Blood Groups and Disease

Peter D’Adamo, ND
The face of cancer

- Cell glycosylation depends on the expression and function of various glycosyltransferases and glycosidases.
- Numerous data demonstrate that malignant transformation is associated with various and complex alterations in the glycosylation process.
- These changes provide a selective advantage for tumor cells during their progression to more invasive and metastatic forms.
AE Mourant: Blood Relations

- “The most striking associations are however with cancers, nearly all of which are associated with group A as are clotting diseases.”
- While bleeding diseases, mostly due to a deficient clotting mechanism, are, on the contrary, associated with group O.
- Other disease, which appear to be associated with group O are the auto-immune diseases. The contrast with the cancer-group A association is an interesting one in view of the suggestion of MacFarland Burnett that there is a fundamental antithesis between the two classes of disease.”
Horror Autoxicus

- Mourant: “Some cancers contain an A-like substance even when they occur in persons who are not A or AB. These observations suggest that in the tissues, both normal and neoplastic, of all persons, there are blood group A-like antigens present at a biochemical levels at which are usually inaccessible to the immune system.”
- This was originally termed ‘horror autoxicus” and postulated by Paul Erlich at the turn of the century to explain the specificities of auto-immunity.
- Horror autoxicus essentially implies that our immune systems are inherently disinclined to attack tissues that contain antigenic similarities to our own.

Thomsen-Friedenreich: Encryption and antibody response

T and its precursor Tn are considered ‘pan-carcinoma antigens.’
Blood groups and disease

Blood groups and Thomsen Friedenreich (T, Tn) antigen

- Mourant: “In the course of the immune response to a growing cancer, the antigen becomes accessible. Then an A person, who cannot make anti-A, will be more likely than an O person to tolerate the cancer.”
- Antibodies against Tn antigen cross-react with A glycolipids. Since Tn antigen and A glycolipids share terminal GalNAc, Tn antigen was concluded to be an A-like antigen in a broad sense.
- Blood-group-A cancer patients had the greatest and uniform suppression of the level of TFA agglutinins, irrespective of age, cancer stage or tumor morphology, and lower levels of anti-B isohemagglutinins.

*Int J Cancer* 1995 Mar 16;60(6):781-785
Characteristics of tumor-associated carbohydrate antigens related to blood group carbohydrates

- Incomplete synthesis of carbohydrate chains (e.g. loss of ABO antigens)
- Accumulation of precursor carbohydrates (e.g. accumulation of I antigen which is one of the precursors of ABO)
- Synthesis of new carbohydrates (e.g. expression of A-like antigens in cancer of O & B hosts).
- Many monoclonal antibodies raised against cancer cells have been shown to react with blood group carbohydrates.

Gan To Kagaku Ryoho 1986 Apr;13(4 Pt 2):1395-401
Blood groups and disease

Blood group changes in malignant transformation

“Deletion or reduction of blood group A or B antigen in tumors of A or B individuals is clearly correlated with the degree of malignancy and metastatic potential.”

*Int J Cancer 1998 Apr 13;76(2):284-9*

<table>
<thead>
<tr>
<th>Tissue, organ</th>
<th>Normal appearance of BGA’s</th>
<th>In Malignancy</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colon</td>
<td>Present</td>
<td>Absent</td>
<td>Lab Invest 1987 Oct;57(4):421-8</td>
</tr>
<tr>
<td>Bladder (1)</td>
<td>Absent</td>
<td>Present</td>
<td>Hinyokika Kiyo 1989 Aug;35(8):1311-21</td>
</tr>
<tr>
<td>Prostate</td>
<td>Present</td>
<td>Absent</td>
<td>Br J Urol 1987 May;59(5):430-5</td>
</tr>
<tr>
<td>Liver (2)</td>
<td>Absent</td>
<td>Present</td>
<td>Zhonghua Bing Li Xue Za Zhi 1992 Feb;21(1):24-6</td>
</tr>
<tr>
<td>Endometrium (3)</td>
<td>Absent</td>
<td>Present</td>
<td>Cancer 1987 Dec;15:60(12):2985-93</td>
</tr>
<tr>
<td>Thyroid</td>
<td>Absent</td>
<td>Present</td>
<td>Langenbecks Arch Chir 1995;380(5):269-72</td>
</tr>
</tbody>
</table>

