Advances in Anti-Doping Science

Newsletter | National Dope Testing Laboratory

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NDTL

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CONTENTS

Director's Message

The National Dope Testing Laboratory (NDTL), New Delhi has always been a hub of innovations in research management and serving the country for the past 15 years in the capacity of Anti-Doping Analysis facility in sports. In this short time span, NDTL has truly made great steps towards “development” in line with upgradation of infrastructure, instrumentation and research etc. It has evolved into a cutting-edge facility with state-of-the-art instrumentation and advanced research infrastructure dedicated to Anti-Doping Science.

NDTL has embraced a vision of being a respective laboratory worldwide by providing Dope Testing results as per World Anti-Doping Agency (WADA) International Standard Laboratories (ISLs) and making joint collaborations with renowned research institutes like CSIR-IIIM, Jammu and NIPERs to develop 19 rare Reference Materials (RMs). The laboratory has demonstrated steady advancement in the synthesis of RMs, as well as in continuation recognition from Scientific and Industrial Research Organizations (SIROs) and acquiring patents. In alignment with India's aspiration for self-reliance across all sectors and in accordance with governmental frame works.

The concerted efforts of NDTL scientists, technical experts, and supporting staff have been instrumental in achieving goals and ensuring timely delivery of results. Our Scientists are providing sharing the knowledge with other WADA Accredited Laboratories. At NDTL, we cultivate a culture of excellence among our scientific and technical personnel, instilling in them a sense of duty, integrity, and accountability. We encourage them to embrace a scientific mind-set, foster creativity, independence, and collaboration, and engage in pioneering research endeavours.

The infrastructure and manpower is being constantly upgraded to meet the Laboratory requirement for carrying out advanced Research & Development activities and through other proposed setup like Athlete Passport Management Unit (APMU) is under progress. The NDTL will have its statutory entity under the umbrella of National Anti-Doping Act 2022, which would further strengthen the Anti-Doping System in India.

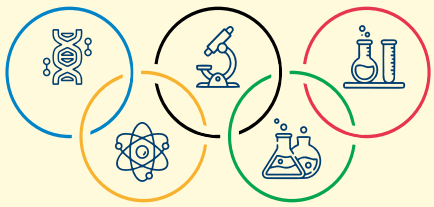
Moreover, we are committed to providing opportunities for young students, faculty, and scientists to visit our facility and gain insights into the field of Anti-Doping Science.

Academic publishing is a significant necessity for promoting Scientific and Research Studies to the Scientific word. With this consciousness, we are happy to publish our laboratory Journals.

In this regard, I extend heartfelt thanks for the endless support of the Government of India, Governing Body and General Body Members, Scientific Advisory Board Members, and Finance Committee Members who have a shared in this success.

Dr. P. L. Sahu
Director & CEO(I/c)
New Delhi

National Dope Testing Laboratory (NDTL)



Introduction and Objectives

The National Dope Testing Laboratory (NDTL) was established as an autonomous body of Government of India in October, 2008 in order to keep the Laboratory independent and to avoid any conflict of interest on testing of the samples of sports persons and handling of test results.

NDTL is accredited to the National Accreditation Board for Testing & Calibration Laboratories (NABL) for ISO/IEC: 17025 and the World Anti-Doping Agency (WADA) for testing of urine & blood samples from human sports.

NDTL is a premier Analytical Laboratory and one of the World Anti-Doping Agency (WADA)-accredited Laboratories dedicated to human sports dope testing & allied research. This is the only Laboratory of its kind in the country having state-of-the-art facilities. It is equipped with the latest and sophisticated analytical equipment including LC-Orbitrap-HRMS, LC-MS/MS, GC-MS/MS, GC/C/IRMS, etc. The Laboratory is pursuing research in the advanced areas of anti-doping science and establishing collaborations with National and International Institutes. The Laboratory engages Research Associates for further strengthening of the research activities.

The Laboratory is located within precincts of the JN Stadium Complex, near Gate No. 10 with an area of 2700 sq. meters. It has excellent infrastructure with sophisticated equipment's for testing of dope control samples as per the requirements of WADA.

There are 30 WADA -accredited labs in the world, out of which six are in Asia. The NDTL is one of the six laboratories in Asia accredited by WADA. The other laboratories in Asia are in China, Japan, Korea, Qatar and Thailand.

The accreditation of WADA is granted on yearly basis, and is based on the evaluation of the proficiency testing results for the particular year.

Objectives

National Dope Testing Laboratory with a rudimentary infrastructure as an independent dope testing entity with the following aims and objectives:-

- To establish and maintain World Anti-Doping Agency (WADA) accredited Dope Control Laboratory in India;
- To cooperate with other relevant national/international Anti-Doping organisations;
- To encourage reciprocal testing between national Anti-Doping organisation;
- To promote anti-doping research in the country;To maintain quality control systems as per latest version of ISO/IEC 17025 and International Standards for Laboratories WADA;
- To conduct testing for In-competition and out-of-competition dope test on sportspersons;
- To have some international cooperation with other anti-doping lab/organisation in terms of research, training and sharing of knowledge;
- To perform all things as are incidental or conductive to the attainment of the objectives of NDTL or as subsidiary to the objects;
- To frame rules and develop procedures as per the WADA Standards;

First Meet with Honorable Minister

The first cum Review Meeting chaired by Hon'ble Minister Dr. Mansukh Mandaviya and Hon'ble Minister of State for Youth Affairs and Sports Smt. Raksha Nikhil Khadse, Government of India regarding National Dope Testing Laboratory, New Delhi on 25.06.2024 in the conference hall at the Ministry of Labour and Employment.

Director with the permission of the chair and on behalf of the National Dope Testing Laboratory briefed about National Dope Testing Laboratory and presented PPT before the Hon'ble Minister and other respective officers of Ministry of Youth Affairs and Sports.

