# BLOOD REALLY COUNTS

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*Blood groups are a basic variable element in mankind, and they are of immense practical importance. Basic similarities and differences of man and other anthropoid forms are reviewed on the basis of recent intensive studies of human and other primate blood groups. Analyses of other blood proteins, such as hemoglobin, transferrins, and myoglobin are used to compare man and other living forms. Due to advances in biochemistry and electron microscopy, phylogenetic problems become more and more puzzling, and more difficult to subsume under one theory. Evolutionists no longer can use casual half-facts and crude homologies.*

## Introduction

Men differ in skin color, and accordingly we say that they are born of different races. They differ in their place of birth, and we describe them as being of several nationalities. But far more fundamental in any classification of men is the difference in their blood groups, a difference which sometimes makes their bloods incompatible for transfusion. When incompatible, the recipient's blood serum clumps (agglutinates) the donor's red blood cells. Such a phenomenon is very serious and can even cause death. It appears to represent a basic variable element in mankind.

This variation is due to antigens in the red blood cells and antibodies in the plasma, and their reaction to one another. Indeed, it is possible to classify human beings into four main types or blood groups by means of the agglutination (clumping) of the red ceils. These groups are AB, A, B, and O. The red blood cells may behave as if they carried antigen A, or antigen B, or both A and B, or neither (the last being "group O" ).

There are other factors independent of the A or B antigen. One of these, for example, is the Rh factor. We say that a person is Rh positive, if his red blood cells are agglutinated by the plasma of a Rhesus monkey. About 15 per cent of the human population do not show such agglutination, and therefore are called Rh negative persons. There are also minor antigens such as M and N, even S and P, but none of these seem to have much clinical importance.

As an example of the importance of the blood groups, we might say a word about Rh negative women. Many of these marry Rh positive men. The child of such a woman is apt to develop *Erythroblastosis fetalis,* which can be a fatal condition. However, the condition can occur only when the baby she carries has its father's Rh group. Then the mother reacts to this by developing Rh antibodies in her plasma, *when* and *if* the child's Rh antigens leak into her blood stream through the placenta. If so, then her own antibodies pass back into the fetal blood, agglutinating the positive red blood cells of that fetus. These red blood cells are damaged accordingly and a severe anaemia of the fetus can develop, even deposit of pigment in its brain (kernicterus).

Since the blood groups were discovered by Landsteiner in 1902, and since Nuttall in 1904 drew up a table to illustrate, amongst other things, some similarity of primate blood types, much has been made of such similarity by evolutionists. Add to this the physical resemblance among primates and one runs into a prima facie case for "human evolution" that has long seemed incontestable to many casual students.

Evolutionists have presented *the superb* biochemical argument-similar tissues. He "hath made of one blood all nations of men (and apes, say evolutionists ) for to dwell on all the face of the earth." Our features may be different, our foreheads higher, and our chins more prominent than those of our primate cousins, but our veins give the misalliance away, and our origins are written there in red for all to see.

Dewar[1] early pointed out some odd things about Nuttall's table that evolutionists should find disconcerting-but few have seen his criticism. Dewar noted, for example, that some primate bloods were "closer" to that of man than the similarity of some races of men. Thus all anthropoids, but only 71 per cent of human beings, showed a full reaction to the precipitins of anti-human serum. Indeed, by these tests some human beings are as nearly related to carnivores, rodents and ungulates as to their own kind.[2]

Recently, there have been many more intensive studies of human and other primate blood groups than Nuttall's study. I will now discuss some interesting results.

## Blood Groups in Apes and Man

In the usual serological tests chimpanzees, gibbons and orangutans have natural iso-agglutinins defining different blood groups indistin-

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guishable from the human A, B and O groups. In 189 chimpanzees tested, 14.3 per cent were group O and 85.7 per cent group A. In gibbons and orangutans groups A, B, and AB, but no group O were found. Nine lowland gorillas had B-like factors only, but two mountain gorillas had group A.[3]

As far as the important A, B, O, groups are concerned, gorillas are more like monkeys than man. Of 40 chimpanzees tested none had group B, but all had antigen A similar to human antigen $A_1$. One animal had an antigen resembling $A_2$; 10 animals tested had the Rh antigen, O and c. All had M antigen.[4, 5]

