

## Blood transfusion

### Myth or reality?

by Dr. Jean-Pierre de Mondenard \*



*Dr. de Mondenard has kindly sent us this article below which we have published.*

It was in 1976 that the world of sport first heard rumours that certain champions owed their achievements to a new doping technique: blood transfusion. At the Winter Olympic Games in Innsbruck, a number of cross-country skiing medals were thought to have been won with the help of this method. Then, at the Summer Games in Montreal, suspicion fell on the Finnish long-distance runner Lasse Viren after, as in Munich in 1972, he had succeeded in winning a brilliant double victory in the 5,000 m and the 10,000 m. Questioned by a French journalist, insisting strongly on the rumours of blood transfusion, Viren pretended not to take the question seriously and answered jokingly that he attributed his great form and his success to the virtues of... reindeer milk. Was the quadruple Olympic champion doped? There is no reason to suppose he was, especially as the technique of transfusion is a dangerous as its effectiveness is unproven...

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Blood transfusion used as a means of improving performance is a process introduced by the Swede Ekblom in 1972. The principle is based on the following facts : first, the red corpuscles, via the haemoglobin, carry oxygen to the muscles; second, performance in endurance sports is bound up with the organism's ability

to capture, transport and distribute oxygen to the muscles. The more oxygen a muscle is capable of consuming, the greater its ability to achieve and sustain intense and prolonged effort; hence the utility of improving oxygenation by increasing the number of red corpuscles.

The technique of transfusion, advocated by Ekblom, consists in taking from an athlete during training, about a month before the actual competition, a certain quantity of blood : from 800 to 1,200 cc. The blood taken in this way is stored in a refrigerator for a month.

During this period, the athlete continues his preparation but reduces the intensity of his training. He gradually replenishes his supply of red corpuscles. At the end of a month, the red corpuscles taken from him are re injected in the form of a "globular puree". Heterotransfusion is a variant of the previous technique which is known as autotransfusion. The principle is the same but the blood is supplied by a donor of the same blood group as the athlete. However the risks of incompatibility between the athlete and the donor are great.

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According to the Swedes, the effects of autotransfusion increase the physical capacities of a subject by 23 % and last for about a fortnight.

Very fortunately for sports ethics, American studies have arrived at the opposite conclusion ! Similarly, Lars Hermansen, a Norwegian physiologist of world repute, has succeeded in proving that Ekblom's conclusions were false.

In fact, the supposed improvement in performance is based on the following hypothesis : if one is capable of increasing the haemoglobin content in the blood, one also increases the quantity of oxygen that the blood can carry as well as the maximum consumption of oxygen, which helps improve performance. While the theory is an attractive one, it still remains to be proved that there is any correlation between the maximum consumption of oxygen and the haemoglobin content.

Does the possession of a high proportion of haemoglobin in the blood necessarily lead to an increase in the consumption of oxygen ? A statistical study has been carried out on a large section of the population concerning this matter.

For a haemoglobin content of 12 grams per 100 millilitres, the quantity of oxygen varies from 3 to 6 litres. In other words, there is no connection between the haemoglobin content and the maximum consumption of oxygen...

On the other hand, it seems that there is a relation between the number of red corpuscles and the viscosity of the blood, which increases with the haemoglobin content. The thicker the blood, the harder the heart has to work. As a result, the heart beat slows down and the consumption of oxygen certainly does not increase. In actual fact, it is dependent upon the strength of contraction of the heart and the difference in the quantity of oxygen between the venous and the arterial blood. Dawson adds another element which bears witness to the doubts concerning the effectiveness of blood transfusions. This scientist has shown that blood stored outside the organism loses part of its property of supplying the tissues of the organism, and above all the muscles, with quantities of oxygen identical to those supplied by fresh blood.

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The most recent work, that of Robert Ruhling \*, of the Laboratory of Research into Human Performances at Utah University, has confirmed that it is in fact training that continues to be the best means of improving performance and that no serious study has ever given any reason for thinking that the reinjection of blood was a worthwhile solution.

His experiment began in 1977 on subjects who were not themselves sportsmen.

Four groups were formed:

1. Those from whom no blood was taken and who were not trained;
2. Those from whom blood was taken, but who were not trained;
3. Those from whom no blood was taken but who underwent physical training;
4. Those from whom blood was taken and who underwent physical training.

The third and fourth groups followed the training programme advocated by Dr. K. Cooper in his best-seller "The Nex Aerobics".

Training took place daily (except for week-ends) and lasted two and a half hours. To avoid any of the subjects being influenced by the taking and reinjection of blood, they were blindfolded and wore ear muffs. In this way, they did not in fact know whether their blood was actually being taken and/or whether blood or a physiological solution was being reinjected.

On three occasions: before the experiment, and at the beginning and end, that is to say seventeen days after the reinjection, blood tests were carried out and measurements of aerobic capacity taken. Changes were noted but they occurred "in all directions" for all four groups. A rise was observed in the number of red corpuscles and the haemoglobin content during the actual experiment, that is to say between the second and the third tests. Ruhling admitted that he could not explain the origin of these generalised increases. At the end of the experiment and after analysing the data collected throughout it, his assistant Frye stated :

*"We have not been able to observe any increase in the capacity for work that could be accounted for by the reinjection".*

According to these different experiments, blood transfusions can be likened to the increase in the number of waggons (represented by the red corpuscles) in a goods train, without these waggons being filled to the top, so that the total volume transported would not be increased.

