مختبر مكافحة المنشطات قطر
Anti Doping Lab Qatar

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NEWSLETTER

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Stamina Or Steroids?

جـــرأة أم جـــرعـــة؟

Anti-Doping Lab (ADL) Qatar is the first specialized laboratory of its kind in the Middle East. The state of the art facility will provide anti-doping testing for athletes across the Gulf region as well as West Asia and the rest of the world. Doping control tests will be administered during competition, training and even in the off-season to catch cheats and protect athletes.

Supported by a team of highly qualified scientists, ADLQ is already compliant with ISO/IEC17025. Has already achieved the WADA accreditation for blood analysis in support of the Athlete Biological Passport (ABP). And ADLQ is officially accredited by the World Anti-Doping Agency (WADA) in August 2015, joining an elite group of only 35 labs that have won WADA›s endorsement so far.

ADLQ since accredited has been analyzing tests for major

يعد مختبر مكافحة المنشطات قطر أول مختبر متخصص من نوعه في منطقة الشرق الأوسط وغرب آسيا. ويوفر هذا المختبر، المجهز بأحدث ما توصل اليه العلم من وسائل الاختبارات المعملية، إمكانية اجراء الاختبارات والتحاليل للرياضيين في منطقة الخليج العربي بالاضافة الى غرب آسيا وبقة دول العالم.

ويتم آداء تلك المهام خلال دورات المنافسات الرياضية واثناء التدريبات وحتى في مواسم العطلات للعثور على من يمارس الغش وبهدف حماية الرياضيين الجادين.

وقد حصل المختبر على شهادة الأيزو IEC 17025 كما حصل على الاعتماد الخاص باجراء فحوصات جواز سفر دم الرياضيين من قبل الوكالة العالمية لمكافحة المنشطات وذلك في شهر فبراير من عام 2014.
كما حقق المختبر هدفه الأساسي في الحصول على الاعتماد الدولي الكامل من الوكالة رسميا وذلك في شهر اغسطس من

عام 2015 ليصبح واحدا من 35 مختبر معتمد عالميا فقط.

ومنذ اعتماده، فقد قام المختبر باجراء التحاليل المختلفة لبطولات عديدة في داخل دولة قطر وفي خارجها مثل: دورة الألعاب الثانية لدول مجلس التعاون الخليجي (أكتوبر 2015)، بطولة العالم للسباحة فينا (نوفمبر 2015) واخرى غيرها.

من خلال موقعه في منطقة أسباير زون يسعى مختبر مكافحة المنشطات قطر (ADLQ) لبذل قصار جهوده للقضاء على استخدام وتعاطي العقاقير المنشطة في كافة الرياضات و ان يحافظ على المبادئ الاوليمبية الاصيلة من العدالة والمساواة في الفرص وتشجيع الروح الرياضية النقية. وخلال السعي لتحقيق تلك الاهداف، فان المختبر يتطلع الى جعل الرياضة بجميع ميادينها و اشكالها أكثر عدالة، وأمانا، وصحة لكل من يهتمون بها، وفي طليعتهم الرياضيون.يعد مختبر مكافحة المنشطات قطر أول مختبر متخصص من نوعه في منطقة الشرق الأوسط وغرب آسيا. ويوفر هذا المختبر، المجهز بأحدث ما توصل اليه العلم من وسائل الاختبارات المعملية، إمكانية اجراء الاختبارات والتحاليل للرياضيين في منطقة الخليج العربي بالاضافة الى غرب آسيا وبقة دول العالم.

championships here in Qatar as well as other parts of the world like: 2nd GCC Games (Oct., 2015), IPC Athletics World Championships (Oct., 2015), FINA Swimming World Cup (Nov., 2015), and AFC U-23 Championship (Jan., 2016) and many others. In addition to its main role of fighting Doping, ADL Qatar also strives to make drug education part of health education, lay down norms regulating the use of technology in sport and provide accurate and current information to athletes to help them think critically and make the wise choice of avoiding doping in any form.

Annually, ADLQ hosts its symposium which has become an international event that is dedicated to issues related to sport, doping and science. It has started in 2011 under the theme (The Fight against Doping), then 2012 (Biomedical and Translational Research), 2013 (the History of Doping and Anti-Doping), 2014 (Anti-Doping; Sport Integrity and Public Health) and 2015 (Global Trends in Anti Doping Research). The event is meant to raise awareness on the topics discussed and presented by the experts of their fields from inside Qatar as well internationally, and the symposium is open to public.

Board of Trustees (BOT) Meeting Highlights: Crisis Management and Sustained Operational Excellence

Maintaining service quality and laboratory readiness in times of crisis.

The Board of Trustees (BOT) of Anti-Doping Lab Qatar (ADLQ) convened virtually on June 29, 2026, connecting leadership and board members to review laboratory operations, strategic priorities, and ongoing organizational developments. A central focus of the session addressed ADLQ's proactive crisis management framework and operational resilience during regional and geopolitical disruptions.

The Board received a comprehensive overview of the laboratory's contingency protocols, which successfully mitigated supply chain risks and ensured the uninterrupted procurement of essential testing materials and reagents. Discussions highlighted the laboratory's capability to maintain strict turnaround times and deliver uncompromising testing quality, safeguarding sample integrity for all regional and international partners.

The BOT commended the executive leadership and operational teams for their foresight and unwavering dedication to maintaining business continuity under challenging conditions.

ADLQ Convenes 2026 Townhall to Review Strategic Milestones and Future Focus

Fostering Innovation and Staff Engagement Across Departments

Transparent communication and strategic alignment stand as foundational pillars to building a robust, future-ready organization. Established as a vital internal platform, the annual Townhall reflects the core values of Anti-Doping Lab Qatar by emphasizing operational excellence and keeping staff integrated into the laboratory's overarching vision. Across all departments, the gathering serves as a collective touchpoint, encouraging colleagues to step away from their daily routines and engage deeply with ADLQ's strategic trajectory, WADA reassessment goals, and collective achievements.

In proud alignment with these organizational objectives, the Anti-Doping Lab Qatar community convened on July 26 for the 2026 Townhall. The comprehensive event featured pivotal updates, ranging from the General Manager's report on strategy progress to critical insights on crisis management and the latest sustainability initiatives. Staff members fully embraced the opportunity to engage in open dialogue during the dedicated Q&A and celebrated the impactful creative ideas successfully implemented by their peers. Paired with a warm welcome to new team members and concluding with a vibrant networking session, the successful event underscored ADLQ's enduring dedication to supporting its workforce and echoing a unified vision for sustained excellence.

Establishment and Strategic Initiatives of the ADLQ Sustainability Ambassadors Committee

Fostering a Culture of Environmental Excellence and Resource Efficiency

The Sustainability Ambassadors Committee was established at the Anti-Doping Lab Qatar (ADLQ) by a decision of the Chairman, bringing together 11 departmental representatives to champion environmental stewardship across the organization. Aligned with the goals of Qatar National Vision 2030, the Committee focuses on raising awareness, conserving resources, and embedding green behaviors into daily operations. Having convened three strategic meetings to date, the cross-functional team continues to outline forward-looking action plans.