In the A B O blood groups, chimpanzees are most like man, and gorillas are the most different (more like Catarrhines, the Old World monkeys). In the Catarrhini A B O types vary from species to species—thus, for example, only B is found in Rhesus monkeys. The serology of A B O in chimpanzee, orangutan and gibbon is more like man than the serology of their M N types. In Rh-Hr systems, resemblance to man from greatest to least is in this order: chimpanzee, gibbon, gorilla and orangutan. But the $Xg^a$ antigen in gibbons is possibly sex-linked as in man—and is not found in chimpanzee, orangutan, baboon, drill and Rhesus at all![6]

### Miscellaneous Blood Groups in Bacteria, Chickens, and Plants

Bacteria, such as Escherichia and Klebsiella, have blood substances probably identical to those found in man: AB and H(O). Macromolecular substances closely similar to the human blood group H(O) substances are obtainable from plants, too, especially from the Japanese Yew and Sassafras.[7] The evolutionary resemblance is obvious here, of course!!

Chickens have serological factors similar to human blood group A. Blood group A antigens occur in leghorn embryos and in partially purified egg-grown influenza virus preparations. Actually it has not been proven to occur in the virus. However, group A activity was found in commercial influenza virus vaccines, and injecting this material into human beings increased anti-human blood group $A_1$ and $A_2$ antibodies.[8]

Specific seed haemagglutinins are almost invariably found in the Leguminosae (the legume vegetables), notably in Viceae (broadbeans), Phaseoleae (kidney beans), and Genisteae (brooms ).[9]

### Blood Proteins

Blood proteins of the gibbon and orangutan are more different from those of man than those of the gorilla and chimpanzee, as is true for serum albumins, transferrins and cerulo-plasmins. Primary structures of the hemoglobins are similar, but the orangutan gives slightly different polypeptides patterns. Gibbon and human hemoglobin are very similar, with a difference in only one tryptic peptide of the beta chain.

The ceboid monkey, *Aotes trivergatus,* shows an unexpected similarity to human serum albumin; yet the two lemur families (Lemur and Propithecus) show considerable differences. High correspondence of the tree shrew to human serum albumin supports the idea that the former is a true primate.[10]

Results from two dimensional starch-gel electrophoresis do not support putting chimpanzees and gorillas in the same genus. But by this standard, man is closer to the gorilla and chimpanzee than to the gibbon and orangutan. Other protein analyses are as follows:

With chicken antisera
to human ceruloplasmin, and
With chicken and rabbit antisera
to human transferrin:
gorilla and chimpanzee are the same as man.

* * *

With Rhesus monkey antisera
to human albumin:
gorilla and man close
but chimpanzee farther away.

* * *

With Capuchin monkey antisera
to human serum:
gorilla closest, then
chimpanzee farther away.

* * *

With rabbit antiserum
to human $alpha_2$ macroglobulin:
gorilla same as man.

* * *

With chicken and rabbit antiserum
to human gamma globulin:
only chimpanzee like man.

Orangutan and gibbon diverged most on all the tests.

All apes and man are nearly identical on immunodiffusion plates with chicken anti-human albumin sera. But gamma globulin revealed distinct differences among the hominoids. (N.B. Chicken anti-human albumin sera developed larger cross-reactions with the albumin of the tree shrew than with albumins of the elephant, beef, rat, dog, rat, rabbit, horse, tenrec and kangaroo. Next closest was the elephant![11])

### Alpha and Beta Chains of Hemoglobin

Hemoglobin A is the pigment of adult human blood cells. There are different types of hemoglobin in the fetus and the adult, in sickle cell anemia and in health. Indeed, many hemo-

globin types are known. Identity depends on amino acid sequences in the globin part of the molecule. A difference in one amino acid, amongst 300 others that are identical, determines whether a hemoglobin is type A, S or C, for example.

Characteristic arrangements of amino acids make up proteins. Each half molecule of adult hemoglobin A contains one alpha and one beta chain of polypeptides. Fetal hemoglobin (F) consists of an alpha and a gamma chain. Many variations in the presence or absence of chains create many different hemoglobin types. Chains can be distinguished by their terminal amino acids.

