Reprint from

International Journal of Biometeorology

Journal of the International Society of Biometeorology

PUBLISHED BY
SWETS & ZEITLINGER B.V. - AMSTERDAM and LISSE

Int. J. Biometeor. 1982, vol. 26, number 1, pp. 49-52.

Age Related Patterns of Immunoglobulin Serum Levels in the Quechua Indians of Andean Mountains

by

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ABSTRACT. – Age-dependent changes of IgA, IgG, IgM, and IgD serum levels in a population of Quechua Indians of Peruvian Andes at 4 300 m were investigated. A first increase and a subsequent decrease in IgA and IgM levels were observed with advancing age. IgG and IgD only display an increase during development. More or less pronounced sex-related changes were also found in all Ig classes, the sex dependent pattern of IgA being the more evident one. It has been suggested that sexual, genetic and environmental influences strongly superimpose to high altitude related changes in Ig profile during ageing.

INTRODUCTION

Among the macro and microenvironmental factors which might influence the efficiency of the immune system (Fabris, 1981; Fabris and Piantanelli, 1981) a certain relevance may be assigned to high altitude induced hormone metabolic modifications (Heath and Williams, 1977). Both primary and secondary responses following antigenic stimulation and the blood serum levels of IgG and IgA have been found to be increased in subjects living at high altitude when compared to sea level residents (Chohan et al., 1975).

Immunoglobulins, as markers of the protective immune state of the organism, are also suggested to be important in relation to prevention in geriatrics (Denes and Orosz, 1977). As a matter of fact, with advancing age a number of immunological parameters, including serum immunoglobulin levels, are modified, although the characteristics of the alterations is still controversial (Mackay, Whittingham and Mathews, 1977). Therefore, it seemed to us worthwhile to take the opportunity of an expedition to Andean Mountains to undertake a study on the age-dependence of the blood serum levels of immunoglobulin classes in a population of natives living in Cerro the Pasco, at 4 330 m altitude. The study included both male and female Quechua Indians whose ages ranged from 10 to 58 years. This population offered the advantage of a high degree of homogeneity of their genetic background, standard of life and physical environment.

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Received 8 January 1981.

MATERIALS AND METHODS

Male and female subjects of different ages, free of clinical signs of illness were choosen at random among the native population of Quechua Indians of Cerro de Pasco (4 330 m), in the Andean Mountains.

Blood was collected in the early morning from overnight fasted individuals using the laboratory of either the "Instituto de Biologia Andina" or the "Hospiral la Esperanza", Cerro de Pasco. Serum was immediately frozen and stored at -20 °C. Any following transport, when necessary, was performed by using dry ice, a gift of the direction of Centromin, Morococha - Perù.

Assays of immunoglobulin were carried out by the technique of single radial immunodiffusion on "Endoplate" from Kallestad Lab. Inc.. All assays were performed at 18°C, immediately after thawing, using human serum Immunoglobulins as standards. Immunoglobulin levels (mg/100 ml) were expressed as mean of values derived from at least 8 subjects, grouped by age and sex.

RESULTS

The IgA serum levels in male Quechua Indians of Cerro de Pasco (Fig. 1a) showed an increase between the age group 10 to 20 years. Maximum values were found at the age of 30 with a slow decrease in the higher age groups. A constant increase of the serum levels of IgA was found in female individuals from 20 to 45 years of age. In addition, IgA levels in adult 45-year old female Indians were found about one third higher than those in male individuals of the same age, and similar to the values observed in 20-30-year old male subjects.

The IgM serum levels (Fig. 1b) increase in male subjects from the 5 to 15 year to the 15 to 20 year age group, followed by a progressive decline thereafter. Values from female Indians were only slightly higher than those ones from males at each of the three age groups investigated.

With regard to the IgG levels (Fig. 1c) there were no significant changes with advancing age, with the exception of the increment observed in both male and female Indians from 10 to 20 years of age. Female Indians display increased levels of IgG when compared with male subjects of the same age.

Finally, the high variability of data from IgD assays, precludes attributing any biological significance to the decreasing tendency of IgD concentration with age.

