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BRIEF COMMUNICATION

ABO SYSTEM: MOLECULAR MIMICRY OF *Ascaris lumbricoides*

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SUMMARY

A. lumbricoides has been associated to the ABO System by various authors. The objective was to detect ABO System epitopes in *A. lumbricoides* of groups O, A, B and AB patients. 28 adult parasites were obtained from children to be used as assay material. The patients ABO blood groups were determined. Extracts of *A. lumbricoides* [AE] were prepared by surgical remotion of the cuticle and refrigerated mechanical rupture. Agglutination Inhibition (AI) and Hemoagglutination Kinetics (HK) tests were used with the [AE]. Of the 28 [AE], eight belonged to O group patients, 15 to A group, three to B group and the remaining two to AB children. The AI Test showed A epitopes in two [AE] of group A patients and B epitopes in two [AE] of group B patients. The HK Test showed B antigenic determiners in two [AE] of group B patients and in two [AE] of group AB patients as well as A antigenic determiners in one [AE] of A group patient. Of the 28 [AE] studied in both tests B epitopes were detected in all [AE] from B and AB patients and A epitopes in three of the 15 [AE] of group A patients. The experiments carried out suggest that *A. lumbricoides* might absorb A and B antigens from the host, and/or modify the cuticular carbohydrates expression as a kind of antigenic mimicry.

KEYWORDS: *Ascaris lumbricoides;* ABO System; Mimicry

Blood groups may act as receptors of parasites, bacterias and viruses[2,4,6,8,10]. At present, there is evidence that they perform a function and play a biological role that might not be associated to the erythrocytes[1,7,15] . *Ascaris lumbricoides* has been associated to the ABO System by various authors[12,13].

The objective of this paper was to detect ABO System epitopes in *Ascaris lumbricoides* of groups O, A, B and AB patients.

28 adult parasites were obtained from children to be used as assay material. The patients ABO blood groups were determined by means of conventional techniques[9]. Extracts of *A. lumbricoides* [AE] were prepared by surgical remotion of the cuticle and refrigerated mechanical rupture[5,11,13]. Agglutination Inhibition (AI) and Haemoagglutination Kinetics (HK) tests were used with the [AE].

AI [9] was carried out facing the [AE] against anti A and anti B monoclonal antibodies in optimal concentrations. Two-percent-suspensions of fresh red cells (A and B) were used as revealing system. Experiments were performed with pure [AE] and diluted [AE] in physiological solution (1/2; 1/4; 1/8; 1/16).

HK[14] applies the relative optical extinction (OE) produced on a light beam transmitted through a suspension of small particles (red blood cells and their agglutinates). The OE decreases as the red cell agglutinates grow, giving a parametric estimate of the haemagglutination rate. Parametric values such as the total relative optical extinction reduction (Δ%ROE: difference between the initial and the final values of OE) are calculated. Two-percent- suspensions of fresh red cells (A and B) were prepared. Optimal concentrations of anti A and anti B monoclonal antibodies were determined for those suspensions.

Δ%ROE of the [AE]-anti A antibody-A erythrocyte reaction (750 nm) and Δ%ROE of the [AE]-anti B antibody-B erythrocyte reaction (660 nm) were calculated for each pure [AE], and they were compared with the Δ%ROE of the control reactions (anti A antibody-A erythrocyte and anti B antibody-B erythrocyte reactions).

AI and HK Tests were made twice.

Of the 28 [AE], eight belonged to O group patients, 15 to A group, three to B group and the remaining two to AB children.

The AI test showed A epitopes in two pure [AE] of group A patients and epitopes B in two pure [AE] of group B patients. The diluted extracts did not show inhibitory capacity.

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The HK test showed B antigenic determiners in two [AE] of group B patients and in two [AE] of group AB patients as well as A antigenic determiners in one extract of A group patient.

Of the 28 [AE] studied in both tests, B epitopes were detected in all extracts from B and AB patients, and A epitopes in three of the 15 extracts of group A children.

No [AE] of O group patients presented ABO epitopes.

Many parasitic nematodes defy potent and specific immune responses to survive for long periods in otherwise immunocompetent hosts. Their success may stem partly from an ability to directly modulate host immunity, but they are also able to withstand continuous and vigorous antibody responses to many of their products. One manner in which many nematodes are able to evade antibody-directed effector mechanims is by shedding of surface-bound antibodies[3].

Soil nematodes are attacked by nematophagous fungi, which recognize the nematode surface in a lectin-like interaction, a presumptive reason for the diversity in carbohydrate expression on this group of nematodes. From this property, the coat has been adapted by parasitic species to new functions[3].

IA test showed A and B epitopes in four [AE] while HK test detected ABO epitopes in other four extracts that had not been found by the first test.

The experiments detected antigenic determiners in eight out 28 [AE].The epitopes found in the extracts are the same as the ones found in the children from whom the parasites were obtained.

This fact suggests that *A.lumbricoides* might absorb A and B antigens from the host and/or modify the cuticular carbohydrate expression as a kind of molecular mimicry[13].

The use of highly sensitive techniques increases the possibility of detecting these antigens that may be present in small amounts in the parasite.

