The Person with Sickle Cell Disease

Dr Felix I.D Konotey-Ahulu (photo left) continues his medical theme.

I was most heartened when, after reading the first article on The Inheritance of Sickle Cell Disease (NA, Jan), a Ghanaian lady wrote this to me: "My son has the AS Trait. We both understood the article. Thanks a lot".

So, "AS Trait"! Reader, did you understand as much as this lady and her son did? To recap quickly before we proceed further: The letter 'A' here stands for 'Normal Adult Haemoglobin' which remains fluid in the red cell whether there is sufficient oxygen surrounding it or not.

This 'A' does not stand for Blood Group-A, which is something entirely different. It stands for 'Haemoglobin Type A' produced by the gene received from one of the parents. Why 'A'? Because it was the very first haemoglobin (red cell protein) described by scientists.

The next adult haemoglobin described was called 'B'. This was found to be a different protein from 'A'. Haemoglobin-B was found to be the reason why, if examined under the microscope, red cells from some people were seen to change shape from round to sickle shape when oxygen was removed from the blood, or when a "reducing agent" was added to the blood.

The ability of some red cells to change shape formed the basis of the so-called 'Sickle Cell Test', and it made more sense to refer to this "abnormal Haemoglobin" as 'Haemoglobin S' rather than Haemoglobin-B ('S' standing for sickling).

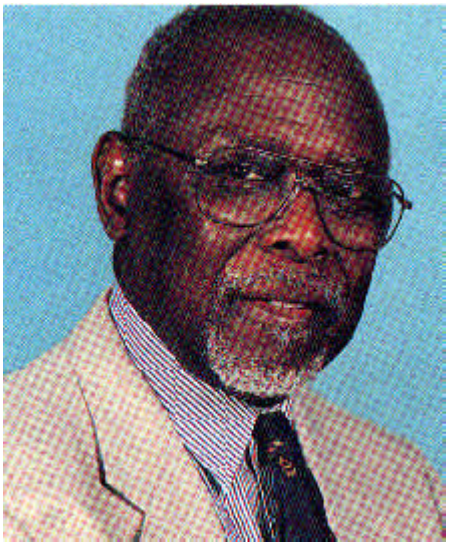
When a person is referred to as 'AS Trait', it means 'A' comes from one parent, and 'S' from the other. I did point out in the last article that my own mother was also 'AS' - 'A' had come from her father (ie through my maternal grandfather's sperm), and the 'S' from her mother's ovum or egg.

'AS' is not a disease! Without testing the blood, it is impossible to tell a Sickle Cell Trait person ('AS Trait') from a person inheriting Normal Adult Haemoglobin from both parents ['AA', ie 'A' from father, 'A' from mother].

I have called the gene producing Haemoglobin-S an 'Ache' gene, and that producing Haemoglobin-A, a 'Norm' gene. I call the 'AS Trait' Norm/Ache. This is not a hereditary disease, because the 'Ache' gene is prevented by the 'Norm' gene from producing cold-season rheumatism.

The third adult haemoglobin discovered is called Haemoglobin-C. It can be distinguished from Haemoglobins 'A' and 'S' by a process called Haemoglobin Electrophoresis. Haemoglobin-C is very common in West Africa, with northern Ghana and Burkina Faso having the highest incidence in the world.

While Haemoglobin-A denotes a 'Norm' gene, Haemoglobin-C, like S, denotes an 'Ache' gene.



People suffer from hereditary rheumatism when two 'Ache' genes are inherited together. 'S' from mother and 'S' from father gives "SS" disease (also called "Sickle Cell Anaemia" - Ache/Ache).

'S' from one parent and 'C' from the other produces "SC" disease, also known as "Sickle Cell Haemoglobin-C disease" [again "Ache/Ache"].

There is no such thing as 'SC Trait'. When one uses the term 'Trait', a Haemoglobin-A gene must be present in the phenotype. Sickle Cell Trait is 'AS Trait', with the proportion of 'A' greater than 'S'. Indeed, the proportion of the abnormal Haemoglobin-S in Sickle Cell Trait is always less than 40%, and can be as little as 20%.

Signs and symptoms

The "signs and symptoms" described below apply to persons with the disease, not trait:

Hand-foot syndrome

"Doctor, the hands and feet of my child are swollen, and painful", complains an anxious mother. This condition, known as 'hand-foot syndrome' [see photos on p....] is often the first sign in life that the child has sickle cell disease 'SS', or 'SC', 'Sbeta-Thalassaemia', or other disease phenotype.

