

Storyline

Allegations of doping have tainted the 2019 Men's Patriot League Indoor Track & Field Championships! At the end of the meet, Lehigh Track & Field athletes bragged about "juicing up" the night before the event. This caught the attention of Patriot League Commissioner, Jennifer Heppel, who demanded that all Lehigh athletes immediately be drug tested. You are the analytical company (Raynell Labs) tasked with determining whether or not members of the Lehigh Men's Track & Field team consumed illegal substances listed on the NCAA banned substances list prior to the Patriot League Indoor Track & Field Championships.

Due to the fact that Lehigh will be competing in outdoor Track & Field meets, you have a short window of time to 1) analyze the urine samples of the Lehigh Men's Track & Field team and 2) create a scientific report to be reviewed by your company's CEO determining whether or not the athletes doped. Additionally, to further educate the public about how doping control is performed, you are tasked with making a 3 minute video walking through the procedure for determining whether doping occurred.

In-Lab Investigation:

You will be handed an initial HPLC chromatogram from an already-worked-up urine sample from a random member of the Lehigh team. You will be allowed to request additional HPLC runs as well as MS runs of the urine sample, but YOU need to decide what variables to change. You can complete the Instrument-Use request ticket to do this. Instrument use, however, takes time! Thus, each request will cost you a certain amount of time (5 minutes or 10 minutes) You will not be able to request another run on the instrument until the timer is up. Your initial task is to separate via HPLC the 3 component mixture. After separating the mixture, you will need to determine the identity of each peak. Finally, some of the substances on the NCAA banned substance list have threshold limits, meaning they are legal up until a certain quantity. Thus, you will need to determine not just the identity of each component, but the quantity.

Scientific Report:

Your CEO managed to score a lucrative contract with the Patriot League to conduct the official testing of the samples from the Lehigh athletes. Your boss wants to review every piece of data that your team analyzed before you definitively determine which athletes doped. Thus, you are tasked with preparing a 15 minute PowerPoint presentation to be given to your boss on the last day of lab highlighting:

- 1) the process you took for separating the 3 compounds via HPLC and the analysis behind it
 - Reporting the methodology for finding appropriate separation conditions
 - Include chromatograms as necessary to support your discussion
 - Calculate all relevant chromatographic parameters and a sample calculation
- 2) a full analysis of mass spectra for positive identification of each of the three compounds and
 - Identification of each compound with name and structure (ChemDraw)
 - Back up the structure determination with 3 important MS fragments and isotope analysis
 - Show drawings of structural fragments, or similar annotations
- 3) the quantification of each of the 3 compounds using a standard curve

- Indicate the slope, intercept, and correlation coefficient (r^2) for each compound
- Sample calculations for determination of analyte concentration

4) Discuss the significance of the data and any caveats for its use; make a recommendation to the Patriot League based on the results.

Public Presentation Video:

Most fans of Patriot League Track & Field have never even heard of HPLC before! Thus, your team's goal is to break the doping control process down into a neatly-packed, engaging and creative video (3 minutes max) educating the public on how doping control works (clearly state the goal in your video). This video will be played in front of your co-workers on the last day of lab.