RESUMEN

Sistema ABO: mimetismo molecular de *Ascaris lumbricoides*

Varios autores han relacionado el Sistema ABO con *A. lumbricoides*. El objetivo fue detectar epitopes del Sistema ABO en *A. lumbricoides* de pacientes grupo O, A, B y AB. Se trabajó con 28 ejemplares adultos parasitarios obtenidos de niños. Se determinó el grupo sanguíneo ABO de los pacientes. Se prepararon extractos de *A. lumbricoides* [EA] por remoción quirúrgica de la cutícula y ruptura mecánica refrigerada. A los [EA] se les realizó pruebas de Inhibición de la Aglutinación (IA) y Cinética de la Hemoaglutinación (CH). Los 28 [EA] correspondieron: 8 a pacientes grupo O, 15 a grupo A, 3 a grupo B y los 2 restantes a niños grupo AB. La prueba de IA reveló epitopes A en 2 [EA] de pacientes grupo A y epitopes B en 2 [EA] de pacientes grupo B. La prueba de CH evidenció determinantes antigénicas B en 2 [EA] de pacientes grupo B y en 2 de pacientes grupo AB, y determinantes antigénicas A en 1 [EA] de paciente grupo A. De los 28 [EA] estudiados por ambas pruebas se detectó epitopes B en todos los [EA] de pacientes grupo B y AB, y epitopes A en 3 de los 15 [EA] de pacientes grupo A. Las experiencias realizadas sugieren que *A. lumbricoides* podría absorber antígenos A y B del huésped y/o modificar la expresión de carbohidratos cuticulares como una forma de mimetismo antigénico.

REFERENCES

1. ADACHI, M.; HAYAMI, M.; KASHIWAGI, N. *et al.* - Expression of Ley antigen in human immunodeficiency virus- infected human T cell lines and in peripheral lymphocytes of patients with acquired immune deficiency syndrome (AIDS) and AIDS-related complex (ARC). **J. exp. Med., 167**: 323-331, 1988.

2. ALPHEN, L. van; POOLE, J. & OVERBEEK, J. - The Anton blood group antigens is the erythrocyte receptor for *Haemophilus influenzae*. **FEMS Microbiol. Lett., 37**: 69, 1986.

3. BLAXTER M.L.; PAGE, A.P.; RUDIN, W. & MAIZELS, R.M. - Nematode surface coats: actively evading immunity. **Parasit. today, 8**: 243-247, 1992.

4. BROWN, K.E.; ANDERSON, S.M. & YOUNG, N.S. - Erythrocyte P antigen: cellullar receptor for B_{19} parvovirus. **Science, 262**: 114-117, 1993.

5. CAPRON, A.; BIGUET, J.; VERNES, A. & AFCHAIN, D. - Structure antigénique des helminthes. Aspects immunologiques des relations hôte-parasite. **Path. Biol., 16**: 121-138, 1968.

6. GARRATY, G. - Asociación entre grupos sanguíneos y enfermedad. ¿Desempeñan un papel biológico los antígenos-anticuerpos de los grupos sanguíneos? **Rev. argent. Transf., 23**: 217-229, 1997.

7. GARRATY, G. - **Immunology of transfusion Medicine.** New York, Dekker, 1994.

8. HADLEY, T.J.; MILLER, L.H. & HAYNES, J.D. - Recognition of red cells by malaria parasites: the role of erythrocyte-binding proteins. **Transfus. Med. Rev., 5**: 108-122, 1991.

9. MARCELLI, A.; FINE, J.M.; HOMBERG, J.C. & RIBAT, I. - **Techniques en Immunohematologie.** Paris, Flammarion, 1981.

10. MILLER, L.H.; MASON, S.J.; DVORAK, J.A.; Mc GINNISS, M.H. & ROTHMAN, I.K. - Erythrocyte receptors for *Plasmodium knowlesi* malaria: duffy blood group determinants. **Science, 189**: 561-563, 1975.

11. MONROY-OSTRIA, A.; GOMEZ-GUTIERRREZ, L.J.; RAMIREZ-RAMIREZ, A. & CARRILLO LANDIN, G. - Reconocimiento por inmunotransferencia de antígenos de *Taenia solium* y su larva. **Rev. lat.-amer. Microbiol., 34**: 33-38, 1992.

12. MORALES, G.; PINO, L.A. & CHOURIO-LOZANO, G. - Ecoepidemiología de *Ascaris lumbricoides* en una zona endémica y su relación con los grupos sanguíneos. **Acta cient. venez., 45**: 287-391, 1994.

13. PONCE DE LEÓN, P.; VALVERDE, J. & ZDERO, M. - Preliminary studies on antigenic mimicry of *Ascaris lumbricoides*. **Rev. Inst. Med. trop. S. Paulo, 42**: 295-296, 2000.

14. RASIA, J.R.; GARCÍA ROSASCO, M.; VALVERDE DE RASIA, J.R. & FORESTO, P. - Evaluación de la cinética de hemoaglutinación por medio de una técnica fotométrica simple. **Sangre, 34**: 368-370, 1989.

15. UCHIYAMA, H. & ANDERSON, K.C. - Cellular adhesion molecules. **Transfus. Med. Rev., 8:** 84-95, 1994.

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