DISCUSSION

The Ig values for different age groups of population of highlanders Quechua Indians, clearly confirm that with advancing age a consistent decline of some immunoglobulin classes does occur. They further support the concept that in old age the efficiency of the immune system is substantially diminished (Walford, Meredith and Chency, 1977). The observed decreased levels of IgM, IgA and IgD in male highlanders with advancing age are in agreement with other author's findings on sea level residents (Buckley and Dorsey, 1970; Denes and Orosz, 1877; Schwick and Becker, 1969). On the opposite, the age-dependence of IgG concentrations is not easy comparable, since conflicting data arise from sea resident studies. Thus, increased (Schwick and Becker, 1969),

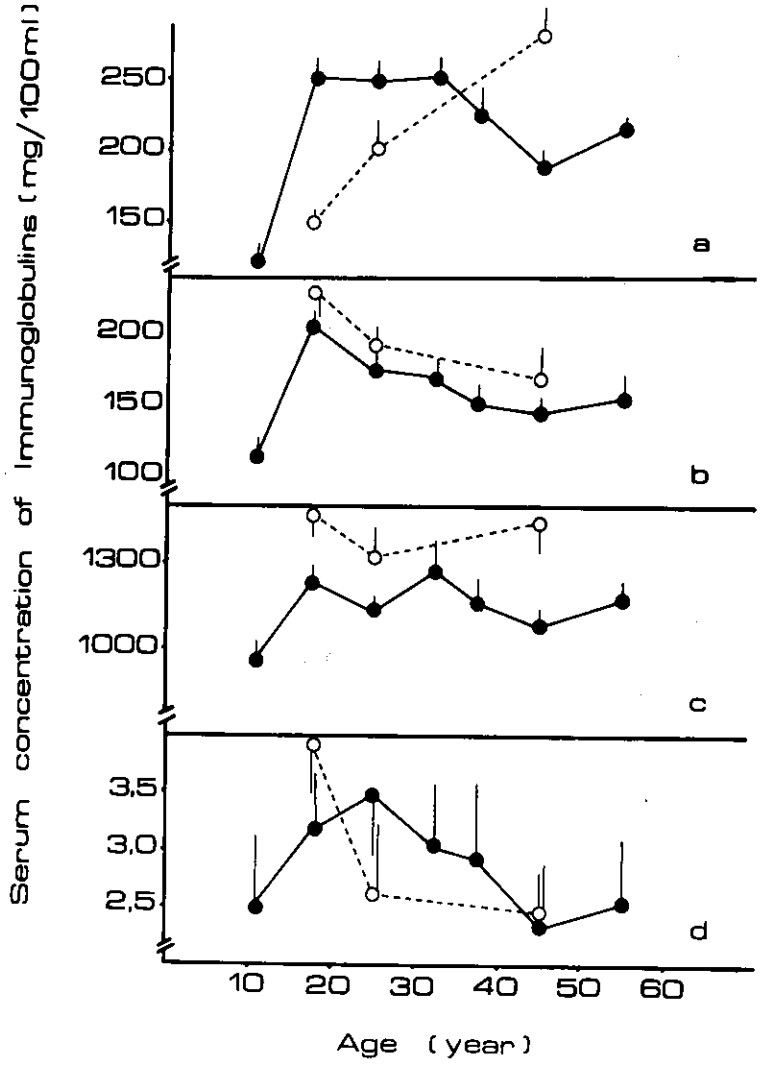

Fig. 1 Age and sex-related pattern of Immunoglobulin classes in Quecha Indians of Peruvian Andes. Data of IgA (Fig. 1a), IgM (1b), IgG (1c) and IgD (1d) from both male (solid line) and female (dashed line) are reported. Bars indicate the SE of data mean of at least 8 subjects.

decreased (Buckley and Dorsey, 1970) or slightly reduced (Denes and Orosz, 1977) levels were found. Taking account of such discrepancies, we may conclude that immunoglobulin patterns in male as well as female native populations undergo modifications during aging in a way similar to that observed at sea level, although the absolute values may be quite different for IgM.

Additionally, in female highlanders, a clearly different profile in the age related changes of IgA is detectable. A progressive increase was observed with advancing age,

in contrast with the early increase and subsequent decline found in males. Such a difference might depend either on a differential effect of altitude on sexual hormones or on different physical environment. In fact, the great majority of males works in the mines, hence exposed daily to high concentrations of dusty materials, in opposition to the open air life of female individuals.

Further investigations are obviously needed in order not only to separate these different effects, but also to elucidate the significance of age and high altitude dependent modifications of Ig classes on the functional capacity of the immune system.

ACKNOWLEDGEMENT

We acknowledge the friendly assistance of Dr. Seminario Olivares (Hospital La Esperanza, Centromin – Cerro de Pasco-Perù), whose help was critical in realizing the present work.

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