Table I. Shared identical epitope between Ankyrin 1 and SARS-CoV-2 surface glycoprotein[1]

| Protein | Accession number | Epitope amino acids | Identity percentage, % |
|---|---|---|---|
| SARS-CoV-2 surface glycoprotein | NCBI ID: YP_009724390·1 | 752-LLLQY-756 | 100 |
| Ankyrin 1 | UniProt ID: P16157 | 323-LLLQY-327 | |

ID, identifier; NCBI, National Center for Biotechnology Information.
[1]We used for comparative analyses BlastP (available at: https://blast.ncbi.nlm.nih.gov/Blast.cgi?PAGE=Proteins) and the whole virus proteome (available at: https://www.ncbi.nlm.nih.gov/nuccore/MN908947).

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**Keywords:** ankirin 1, autoantibodies, autoimmunity, COVID-19, molecular mimicry, severe acute respiratory syndrome coronavirus 2

First published online 8 June 2020
doi: 10.1111/bjh.16883

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# COVID-19 and ABO blood group: another viewpoint

Li *et al.*[1] have recently published '*Association between ABO blood groups and risk of SARS-CoV-2 pneumonia*', an observation already reported a few weeks ago as a MedRxiv preprint by Zhao *et al.*[2] and which had a certain impact in the press.

In both studies, the ABO blood groups distribution of patients with coronavirus disease 2019 (COVID-19) were compared to that of controls from the local populations that showed that blood group A was associated with an increased risk of infection, whereas group O was associated with a decreased risk. Considering this information rather as a working hypothesis, some scientists have called for caution.[3]

However, as already strongly suggested by others,[4] this variable susceptibility to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection could be linked to circulating anti-A antibodies, which could interfere or even inhibit the virus–cell adhesion process.

We had the idea to analyse these important available data series from the anti-A or -B antibodies viewpoint instead of ABO blood group antigens as the authors did.

In fact, considering the largest series of patients with COVID-19 ($N = 1888$) analysed by Zhao *et al.*,[2] we compared the proportion of those possessing anti-A in their serum (i.e. those of B and O blood groups) and those who

Table I. Comparison of subjects with/without anti-A antibodies in their serum.

| | RBC blood group | Control, *n* (%) | COVID-19, *n* (%) | $\chi^2$ | *P* | OR (95% CI) |
|---|---|---|---|---|---|---|
| With anti-A | B and O | 2170 (58·7) | 927 (52·2) | | | |
| | A and AB | 1524 (41·3) | 848 (47·8) | 20·74 | <0·001 | 1·30 (1·16–1·46) |
| Without anti-A | A | 1188 (32·2) | 670 (37·7) | 19·97 | <0·001 | 1·32 (1·17–1·49) |
| | AB | 336 (9·1) | 178 (10·0) | 4·58 | 0·0323 | 1·24 (1·02–1·51) |

Table II. Comparison of anti-A from O and from B subjects.

| | RBC blood group | Control, *n* (%) | COVID-19, *n* (%) | $\chi^2$ | *P* | OR (95% CI) |
|---|---|---|---|---|---|---|
| Anti-A from O | O | 1250 (57·6) | 458 (49·4) | | | |
| Anti-A from B | B | 920 (42·4) | 469 (50·6) | 17·64 | <0·001 | 1·39 (1·19–1·62) |

did not (i.e. those of A and AB blood groups) to the control cohort ($N$ = 3694; Table I).

The results (Table I) indicate that subjects with anti-A in serum (i.e. B and O blood groups) are significantly less represented in the COVID-19 group than those lacking anti-A whatever the group: A and AB ($P < 0·001$), A ($P < 0·001$) or AB ($P = 0·0323$), whereas there was no significant difference *versus* circulating anti-B (data not shown).

We then wondered if there was a difference between anti-A from O and anti-A from B, and then we compared the supposed protective effect of anti-A from O and from B (Table II).

Whereas both blood group O and B patients possess circulating seric anti-A, it appears and it is statistically highly significant ($P < 0·001$) that O group patients are underrepresented (49·4 % vs. 57·6%), whereas B group patients are, on the contrary, overrepresented (50·6% vs. 42·4%), meaning that anti-A from O is more protective than anti-A from B.

This latter observation is probably related to the fact that the immunoglobulin predominant isotype of anti-B/anti-A is IgM in serum from group A and B individuals, but IgG in O group serum, an already known notion,[5] which has been well documented by flow cytometry.[6]

In conclusion, this way of analysing the data strongly suggests that the presence of anti-A antibodies in serum and more specifically IgG anti-A, should be considered as a factor more significant than the blood group itself, as far as the relationship between COVID-19 susceptibility and ABO blood groups is concerned.

Far from intending to corroborate the authors' conclusions as such, we wanted to show that the resources of immuno-haematology allow several approaches that could perhaps be useful for the disease follow-up.

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Keywords: antibodies, blood group serology, COVID-19

First published online 8 June 2020
doi: 10.1111/bjh.16884

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