The PPT was on the following points

Significance of the laboratory, mandatory requirement for WADA accreditation, Innovation, Collaboration, Publications, trainings, overcomes to prevent Doping, way forward roadmap to strengthen dope control ecosystem in the country.

To strengthen dope control ecosystem in the country, it was requested for the following:

- For opening Anti-Doping Research Institute in the country.
- More Dope-Test Laboratories in India to cater domestically and become a pioneer in South-East Asia for Anti-Doping Science

Hon'ble Minister of Youth Affairs and Sports has suggested exploring Research Institute in India for consideration and opening Anti-Doping Research Institute in the premises of other Research Institute.

The Director expressed gratitude to the Hon'ble Minister and Hon'ble Minister of State for Youth Affairs and Sports and other respective officials.

WADA's Athlete Passport Management Unit (APMU): Act as an Artificial Intelligence tool for Anti-Doping

Puran Lal Sahu*, Director, Kapendra Sahu* Scientist 'C'
*National Dope Testing Laboratory, New Delhi-110003, India.

Kapendra Sahu
Scientist 'C'

The ABP is essentially a tool to translate an individual's biological data into specific anti-doping actions. It can provide robust evidence that can be used to directly sanction athletes; and, it is also used behind the scenes to inform many other anti-doping activities such as test distribution planning and investigations.

Dr. Reid Aikin

WADA's Associate Director Responsible For The Abp Program

The Athlete Biological Passport (ABP) was established, which indirectly outlines the use of prohibited drugs or methods in sports as a complement approach to the direct anti-doping strategy. Athlete Biological Passport (ABP), a vital anti-doping tool that means for monitoring selected individual biological biomarker over the long period/time to reveal the effects of doping to obtain indirect but potentially long-term indications of the use of substances or methods prohibited in sport. It works against doping through enhanced target testing and analysis, investigations, deterrence, and as indirect evidence for use of prohibited methods or substances.

Background

A number of substances listed in World Anti-Doping Agency (WADA) prohibited list, including testosterone and its metabolites, erythropoietin (EPO), and growth hormone (GH), are model substances of endogenously produced compounds, which are present naturally in the human body but may be misused in sports by exogenously administered pharmaceutical products for doping purposes. The majority of substances indicated in the list are exogenous substances, for which the analytical approach is to screen and qualitatively identify the adequate target compounds, often metabolites, in the biological sample collected for antidoping purposes.

An additional tool has been required to obtain orthogonal information on the doping activities since good timing for sample collection and frequently intricate and time-consuming methodological setup are necessary.

The Athlete Biological Passport is one of these indirect methods (ABP). The idea is to track the longitudinal profiles of specific athletes in relation to a number of selected biological parameters that are changed when banned substances or methods are used and may continue to be changed for a longer period of time than the substance or method's direct indicators can be found in the anti-doping sample.

The Athlete Biological Passport (ABP) was suggested as a substitute for drug testing in the early 2000s. When the scientific community investigating doping discovered blood doping by tracking certain haematological variables over an extended period of time, they coined the phrase "Athlete Biological Passport." To further develop, standardize, and validate the concept, WADA took the lead with help from stakeholders and medical professionals. As a result, the first set of ABP operating guidelines for Anti-Doping Organizations (ADOs) were established by WADA and released in 2009 for implementation of the Haematological Module. Then, in order to create longitudinal profiles of an athlete's endogenous steroid profile in urine, the Steroidal Module was introduced in 2014. The WADA ABP Guidelines have undergone constant improvement since then. This strategy has been successfully unified. The number of positive tests/findings has significantly increased as a result of these efforts.

WADA's Athlete Passport Management Unit (APMU): Act as an Artificial Intelligence tool for Anti-Doping

The ABP Program

Passport management involves coordination and collaboration between Anti-Doping Organizations and their respective Athlete Passport Management Units (APMUs), the latter of which have specific expertise in Passport data interpretation and are housed within WADA-accredited laboratories worldwide. APMUs review Passports, without knowing the identity of the corresponding athlete, and can send atypical Passports to external experts for additional review and make recommendations to ADOs for follow up actions – including target testing. The APMU network is essential for providing rapid, objective, and high-quality management of the global pool of Passports.

Dr. Norbert Baume, WADA ABP Manager

An approach relies on statistical analysis of laboratory results and evaluation of Passport data to find out the suspicious samples requiring further investigations. This program supports as indirect evidence that a prohibited substance or method has been used in accordance with the World Anti-Doping Code Article 2.2.

The ABP currently consists of following modules;

1. Haematological Module: it was announced in December 2009 with an imperative goal to identify enhancement of oxygen transport, including use of erythropoietin receptor agonists (ERAs) and any form of blood transfusion or manipulation. This Module considers a panel of biomarkers of blood doping that are measured in an athlete's blood sample

2. Steroidal Module: it was launched in January 2014, intends to identify the use of anabolic androgenic steroids (EAAS) when they are provided exogenously that means not produced by the human body naturally and other anabolic agents, such as selective androgen receptor modulators (SARMS). The biomarkers of steroid doping that are measured in an athlete's urine are the focus of this module.

3. Endocrine Module: It was launched in July 2023 accompanied by its amended ABP Guidelines, which included the Endocrine Module of the ABP. The purpose of this new module is to gather data on markers of human growth hormone (hGH) doping. It seeks to detect the misuse of human growth hormone (hGH) and the usage of releasing factors, analogues, and fragments that fall under Section S2.2 of the Prohibited List. Additionally, this module might suggest using insulin-like growth factor-I (IGF-I), which is included in Section S2.3 of the Prohibited List.