1. BGA’s better than all other tumor markers
2. BGA’s effective at prediction hepatitis transformation to malignancy
3. Vast majority of BGAs secreted are H antigen
Blood group antigens and embryonic development

- A strong correlation is observed between the amounts of blood group antigen and the degree of embryonic differentiation.
- ABH blood group antigens serve as early immunomorphologic markers of endothelial differentiation of mesenchymal cells, thus specifying the location of future blood vessels. (Folia Med (Plovdiv) 1997;39(2):5-9)
- Scrutiny of 2557 medical records for type 1 diabetic cases and control children showed ABO blood group incompatibility in close to 90% of children. (Diabetologia 1992 Jul;35(7):671-5)
- In the female malformed newborns, an excess of O-B parental pairs were detected. (Hum Hered 1991;41(3):195-200)
Blood groups and disease

**Blood group antigens and healing the oral mucosa**

- In oral mucosa, a close relationship is seen between the type of tissue differentiation and expression of blood group antigen; keratinized, nonkeratinized, and junctional epithelium all show different patterns of carbohydrate expression. (1)

- Within hours of wounding blood group antigen reactivity was lost from epithelial cells adjacent to the wound margin but returned with restoration of epithelial continuity. Antigen loss appeared to be associated with an area of increased cell movement. Some studies suggest that the relationship between expression of blood group antigens and cell motility can be explained by different degrees of glycosylation of integrins. (2)

Blood groups and disease

**Breast cancer and aberrant glycosylation**

- Predicting long-term outcome after breast-cancer diagnosis remains problematic, particularly for patients with clinically small, axillary lymph node- negative tumors. Evidence suggests that the lectin Helix pomatia agglutinin (HPA) identifies oligosaccharides associated with poor-prognosis cancer.

- It has been suggested that the prognostic significance of HPA binding may be through recognition of either Tn epitope or blood group A antigen.

- A alternative hypothesis suggests that aberrant glycosylation in in breast cancer results in the production of a ‘ligand like complex’ (LLC) which by virtue of altered antigenicity either allows for metastatic egress from the regional lymph nodes or detachment from the extracellular matrix.
**Blood type and cardiovascular disease**

- While each blood type can develop elements of cardiovascular disease, they appear to do so for different reasons.
- Some of the causes of heart disease in one blood type may be obvious, such as the link with blood type A and cholesterol.
- Others, such as the effects of type A behavior, high triglyceride and insulin resistance in blood types O and B, are less well-known.
Blood type, adhesion molecules and heart disease

In 1962 the Framingham Heart Study blood typed the surviving 4125 members of the original study group of 5209 people first examined in 1948-51. The most striking observation was the lower rates of non-fatal heart disease in men ages 39-72 that were blood type O versus blood type A.

In a study of 191 coronary artery bypass candidates investigators paradoxically found an excess of type O over type A. When they examined the data more closely, they concluded that the tendency of type A to develop blood clots more readily ("thrombotic proneness") caused a poorer prognosis.

In essence the type A’s were missing from the study because they had already died in greater numbers, leaving a disproportionate excess of type O among the long term survivors.
Blood group A and heart disease

- An Italian study in 1975 on 746 patients with high blood pressure, 3258 with congenital heart disease, 4503 with a history of heart attack, found a significant lack of patients with type O blood, and a significant excess of blood type A in patients with myocardial infarction. The study also showed an excess of blood type A patients with high blood pressure, and a lack of patients who were blood type B.

- In a study of male survivors of heart disease researchers found that there were fewer patients who were type A before age 55 than would have been otherwise expected.