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The most advanced experiments were carried out in Scandinavia, particularly in Sweden (especially on long-distance runners and cross-country skiers). In France, to our knowledge, the process has never been used. There is no tendency for the practice of reinjections to become generalised for, as we have seen above, the results are not as spectacular as might have been expected and, above all, doctors' conclusions as to their beneficial effects are fairly negative. In fact, transfusions are undoubtedly incapable of modifying to any significant extent the performance of an individual. This process does not improve performance in any physical way but it may, in certain cases, have the effect of a placebo.

In France, we must nevertheless mention the case of the Dutch racing cyclist Zoetemelk, who is very definitely against this technique even though he once received a blood transfusion.

As a result of a serious accident at Valras at the finish of a stage in the Midi-Libre race in 1974, Zoetemelk contracted cerebra-spinal meningitis which reduced his red corpuscle content to below 4 million per cubic millimetre (normal content for a sedentary man: 5 million).

For an athlete who has to climb the hills to be found in the Tour de France cycle race, this was too low and, in fact, the Dutchman was at a disadvantage every time the road climbed. That is why he received a heterotransfusion before the start of the race in 1976. But Zoetemelk is quite adamant:

"Now that I have recovered my normal red corpuscle content and my health, there is no reason for me to do it again."

In this particular case, attention should be called to a particularity shown by sportsmen specialising in repeated and long tests of

endurance, such as for example stage cycle races. On examination, they all show a low red corpuscle content, which however has nothing abnormal about it.

The American physiologist Dave Costill has explained the reasons for this:

*"It should be remembered that during exercise and intense sweating" there is generally an increase in plasmatic volume (blood is formed of red corpuscles plus plasma), itself dependent on the storage of sodium (salt) in the organism. This sodium left in the organism holds the blood liquid as it does water in general, which corresponds to an increase in plasmatic volume and a dilution."*

There is therefore more liquid for the same quantity of corpuscles, i.e. a comparative anaemia. This anaemia can then, wrongly, be considered as evidence of an overall shortage of red corpuscles; it is therefore necessary to interpret very carefully the results obtained among athletes trained for endurance.

The same phenomenon occurs, in the same particular cases of effort, with regard to the amount of potassium in the blood. Let us return to transfusion itself, as seen in the light of our definition of doping.

Is it "stimulating and artificial" ? All studies have shown that it was certainly ineffective and that, in any case, the polyglobulia produced was artificial.

The dangers of this technique are very real since, in the recent report represented to the Academy of Medicine by A. Dufour and J. P. Soulier, the authors reach the conclusion that the method is ineffective and that the risks involved in autotransfusion are considerable.

*"In fact, autotransfusion is followed by a hypervolemia and an increase in viscosity likely to increase the work demanded of the cardiac muscle, which is already under considerable strain through the effort of competition. The blood reinjected during the transfusion adds to the organism a large quantity of potassium, citric acid and sodium (from the preservation liquid). Finally, microaggregates and free haemoglobin appear in the blood that has been stored"*

This report shows that it is unacceptable to run a risk, no matter how small, by carrying out transfusions. Let us also mention risks of an

accidental nature and, in particular, the possible transmission of diseases.

Concerning inequality of performance, it seems that the differences observed by Ekblom are above all psychological in nature, which obviously strengthens the "motivation of the person involved.

To sum up, blood transfusion is an artificial form of recharge beyond the field of normal physiology. This practice is therefore to be condemned. It is moreover dangerous and contrary to fair play. Even so, some athletes make use of it: while suspicion has been cast without definite proof on certain Scandinavian athletes, the great German footballer, Franz Beckenbauer, on the other hand, has never attempted to deny that he makes frequent use of this technique...

### Arguments against

*Dave Costill*, specialising in the physiology of effort at Ball State University in the USA, expresses serious doubts as to the effectiveness of blood transfusion :

"The blood undoubtedly contains many more red corpuscles but it is also thicker. And consequently, it is much more difficult for the heart to pump, especially through the small veins and capillary vessels. So that the gain in red corpuscles is cancelled out by the difficulty in pumping the blood.

In addition, an athlete who has just given a pint of blood can no longer train properly. This method therefore constitutes an obstacle to training precisely when needed most by the athlete. I conclude that 'doping the blood' is worth neither the trouble nor the effort required".

*Matti Hannus*, the Finnish sports journalist, comparing Viren's performances with the theoretical duration of the effectiveness of blood transfusions (two to three weeks) arrives at a conclusion which is difficult to imagine-that he must have had four transfusions in the space of four months :

"Rumour has it that Lasse Viren owed his gold medals to blood transfusions. But I don't think so. How could he have run 25 kilometres in 1 hour 14 minutes 21 seconds (which is a world record) in April, won the Finnish cross-country title in May, run 10,000 metres in 27 minutes 43 seconds in June and dazzled the crowds in Montreal with his brilliant performances in July? Do you really expect me to believe that he had four blood transfusions during this time"?

Source : "Sports Medicine" by Gabe Mirkin, published in Editions de l'Homme - 1981

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\* Work presented in the periodical "Spiridon" No. 42, February-March 1979 by Noël Tamini (original: "Track and Field News" February 1978).

\* Sweating is a normal phenomenon corresponding to a thermal evacuation, it must not be excessive; it is in this sense that the storage of sodium, by limiting perspiration, allows the organism to adapt to effort.