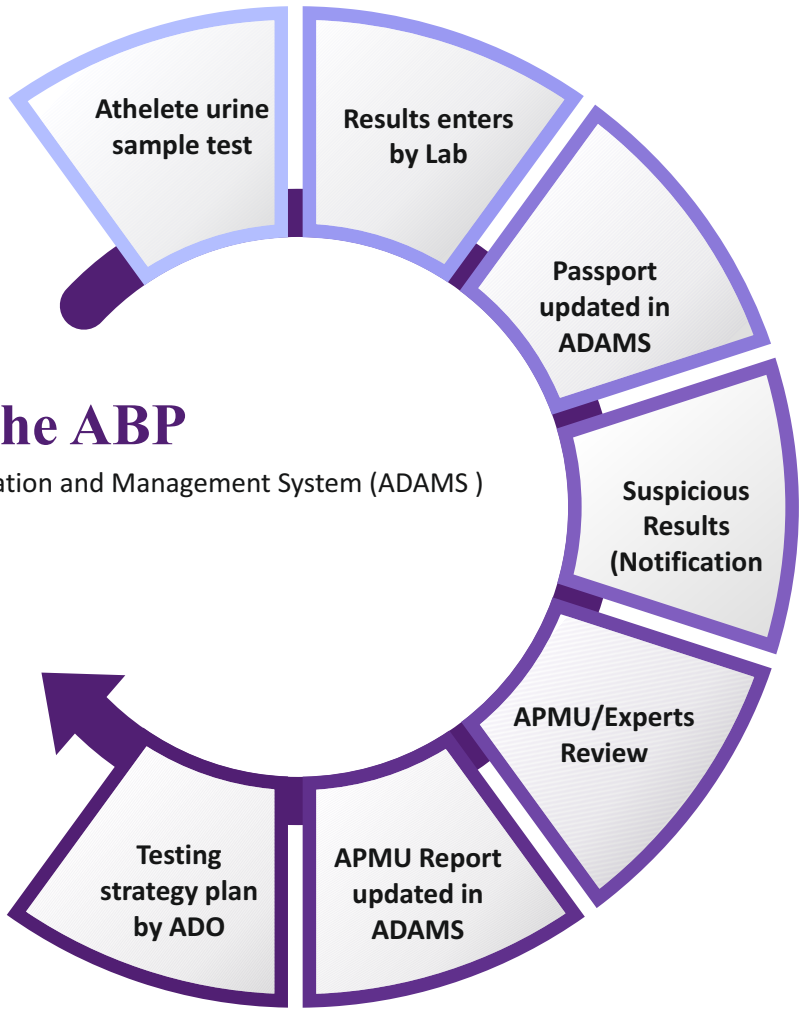
A case study.....

Lance Armstrong, American cyclist, was the only rider to win seven Tour de France titles (1999–2005) but he was later stripped of all his titles after found guilty in doping. In 2012, USADA investigation concluded that Armstrong had used performance-enhancing drugs over the course of his career and named him as the ringleader of "the most sophisticated, professionalized and successful doping program that sport has ever seen". He used erythropoietin (EPO) and human growth hormone. USADA also accused Armstrong of having undergone blood transfusions and testosterone injections. In January 2013, during a televised interview with Oprah Winfrey, Armstrong finally admitted to taking performance-enhancing drugs from the mid-1990s through 2005.This testing methodology comes under hematological module study of Athlete Biological Passport. Hence, for such professional cases of doping, ABP program plays indispensable role.

WADA's Athlete Passport Management Unit (APMU): Act as an Artificial Intelligence tool for Anti-Doping

Process of the ABP

*Anti-Doping Administration and Management System (ADAMS)



What is APMU?

The Athlete Passport Management Unit (APMU) is a specialized body responsible for managing and reviewing athletes' biological passports. It is composed of individuals assigned by the anti-doping organization (ADO) to oversee the issuance of athlete biological passports (ABPs). It should ideally be associated with a WADA-accredited laboratory. It is in charge of the administrative management of athlete passports, advises the ADO on intelligent target testing, communicates with the Expert Panel, creates and authorizes an ABP Documentation Package, and reports adverse passport findings.

These passports contain longitudinal profiles of athletes' biological markers, which are used to detect abnormalities that may indicate doping. The APMU ensures the integrity of these profiles by analyzing data, identifying suspicious patterns, and recommending further testing or investigation if necessary. It operates under the framework of anti-doping regulations, collaborating with various stakeholders, including anti-doping organizations, laboratories, and sports federations, to maintain fair play in sports.

Achievements

NDTL participated in Government Achievements & Schemes Expo 2024

The Government Achievements & Schemes Expo and concurrent exhibitions, 'International Agriculture & Horti Expo', World Organic Expo and Food & Technology Expo are being organized by NNS-India's most diversified media group since 1950 at New Delhi, India.

The 3 days exhibition is being organized with focus on various welfare & development schemes of central and state governments and PSUs.

In this year, National Dope Testing Laboratory (NDTL) also took part in the Government Achievements and Scheme Expo 2024, the premier exhibition being held at Pragati Maidan, New Delhi on 20th- 22nd July, 2024. The NDTL stall was awarded 2nd Prize for Excellent Achievements by NNS Organizer Media Group.

During the Exhibition, NDTL scientists provided lot of exposure and share the knowledge regarding the Doping in sports and its long-term consequences to many School going students and their parents. The new generations of students are very eager to know about the doping. They took a lot of interest in knowing the various things about the collections, receiving and analysis of the doping samples. The Doping was new to many old age people visited the stalls but they were also very interested to know about our Laboratory.

The NDTL stall was awarded 2nd Prize for Excellent Achievements by NNS Organizer Media Group.