A primary highlight of this agenda is the rollout of the "My Green Lab" initiative, aimed at auditing workflows and implementing sustainable laboratory protocols to reduce environmental impact. Complementing operational shifts, the workplace environment has been enhanced with indoor green spaces and plants to promote air quality and staff well-being, creating a healthier daily working atmosphere across all laboratory facilities. Resource conservation and waste reduction form another key pillar of the organization's green transition.

Dedicated paper recycling containers have been placed strategically across divisions to curb non-essential printing, while the lab has phased out single-use plastics by installing filtered water dispensers and distributing reusable bottles and tumblers to staff members to encourage responsible everyday consumption habits. To align sustainability with operational cost efficiency, targeted Key Performance Indicators (KPIs) have been established. The Engineering Department is committed to achieving a 10% annual reduction in electricity and water utility expenses, while the General Services Department targets a 10% cut in paper consumption alongside a 10% annual increase in employee participation, reinforcing the shared principle that every small action counts.

Moving forward, the Committee will continue expanding initiatives to embed environmental responsibility across all laboratory operations. By championing resource efficiency, active employee engagement, and practical everyday actions, ADLQ remains committed to fostering a sustainable workplace that generates a lasting positive impact for future generations.

Participation in the 3rd Asia Association of Anti-Doping Scientists (AAADS) Workshop

Advancing Regional Anti-Doping Science

Anti-Doping Laboratory Qatar (ADLQ) participated for the second year in a row in the 3rd Asia Association of Anti-Doping Scientists (AAADS) Workshop, hosted by the Beijing Anti-Doping Laboratory in Beijing, China, on 31 May–1 June 2026. The workshop brought together laboratory directors, scientists and quality managers from anti-doping laboratories and organizations across Asia to promote scientific collaboration, technical innovation, and the harmonization of laboratory practices.

The scientific programme featured presentations on emerging analytical methodologies, including advances in GC/C/IRMS sample purification, laboratory information management systems (LIMS), steroid profiling, erythropoietin (EPO) testing, quality assurance case studies, and automated sample preparation technologies. Interactive discussions also focused on the implementation challenges associated with the upcoming WADA International Standard for Laboratories (ISL) and Technical Documents (TDs) for 2027, as well as the results of 2026 AAADS IQAS and planning for the Cross-Laboratory IQAS 2027.

A laboratory tour and dedicated technical discussions provided participants with an opportunity to exchange practical experiences, review analytical workflows, and discuss quality management practices with colleagues from anti-doping laboratories across the Asian region.

Participation in the AAADS Workshop reinforces ADLQ›s commitment to continuous scientific development, international collaboration, and the adoption of best practices in anti-doping analysis. The knowledge and insights gained during the meeting will contribute to strengthening laboratory operations, enhancing analytical capability, and supporting the global mission to protect clean sport.

Exploring the Future of Clean Sport: ADLQ Hosts Café Scientifique on AI

Engaging Session Sparks Critical Dialogue on AI in Anti-Doping

On June 24th, Anti-Doping Lab Qatar hosted a highly engaging session of Café Scientifique at the ADLQ Cafeteria, centering on the thought-provoking theme, “AI in Anti-Doping: Smarter Detection or a Threat to Fair Play?”

The event brought together staff for a critical discussion on the complex and evolving role of Artificial Intelligence in modern sports. Participants explored how AI promises to be a powerful addition to the anti-doping arsenal capable of identifying subtle biological patterns and performance anomalies; while also debating the vital ethical concerns it raises regarding transparency, data privacy, and fairness. The successful gathering provided an open forum to weigh these technological breakthroughs against practical dilemmas, highlighting the laboratory’s commitment to staying at the forefront of scientific advancements and fostering dynamic conversations around the protection of clean sport.

MOPH Delegation Visits Anti-Doping Lab Qatar to Strengthen Collaboration

Strengthening regulatory alignment and testing operations.

The Anti-Doping Lab Qatar (ADLQ) hosted a delegation from the Ministry of Public Health (MOPH), led by Dr. Manal Borhan Al-Zaidan, Director of Pharmacy and Drug Control, to strengthen collaboration and coordination in the areas of drug control, laboratory operations, and anti-doping operation logistics.

Dr. Maneera Yousef Al-Jaber, Laboratory Director and Qatar APMU Director, delivered an overview of ADLQ's specialized divisions, key achievements, national and international activities, sample analysis capabilities, and WADA and NATA accreditations. Discussions focused on the procurement and regulatory permits, clearances, and other laboratory supplies required for testing and research.

The meeting also explored areas of cooperation between ADLQ and the MOPH Drug Control Department. The visit included a tour of the labs providing the delegation with an overview of its specialized facilities and operational capabilities.

The visit concluded with a token of appreciation to Dr. Manal and MPH team of the commitment of both institutions to continued collaboration and to supporting Qatar's efforts in drug control and anti-doping.

ADLQ Welcomes RACA Representatives to Showcase Institutional Alignment with New Values

Exchanging Best Practices on Institutional Culture and Core Values

Institutional synergy and cultural integrity serve as essential cornerstones in building a high-performing, future-ready public sector. Demonstrating a shared commitment to national excellence, Anti-Doping Lab Qatar (ADLQ) recently hosted representatives from the Regulatory Authority for Charitable Activities (RACA). The benchmark visit centered on exchanging institutional best practices and observing firsthand how ADLQ has successfully embedded Qatar's national government values into its operational framework, organizational identity, and long-term strategic direction.

During the session, the visitors received an introduction to ADLQ's overarching mandate, followed by a guided walk-through of the laboratory's facilities. Representatives from the laboratory showcased the tailored internal roadmaps, awareness campaigns, and engagement initiatives implemented to foster these guiding values across all departments. The productive meeting highlighted how intentional cultural alignment drives transparency and workplace synergy, underscoring ADLQ's dedication to upholding national standards and fostering peer-to-peer institutional collaboration.

Ministry of Environment and Climate Change Visits Qatar Anti-Doping Laboratory to Strengthen Scientific and Research Collaboration

The Qatar Anti-Doping Laboratory welcomed a delegation from the Ministry of Environment and Climate Change as part of an initiative to explore opportunities for collaboration and strengthen coordination in scientific, research, and technical fields, while promoting the exchange of expertise and knowledge to support professional development and sustainable practices.

The delegation included representatives from the Environmental Monitoring and Inspection Department:
•Mr. Yousef Nasr – Environmental Laboratory Section
•Mr. Muhannad Nasr – Marine and Soil Environmental Quality Section
•Mr. Mohammed Abu Jalala – Air Quality Section
•Mr. Khalil Al Balushi – Environmental Inspection Section

Representatives from the Chemicals and Hazardous Waste Department also participated in the visit:
•Ms. Rawda Al Mohammadi
•Ms. Maria Al Haqi

During the meeting, both sides explored areas of mutual interest and discussed opportunities for collaboration, knowledge sharing, and the exchange of technical expertise. The discussions also highlighted the specialized capabilities of both organizations and potential opportunities to further enhance technical and research excellence.

The visit marks an important first step toward building a fruitful and sustainable partnership between the two organizations, opening new avenues for collaboration and knowledge exchange in support of shared scientific, technical, and environmental objectives.

