REPUBLIC OF CYPRUS

STATE GENERAL LABORATORY

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ANNUAL REPORT 2020

ABRIDGED VERSION

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Excellence. The foundation
to a better quality of life.

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INTRODUCTORY NOTE

by the Director of the State General Laboratory

Dear readers,

Through the annual report of the State General Laboratory (SGL), I am pleased to present to you an assessment of its work. A work, which the management team and its staff completed with a deep sense of responsibility, under unprecedented conditions due to the restrictive measures imposed to address the coronavirus pandemic during 2020. The stable and continuous effort to implement the national strategic objectives to protect public health, the environment, the safety of citizens and the consumer's interests is demonstrated within the wide range of activities of the SGL during 2020.

2020 was a year with peculiarities, many challenges and obligations, where the SGL, amongst other, managed:

- To respond effectively to official control requirements in the areas of food safety and quality, environmental protection (including drinking water) and consumer products, and to support the Police in the fight against crime, by conducting a significant number of laboratory tests.
- To meet the requests of the competent Authorities in different Ministries, Governmental Departments and Municipalities, dealing with emergencies, incidents and crises that fall under its competence.
- To effectively utilise its financial resources and absorb national and European funds for applied research, for the benefit of its further development as an organisation.
- To exploit all possible forms of cooperation at national, EU and international level to effectively achieve its goals.

The SGL, both as a Public Service Department and a well-recognised scientific research centre, through the continuous development of innovative and modern methodologies and approaches, within the framework of its strategic objectives and priorities, managed to further upgrade its services, and at the same time, to develop its scientific knowledge and improve its expertise in the areas of its competence.

In the framework of the Public Sector Administration Reform and the implementation of the new Public Finance Management System, the SGL continued with the development and implementation of its strategic planning, as well as with the parallel monitoring of the implementation of its activity-based budget. To this purpose, it has implemented appropriate performance indicators for the timely monitoring, implementation and final evaluation of its performance.

In 2020, a certificate of excellent performance has been awarded to the SGL, being among the top-three laboratories with the lowest average z-score in the proficiency test: "EURL-MN PT-2020-01: Fresh frozen fish, As, iAs, Cd, Pb, Hg and MeHg". The proficiency test was organised by the European Union Reference Laboratory for metals and nitrogenous compounds in feed and food.

Even though the SGL, for the greater part of 2020 (starting in March), operated with security personnel due to the restrictive measures implemented to deal with the coronavirus pandemic, as an organization, it adapted to the new circumstances and took advantage of opportunities such as the following, to effectively carry out its duties:

- It applied flexible working hours alongside remote working to execute laboratory tests.
- It continued (online) its collaborations at national and European/ international level.
- It participated in Councils/ Committees/ Working Groups/ Networks as well as in research programmes.

The most important activities that marked the work of the SGL in 2020, among others, were the following:

1. Continuation of its official control for the surveillance of the Cypriot market for the safety and quality of the food and other consumer products, for the protection of the environment, and contribution to the fight against crime.
2. Continuation of its active involvement in EU research projects (e.g. "Human bio-monitoring", "Risk characterisation of Ciquatera food poisoning in Europe", "Detection and identification of biological toxins," "Identification of traditional and local products of Cyprus and the North Aegean", "Carobs- The Black Gold of Cyprus", "Life with Vultures - Overall effort to rescue the Vulture (considered a "natural cleaner" of the countryside)", "Isolation and study of saponin extracts from plants of the genus Saponaria, a common and endemic species of Cyprus, with the ultimate goal of developing antimicrobial soaps", "Development of an integrated framework for real-time detection, assessment and migration of biological, chemical and environmental contaminants throughout the food supply chain", etc.).
3. Active contribution to dietary risk assessment at national and European level by processing and evaluating the actual food consumption data of Cypriots using "Improrisk", its own upgraded deterministic model.
4. Expansion of the official control to include new parameters and/or new categories and products.
5. Further expansion of the scope of its accreditation as regards the new international standard EN ISO/IEC 17025: 2017 to new parameters, new product substrates and new analytical methods, some of which with flexible scope.
6. Contribution to the effective response on environmental crises (e.g. ground/ water pollution) and other emergencies (e.g. crime, murders, drug cases), the antimicrobial resistance to antibiotics and the standardisation of traditional products of Cyprus.
7. Contribution to Cyprus' ranking first at European level as regards the microbiological purity of the bathing waters of its beaches, with 100% of its beaches having excellent water quality.
8. Representation of Cyprus at European and international level, as the Cyprus Contact Point on issues of food safety and quality, human bio-monitoring, environment and health, etc.
9. Representation of the EU in European and international fora in areas such as human bio-monitoring.
10. Upgrading to scientific posts of all analysts holding a University degree and/or MSc & PhD, working for several years as Laboratory Technicians (accounting for 60% of SGL personnel holding university degree).