Inauguration of the Renovated Conference Hall on the first floor of the NDTL

NDTL has renovated the conference hall to accommodate all scientists and other Technical staff's member on the first floor, the same was inaugurated by Shri. Anurag Singh Thakur (Ex-Hon'ble Minister of Youth Affairs & Sports, MYAS) with Secretary of Sports, along with senior officers of the Ministry on 22.02.2024.

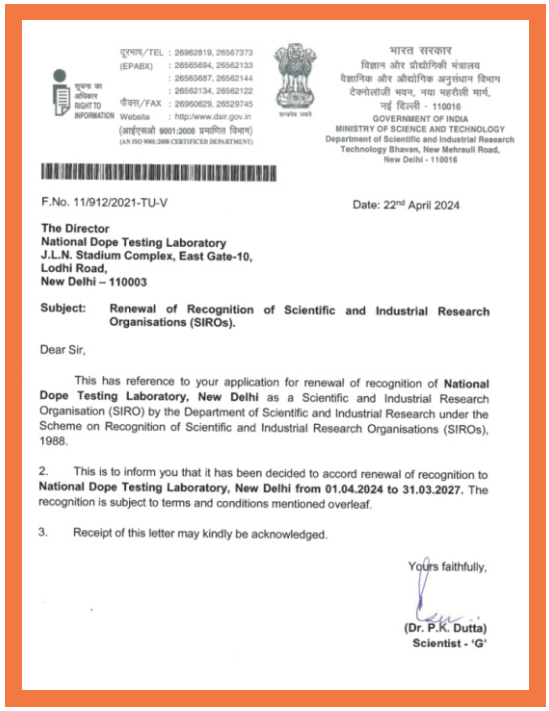
Achievements

Release of Newsletter-2023

The NDTL fourth Newsletter (vol. 3, Issue 1, 2023) was released by Shri. Anurag Singh Thakur (Ex-Hon'ble Minister of Youth Affairs & Sports, MYAS) with Secretary of Sports, along with senior officers of the Ministry on the occasion of the 22.02.2024

DSIR Recognition

National Dope Testing Laboratory, New Delhi was first recognized by Scientific and Industrial Research Organization (SIROs), 1988 by the Department of Scientific Industrial Research for the period of year 24.03.2022 to 31.03.2024. The same got renewed from Scientific and Industrial Research Organization (SIROs) by the Department of Scientific Industrial Research Recognition to NDTL for the period of from 01.04.2024 to 31.03.2027 (three years).



भारत सरकार
विज्ञान और प्रौद्योगिकी मंत्रालय
वैज्ञानिक और औद्योगिक अनुसंधान विभाग
टेक्नोलॉजी भवन, नया महरौली मार्ग,
नई दिल्ली - 110016
GOVERNMENT OF INDIA
MINISTRY OF SCIENCE AND TECHNOLOGY
Department of Scientific and Industrial Research
Technology Bhavan, New Mehrauli Road,
New Delhi - 110016

F.No. 11/912/2021-TU-V

Date: 22nd April 2024

The Director
National Dope Testing Laboratory
J.L.N. Stadium Complex, East Gate-10,
Lodhi Road,
New Delhi – 110003

Subject: **Renewal of Recognition of Scientific and Industrial Research Organisations (SIROs).**

Dear Sir,

This has reference to your application for renewal of recognition of **National Dope Testing Laboratory, New Delhi** as a Scientific and Industrial Research Organisation (SIRO) by the Department of Scientific and Industrial Research under the Scheme on Recognition of Scientific and Industrial Research Organisations (SIROs), 1988.

2. This is to inform you that it has been decided to accord renewal of recognition to **National Dope Testing Laboratory, New Delhi from 01.04.2024 to 31.03.2027.** The recognition is subject to terms and conditions mentioned overleaf.

3. Receipt of this letter may kindly be acknowledged.

Yours faithfully,

(Dr. P.K. Dutta)
Scientist - 'G'

Research and Innovations in Anti-Doping Science

In dope testing analysis, the availability of Reference Materials (RMs) / Standards are critical. Reference Materials of the prohibited substances are available only selected manufacturers across the world, and not easily available commercially, some of them with not available worldwide. The Reference Materials of prohibited substances are used essentially during dope-testing for quality control purposes, and, so their availability remains critical in sports dope testing, globally. As India was not manufacturing of various Reference Materials within the country, NDTL was importing these rarely available Reference Materials from other countries of the world so far for its doping analysis at a huge cost.

In the last three years, NDTL has taken several initiatives towards strengthening its research activities in collaboration with premier Scientific Institutes in India for synthesis of Reference Materials or metabolites, which are highly pure chemical compounds used for dope testing, in a phased manner. As of now NDTL successfully synthesized 19 reference materials in the country for the first time and various under pipeline.

The innovation reached globally. These 19 Reference Materials have been shared with all 30 WADA accredited Laboratory as a part of **"Vasudhaiva kutumbakam"**. It will boost research and development activity, generate more scientific talents and thus, it gainful employment in Dope Testing Laboratory leading to substantive economic growth.

Particularly in the year 2024 following Reference Materials was synthesized with collaborative research with two premier institutes.

Synthesized a Reference Material in the year of 2024

1. GHRP-1(2-7).
2. 17β-Hydroxy-androsta-1,4-dien-3-one (ATD Metabolite.)

Renewal of Memorandum of Understanding (MoU) between the Premier Research Institutes.

NDTL has signed MoU with premier research institutes to expedite and strengthen research activities like new metabolites identification and rarely available Reference Materials synthesis around the globe. With the two esteemed institutes NDTL has synthesized many new parent and its metabolites reference materials also distributed many WADA accredited Laboratories across the world. The same has been renewed in this year between the National Dope Testing Laboratory (NDTL) and the CSIR-Indian Institute of Integrative Medicine (IIIM), Jammu, for 3 years up to 2027 on 26th April, 2024, Also with NIPER, Guwahati for three years up to 2026 on 31.10.2023. As part of joint effort to advance anti-doping science and research, reference standard synthesis activity and to achieve excellence in the field of dope testing in sports.