- 1981 German study of 13,175 patients showed a prevalence of A blood type in all types of heart disease examined.
### Blood groups and disease

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conclusion</th>
<th>Comments</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent claudication</td>
<td>• Type A higher incidence</td>
<td>Framingham Heart Study; not associated with higher levels of cholesterol</td>
<td>Atherosclerosis 1976 Nov-Dec;25(2-3):311-8</td>
</tr>
<tr>
<td>Total cholesterol</td>
<td>• Type A elevated levels</td>
<td></td>
<td>J Natl Med Assoc 1991 Aug;83(8):682-8</td>
</tr>
<tr>
<td></td>
<td>• Type A and AB increased frequency</td>
<td></td>
<td>Genet Epidemiol 1992;9(6):405-18</td>
</tr>
<tr>
<td></td>
<td>• Type O lower frequency over ‘non-O’</td>
<td></td>
<td>Kardiologiia 1977 May;17(5):108-13</td>
</tr>
<tr>
<td></td>
<td>• Type B ‘less than expected.’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triglyceride levels</td>
<td>• Types B and AB higher incidence</td>
<td>Triglyceride levels were higher in individuals with B antigen (B + AB) than in subjects without this antigen</td>
<td>Anthropol Anz 1994 Sep;52(3):221-30</td>
</tr>
<tr>
<td>Coagulability</td>
<td>• Type O lower coagulation values</td>
<td>Higher sensitivity to the in vitro heparin anticoagulant effect in O group individuals was confirmed</td>
<td>Hum Genet 1979 Apr 27;48(2):221-30</td>
</tr>
<tr>
<td>LDL</td>
<td>• Type A elevated levels</td>
<td></td>
<td>Genet Epidemiol 1987;4(4):267-75</td>
</tr>
<tr>
<td>Coronary artery pathology</td>
<td>• Type A higher incidence</td>
<td>Type A had significantly higher coronary pathology; higher levels of inflammation on the vessel walls.</td>
<td>Orv Hetil 1995 Apr 9;136(15):767-9</td>
</tr>
</tbody>
</table>
Blood groups and disease

ABO type and endothelial damage

- Consistent results link type A with elevated cholesterol (and types B and O with lower than expected levels). However, if we look at the data it is probably not sufficient to account for the stronger association between type A and the majority of cardiovascular ‘events.’
- One alternative is to examine known markers of acute phase inflammatory reactions with respect to blood groups.
- There are several mediators of endothelial damage that are known to be influenced by ABO blood type.
- They include E selectin, Von Willebrand Factor (Factor VIII), LDL, thrombomodulin and the ESR.
Blood Type and Factor VIII

- Thirty percent of the genetic variance of VIII is due to the effect of ABO blood type.
- Blood group O individuals have significantly (approximately 25%) lower plasma levels of both glycoproteins.
- Conversely, elevated FVIII-vWF levels is an important risk factor for ischaemic heart disease and venous thromboembolic disease.
- Factor VIII (von Willdebrand Factor) vWF antigen (vWF:Ag) and factor VIII antigen (FVIII:Ag) levels were highest in A(1)A(1) individuals and higher in A(1)O(1) than in A(2)O(1) or O(1)O(1) individuals.
- Levels of VWF rise after strenuous exercise, and are greatly increased in the presence of even moderately elevated serum cholesterol.
Blood type, thrombomodulin and E-selectin

- von Willebrand factor is a marker of generalized atherosclerosis, but soluble thrombomodulin is related to the extent of disease.
- E-selectin is expressed on inflamed endothelial cells in response to inflammatory cytokines.
- Less known is the role of thrombomodulin as a c-type lectin with a domain that interferes with neutrophil adhesion to endothelial cells.
- Elevated levels of E-selectin and thrombomodulin are linked with group A individuals.
- Both E-selectin and thrombomodulin are always elevated in intermittent claudication, a disorder with a distinct association with type A

C-reactive protein is so-called because of its ability to bind to the C protein of pneumococci. When C-reactive protein and other complement proteins bind to bacteria it becomes easier for phagocytic cells such as macrophages to recognize, take in and destroy the bacteria. CRP is a pentraxin class lectin (homology to Con-A folding structure).