The child needs to be under medical and nursing supervision. The child will be found to be feverish, not feeding well, nails may be pale, and eyes yellow. The fever, with lack of fluids (not drinking well) has caused some of the red cells within the body to change from round to sickle-shape, impeding the flow of blood in the vessels (as shown on p..).

When this happens in the tiny vessels of the hands, it results in the 'hand-foot syndrome'. What parents need to know is that there is always a precipitating cause of this "sickle cell crisis" (red cells sickling within the body). Dehydration, for example from lack of drinking due to severe sore throat, and high body temperature from any infection (including malaria) can cause 'hand-foot syndrome' in a child with sickle cell disease. There is urgent need to replace lost fluid and treat the infection.

When a child with sickle cell disease has no problems, and is quite happy running about and playing, that means the red cells have not altered their shape to sickle-shape, and are moving freely round the body. The child is said to be "in the steady state".

But if circumstances like teething or immunisation or infections, produce fever and cause a significant proportion of the red cells in the body to change from round to sickle shape and clog up blood vessels and start sudden rheumatic and bone pains, then she/he is said to be "in sickle cell crisis".

To give only pain-killers in severe sickle cell crisis and to forget the cause of the crisis and fluid replacement is to court disaster.

Sequestration Syndrome

"Doctor, my child's tummy is getting bigger, and he complains of pains". Sickled red cells sometimes collect in the spleen (left side of the abdomen) or in the liver (right side of the abdomen), or both. When this happens suddenly, it constitutes a form of sickle cell crisis which makes the child very pale (judged by the nails, palms, and within the lower eyelids).

This so-called Sequestration Syndrome with much of the child's blood collecting in the spleen and liver, can be very dangerous. Again, an infection in the body, with the child not eating or drinking properly can set this up. Parents are taught to feel the child's tummy gently to see if these organs are getting suddenly bigger, and to seek medical attention.

It is amazing how many parents have been taught to educate their doctors and nurses: "I think my child may be getting the sudden big spleen syndrome. She has been off colour recently".

As these circumstances are almost invariably the cause of a sickle cell crisis, parents should be watchful and anticipate problems. Daily oral Penicillin has been known to prevent not only frequent sore throats and many sickle crises, but also the sequestration syndrome.

Folic acid tablets (5 milligrams daily) helps to replenish the "blood factory". Those who live in the tropics or visit there on holidays should

remember that, contrary to what they hear from some scientists, malaria is the commonest cause of sickle cell crisis in Africa! You had better believe me, and not those scientists!

Priapism

"Doctor, my son sometimes gets erection of the penis and it takes hours and hours before it settles". Wherever red cells change in the body from round to sickle shape, expect to have some problems. If this happens in the vessels of the penis, then persistent erection could occur. Priapism is the medical term for it, and it can be most distressing especially in the older person where the tendency is to hide the problem and not tell the nurse or even the doctor about it.

Again, what are the circumstances for this problem? It starts most often after midnight, waking the person up. Sometimes a urinary tract infection needs to be treated before it disappears. On other occasions, dehydration requires to be corrected.

In the older person who arrives in hospital several days after priapism had begun, successful treatment occurs with rehydration and partial exchange blood transfusion.

A drop in the oxygen content of the blood during the night, I suspect, could be another factor, hence priapism occurs most often after midnight.

Snoring reduces arterial oxygen content, so patients need examination by an ear/nose/throat specialist to make sure the tonsils (which are often huge in sickle cell disease patients) are not obstructing the airways.

I have known some young men cut short a priapism attack by getting out of bed and walking about to drive sluggish blood round the body, or taking a shower.

Sickle Cell Anaemia

"Doctor, I get easily tired when I play football or swim". Well, the 'SS' phenotype is known as 'Sickle Cell Anaemia'. Because sickled red cells are often removed from the blood by the spleen, the number of red cells in the body is constantly reduced, producing anaemia.

The haemoglobin level in the 'steady state' in Sickle Cell Anaemia is seldom above 9 grams per deci-Litre of blood (Normal value is between 13 and 15 g/dL). The 'SS' person's body tissues adjust beautifully to cope with a steady-state Hb of 9 g/dL, but this is not enough to make Kwesi or Yomi exercise his football skills without getting out of breath. They should stick to gentler games. Although the 'SC' phenotype people are not usually anaemic, they can get into sickle cell crisis after exercising. Swimming can precipitate rheumatic and bone pains, not only because of the exercise, but also from the cold water.

