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Detection of Epoetin-alfa and its biosimilar Epoetin-kappa

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Abstract

Since the expiration of patent protection, a number of new recombinant erythropoietin (rEPO) biosimilars have appeared on the worldwide market. In 2010, epoetin kappa, which is biosimilar to epoetin alfa, was clinically approved in Japan. It was unclear whether epoetin kappa could be detected by the WADA-approved detection methods (isoelectric focusing polyacrylamide gel electrophoresis (IEF-PAGE) and sodium dodecyl sulphate-polyacrylamide gel electrophoresis (SDS-PAGE)). Hence, intravenous administration studies of epoetin kappa and epoetin alfa were performed to test the applicability of these methods. The isoform bands of epoetin kappa expanded more widely towards the basic area and the profile appeared to be composed of at least eight bands, which were clearly different from those of other epoetins. The results showed that epoetin kappa also contains isoforms of higher molecular masses than those of originator epoetins on SDS-PAGE; the mass distribution was confirmed by electrospray ionization time-of-flight mass spectrometry. We clearly detected epoetin kappa after its administration up to 10 h by IEF-PAGE and 24 h by SDS-PAGE. SDS-PAGE compensates for the disadvantages of IEF-PAGE in detecting urinary epoetin kappa. We also concluded that athletes abusing rEPO might move to intravenous administrations for shorter clearance times instead of subcutaneous injections. Hence, out-of-competition tests need to be applied more frequently to improve the effectiveness of the rEPO detection.

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