Efficient transport of oxygen within the body is of particular importance for physical work performance, maximal aerobic power and resistance to fatigue, especially in endurance disciplines such as cycling, long distance running or cross-country skiing. The oxygen supply to tissues is influenced mainly by the oxygen-carrying capacity of blood, which is determined primarily by blood's haemoglobin concentration. A single bout of physical effort and, even more, repeated exercise leading to profound changes in the organism triggers a series of changes in erythrocytic system of peripheral blood and influences the erythropoietic processes in the bone marrow. One can expect that exercise training aimed at an increase in the physical performance should bring about an elevation of the oxygen carrying capacity of blood by increasing, among others, the values of haematological parameters such as erythrocyte count, haematocrit and haemoglobin concentration. Many authors, however, have observed that under resting conditions, the parameters of the erythrocyte system are lower in some well-trained athletes, particularly those performing in endurance disciplines than in those specialising in high-speed disciplines. Most interestingly, for more than 10 years, there have been many reports on anaemia occurring in top athletes of both sexes, even among the members of Olympic teams, performing in various endurance disciplines. This kind of anaemia has been termed as sports anaemia, athletes' anaemia, postexercise anaemia, runner's anaemia or swimmer's anaemia. In most of the cases, there is dilutional anaemia (pseudoanaemia or false anaemia) and required no treatment. One may, however, remember that true anaemias may also developed in athletes. Acceleration of erythropoiesis is confirmed by elevated reticulocytosis observed both after single strenuous physical exercise (rise by 20–100%) and after training. The regulation of biosynthesis of erythropoietin (EPO) under specific condition of physical exercise and training, however, is not yet fully understood. It was shown, using sensitive radioimmunoassays, that neither physical exercise nor training has any significant effect on serum EPO level. However, the measurements taken during the postexercise restitution period revealed the increase in this hormone 3 h after exertion with the highest values during the second and the third day after marathon runs. Discovery, isolation, and, in 1985, successful cloning and expression of the human erythropoietin gene in mammalian cells have permitted a large-scale production of recombinant human erythropoietin – rHuEPO. In this way, the haematopoietic growth factor has become available for clinical use. Almost immediately, rHuEPO has been perceived by athletes as an easy and effective way of doping. One study shows that 3–7% of sportsmen performing in endurance disciplines use EPO. It appears, however, that doping with EPO is more dangerous than doping with blood. It is most probable that doping with rHuEPO has been the reason of the death of more than 20 cyclists mainly from Holland and Belgium. For these reasons, doping with EPO has been banned by the International Olympic Committee in 1990. Nowadays, however, doping control is becoming much more difficult because there are various novel erythropoietic agents available on the market.

53 SPORTS ANAEMIA, REGULATION OF ERYTHROPOIETIN BIOSYNTHESIS DURING PHYSICAL EFFORT AND EPO DOPING

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