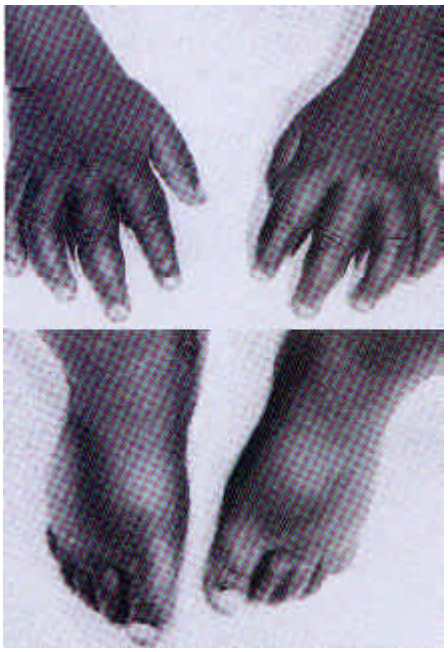
"Doctor, the whole family flew from Accra to Nairobi, arriving in the early hours of the night. The very next day our 13-year-old daughter suffered a stroke. She is SS". Oh, circumstances again!.

The day before the flight from Accra (at sea level), Ruth did not drink enough fluids even though she sweated profusely in the hot March weather. She snored a bit in her sleep on the plane, and she had a restless night.

The plane was flying at 35,000 feet and although pressurised, the air within the aircraft was only at 6,000-feet pressure. So the proportion of oxygen was much less than in Accra at sea level.

Then they arrived in Nairobi, nearly 8,000 feet above sea level. The oxygen content of the breathed air was again less than in Accra. There had been no moving of legs on the plane to keep the blood flowing. Red cells changed from round to sickle-shape.

When this happened within vessels on the Left side of Ruth's brain, she became paralysed on the Right side of the body, with some speech impediment. She was rushed to Nairobi Hospital. Fortunately she lived, but things could have been much worse.



The 'hand-foot syndrome': Swollen, painful hands are usually the first indication of Sickle Cell Disease

As 'Genius' genes were inherited from her parents alongside their 'S' genes, Ruth managed to educate her Left hand to be used in computer work in which she presently excels. Her speech has recovered, though she walks with a paralytic gait.

If the vessel blockage had occurred on the Right side of the brain, Ruth would have been paralysed on the Left side of the body, and her speech would not have been affected, being a right-handed person.

Enough teaching for this month, but test yourself:

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Enough teaching for this month, but test yourself:

1. Can an 'AS Trait' suffer from hand-foot syndrome?
2. Does Sickle Cell Trait mean 'SC' phenotype?
3. Is there such a person as 'SC' Trait?
4. Can malaria kill a Sickle Cell Disease child suddenly?
5. What circumstances can cause a stroke in a Sickle Cell Disease person?
6. Why are pain-killers not necessarily the most important requirement for sickle cell crisis when the patient first arrives in hospital?
7. What is priapism?
8. How can snoring affect the wellbeing of the sickle cell disease person?
9. Can a Sickle Cell Trait person have only 20% of Haemoglobin-S?
10. The Sickle Cell Test on Dr Konotey-Ahulu's mother was POSITIVE, but on his father's blood the test was NEGATIVE. How was it possible for 3 of their 11 children to have suffered from hand-foot syndrome?

NB: One in 3 West Africans reading this article have the 'AS' or 'AC' haemoglobin phenotype and are probably not aware of this.

The KAGÉ Foundation, and the University of Cape Coast, Ghana, have undertaken to help Africans and their Diaspora relatives to identify their haemoglobin phenotype, so that they can ascertain the chances of Sickle Cell Disease in their offspring. This will help us all in taking informed decisions about procreation and family size limitation.

If you yourself are among the 2 in 3 West Africans who are Norm/Norm (AA), but would nevertheless like to help others identify their phenotype, please contact the "Kwegyir Aggrey Distinguished Professor of Human Genetics, Faculty of Science, University of Cape Coast, Ghana", mentioning how many people you could sponsor for laboratory tests and genetic counselling.

Those in the UK may find that their Family Practitioner may not agree to do the Sickle Cell Test plus Haemoglobin Electrophoresis.

Most doctors outside Nigeria and Ghana have never heard of Haemoglobin-C, so they will not ask for Haemoglobin Electrophoresis to identify the 'AC' Trait person.

If the GP is not prepared to do this test, then West Africans in the UK should tell their doctor they are willing to pay for the tests themselves. Had they better not spend some money to find out their phenotype, than stand amazed when their first, second, or third child begins to suffer hand-foot syndrome at 18 months of age?

(Readers could write to me, care of New African, or direct to me at: konotey-ahulu@sicklecell.md or at my website: www.sicklecell.md)