Differences between alpha and beta amino acid sequences in the hemoglobin of animals are very numerous. Indeed, alpha sequences of mice and men, and their beta sequences also, are more alike than the alpha and beta sequences of hemoglobin of either mice or men! The amino acid sequences of the protein myoglobin in whales are like the sequences of hemoglobin in man![12]

Hemoglobin of gorillas and man differ by only one amino acid residue, but each is still distinct, and any idea of a phylogenetic distance between them is a "concept that is confusingly applied." Again, the hemoglobin peptide pattern of the baboon, *Papio,* is as different from human hemoglobin as that of some prosimians! The hemoglobin of Ceboidea ( South American monkeys) rather closely resemble human peptide patterns in starch gels, but these South American monkeys are "not closely related to man." However, many pongid (ape) hemoglobins could be mistaken for that from human beings. We must be careful not to tamper with the classifications on the basis of a single trait, such as hemoglobin''—for primate hemoglobin molecules are hard to interpret on the basis of evolutionary theory. Therefore, say evolutionists, "They are not crucial."[13]

### Gamma Chains of Hemoglobin

Gamma chains are found in fetal human hemoglobin–and ( gamma-like) beta chains in lemurs. Is this recapitulation or convergence? "More data are needed." Till then: "It will be difficult to assess how easily the molecular and nonmolecular approaches can be synthesized into a complete picture of evolution."[14] The evolutionist is really asking here for "time out" till he feels able to continue the game.

But Pauling[15] points to similarities in hemoglobins of evolutionary "near-relations''-and vice versa. He estimates that horse hemoglobin and human hemoglobin differ by 18 amino acid substitutions, as do their beta chains–each chain showing an effective mutation every 14.5 million years. But gorilla chains differ from ours only in one or two amino acids. Hence Pauling computes about 11,000,000 years since apes and man had a common ancestor!

The human fetus has an abnormal beta chain in hemoglobin F called a gamma chain. It has 36 amino acid differences; therefore, the fetus and man separated 260,000,000 years ago, at the beginning of the Carboniferous! But, according to evolutionists there were no human beings then! Believe it or not, in regard to hemoglobin, a human fetus is closer to a fetal horse than to a human adult, Pauling concludes!! Here is an evolutionist surely at the end of his very considerable wits!

Zuckerkandl[16] argues that, as far as hemoglobin is concerned, a gorilla is merely an abnormal human and vice versa. G. G. Simpson[17] says this consideration merely means that hemoglobin is a bad choice as a criterion; it "has nothing to tell us about affinities, or indeed tells us a lie." One or many molecules could be misleading here. No one kind of evidence on evolution is sufficient, concludes Simpson. Convergence is the real problem according to Simpson.

Cohen[18] points out that the homoproteins classed as hemoglobins have an apparently random distribution in such lower forms as protozoa and fungi—and evolutionary significance here becomes "quite mysterious." Be it noted that some cold water fish have neither erythrocytes nor hemoglobin!

It is not enough for vertebrates to make hemoglobin. It must be converted to ferrous iron, absorbed, transported by a special transferrin, stored, and consumed with a special ferritin. Are such proteins to be found in "lower forms"? Probably not.

### Transferrins

That study of electrophoresis of serum transferrins in primates is not helpful to decide any evolutionary relationship is conceded by recent authors.[19] Thus electrophoresis shows serum transferrin bands in chimpanzees similar to no primates tested, but to the tree shrew, *Tupaia glis!* All other primates tested, except man, showed iron-binding bands of the beta globulins two or three times as mobile as that of chimpanzees.[20]

### Phylogeny of Primate Myoglobin

The same myoglobin-peptide patterns exist in Hominoidae, Cercopithecoidae (old world monkeys), and Ceboidae (new world monkeys), but all differ from each other. This is more distinctive than serum albumin or hemoglobin comparisons.[21]

### Heteroagglutinin of Horseshoe Crab

Serum of *Limulus polyphemus* agglutinated red blood cells of other species, notably those of

the human and sheep, but not the goat or alligator. Ox cells were strongly clumped by one Limulus serum tested. Cells of *Testudo hermanni*, a turtle, are also agglutinated thus, it is reported.[22]

## General Discussion

As men, we care about interrelations of the primates. Is man really first in peace, first in war, and first in the hearts of the globulins?

Much depends on our criteria. If we select heteroagglutinins of the horseshoe crab, then we respond like sheep. We share our blood substances with the colon bacillus and sassafras, certainly sharing type A with chickens. Even leguminous seeds have hemagglutinins. Human serum albumin is very much like a certain ceboid monkey and the tree shrew-even somewhat like that of the elephant.

