Project Review

"Sensitivity and Specificity of a Gene doping test detecting transgenic DNA on a single molecule level in peripheral blood probes"

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A variety of different gene transfer technologies enable to deliver functional active genes, so called transgenic DNA (tDNA), to various cells of the human body. The activity of the tDNA can be tightly regulated to control the quantity as well as the cellular localization of the derived proteins. So far, a variety of tDNAs mostly coding for growth and differentiation factors have been shown to influence positively physical performance in animal studies.

Detection of an abuse of such a technology for the purpose of gene doping would be difficult because of two main problems:

1. The tDNA used is considered to be homologous to the genomic DNA (gDNA), which naturally is present in every probe taken from an individual.
2. The protein derived from the tDNA is most likely similar to the naturally occurring human protein, both being manufactured by the human body itself.

Since gene transfer technologies administer billions up to trillions of copies of tDNAs to cells of a body and since every cell is subjected to a natural turnover an athlete, once being gene doped, may set free and maintain small amounts of tDNA within the blood throughout life time. Moreover, tDNA is not 100% homologous to gDNA, since it does not contain certain sequence parts of the gDNA, which are called introns.
We developed a method which enables detection of tDNA on single molecule level within a conventional blood test probe of 2-10 ml. Detection is based on specific amplification of tDNA even in the presence of huge amounts of gDNA. We designed prototypes to detect all potential tDNA variants (splice variants) of first line candidate genes.

Our WADA project now deals with the further development of these prototypes and with the determination of the exact specificity and sensitivity of the method in humans.