Both the team for steadfast dedication for creating essential reference materials and enhancing the research in the area of Anti-Doping Science.

Important Lecture given by the Director, in Road to Paris

With the Paris Olympic Games approaching, the National Anti-Doping Agency (NADA) hosted the "Road to Paris 2024 at the India International Centre, New Delhi provided a vital platform for stakeholders in the sporting community to converge, deliberate, and strategize on key anti-doping Championing Clean Sports and Uniting for Anti-Doping". The event aimed to educate Indian athletes about the dangers of prohibited substances while emphasizing ethical competition dated on 09.02.2024. The Director, NDTL, New Delhi has given the lecture about Anti-Doping science for to encourage clean sports.

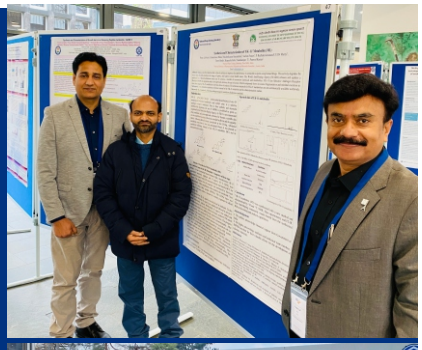
Workshop and Conferences

42nd Cologne Workshop on Dope Analysis Poster Presentation

The National Dope Testing Laboratory (NDTL) team Dr. P. L. Sahu, Director & CEO(I/c.), Dr. Anand Raj, Scientist-B; Sh. Akhilesh Bhardwaj, Scientist-B participated in Manfred Donike Workshop, 42nd Cologne Workshop on Dope Analysis, held on 26-29 February 2024 (4 Days) at Cologne, Germany.

The following research works were presented:

- Investigation of Triamterene excretion pattern: Expanding the detection window in sports doping.
- Quantification of emoxypine, emoxypine sulfate, and emoxypine glucuronide in cow´s milk and human urine in collaboration with Anti-doping Laboratory, Cologne, Germany.
- 17β-Hydroxy-androst-1, 4, 6-triene-3-one: Synthesis and characterization in collaboration with CSIR-IIIM, Jammu.
- Synthesis and characterization of Molidustat glucuronide in collaboration with NIPER-G
- Synthesis and characterization of YK-11 Metabolite (M1) in collaboration with NIPER-G
- Synthesis and characterization of Growth Hormone Releasing Peptide Metabolite: GHRP-1 in collaboration with CSIR-IIIM, Jammu.



Important Meeting

Traditional Pharmacopoeia in the context of Sports Ethics, Values and Integrity

Meeting on Global Task Force of Experts on Traditional Pharmacopoeia in the context of sports ethics, values and integrity was held on 18.07.2024 under the chairmanship of Dr. P. L Sahu, Director, NDTL and Honorable Members Dr. Raman Mohan Singh, Director, PCIIM & Head, Ministry of Ayush, Gaziabad; Dr. Sharad Srivastava, Chief Scientist and Head, CSIR-NBRI, Lucknow; Dr. Shashank K. Singh, Senior Principal Scientist and Professor (AcSIR), CSIR-IIIM, Jammu.

16th Finance Committee Meeting

The 16th finance committee meeting was held at NDTL on 20.06.2024 under the chairmanship of Additional Secretary & Finance Adviser, Government of India. Annual account of 2023-2024 was approved including other agenda items.

Ethics Committee Meeting

The Ethics Committee meeting was held under the Chairmanship of Prof. Y. K. Gupta at National Dope Testing Laboratory (NDTL), during the period 15th - 21st May 2024. The Basic training and Ethical approval of research project was given to NDTL, Staff's by Prof. (Dr.) Y.K. Gupta, Chairman of Ethics Committee. Total eight new research projects were approved.

Important Meeting

Participation in WADA Laboratory Directors meeting and WADA Annual Symposium:

Director, NDTL participated in WADA Laboratory Directors meeting held on 11-12 March 2024 in Lausanne, Switzerland. All 30 Laboratories Directors attended the said meeting.

National Dope Testing Laboratory (NDTL) also participated in WADA Annual Symposium 2024, which was held in Lausanne, Switzerland on 12-13 March, 2024 and brought together approximately 1100 delegates from the global anti-doping community under the theme of **'One Mission - One Team'.**

The symposium, which also celebrated the 25th anniversary of the World Anti-Doping Agency, was held with the participation of International Olympic Committee President Thomas Bach and former WADA Presidents.

In a historic move towards clean and fair sports, the National Anti-Doping Agency of India (NADA- India) and the Agence française de lutte contre le dopage (AFLD) of France have signed MoU at this occasion. NADA-India also working with International Testing Agency (ITA) to keep eye on the upcoming Paris Olympics. This collaboration aims to combat doping in sports through enhanced cooperation in doping control, prevention, education, and research.

Scientific Advisory Board meeting

The Scientific Advisory Board meeting (SAB) of NDTL held on 24th April 2024 was Chaired by Dr. S. K. Raza, Chairman of the SAB. This meeting was attended by the SAB members, Scientists and Technical Staff of the NDTL. The present status of the laboratory, progress and achievements made by the laboratory since last meeting of the SAB was discussed. About progress of research projects and new initiatives were presented. There was a consensus opinion of the members and scientific staff that a detailed proposal reflecting the needs, research activities to be carried out and the research personnel for the proposed research and development unit in the NDTL.

Important Meeting

Management Review Group Meeting

27th Management Review Meeting was held on 01.02.2024 at NDTL, Conference Hall under the chairmanship of Director, NDTL and honorable External Expert member Dr. Raza, Former Director, IPFT, Deputy Director, Finance office, Quality Manager along with all the scientist of the NDTL. Various issues and developments points have been discussed as per agenda.