This defensive process of coating bacteria and other infectious organisms with protein is known as opsonisation.

Raised serum C reactive protein is associated with raised levels of clotting factors (serum fibrinogen, plasminogen, factor VIII) immune activity (white blood cell count),

Periodontal disease is common instigator of CRP.

The levels of C-reactive protein, erythrocyte sedimentation rate and the body temperature were significantly higher in non-secretors than in secretors (p less than 0.004).

Clinically, you would like to have your group A patients stay towards the low/ low-normal-scale.
1. Infectious diseases, especially the worldwide epidemic diseases such as plague, smallpox, syphilis, tuberculosis have to a great extent selective effects. This is demonstrated inter alia in the different "selection values" in the ABO blood group system.

2. Five most historically catastrophic epidemic and endemic illnesses are ABO selective. This includes plague (O), cholera (O), smallpox (A), malaria (A), influenza (depends on strain)

3. Under present day civilized living conditions O carriers have a preservation advantage over blood group A. The deletion of the selection factor "infectious disease", which entails a decline of immunity, may nevertheless regain importance if environmental changes occur.

• MMW Munch Med Wochenschr 1981 Sep 25;123(39):1447-52
**Blood groups and disease**

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**Norwalk virus and ABO types**

- Noroviruses are a major cause of epidemic acute nonbacterial gastroenteritis worldwide. Almost all of them agglutinate RBCs.
- It appears that group O RBCs are most easily bound by Noroviruses, versus group B RBCs which are apparently little bound at all. Individuals with an O phenotype were more likely to be infected with NV.
- The preferred binding sites are apparently the H type 2 antigen which functions as the viral receptor on human type O RBCs.
- The Lewis B antigen is also a binding site.
- If you’re type B non-secretor, you may want to think about taking advantage of the current special savings on most cruise ship tours.

_J Infect Dis_ 2002 May 1;185(9):1335-7
Blood Type and Influenza

- **Blood type A**: Overall has a great ability to generate a quick and substantial antibody response against influenza type A(H1N1) and especially A(H3N2). Their antibody response against influenza B is not quite as dramatic.

- **Blood type AB**: Relatively poor ability to generate high antibody levels against any of the influenza viruses.

- **Blood type B**: Reasonable, but not great ability to generate an antibody response against influenza A(H1N1). Slowest (it can take them 3-5 months) and weakest ability to generate antibodies against influenza A(H3N2 “hong Kong”) of any blood type. Against influenza B virus, blood type B has a significant advantage and responds differently from either blood group A or O. The blood type B immune response happens much earlier and persists longer.

- **Blood type O**: Relatively decent ability to generate antibody response against influenza A(H1N1) and A(H3N2) viruses. Antibody response against influenza B is not as dramatic as blood type B.
Blood groups and disease

Blood type and malaria

- The evidence suggests that blood type A and O individuals might have a higher predisposition to infection with the Plasmodium vivax species while blood type B individuals tend toward higher infection rates with P. falciparum. However, severity of infection is another matter.

- Malaria infected red blood cells sometimes bind to uninfected red blood cells to form clumps, called rosettes. The rosettes can obstruct flow in small blood vessels and lead to tissue damage and severe malaria disease.

- This tendency for malaria to be worse among A’s and AB’s is due primarily to a greater degree of rosette formation by RBCs with these antigens.

- vWF also enhances rosette formation.

