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Simultaneous analysis of doping drugs in human plasma and urine using HPLC-DAD and HPLC-ESI-MS

Naglaa Sheiba
Ain Shams University, Egypt

Two liquid chromatographic methods have been developed for determination of doping drugs in spiked plasma and urine. The first method, HPLC-DAD (diode array detector) is used for simultaneous separation and quantitation of AMI (amiloride), TOR (torasemide), FUR (furosemide) and IDP (indapamide). It is also used for simultaneous separation and quantitation of ATE (atenolol), caffeine and FUR. They are applied in spiked plasma samples. However, ATE could not be determined quantitatively due to interference with plasma. LODs were found to be 0.16, 0.15, 0.11, 0.12 and 0.25 for AMI, TOR, FUR, IDP and caffeine, respectively. LOQs were found to be 0.49, 0.45, 0.33, 0.36 and 0.75 for AMI, TOR, FUR, IDP and caffeine, respectively. The second method, HPLC-ESI-MS (electrospray ionization-mass spectrometry) has been developed for the routine detection of doping drugs in spiked urine samples. It requires only one injection per sample and is currently capable to detect 10 doping drugs, including six diuretics- FUR, AMI, TOR, hydrochlorothiazide (HCTZ), IDP and spironolactone (SPIRO), two stimulants-caffeine and phenylephrine (PHE) and two β blockers- ATE and bisoprolol in a running time of 14.5 minutes. Both positive and negative ionization modes were used depending on the structure of the separated compounds. The linearity range for most of the drugs was 10-1000 ngmL-1. All parent compounds can be detected at urinary concentrations significantly below 50 ngmL-1.The methods developed simple pretreatment procedure, protein precipitation by acetonitrile and direct dilution for spiked plasma and urine, respectively.

naglaa1986@gmail.com

Non-invasive diagnosis of breast disease by analysis of characteristic hormone ratios

Rui Su
Jilin University, China

There is increasing interest in the development of noninvasive diagnostic methods for early breast cancer detection to improve the survival rate and minimize the pain of diagnosis. Common methods for diagnosis and surveillance include mammography, histopathology and blood tests. The major drawbacks of these methods involved high rate of false reports, time consuming and poor specificity. Identification of characteristic compounds by using high resolution mass spectrometer may provide a powerful approach for diagnosis of breast cancer. Here, a new noninvasive method was developed for fast screening breast disease. The hormones, which were collected by scrubbing the surfaces of armpit and nipple with alcohol swabs, were analyzed by Orbitrap mass spectrometry. The obtained mass spectra were subsequently treated statistically to identify discriminating hormones between normal vs. breast disease (breast lesions and breast cancer) patients. We found that the ratios of some hormones including progesterone to testosterone and estrogens to testosterone changed significantly among different breast diseases. The changes in some typical hormone ratios which were produced by the glands of the armpit and nipple will reflect the health status of breast and relate to the female breast disease. This method offers considerable potential as a noninvasive strategy to screen early breast cancer.

sranalchem@163.com