A B O blood groups put gorillas further from man and closest to monkeys. Of all the great apes, orangutans are closer to man than chimpanzees with respect to the M and N factors. The $Xg^a$ antigen in gibbons is sex-linked, as in man, and is not found in most other primates at all. We must decide if A B O matter more than M and N and $Xg^a$. Do they? The inferences change tremendously as we decide.

Implications of hemoglobin studies are ambiguous, perhaps relating adult men to Ceboid monkeys, but human fetuses to horses and lemurs! Indeed they could relate us to protozoa and fungi and mice! And myoglobins can relate us to whales. Transferrins do not help in our quandary, really, showing only the closeness of chimpanzees to tree shrews.

Evolutionists have always thriven on casual half-facts and crude homologies. Now that biology is growing up and enlisting the help of biochemistry, electron microscopy, and other such approaches, phylogenetic problems become more and more puzzling, and more difficult to subsume under one theory.

If one knows enough and reads enough, he has real trouble in accepting many of the old arguments of evolutionists. The very data the latter hoped for and sought to clinch their argument now give them the greatest trouble. But then facts are "awkward chiels and winna ding and darena' be disputed."

## References


[1]Dewar, D. 1931. Difficulties of the evolution theory. Edward Arnold and Co., London.

[2]Shute, E. V. 1961. Flaws in the theory of evolution. Temside Press, London, Canada.

[3]Wiener, A. S. 1965. Blood groups of chimpanzees and other non-human primates, *Transaction of New York Academy of Sciences,* 27:488.

[4]Eyquen, A., Podliachouk, L., and Millet, P. 1962. Blood groups in chimpanzees, horses, sheep, pigs and other mammals, *Annals of New York Academy of Sciences,* 97:320.

[5]Wiener, A. S., and Moor-Janowski, J. 1963. Blood groups of anthropoid apes and baboons, *Science,* 142: 67.

[6]Moor-Janowski, J., and Wiener, A. S. 1965. Primate blood groups and evolution, *Science,* 148:255.

[7]Springer, G. F., Williamson, P., and Readier, B. L. 1962. Blood group active gram-negative bacteria and higher plants, *Annals of New York Academy of Sciences,* 97:104.

[8]Springer, G. F., and Tritel, H. 1962. Blood group A active substances in embryonated chicken eggs, *Science,* 138:687.

[9]Bird, G. W. G. 1959. Haemagglutinins in seeds. *British Medical Bulletin,* 15:165.

[10]Hafleigh, A. S., and Williams, C. A., Jr. 1966. Antigenic correspondence of serum albumins among primates, *Science,* 151:1530.

[11]Goodman, M. 1962. Immunochemistry of the primates and primate evolution, *Annals of New York Academy of Sciences,* 102:219.

[12]Wallace, B. 1966. Chromosomes, giant molecules and evolution. W. W. Norton & Co., New York. p. 67.

[13]Buettner-Janusch, J., and Hill, R. L. 1965. Molecules and monkeys, *Science,* 147:836.

[14]Hill, R. L., and Buettner-Janusch, J. 1964. Evolution of hemoglobin, *Federal Proceedings,* 23:1236.

[15]Pauling, L. 1964. Molecular diseases and evolution, *Bulletin of New York Academy of Medicine,* 40:334.

[16]Zuckerkandl, E. 1965. The evolution of hemoglobin, *Scientific American,* 212: May, 110.

[17]Simpson, G. G. 1964. Organisms and molecules in evolution, *Science,* 146:1535.

[18]Cohen, S. G. 1963. Biochemical variability and innovation, *Science,* 139:1017.

[19]Buettner-Janusch, J. 1962. Biochemical genetics of the primates hemoglobins and transferring, *Annals of New York Academy of Sciences,* 102:235.

[20]Buettner-Janusch, J. 1961. Transferring differences in chimpanzee sera, *Nature,* 192:632.

[21]Hudgins, P. C., Whorton, C. M., Tomoyashi, T., and Riopelle, A. J. 1966. Comparison of the molecular structure of myoglobin of 14 primate species, *Nature,* 212:693.

[22]Cohen, E., Rose, A. W., and Wissler, F. C. 1965. Heteroagglutinins of the horseshoe crab, *Limulus polyphemus, Life Sciences,* 4:2009.