NABL ISO/IEC 17025:2017 Re-Assessments Audit

NABL Audit was conducted in NDTL from 02.03.2024 to 03.03.2024 (2 Days) with the auditors namely Dr. R. Pirabhakaran (Lead Assessor), Dr. Abhay Tulshiram Sangamwar (Technical Assessor-Chemical), Dr. Salauddin Qureshi (Technical Assessor -Biology), Ms. Iti Saxena (WADA Assessor), Mr. Amit Kumar (NABL) had evaluated the assessments and granted NABL ISO: 17025:2017 accreditation to NDTL for another two years from 2024 to 2026.

Training programs

DCO/BCO at NADA

The training was given by Dr. Ashok Kumar Maurya, Scientist-C to DCO/BCO at NADA, JLN stadium on 02 July 2024 regarding the Nonconformities/Irregularities observed in Dope Samples (Human Urine and Blood Samples). 17 participants attended the same.

Knowledge Sharing Activity

Prof. (Dr.) Peter Van Eenoo, Director, DoCo Lab, University of Ghent, Belgium, a distinguished Scientist renowned for his work in the field of Anti-Doping Science, visited National Dope Testing Laboratory (NDTL), New Delhi on 24-25th June 2024.

He delivered a keynote lecture on "Fundamental of Steroidal Module in respect to APMU". The discussion was on GC-MS/MS, LC-MS/MS techniques, its advancements, QMS and he also shared his views for further strengthening of the Laboratory.

He interacted with the scientists of various sections including Biological section with their teams in formal meeting accompanied by discussions on latest research findings and insights of WADA Technical Documents, ISL and recent advancement in anti-doping. These interactions provided valuable opportunities for knowledge sharing and networking within the scientific community. Attendees appreciated willingness to answer questions and provide guidance on current challenges in the field. Overall, the visit of Prof. Peter was a very fruitful, resounding success, motivating, leaving a lasting impact on Laboratory's scientific community. His insights and expertise have inspired further research and collaboration with the Laboratory.

Team Alignment Workshop & training

The team Alignment workshop was held at NDTL dated on 19.06.2024 in the conference Hall, from NDTL approx. thirty one staff's were participated in the program. The training Was conducted by VALT Consultancy.

Training programs

External Scientists Trainings at NDTL

Dr. Talari Kalpana, Senior Scientist and Mrs. K. Keerthi, Junior Scientist, Analytical Testing Laboratory, NIPER-Hyderabad, Telangana visited NDTL on 12.02.2024 & 13.02.2024 and got exposure training for procuring reference material related to dope supplement analysis.

LC-MS/MS Training

The basic training of LC-MS/MS was imparted by Sh. Chandra sekar & Sh. Himanshu Thiyagi on 06.02.2024 at NDTL staff's of the LC-MS/MS section, about the instrumentation and software.

Important celebrations

International Yoga Day

NDTL celebrated 10th International Yoga Day. The theme of this year's Yoga Day was 'Yoga for Individual and Society'. The main objective of this event was to increase awareness about the physical and mental benefits of yoga among the scientists, officers and staff of NDTL. Yoga Teacher Ms. Preeti was invited for Yoga Program. The yoga session was excellent and appreciated by all the participants. She also emphasized that yoga is best for a healthy body and mind as it can ward off diseases and strengthen the immune system.