Qinghaosu (Chinese wormwood or Artemisia annua) probably best drug at inhibiting rosette formation.
Blood Type and Tuberculosis

- Type O blood have much higher rates of infection with tuberculosis (this is particularly true in individuals of European descent).
- Tuberculosis runs a much more aggressive and detrimental course in blood type O's, while A's are afforded the highest degree of protection.
- Typically, during the first two years of infection with bacillary tuberculosis, there is a significant excess of infection among individuals with blood type O and AB.
- Yet when we investigate blood type associations with tuberculosis 2-5 years down the road, the distribution of blood type among tuberculosis survivors more closely resembles that found in a healthy population.
- What happened to the O’s?
- Many of them died.
Blood Type and Cholera

1. Blood type O individuals have a much higher likelihood of being infected with cholera and develop the most severe and life-threatening forms of this illness. This has been documented in several studies.

2. Type AB's on the other hand appear to have the highest degree of protection from cholera infections.

3. Type O had more diarrhea-like stools per day than persons of other blood groups, were more likely to report vomiting and muscle cramps, and were almost eight times more likely to require hospital treatment.

4. To hammer this point home, another separate study found that 1/3 of all individuals with blood type O developed a severe form of cholera, while none of the individuals with other blood types developed a severe form of cholera infection.
Blood type and other diarrheal diseases

- **E. coli**: It appears that many forms of E. coli capable of causing diarrhea are immunologically 'B-like'. This results in a substantially higher number of cases of diarrhea among individuals of blood type B and AB people.

- However, when it comes to the overall severity of infection with E. coli, type B and AB are not alone; type O's also are more likely to get a severe form of diarrhea.

- **Dysentery**: Blood types B and AB have a degree of resistance against developing severe or acute dysentery, especially the amoebic forms.

- **Giardia**: Blood group A was more susceptible to giardiasis especially asymptomatic form, while blood group B was less susceptible to giardiasis.

*Wittels EG, Lichtman HC. Blood group incidence and Escherichia coli bacterial sepsis. Transfusion 1986;26:533-5*
**Blood type and urinary tract infection**

- As a general rule, blood type B is most plagued by chronic or recurrent UTI's.
- Type AB is next on the susceptibility list, followed by type A's.
- Type O's are the most protected.
- Non-secretors are much more prone to repeated and severe UTI's.

<table>
<thead>
<tr>
<th>Blood Type</th>
<th>Strains</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Staphylococcus saprophyticus</td>
</tr>
<tr>
<td>B</td>
<td>Klebsiella pneumoniae</td>
</tr>
<tr>
<td></td>
<td>Proteus sp.</td>
</tr>
<tr>
<td></td>
<td>Pseudomonas sp.</td>
</tr>
<tr>
<td>AB</td>
<td>Klebsiella pneumoniae</td>
</tr>
<tr>
<td></td>
<td>Proteus sp.</td>
</tr>
<tr>
<td></td>
<td>Pseudomonas sp.</td>
</tr>
<tr>
<td></td>
<td>Staphylococcus saprophyticus</td>
</tr>
<tr>
<td>Non-secretor</td>
<td>Uropathogenic E. coli</td>
</tr>
</tbody>
</table>
## Blood groups and disease

### Strains

<table>
<thead>
<tr>
<th>Strains</th>
<th>Blood Type</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staphylococcus aureus</td>
<td>A</td>
<td>Blood type A is much more likely to be a chronic carrier of Staphylococcus aureus. This is partly due to blood type A individuals having a decreased ability to mount an aggressive antibody (or immune) response against this organism.</td>
</tr>
<tr>
<td>Schistosomiasis</td>
<td>A</td>
<td>Group A tends to be more susceptible to infection, tends to get more intense symptoms following infection, and is much more likely to have damage to organs (like the liver) following infection.</td>
</tr>
<tr>
<td>Shigellosis</td>
<td>B, AB</td>
<td>A strong association between blood type B (and AB to a slightly lesser degree) and shigellosis exists.</td>
</tr>
<tr>
<td>Strongyloidiasis</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Dengue Fever</td>
<td>B</td>
<td>According to researchers, blood type B was strongly associated with the severe form of dengue fever known as dengue hemorrhagic fever.</td>
</tr>
<tr>
<td>Group B Streptococcus</td>
<td>B</td>
<td>A blood type connection with neonatal group B streptococci infection exists for blood type B. Maternal blood group B associated with about a doubling of risk for infection among their infants.</td>
</tr>
<tr>
<td>Hookworm</td>
<td>O</td>
<td></td>
</tr>
<tr>
<td>Dermatophytosis</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Coccidioidomycosis</td>
<td>B</td>
<td>Blood type B are more prone to disseminated disease following exposure to this infectious agent.</td>
</tr>
</tbody>
</table>
Blood groups and disease

