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RECENT ADVANCES IN DOPING ANALYSIS (8)

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The medical monitoring of the International Cycling Union

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We report some considerations about the medical monitoring that the International Cycling Union introduced at the beginning of 1999, to monitor the health status of some professional male riders.

During the last decade, synthetic peptides made their arrival in the range of products that can improve performance, particularly in the endurance disciplines. One above all: erythropoietin (EPO).

These molecules are known to be more effective than other substances employed and they cannot be detected in normal anti-doping control. These two properties have contributed to the implementation of EPO among the athletes.

In 1994, the International Cycling Union (UCI) has financed a research for the detection of EPO in urine. This effort has unfortunately not brought any satisfactory result.

It was then decided to modify the approach to the problem of doping, first by introducing in 1997 a limit for hematocrit (Hct) for men and women (50% and 47% respectively). This measure contributed to a diminution of EPO use, and limited the danger for the organism.

At the beginning of 1997, UCI had started to think about rider's health monitoring through regular check-ups for the athletes, in order to prevent the negative effects of cycling and medications, included non detectable doping products, on the health, and to ensure a medical follow-up.

It is important to underline that they were the first International Federation to make such an effort. This was officially introduced in January 1999.

By the term medical monitoring, UCI intends a list of exams determined to detect and prevent negative effects of sport.

Their goal is also to limit the use or misuse of medications and doping products. It's not a repressive method. It is not an anti-doping control, and it is not used as direct or indirect evidence of utilisation of a doping product. It is meant as a measure to protect the rider's health, and for this reason some riders are excluded for a period of time from racing and training, if the exams show that there is a danger for their health.

It is a decision of medical inaptitude, not a disqualification. The medical follow-up will not substitute usual anti-doping controls, which will still be performed.

In Table 1 are shown the exams that the professional riders have to pass, following an established calendar. They include a physical exam, cardiac investigations and laboratory tests.

Table 1: **List of exams for the medical monitoring**

Exams	*Every 2 years*	*Every year*	*Every 3 months*	*Optional*
Complete Clinical Exam		X		
Cardiological questionnaire		X		
Electrocardiogram		X		
Cardiac Echo-Doppler	X			
Stress-electrocardiogram	X			
Visual acuity	X			
Na, K, Cl, Ca		X		
Uric Acid, Urea		X		
Blood Glucose		X		
Total Cholesterol, Triglycerides		X		
TSH		X		
Full Blood Count			X	
Reticulocytes			X	
C-Reactive-Protein, Ferritin			X	
GOT, GPT, γGT			X	
Total Bilirubin, Alkaline Phosphatase			X	
Creatinine, Total Proteins			X	
CPK			X	
Total Testosterone, LH, Cortisol (08.00 h)			X	
Urinary Stick			X	
HIV, HBV, HCV serologies				X
Tetanus Immunization				X

These exams are performed under the direction of the team doctor, who also is responsible for further investigations or treatments when necessary, under the supervision of the medical inspector of the UCI, who is authorised to check the results and take measures when necessary (for example, rider's suspension). The team is responsible for finding a doctor; they pay for the exams and have to make everyone follow the medical decisions.

The 1st and 3rd series of exams have to be done in an accredited (by the UCI) laboratory.

Concerning the results from last year, we have not showed a rider's typical pathology. No severe cardiac, renal, hepatic, endocrinological or haematopoietic disorder has been discovered.

The only parameter, which was very often above normal levels, was ferritin.

In Table 2 are represented the values of ferritin for some riders, between January 1999 and January 2000. We consider values as normal up to 200 ng per ml; from 200 to 500 are elevated values; between 500 and 700 are pathological values and above 700 are dangerous values. The danger is the risk of developing a hemosiderosis.

Table 2: **Percentage of ferritin values among professional male riders**

Ferritin (ng/ml)	*Date of exams*			
	January 1999 *n = 536*	*January 2000* *n = 1067*	*April 2000* *n = 1002*	*June 2000* *n = 856*
< 200	37 %	47,4 %	49,0 %	49,9 %
200 - 499	36 %	39,1 %	38,3 %	38,2 %
500 - 700	13 %	7,9 %	7,1 %	6,8 %
> 700	14 %	5,6 %	5,6 %	5,1 %

Analysing the results of January 1999, it appears that more than one fourth of the riders have had pathological values and 14% have dangerous values. But when we compare these to those obtained in July 2000, we can easily recognize that there was a substantial improvement, because the pathological and dangerous values dropped significantly to 6,8% and 5,1% respectively.

It is important to realize that iron intake differs in quantity and administration route between the riders, due to different traditions and habits. In some nations, riders are more prone to take large amounts of iron, especially by parenteral administration.

Another important factor is the age of the rider. Table 3 shows ferritin values according to rider's age in January 2000:

Table 3: **Percentage of ferritin values according to age in January 2000**

Ferritin (ng/ml)	*Age group*					
	< 23	*23 - 25*	*26 - 27*	*28 - 30*	*31 - 34*	*> 34*
< 200	80,7 %	55,3 %	48,7 %	41,9 %	37,3 %	20,9 %
200 - 499	19,3 %	40,3 %	36,2 %	43,0 %	41,2 %	46,5 %
500 - 700	0,0 %	2,4 %	9,9 %	9,3 %	11,3 %	9,3 %
> 700	0,0 %	2,0 %	5,2 %	5,8 %	10,2 %	23,3 %

It appears that the older riders have the highest values of ferritin. Almost one third of the riders older than 34 have values more than 500; on the other side, less then 5% of the riders younger than 25 have such high values.

We think that this is due to the fact that older riders had taken large amounts of iron during several years, which leads to accumulation of iron in the body, increasing iron stores (measured by ferritin values).

When we compare the mean values, for each age group, between January 1999 and January 2000 (Table 4), we observe the same evolution seen in Table 2:

Table 4: **Mean values of ferritin (ng/ml) according to age between 1999 and 2000**

Date of exams	*Age group*					
	< 23	*23 - 25*	*26 - 27*	*28 - 30*	*31 - 34*	*> 34*
January 2000	139	221	271	293	350	472
January 1999	256	289	335	435	461	576

These improvements are the consequence of the changing of behaviour of the riders, after they have been informed of the risks of iron accumulation (hemosiderosis). We hope that this evolution will continue in the future.

This leads to the following conclusions.

The medical monitoring is a new tool based on an old philosophy: occupational medicine.

It's a kind of preventive medicine, which must fight against the risks of the profession of

cycling, which include medication misuse or doping products utilisation. Iron can be very dangerous, even if it is allowed.

It must evolve every year, become more sophisticated, to be more efficient in order to counteract the constant modifications of the world sport (the same way of reasoning is applicable to anti-doping controls).

To be effective, it must have the total collaboration of all the partners involved (riders, doctors, team-directors).