Laboratory Training Unit (LTU): Advancing Learning, Development, and Sustainability

Introduction

The Laboratory Training Unit (LTU) was established in October 2025 with the mission of coordinating and overseeing all laboratory training activities while ensuring the continuous professional development of laboratory personnel. Since its establishment, LTU has become a cornerstone of the laboratory's commitment to excellence, workforce development, and lifelong learning.

The creation of LTU stemmed from the vision of the Laboratory Director, whose initiative was fully supported and endorsed by the laboratory top management. Recognizing the critical role of structured training in maintaining high-quality laboratory services, LTU was established to strengthen training governance, competency management, and professional development across all laboratory sections.

Vision and Objectives

LTU is dedicated to building a highly competent, knowledgeable, and future-ready workforce through the implementation of effective training programs and continuous learning opportunities. Its key objectives include:

- Coordinating and monitoring laboratory training activities.
- Supporting competency-based development of technical staff.
- Ensuring compliance with training and accreditation requirements.
- Promoting a culture of continuous learning and professional growth.
- Leveraging digital solutions to enhance training management and efficiency.
- Supporting sustainability initiatives through paperless processes and digital transformation.

Alignment with Strategic and National Priorities

Supporting the laboratory's strategic goals and reinforcing its commitment to continuous improvement and organizational excellence, LTU has implemented the training software (ADLearn). By integrating digital solutions into training management processes, the laboratory has strengthened governance, improved process efficiency, and enhanced workforce development.

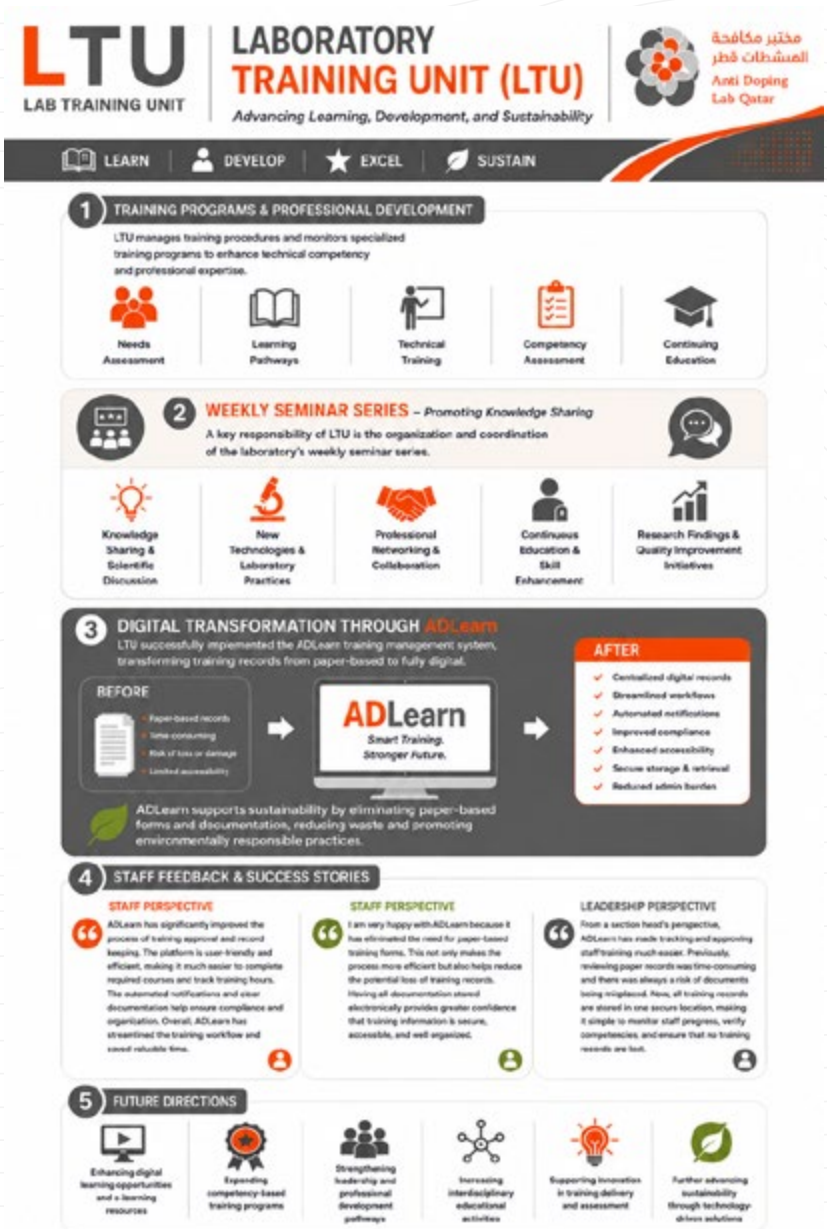
Furthermore, ADLearn contributes to the achievement of broader national priorities outlined in Qatar National Vision 2030 and Qatar's Third National Development Strategy (NDS-3), particularly in the areas of:

- Digital transformation.
- Human capital development.
- Innovation and knowledge-based growth.
- Operational excellence.
- Environmental sustainability.

Conclusion

Since its establishment in September 2025, the Laboratory Training Unit has become a driving force for professional development, knowledge sharing, and organizational excellence. Through its leadership in training coordination, competency management, educational activities, and digital transformation, LTU has strengthened the laboratory's learning culture and improved the effectiveness of workforce development processes.

The successful implementation of ADLearn stands as a milestone achievement, demonstrating how innovation can enhance operational performance while supporting sustainability and strategic objectives. As LTU continues to evolve, it remains committed to empowering staff, fostering continuous learning, and contributing to the laboratory's ongoing pursuit of excellence in alignment with organizational and national goals.



Role of GC/C/IRMS in Anti-Doping: Advancing Excellence at ADLQ

by Haseen Jamal, Senior Scientist, IRMS Section, ADLQ

The detection of doping involving endogenous anabolic steroids remains one of the most scientifically complex challenges in anti-doping. While conventional analytical techniques can identify atypical steroid profiles, they are often insufficient to conclusively distinguish between endogenous production and exogenous administration. In this context, Gas Chromatography/Combustion/Isotope Ratio Mass Spectrometry (GC/C/IRMS) has emerged as a cornerstone of confirmatory analysis, providing a robust and scientifically defensible solution.

Fig. 1: GC/C/IRMS

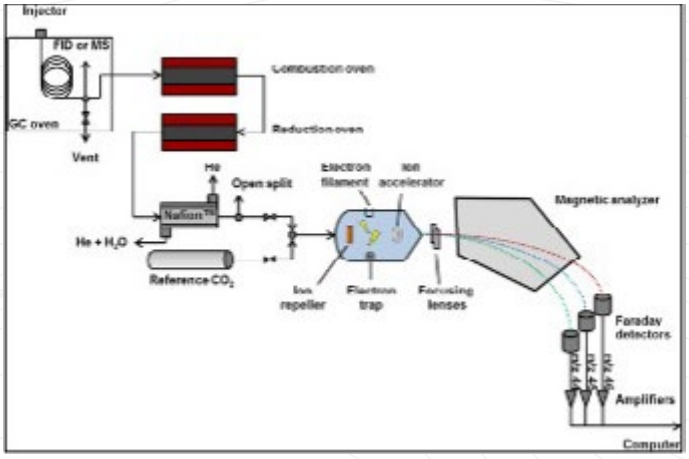


Fig. 2: Schematic Diagram of GC/C/IRMS

GC/C/IRMS operates by measuring the carbon isotope ratio ($\delta^{13}C$) of steroid molecules. The scientific foundation of this approach lies in the fact that synthetic anabolic steroids are typically derived from plant precursors, which exhibit distinct ^{13}C depletion compared to human endogenous steroids. This difference enables the clear differentiation of steroid origin through isotopic fingerprinting.