Otitis: another blood type-maternal link

- In general with routine ear infections, type A's have at least about a 50% higher rate of infection than other blood types. This appears to be a case of adhesion/anti-adhesion factors predisposing blood type A to far greater ease of bacterial attachment.
- In mothers with blood type A, the child has a 282 percent increase in risk of developing an ear infection requiring medical treatment.
- While this increase in risk is dramatic, it pales in comparison with what occurs if your child has an ear infection prior to his/her first birthday.
- The combination of being a child with a blood type A mother and having an ear infection prior to your first birthday increases your relative risk of having recurrent ear infections by 2677 percent.
- Type As monopolize most cases of otitis externa as well.

Blood type and H. pylori

- H. Pylori variants produce a variety of blood group antigens, including A, Lewis (a) and a variety of type 1 H like antigens (O)
- Blood group O would be a moderate risk factor for infection by Helicobacter pylori, with more severe cases in men.
- Group O has a more pronounced inflammatory reaction to H. pylori. Group O cells released significantly more IL-6 and TNF in response to H. pylori infection.
- The Le(a + b-) phenotype and the ABH non-secretor trait are relevant genetic markers of peptic ulcer.
- Helicobacter pylori infection is a crucial determinant for the development of Barrett’s esophagus into adenocarcinoma.
- Lewis(a+b-), nonsecretor and blood group A were all positively associated with esophageal adenocarcinoma, with concurrent H. pylori infection.
Blood groups and disease

Candida carriage and blood type

- Candida carriage was associated with blood group O (P < 0.05) and, independently, with nonsecretion of blood group antigens (P < 0.01). (Dig Dis Sci 1993 Aug;38(8):1453-8)

- Carriage of C. albicans was significantly associated with blood group O (p less than 0.001) and independently, with non-secretion of blood group antigens (p less than 0.001), with the trend towards carriage being greatest in group O non-secretors. (J Med Vet Mycol 1988 Feb;26(1):49-56)

- Candida albicans extracellular polymeric material (EP) contains a mannoprotein adhesin with a lectin-like affinity for H (type 2) blood group antigen

- There was a significantly higher number of non-secretors (48.9%) among 174 patients with either oral or vaginal candida infections compared with the proportion of non-secretors in the local population (26.6%). Non-secretor saliva actually seemed to enhance Candida attachment.
Blood groups and disease

Smallpox and blood types

• Type A has more mortality from smallpox infection

• Type As also have more reactions from smallpox vaccination.

• The leukocytes of peripheral blood of these persons showed a poorer binding capacity with respect to the smallpox vaccine virus.

• They also exhibited a high rate of chromosomal aberration after vaccination, resulting to some extent from increased proliferative ability of the cells.
Blood groups and disease

Blood type and Stress

- In pigs, blood type is an accurate predictor of susceptibility or resistance against porcine stress syndrome. (*Science* 1976 Mar 5;191(4230):947-8)

- In humans, blood type A is the most affected by the type of stress we encounter everyday and type O the least (B and AB are in between).
Blood type, anger and viscosity

- Non-genetic inducers of vWF include inflammation, age, stress.
- Studies have linked blood group A to viscosity changes in blood flow in association with stress, cancer, diabetes and heart disease. (*Dintenfass*)
- Unlike vWF levels which tend to rise with strenuous exercise (bad for type A), soluble cell adhesion molecules (selectins, ICAM) tend to be shed by the endothelium during exercise (good for type O)
- Among MI patients, patients with blood type O scored significantly higher on type A behavior scales and related indices than those having blood type A. (*South Med J. 1991 Feb;84(2):214-8.*)