The SGL is a scientifically mature, accredited organisation, which contributes to the socio-economic development of the country and upgrade of the quality of life of Cypriot citizens. At the same time, it can and should contribute to the further promotion of Cyprus's role in the European Union's scientific activities. To this end, it continues its efforts towards its recognition as a "Centre of Excellence".

The construction of its new building, among other things, will contribute greatly to this end. After the inclusion in the state budget of 2018 of a relevant amount for the initiation of its construction – with a time horizon of its completion by 2023 – the necessary procedures for the project initiation continued during 2020.

With the constant support of the Director General of the Ministry of Health and the Minister of Health, whom we thank in particular, as well as the support of other collaborating public Services and partners, the SGL manages to carry out its work and achieve its goals.

The hard work, dedication and responsibility of the staff of the SGL – to which I express my deep gratitude and appreciation – the commitment to the SGL's vision as well as the actions taken and the goals achieved in 2020, make it a year of success, with a positive impact on the society and the economy of the country.

In conclusion, I hope this publication will be a valid source of information for all competent authorities and stakeholders on SGL's work, and for all citizens in general, so as to create a relationship of mutual trust and good cooperation based on scientific integrity and transparency.

Dr Stelios Yiannopoulos

Director of SGL

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• Seawater/costal sea water
• Swimming pool water
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ABOUT THE SGL

GENERAL SCOPE AND RESPONSIBILITIES

The State General Laboratory of Cyprus (SGL) is one of the five independent Departments of the Ministry of Health. It is the main official laboratory for the chemical/biological/microbiological/toxicological and radiological control and the official National Control Centre for foodstuffs, water, environment, pharmaceuticals, cosmetics, various consumer goods, controlled drugs and other police exhibits. This wide scope of responsibilities is covered under 21 specialised laboratories.

All laboratories under the SGL are accredited according to the European Standard EN ISO/IEC 17025:2017 in the areas of its competence.

It is also the National Reference Laboratory for several food safety sectors.

The activities of the SGL, a non-conflict of interest organisation, governed by the principles of scientific excellence, independence, integrity, accountability and transparency, ensure compliance with the Public Service Law, as well as the fulfillment of citizens' expectations.

Within the framework of supporting and forming national policy, relative to its responsibilities, the SGL staff serves on many National Council Boards (Food, Pharmaceuticals, Cosmetics, Plant Protection Products and Biocides, Veterinary Medicines, Chemicals, Tenders of the Ministry of Health, Chemists Registration) as well as the Cyprus National Addictions Authority, the Food Safety Council, and also in National Committees (e.g. Research and Innovation Coordinators, Environment and Children's Health, School Canteens, Natural Mineral Water, Environmental Impact, Veterinary Drugs Register, Reduction of Drugs Supply & Drugs Legislation, National Centre of Information on Narcotics, ECOLABEL and UN-Children Rights on Health).

Also, at European/ international level, the SGL constitutes, among others, the National Representative in the Advisory Forum of the European Food Safety Authority (EFSA) and the National Focal Point of EFSA, the National Representative in the Governing Board of the European Joint Research Programme on "Human Biomonitoring for Europe (HBM4EU)" (2017-2021) and the National Representative (for the health sector) in the "Environment and Health Task Force" of the World Health Organization (WHO)-Europe.