The technique is applied through a comparative approach, where $\delta^{13}C$ values of target compounds (TCs) such as testosterone metabolites, 19-norandrosterone or Boldenone are evaluated against endogenous reference compounds (ERCs) within the same sample. A significant isotopic deviation between TCs and ERCs provides strong evidence of exogenous administration. This principle is well established and forms the basis of mandatory confirmatory testing under World Anti-Doping Agency (WADA) technical documents (TD IRMS).

Over the past two decades, GC/C/IRMS has evolved into the gold standard confirmatory method in anti-doping laboratories. Standardization through WADA technical documents has ensured harmonized methodologies, improved inter-laboratory comparability, and strengthened the reliability of isotope ratio measurements.

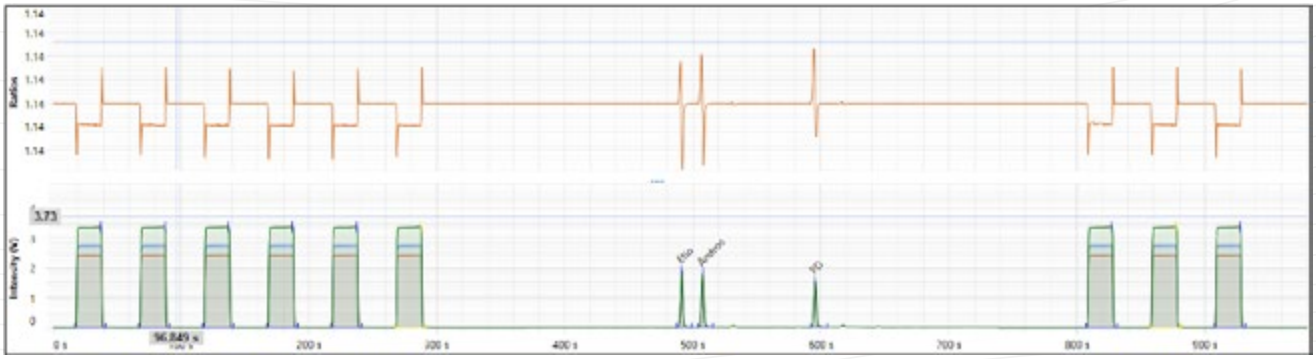


Fig. 3: Chromatographic GC/C/IRMS profile of certified reference standard

At the Anti-Doping Laboratory Qatar (ADLQ), GC/C/IRMS capabilities have been progressively strengthened in alignment with international best practices. A key milestone has been the development and accreditation of the 19-norandrosterone (19-NA) IRMS method, significantly enhancing the laboratory's ability to confirm exogenous nandrolone administration, particularly in low-concentration and complex cases. This achievement reflects ADLQ's commitment to ISO/IEC 17025 compliance and adherence to WADA technical requirements.

Building on this success, ADLQ is currently advancing its analytical scope through the development of a boldenone IRMS method. The detection of boldenone misuse presents unique scientific challenges due to reported cases of endogenous formation and microbial transformation, which complicate interpretation. Recent studies have demonstrated the applicability of isotope ratio analysis to boldenone and its metabolites, reinforcing its importance in addressing emerging analytical challenges.

Despite its strengths, GC/C/IRMS remains analytically demanding. Reliable isotope measurements require extensive sample purification, chromatographic separation, and strict control of analytical conditions, as urine is a highly complex biological matrix.

These requirements highlight the need for advanced technical expertise and robust quality systems, areas in which ADLQ continues to demonstrate strong capability.

In conclusion, GC/C/IRMS remains an indispensable tool in modern anti-doping science, uniquely capable of distinguishing endogenous from exogenous steroid sources with high certainty. Through the successful implementation of advanced methods such as the 19-NA IRMS method and ongoing development of boldenone IRMS capabilities, ADLQ exemplifies scientific excellence and innovation, contributing to the global effort to uphold fair play and integrity in sport.

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Machine Learning to Unmask Anti-Doping Sample Reuse

by Dr. Souhail Kraiem

Introduction

Elite athletes are routinely subjected to doping-control procedures and must provide biological samples for testing. Urine continues to be the primary specimen used in anti-doping programs because it offers high analytical sensitivity and a longer detection window for many prohibited substances.

As testing methods have become more advanced, some athletes have adopted increasingly sophisticated strategies to avoid detection, as highlighted by events surrounding the Sochi 2014 Olympic Games. One such strategy is sample substitution, in which a potentially positive urine sample is replaced with one that does not contain banned substances. This can occur either by submitting urine from another athlete or by reusing a previously collected sample from the same athlete that predates the use of a prohibited substance. The first scenario can often be identified because each athlete has a distinct and relatively stable steroid profile.

These profiles are monitored through the steroidal module of the Athlete Biological Passport (ABP), which tracks endogenous steroid concentrations and ratios over time. Significant deviations from an athlete's established baseline or individualized limits can trigger further investigation. Developed by the World Anti-Doping Agency (WADA), the ABP uses statistical approaches, including Bayesian modeling, to identify unusual profiles. Machine-learning techniques have also been explored for detecting sample substitution. However, when an athlete replaces a sample with their own previously collected clean urine, detection becomes substantially more challenging. Because the substitute originates from the same individual, its steroid profile remains consistent with the athlete's longitudinal record. The challenge increases further when the reused sample is analyzed at a different time or by another WADA-accredited laboratory, where no automatic mechanism exists to recognize the specimen as identical. Historically, such cases have been uncovered only by coincidence, usually when both samples were processed within the same laboratory over a short period.

The case of Russian Paralympic cross-country skier and biathlon athlete Nikolay Polukhin during the Sochi 2014 Paralympic Winter Games illustrates this issue. Investigations found that contaminated samples had been exchanged for clean urine supplied by the athlete himself to conceal prohibited substance use. Forensic examination of the sample container revealed evidence of tampering, while DNA testing confirmed that the urine belonged to Polukhin, demonstrating reuse of his own sample. As a result, his performances were annulled, including one gold medal and two silver medals.

Despite progress in steroid profiling and longitudinal monitoring, detecting the reuse of samples from the same athlete remains an unresolved technical challenge. The ABP contains thousands of samples collected across many years from numerous athletes and analyzed by different WADA-accredited laboratories. At present, no automated system exists to compare a newly submitted sample against this extensive archive to identify possible reuse. Manual comparison is impractical because of both the volume of data and the complexity of multidimensional steroid profiles. Although biological and analytical variability may introduce minor differences, reused samples from the same athlete generally display almost identical steroid concentrations and ratios.