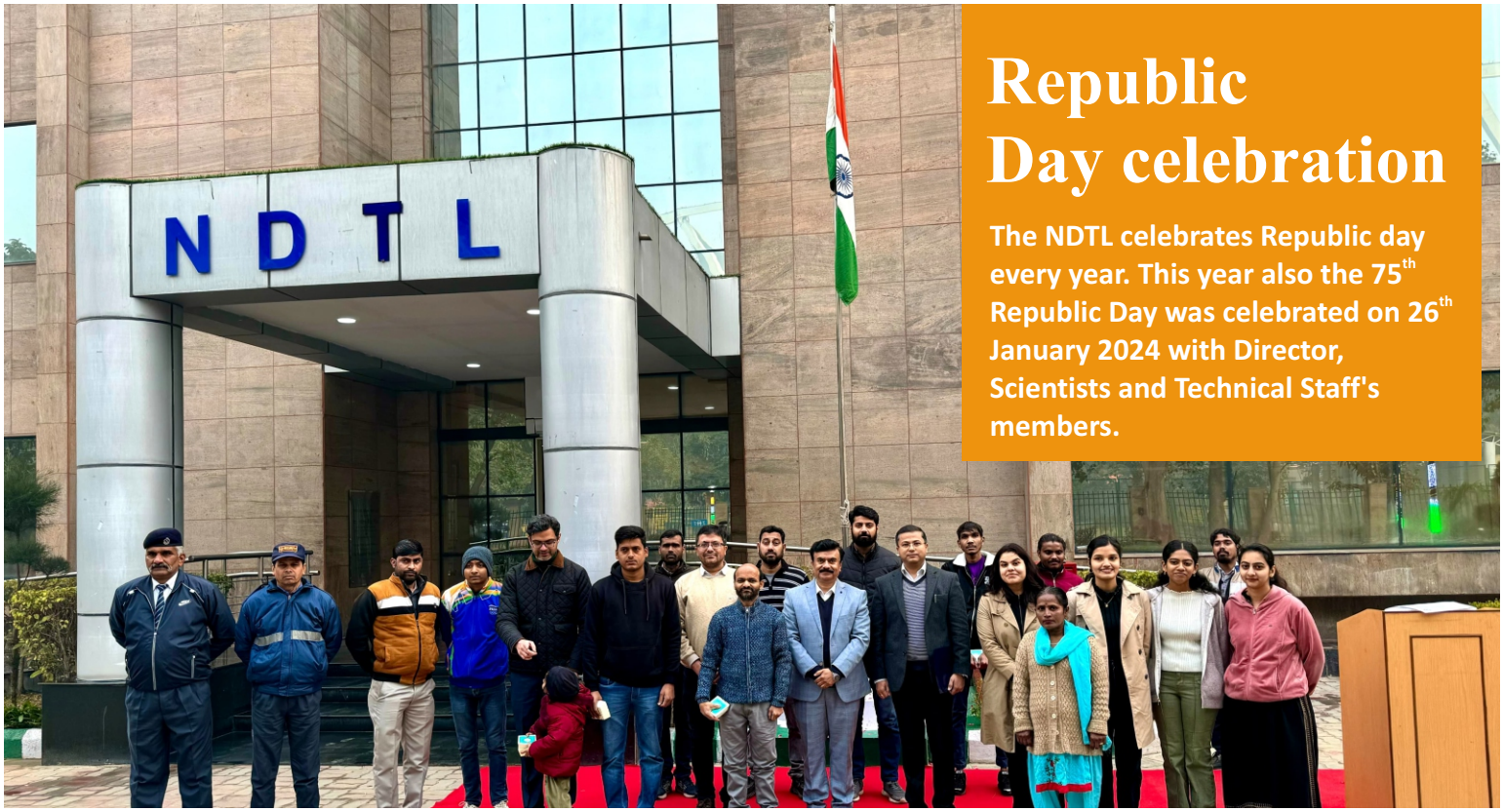
"Play True Day" Celebration

National Dope Testing Laboratory (NDTL), celebrated 'Play True Day' on 19 April 2024. Play True Day - a day that is dedicated to Clean Sport and raising awareness among athletes, the sporting public and others of the importance of preventing doping. The Quiz and Drawing competition were also organized on this occasion. Prof. (Dr.) Y. K. Gupta distributed the cash prize and certificates to first three positions. The first prize received by Mr. Nidhin Vijay, Internship trainee, the second prize was received by Ms. Shailza Mishra, Analyst trainee. Third prize received by Ms. Sweety, Internship Trainee.

Important celebrations

International Women's Day Celebration

International Women's day was celebrated at NDTL on 08.03.2024, the invited Chief Guest Mrs. Navneet Sandhu , Deputy Director, WDRA and many of the female staff's members had participated.



Republic Day celebration

The NDTL celebrates Republic day every year. This year also the 75th Republic Day was celebrated on 26th January 2024 with Director, Scientists and Technical Staff's members.

Visit at NDTL

Forensic investigator trainee from private origination visited at NDTL

Around 27 Forensic investigator trainees from Reveal Affirm Testify Pvt. Ltd (RAT Pvt. Ltd), a professional organization visited the NDTL on 28.06.2024 and got training about Anti-Doping sciences.

Trainee IAS Officers Visit

IAS officer trainees Sh. Akshay Pillay, IAS (Odisha:2022), Sh. Kartikeya Jaiswal, IAS (Madhya Pradesh:2022), Ms. Pratibha Dahiya, IAS (Gujarat:2022) posted in Department of Sports as Assistant Secretaries under Assistant Secretary Programme visited NDTL on 22nd May 2024.

Foreign Delegate Visit

Eight members of delegation from Bhutan visited at NDTL, on 12.03.2024 to enquire about their dope control samples.

Teerthanker Mahaveer University, Moradabad Visit to NDTL

From Teerthanker Mahaveer University twents students and faculty members were visited on 21.03.2024 and got Anti-Doping science education.

Significance of Athlete Biological Passport (ABP) and Hormonal Analysis in Anti-Doping Science

Puran Lal Sahu*, Director, Mrs. Madhu Joshi Technical Officer*
*National Dope Testing laboratory, New Delhi-110003, India.

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Doping refers to the use of prohibited substances or methods by athletes to enhance their performance unfairly. It undermines the principles of fair competition and poses serious health risks to athletes. Doping can take many forms, including the use of performance-enhancing drugs (PEDs), such as anabolic steroids, stimulants, and hormones, or employing techniques like blood transfusions and gene doping to artificially boost physical capabilities.

There are several key types of doping:

- **Blood Doping:** This involves increasing the number of red blood cells in the bloodstream to enhance oxygen delivery to muscles, improving endurance. Methods include the use of erythropoiesis-stimulating agents (ESAs) like erythropoietin (EPO) or blood transfusions.
- **Hormonal Doping:** Athletes may use hormones such as testosterone, human growth hormone (GH), and erythropoietin (EPO) to increase muscle mass, strength, or endurance. These substances can alter the body's natural hormonal balance, leading to significant performance enhancement.
- **Anabolic Steroids:** These synthetic variants of the male sex hormone testosterone promote muscle growth and improve recovery times. Their misuse is widespread in sports requiring strength and power.
- **Stimulants:** Stimulants, such as amphetamines, increase alertness, reduce fatigue, and can enhance reaction times. However, their use can also lead to dangerous side effects, including addiction and cardiovascular problems.
- **Diuretics and Masking Agents:** These substances are used to flush out banned substances from the body or to mask their presence in drug tests, making it harder to detect doping.
- **Gene Doping:** A more advanced and harder-to-detect method involves manipulating genes to enhance athletic performance, such as altering the genes responsible for muscle growth or endurance.

Doping not only endangers the health of athletes but also threatens the integrity of sports by creating an uneven playing field. To combat these challenges, anti-doping science has developed a range of sophisticated tools and techniques. In competitive sports, fairness and integrity are crucial. Biological analysis plays a key role in anti-doping science.

