation was used undiluted and in dilutions up to 1 : 32. The data were calculated in accordance with the instructions for the use of the preparation (Rowe et al., 1970) and statistically treated by the method of variation analysis.

Results and discussion

The results are presented in Table 1 and Fig. 1. The individual values varied within wide limits. However, the standard deviations did not differ from those reported by Hein (1969) and other workers (Table 2). Fig. 1 indicates that only a limited number of individuals showed high upper limits of IgA and IgM values.

The values of IgG in men and in women were rather close, no statistically significant differences being found ($P > 0.1$). The same was true for IgA. In contrast, the IgM concentration in females was substantially higher than that in males (Table 1 and Fig. 1). Analogous data obtained by other workers (Butterworth et al., 1967) and the confidence level ($P < 0.01$) of the difference found (about 30 units) reflect the influence of sex on the IgM concentration.

Table 2 shows the concentrations of immunoglobulins expressed in international units per millilitre. The quantitative ratios between the three main classes found when the concentrations were expressed by weight (IgG > IgA > IgM) disappeared when the international units were introduced. This might render the interpretation of certain dysglobulinaemia states difficult for those who are not yet familiar with the international units. For this reason, we suggest that concentrations of immunoglobulins should be expressed in both ways when appropriate.

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