Across all measured steroid markers and ratios, existing machine-learning applications in anti-doping have largely focused on detecting abnormal values associated with doping rather than identifying duplicate profiles across time. Consequently, reliable detection of sample reuse remains an open challenge in anti-doping analytics.

To address this limitation, a machine-learning-based similarity detection framework has been proposed to identify reused or duplicate urine samples with high specificity. The aim is to detect suspicious sample pairs submitted by the same athlete at different points in time using only steroid-profile information.

Although normal biological variation can introduce some noise into longitudinal datasets, truly identical samples are expected to exhibit extremely high agreement across all steroid markers and derived ratios.

How the Model Works

The steroidal module of the ABP monitors an athlete's steroid profile over time. These longitudinal records are generated from routine testing procedures performed by anti-doping laboratories. When a profile contains values approaching or exceeding individualized passport thresholds, the complete steroid profile for that sample may be reviewed by the Athlete Passport Management Unit (APMU). During confirmation, laboratories apply a slightly modified preparation procedure that can reduce measurement uncertainty and improve analytical precision.

The proposed anti-doping sample-swapping detection system uses a machine-learning similarity framework based on a Convolutional Neural Network (CNN). Its purpose is to identify pairs of urine samples from the same athlete that are identical or highly similar according to their steroid profiles. This approach targets a difficult form of manipulation in which athletes reuse previously collected clean urine samples to avoid detection.

The model formulates similarity detection as a binary classification task. Given two steroid profiles, it predicts whether they originate from the same athlete. The central assumption is that, despite minor biological and technical variation, duplicated samples will demonstrate near-perfect correspondence across steroid markers and derived ratios.
Each profile contains urinary concentrations of major endogenous steroids, such as testosterone, epitestosterone, and androsterone, together with calculated ratios including T/E and A/T.

To reflect real-world testing conditions, measurement uncertainty, which typically ranges from 15% to 30% during initial analysis, was standardized at 15% for all steroid variables.

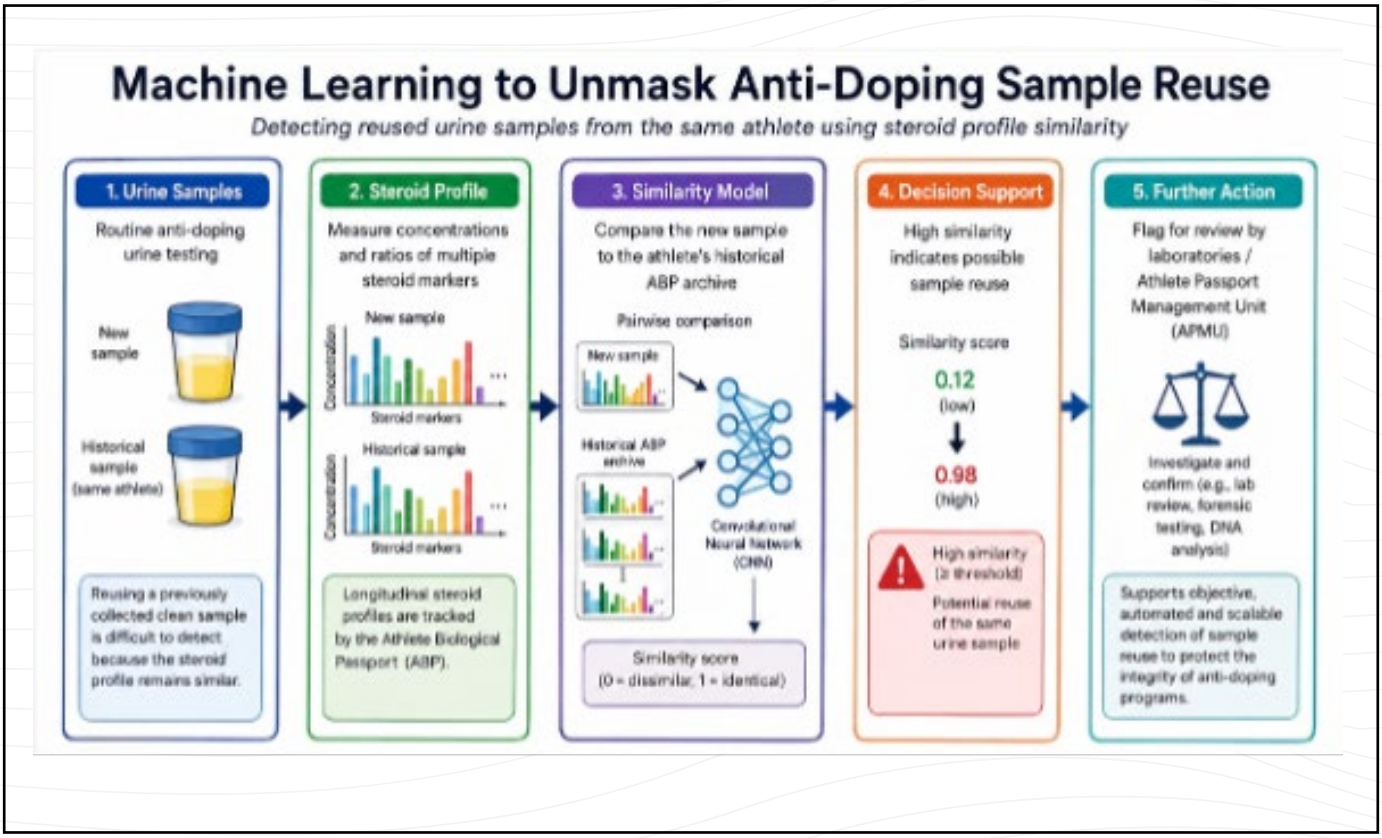
The robustness of the model was evaluated using laboratory confirmed samples, where the same urine specimen was reanalyzed using a slightly modified procedure. This approach captures both biological consistency and procedural variation encountered in practice.

After training, the CNN functions as a similarity-scoring engine. For each test sample, candidate pairs are created by matching it against all other samples in the historical database. Each pair is processed by the trained network, which produces a probability score indicating the likelihood that the profiles are highly similar.
Once trained, the CNN acts as a similarity scoring function, For a given test sample, it generates candidate profiles by pairing it with every other sample in the historical dataset, Each profile pair is fed into the trained CNN, which outputs a probability score representing the likelihood of similarity.

Conclusion

The replacement of a urine sample that could lead to an adverse analytical finding with a previously collected, drug-free sample is a prohibited practice under World Anti-Doping Agency (WADA) regulations and is commonly known as sample swapping. Detecting this form of manipulation is particularly challenging when athletes substitute samples with their own previously collected urine, as conventional analytical approaches often fail to identify such cases.

The implementation of automated detection methods highlights the potential of machine learning to enhance anti-doping programs by enabling the systematic identification of reused or highly similar urine samples within the extensive datasets maintained through the Athlete Biological Passport framework.



Streamlined, Single-Step SAR-PAGE Analysis for Rapid EPO Detection in Antidoping

by Dr. Konduru Seetharama Sastry

At the recent Cologne conference, our team presented a poster showcasing a significant advancement in the detection of recombinant human erythropoietin (EPO) for antidoping purposes. The work, titled "Streamlined, single-step SAR-PAGE analysis for rapid EPO detection in Antidoping," addresses a critical need in the field: the demand for faster, more efficient testing without compromising sensitivity or specificity.