This article explains important aspects of this field, including the Athlete's Biological Passport (ABP), erythropoietin (EPO), luteinizing hormone (LH), human chorionic gonadotropin (hCG), and growth hormone (GH). These tools help detect and prevent doping, ensuring fair play in sports.

Significance of Athlete Biological Passport (ABP) and Hormonal Analysis in Anti-Doping Science

Athlete's Biological Passport (ABP)

The ABP tracks an athlete's key biological markers over time, creating a unique profile. Instead of directly looking for banned substances, the ABP identifies changes in the body that suggest doping. This method helps catch doping that might be missed by other tests especially when the substance is present in ultra-trace levels, ensuring fair competition. The Athlete Biological Passport (ABP) is a crucial tool in anti-doping efforts, designed to monitor various forms of doping. It tracks **blood doping** by measuring markers related to red blood cell production and volume, helping identify practices like erythropoiesis-stimulating agents (ESAs) and blood transfusions. For **hormonal doping**, the ABP observes changes in hormone levels to detect use of prohibited substances like externally administered or artificially induced generation of testosterone and human growth hormone (hGH). Although **diuretics and masking agents** are not directly measured, their effects can be inferred from abnormal biological markers. The ABP also detects unusual patterns by establishing an athlete's baseline data and monitoring deviations, the ABP helps identify both traditional and advanced doping methods, maintaining fair competition and athlete integrity.

Erythropoietin (EPO)

Erythropoietin (EPO) is a hormone that stimulates the production of red blood cells, which are crucial for oxygen transport in the body. The misuse of EPO to enhance athletic performance by increasing oxygen delivery to muscles is one of the predominant method. Biological analysis enables the detection of synthetic EPO and the identification of abnormal fluctuations in hematological parameters, thereby deterring athletes from employing such practices to gain an unfair advantage.

Luteinizing Hormone (LH)

Luteinizing hormone (LH) plays a significant role in regulating the reproductive system. In the context of doping, LH is prohibited in male athletes only. Abnormal levels of LH, as well as changes in other steroid profile parameters, can indicate the use of substances like anabolic steroids. Monitoring LH levels through biological analysis helps identify athletes who might be using performance-enhancing drugs to manipulate their hormonal profiles, ensuring that any deviations from normal levels are thoroughly investigated.

Human Chorionic Gonadotropin (hCG)

Human chorionic gonadotropin (hCG) is another hormone with significant implications in doping control. Commonly associated with pregnancy, hCG can also be used by athletes to stimulate the production of endogenous testosterone. hCG is prohibited in male athletes only and, in particular, serves as a red flag for potential doping, prompting further investigation and testing to maintain the integrity of the sport.

Growth Hormone (GH)

Growth hormone (GH) is critical for growth and metabolism. Its abuse in sports is aimed at enhancing muscle mass and recovery. Detecting GH misuse presents unique challenges due to its short half-life and the body's natural fluctuations. However, advancements in biological analysis, employing both direct and indirect detection, have led to more sophisticated methods for identifying GH abuse, ensuring that athletes adhere to the principles of fair play. The World Anti-Doping Agency (WADA) prohibits the use of exogenous Human Growth Hormone (hGH) in sports due to its performance-enhancing effects. To enforce this prohibition, WADA relies on specific biomarkers and tests that can detect the presence or use of hGH. The key biomarkers and methods used to detect hGH abuse include:

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i. **Isoform Differential Immunoassays:**

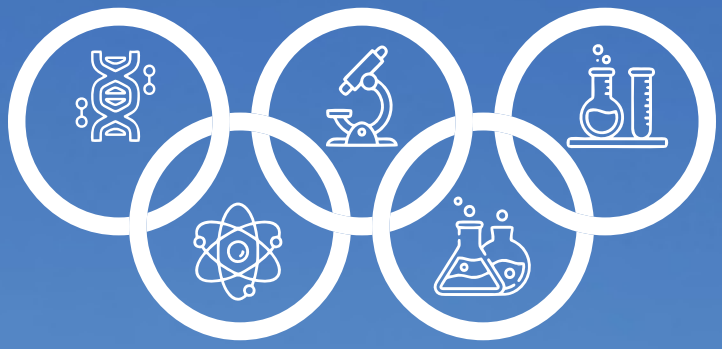
hGH exists in various isoforms (molecular variants). Endogenous (naturally produced) hGH is secreted as a mixture of different isoforms, whereas recombinant (synthetic) hGH used for doping often consists predominantly of the 22-kDa isoform. The isoform differential immunoassay compares the ratio of these isoforms. A significant deviation from the normal ratio indicates the use of synthetic hGH. This method is effective within a short detection window after hGH administration (24-36 hours).

ii. **Marker-Based Test (Biomarker Approach):**

- **IGF-1 (Insulin-like Growth Factor 1)**: IGF-1 levels increase in response to hGH administration. Since IGF-1 has a longer half-life than hGH, elevated levels can serve as an indirect marker of hGH use.
- **P-III-NP (Procollagen Type III N-Terminal Propeptide)**: P-III-NP is a marker of collagen turnover and is elevated in response to hGH, reflecting increased tissue growth.

Conclusion

In the realm of competitive sports, ensuring fairness and integrity is paramount, and biological analysis is essential in achieving this goal. The Athlete's Biological Passport (ABP), alongside the monitoring of key biomarkers such as Erythropoietin (EPO), Luteinizing Hormone (LH), Human Chorionic Gonadotropin (hCG), and Growth Hormone (GH), forms a comprehensive framework for detecting and preventing doping. These tools not only identify and address instances of cheating but also act as a deterrent against the use of performance-enhancing substances. By focusing on biological markers and individual athlete profiles, anti-doping science continues to evolve, reinforcing the principles of fair competition and promoting athletic excellence. As the battle against doping advances, the role of biological analysis remains indispensable in preserving the integrity of sports.



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