Towns with a higher prevalence of blood group O had higher incidences of heart disease. In individual subjects, however, the incidence of heart disease was higher in those with group A than in those with other blood groups. (*BMJ 1990 Jun 30;300(6741):1679-82*)
Blood groups and disease

Stress and Blood Type A

- Tend to be hyper-secretors of cortisol.
- Over-respond to even minor stress.
- Appear to produce the most catecholamines in response to stress.
- Calm-down after stress relatively quickly because they rapidly eliminate catecholamines but have chronically higher basal cortisol levels.

Blood groups and disease

Stress and Blood Type O

- Least affected by low level stress, but also most resistant to high stress.
- Release the least cortisol in response to stress. After stress, tend to be able to lower cortisol levels quickly and dramatically.
- Difficulty eliminating catecholamines when they are produced in large quantities.
- Normal type O subjects have lower platelet MAO levels over other other types. The lower activity of this enzyme (coupled with the association with DBH) will make it harder for them to break down an excess of catecholamines.

Cortisol and VLDL toxicity preventing activity
Exposure to the stressor significantly decreased TxPA and increased cortisol for the total group of 25 older adult males. However, the stress response patterns of the 15 blood type A males were different from those of the 10 type O subjects.

The blood type A group had higher initial levels of TxPA and cortisol as well as quicker stress recovery rates than the type O group.
**Stress and Blood Type B**

- Between the stress response of type A and type O --but more A-like.

- Tend to be hyper-secretors of cortisol. Broadest range of cortisol response.

- Over-respond to even minor stress (but not quite as dramatically as blood type A's).

**Stress & Blood Type: Key Point**

- Type A’s will tend to spend more time with chronically elevated basal cortisol levels.

- “The importance of calming the nervous system or reducing stress is paramount for all blood type A's.” (James D'Adamo, 1972)

- Blood type O's are the least likely to over respond to stress; however, when they do make a lot of adrenaline, they don't eliminate it as efficiently, so they will stay in the "fight or flight" mode longer.

- “Type O’s generally will thrive on vigorous exercise.” (James D’Adamo, 1972)

Yoga, meditation and plant based diets all lower cortisol levels.

*Percept Mot Skills* 2000 Jun;90(3 Pt 1):1027-32

Blood groups and disease

Deep Thoughts

Stress: Blood type A personality

• If you are blood type A and have traits like being nit-picky, selfish, secretive, pessimistic, or inflexible you are much more likely to have stress problems.

• On the other hand, positive traits like being orderly, transcendental, law-abiding, fastidious, soft-spoken, fashionable and calm will lessen your overall stress.
Deep Thoughts

**Stress: Blood Type B Personality**

- For Type B's, a tendency to be unpredictable, indiscrete, lazy, impatient or overbearing and not being able to wake up are sure signs you are moving in the wrong direction.

- Cultivate positive traits like independence, flexibility, analysis, candidness, sensitivity, and passion.
Deep Thoughts

**Stress: Blood Type AB Personality**

- For Type AB's, negative traits like being unforgiving, a playboy, easily offended, too conservative, or distant can be a problem.

- Work on being honest, understanding, organized, rational, diplomatic and cultivate your innate stronger ESP abilities.
Deep Thoughts

**Stress: Blood Type O Personality**

- For Type O's are most affected negatively by status-seeking, jealousy, greed, unreliability, and a tendency to never shut up.

- Emphasis should be placed upon sports, education, activity, goals, health, and idealistic pursuits.
Deep Thoughts

“I once told my therapist I was worried that I had schizophrenia. After examining me, he eased my worries by telling me, "Son, you don't have multiple personalities... heck, you don't even have one!".

--Milton Berle

“Sometimes a cigar is just a cigar.”

--Sigmund Freud