The Challenge

Currently, the World Anti-Doping Agency (WADA) protocol (TD2024EPO) for EPO detection relies on a two-step Western blot format following SAR-PAGE electrophoresis.

While highly specific and robust, this procedure is time-consuming, requiring up to 24 hours for the detection of endogenous and recombinant EPO species from enriched samples. The protocol involves immunoaffinity enrichment, gel electrophoresis, membrane transfer, and subsequent incubation with a primary anti-EPO antibody, followed by a secondary antibody conjugated to horseradish peroxidase (HRP) for chemiluminescent detection.

This extended turnaround time poses significant challenges during major sporting events, where laboratories must analyse hundreds of samples within a short timeframe to support effective antidoping enforcement. Additionally, the use of secondary antibodies may introduce non-specific cross-reactivity, which can complicate result interpretation and delay confirmatory analysis.

Our Approach

Building on our previously published proof-of-concept work (Voss et al., 2021), we developed and validated a streamlined protocol using a directly labelled anti-EPO primary antibody–HRP conjugate (AE7A5-HRP). The conjugate was generated in-house and subsequently characterized to confirm successful conjugation and functional integrity.

The performance of the AE7A5-HRP conjugate was systematically compared with the conventional two-step method used in WADA-accredited laboratories. Analytical specificity was evaluated using multiple EPO isoforms and related molecules, including EPO-α, EPO-β, darbepoetin, and MIRCERA, as well as irrelevant proteins.

Sensitivity and signal quality were assessed in both spiked reference materials and authentic doping-control urine samples. Key assay parameters - including washing buffers, detergent use, and conjugate concentration - were systematically optimized.

Key Findings

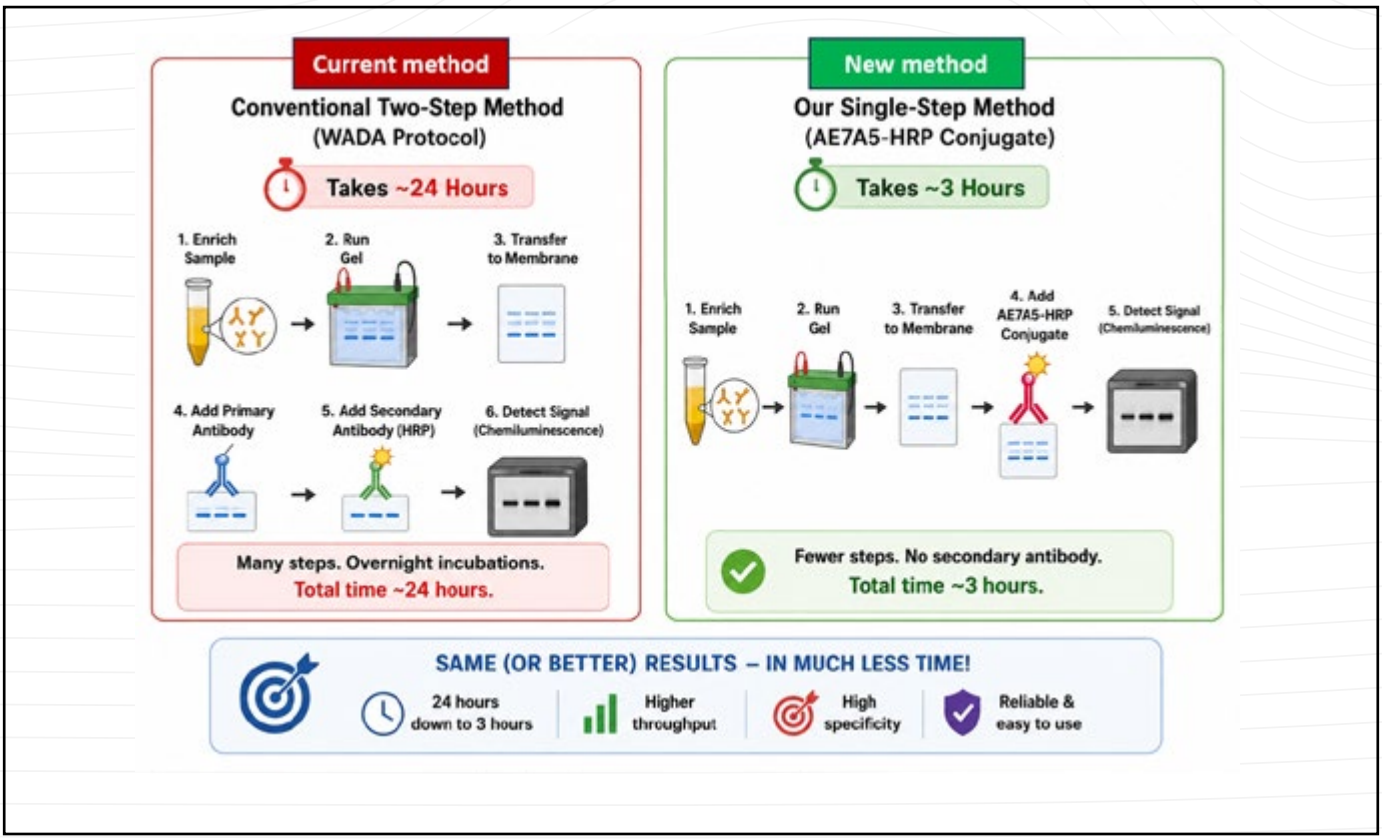
The results were highly encouraging. The AE7A5-HRP conjugate detected all tested EPO forms with no observable binding to irrelevant proteins, confirming that the specificity of the conjugate was comparable to that of the unconjugated AE7A5 antibody. Sensitivity was at least equivalent to the conventional protocol, with the HRP-conjugated antibody often producing stronger signal intensities for EPO bands than the unconjugated primary antibody with secondary antibody detection.

In real doping-control urine samples, the in-house conjugate robustly detected EPO, again with higher band intensities than the standard method. The conjugate was also able to detect EPO in as little as 250 µL of serum, supporting its potential extension to blood-based applications—an area of growing interest in antidoping testing.

The most significant advantage, however, was the dramatic reduction in analysis time. Using the optimized single-step protocol, the total analysis time for enriched samples—from membrane blocking to signal acquisition—was reduced from approximately 24 hours to about 3 hours. This same-day reporting capability represents a dramatic shift in EPO testing workflows.

Reproducibility and Robustness

Importantly, the assay demonstrated excellent reproducibility, with inter- and intra-assay coefficients of variation below 15%. The conjugations showed robust reproducibility across multiple preparations, and the assay demonstrated rapid adaptability across operators, indicating that the protocol can be readily implemented in routine laboratory settings.



Conclusion and Impact

The AE7A5-HRP conjugate antibody enables same-day EPO Western blot results, eliminating the need for a secondary antibody and substantially increasing sample throughput.

This approach could be particularly valuable during major sporting events, where rapid and reliable analysis of large numbers of samples is critical for effective antidoping control.

By reducing analysis time from 24 hours to just 3 hours while maintaining—and often improving—signal intensity and specificity, this streamlined protocol offers a practical solution to the growing demands on antidoping laboratories. The method not only enhances operational efficiency but also reduces the potential for procedural errors and non-specific cross-reactivity, ultimately contributing to more reliable and timely antidoping enforcement.

This work represents an important step forward in the ongoing evolution of EPO detection methodologies, and we are excited to continue refining and validating this approach for broader implementation in the antidoping community.

Keeping Pace with Science: The Evolving Landscape of Anti-Doping

by Dr. Vandana, DD ORQM

Anti-doping science plays a critical role in protecting the integrity of sport. As new performance-enhancing substances and methods emerge, laboratories must continuously adapt their analytical strategies to detect them. Advances in analytical chemistry, biological monitoring, and data science are helping anti-doping laboratories detect substances at extremely low concentrations and identify biological changes associated with doping.

Continuous research supported by organizations such as the World Anti-Doping Agency has expanded the scientific tools available to laboratories worldwide, including new detection technologies, biomarker discovery, and innovative testing strategies.

Advances in Analytical Technologies

One of the most significant developments in anti-doping science is the use of advanced mass spectrometry-based analytical techniques. Instruments such as high-resolution mass spectrometry (HRMS) and modern LC–MS/MS platforms enable laboratories to detect prohibited substances and their metabolites at extremely low concentrations.

Recent scientific developments include improved chromatographic separation methods and techniques such as ion mobility spectrometry, which can help differentiate compounds with very similar structures. These approaches increase confidence in identifying designer drugs and previously unknown metabolites.

Another important trend is retrospective analysis. Analytical data from previously tested samples can be stored and re-examined when new substances or metabolites are identified. This strategy extends the effectiveness of testing programs and acts as a strong deterrent against doping.

Detection of Emerging Substances

The continuous emergence of new performance-enhancing compounds remains one of the biggest challenges in anti-doping science.

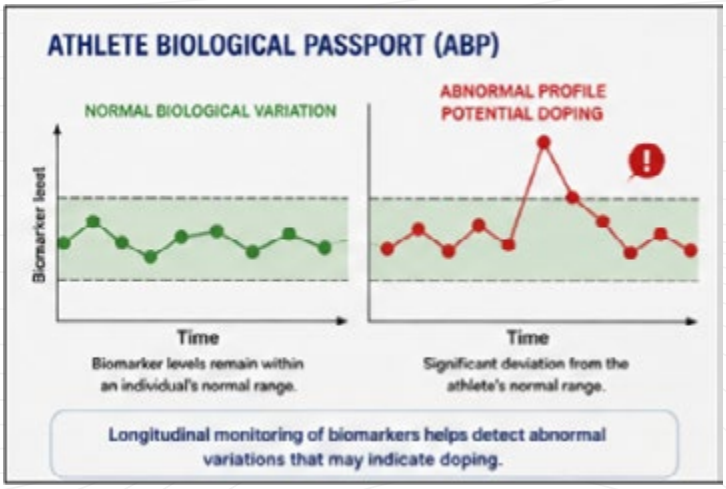
Among the substances receiving increased scientific attention are selective androgen receptor modulators (SARMs) and plant-derived anabolic compounds such as Ecdysterone. These compounds may promote muscle growth and recovery, making them attractive for misuse by athletes.

Scientific research is therefore focused on identifying long-term metabolites and developing sensitive analytical methods to ensure reliable detection.

Athlete Biological Passport and Advanced Biomarkers

Traditional anti-doping testing relied mainly on detecting prohibited substances directly in biological samples. However, modern strategies increasingly rely on longitudinal monitoring of biological markers.

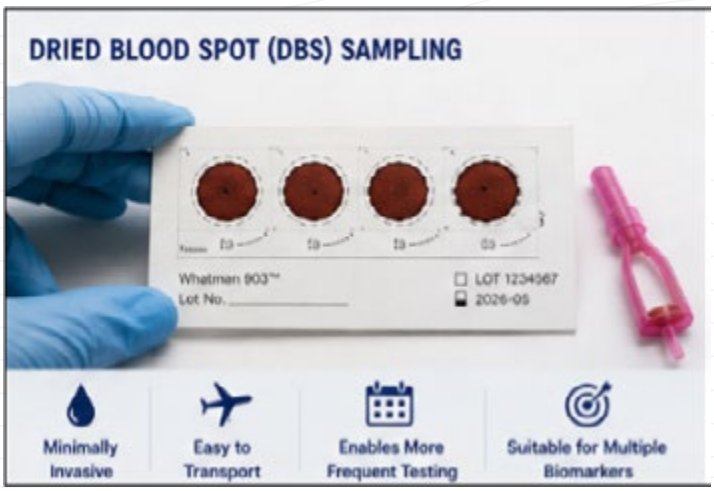
The Athlete Biological Passport (ABP) monitors changes in specific biomarkers over time. Rather than identifying a substance itself, this approach detects abnormal variations in an athlete's biological profile that may indicate doping.
Recent research is exploring new biomarkers and improved statistical models, which could further enhance the sensitivity of the biological passport and strengthen the detection of micro-dosing strategies.



Dried Blood Spot Testing and New Sampling Strategies

Another emerging trend in anti-doping testing is the use of dried blood spot (DBS) sampling.

This method involves collecting a small amount of blood on filter paper, which can then be analyzed for specific biomarkers or prohibited substances.DBS sampling is minimally invasive, easier to transport, and allows more frequent testing compared to traditional blood sampling. As analytical technologies continue to improve, DBS may become an increasingly valuable tool in anti-doping programs.



Artificial Intelligence and Data-Driven Anti-Doping

Modern anti-doping programs generate large volumes of analytical and biological data. Researchers are increasingly exploring the use of machine learning and artificial intelligence to analyze this data more effectively.

AI-based models may help identify abnormal patterns in biological passport data, improve risk-based testing strategies, and support the interpretation of complex analytical datasets. These data-driven approaches are expected to become an important component of future anti-doping programs.

Gene Doping

A potential threat in sport is gene doping, which involves modifying genetic material to enhance athletic performance.

Although confirmed cases are extremely rare, scientific research is actively exploring detection methods based on molecular biology and genomic analysis. Early detection strategies focus on identifying genetic markers or abnormal expression of specific proteins associated with gene manipulation.

Conclusion

Anti-doping science continues to evolve in response to increasingly sophisticated doping practices. Advances in analytical technologies, biological monitoring, and data science are strengthening the global anti-doping system and helping laboratories detect prohibited substances with greater accuracy and sensitivity.

Through continued research, collaboration, and technological innovation, the anti-doping community remains committed to protecting clean athletes and maintaining fair competition in sport.

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doi: 10.1016/j.jpba.2021.114312

Anti-Doping Lab Qatar Celebrates Cultural Diversity at International Food Day

Embracing Global Heritage with Culinary Delights, Games, and Family Fun

On May 10, Anti-Doping Lab Qatar hosted its International Food Day, bringing the team together to celebrate the rich cultural backgrounds of our staff. The vibrant agenda featured a spectacular culinary journey, allowing colleagues to share and experience a wide array of authentic dishes from different cultures around the world. Complementing the global feast, the event included a variety of engaging segments, featuring interactive games that sparked joy and friendly connection across all departments.

A special highlight of the celebration was the dedicated kids' corner, a lively and welcoming space designed to involve our extended family in the festivities. Complete with fun activities and specialized entertainment, it provided a memorable experience for the younger attendees. By sharing our diverse traditions and enjoying these interactive moments together, the event deeply resonated with everyone, fostering a stronger sense of community, inclusivity, and unity within the laboratory.

Anti-Doping Lab Qatar Highlights Core Values at Efficiency Activity

Combining the Spirit of Eid with Teamwork and Creative Thinking

On May 21, Anti-Doping Lab Qatar hosted a special "Efficiency Activity with Eid Spirit," bringing the team together as part of the ongoing ADLQ Values Program. The vibrant agenda featured an interactive and enjoyable experience, allowing colleagues to celebrate the festive joy of Eid while focusing on the laboratory's core value of efficiency. Complementing the celebration, the event included a variety of engaging segments designed to encourage teamwork and spark creative thinking in a fun and welcoming atmosphere across all departments.

A special highlight of the gathering was the interactive games and collaborative challenges, which provided a memorable experience for the attendees. By sharing in the festive spirit and exploring these core principles together, the event deeply resonated with everyone, fostering a stronger sense of community, collaboration, and continuous improvement within the laboratory.

ADLQ Seminars & Workshops

The Art of Initiative and Working Smart and Effectively

A seminar titled “The Art of Initiative and Working Smart and Effectively” was delivered to staff, highlighting the value of proactive thinking, personal accountability, and effective work practices.

WADA Laboratories in the Anti-Doping Ecosystem

A seminar titled “WADA Laboratories in the Anti-Doping Ecosystem” was delivered to staff, providing an overview of the role of WADA-accredited laboratories within the global anti-doping framework. The session explored laboratory responsibilities and the importance of scientific excellence in protecting the integrity of sport.

How to Deal with People with Disabilities

A workshop titled “How to Deal with People with Disabilities” was delivered to registered Arabic-speaking administrators and laboratory staff, exploring best practices when interacting with people with disabilities to promote a culture of respect and inclusion in the workplace.

ADLQ Seminars & Workshops

Enterprise Cyber Crisis Management Framework

A seminar titled “Enterprise Cyber Crisis Management Framework” was delivered to staff, raising awareness of the framework and exploring key strategies for effective cyber crisis management, digital resilience, and organizational preparedness.

Innovation and Enhancing a Culture of Employee Excellence

A seminar titled “Innovation and Enhancing a Culture of Employee Excellence” was delivered to staff, highlighting the importance of innovation in improving government performance, promoting a culture of employee excellence, and building a work environment that fosters creativity and continuous development.

ADLQ Upcoming Events

ADLQ Symposium

Date: 29th November - 1st December 2026

Looking ahead to the end of the year, the ADLQ Symposium will serve as our premier gathering for scientific excellence. This event will bring together global experts to discuss cutting-edge research and the future of anti-doping technology.

It is a key opportunity for the laboratory to showcase its commitment to innovation and leadership within the international scientific community.

Celebrating Professional Excellence: ADLQ Colleague Earns Diploma in Taxation

Mesfer Al-Marri Successfully Completes Rigorous Certification through QCPA and UKM

Anti-Doping Lab Qatar proudly congratulates Mesfer Salem Abu Shehab Al-Marri on attaining the Professional Diploma in Taxation. This remarkable recognition, earned following an intensive 85-hour certification program in collaboration with the Qatar Association of Certified Public Accountants (QCPA) and Universiti Kebangsaan Malaysia (UKM), highlights his exceptional dedication to professional advancement, reflecting the high caliber of professionals within our organization.

His achievement stands as an inspiration to the entire team and reinforces ADLQ's ongoing commitment to supporting the continuous educational and professional development of its staff.

Staff Innovations Spotlight

ADLearn: Lab Staff Training Management e-Platform

Innovators: Aisha Al-Wahaibi & Eman Ahmed | Department: Lab Training

A digital training management initiative titled "ADLearn" was introduced to transition existing paper-based records into a centralized digital hub. The e-platform streamlines workflows through automated notifications, enhances regulatory compliance, and reduces administrative overhead while supporting organizational sustainability goals.

Financial Dashboard

Innovator: Alia Al-Kaabi | Department: Finance Department

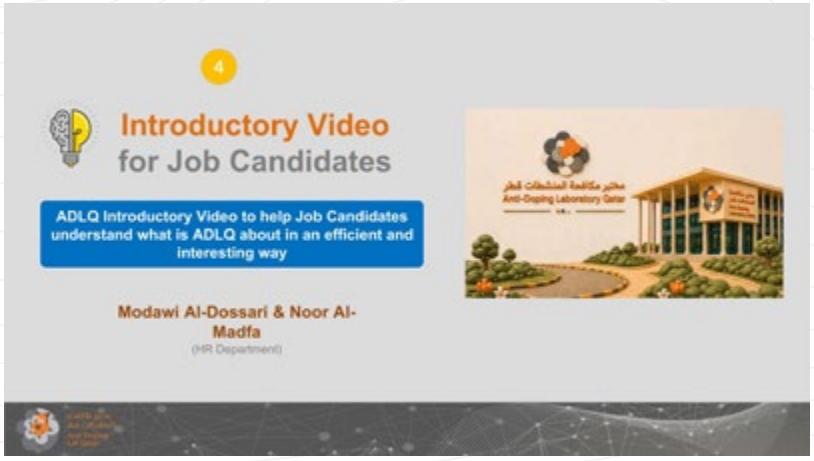
A centralized "Financial Dashboard" project was delivered to establish real-time reporting, budget tracking, and performance visibility. The initiative eliminates manual inquiries by consolidating budgets and financial reports into a single access point, strengthening internal governance and enabling faster, data-driven operational decisions.

Staff Innovations Spotlight

Employees Statistics Dashboard

Presenter: Sharifa Al-Ansari | Department: IT Department

A comprehensive workforce project titled “Employees Statistics Dashboard” was presented to provide HR with centralized employee metrics. Incorporating AI-driven predictive insights, retention tracking, milestone automations, and an automated resume parser, the platform enhances HR capabilities and operational efficiency.



Introductory Video for Job Candidates

Innovator: Modawi Al-Dossari | Presenter: Noor Al-Madfa | Department: HR Department

An initiative to revamp prospective talent engagement was introduced, converting traditional slide presentations into a short, high-impact introductory video. The production delivers a standardized, professional first impression of ADLQ for candidates while significantly conserving staff time and presentation resources.

Staff Innovations: Shaping the Future of Anti-Doping Lab Qatar

Share Your Ideas and Suggestions to Drive Organizational Excellence

We believe our greatest asset is the expertise and innovations of our team. To better reflect the high caliber of strategic thinking across our departments, we have this space we title Staff Innovations.

This is your dedicated platform to share forward-thinking ideas, process improvements, and creative suggestions. Whether it is a small operational tweak or a major strategic initiative, your voice matters. Submit your concepts to be reviewed, considered, and potentially brought to life as we work together to advance our institutional goals.

Ready to share your idea? Scan the QR code above to submit your innovation.