Through this active involvement, the SGL contributes to the revision, modernisation and harmonisation of legislation, and the formulation of policies / strategies related to its competences, not only at the national but also at the European level. Its constant contribution to the revision of food/ water/ consumer products legislation and the legislation on drugs and psychotropic substances for the integration of new synthetic drugs, has been significant.

VISION AND MISSION

The vision of the SGL is to substantially contribute to the improvement of quality of life by providing reliable and high-quality services through the organisation's continuous development and excellence.

Based on this vision, the SGL has been continuously widening its mission to include the provision to the Authorities and the citizens of high-quality services and independent opinions, through innovative administration procedures and technology.

The SGL's motto, "Excellence. The foundation to a better quality of life", has been guiding the organisation, based on its vision and mission, towards the following strategic objectives:

1. To safeguard public health and the environment, citizens' safety and consumers' rights, mainly through prevention.
2. To facilitate fair trade and enhance competitiveness.
3. To respond promptly and reliably to new obligations, emerging problems and crisis incidents.
4. To promote applied research to prevent or solve emerging/ existing problems.
5. To contribute to the legislative process and policy-making.
6. To strengthen networking and enhance expertise.
7. To scientifically support the judicial and police authorities.

To fulfill its mission, the SGL operates at many levels:

- It ensures quality, reliability and accountability through its accreditation by EN ISO / IEC 17025:2017 and by embedding the value of quality at all levels of the organisation, while implementing the model of the Common Assessment Framework Programme (CAF) with benchmarking towards excellence.
- It promotes new approaches at the managerial and technical level and the elaboration of its services, while keeping abreast of European and international developments and requirements.
- It collaborates with all public sectors and respective EU organisations and committees.
- It continuously develops and implements:
  - new preventive and targeted national control programmes,
  - a holistic and interdisciplinary approach, which reflects upon the design of monitoring, surveillance, control and research programmes with added value and synergistic efficacy, and
  - risk assessment for food/ water and environmental safety (chemical, microbiological, biological).
- It enhances productivity by implementing modern technologies and multi-residual analytical methods by fully utilising the human resources, equipment and available financial resources.
- It attracts young scientists with high academic qualifications through the implementation of applied research projects, while utilising local and EU funds to solve existing problems and prevent emerging risks.
- It strengthens international networking and collaboration with universities, European research centres and relevant bodies to promote the exchange of scientists, joint research projects, technology transfer and other common actions towards development.
- It contributes to academic activities by investing in capacity building of post-graduate students who undertake research projects at the SGL in collaboration with European and Cyprus universities.
- It invests on staff training and expertise.
- It disseminates information and knowledge through educational programmes to the relevant stakeholders and to the public at large.
- It provides expertise and advice and works as a technical consultant/ advisor for public authorities or as third member.
- It facilitates the execution of a wide range of laboratory tests as well as the solution of complex scientific and technical issues, through its modern laboratory equipment and its well-trained staff.

CORE PRINCIPLES OF THE STATE GENERAL LABORATORY

THE SGL IN NUMBERS IN 2020

112 Interlaboratory skills testing

1,065 Parameters checked in interlaboratory skills testing

21,024 Analysed samples

517,084 Analysed parameters

€8,068,819 Budget implemented

1 European Award

3 Posters & Oral Presentations in international conferences

6 Scientific publications

18 Presentations in national, European, international conferences/workshops/seminars

19 Applied research programmes

21 Specialised laboratories

59 National Control - Monitoring - Surveillance programmes

ORGANISATIONAL STRUCTURE

The SGL has its own organisational structure: the Director and the Heads of Sectors comprising the management team, as shown in the 2020 Organisational Chart below. The SGL's wide range of analytical work is covered by 21 Laboratories that fall under eight sectors, which are being supported by the following five Units:

1. Cooperation with European Food Safety Authority (EFSA) and Risk Assessment Unit
2. Quality Assurance Unit
3. Research and Funded Projects Unit
4. Information Technology Unit
5. European / International Issues, International Cooperation & Communication Unit

The following services assist the SGL in its day-to-day operation and implementation of its work:

Registry, Stores, Library, Secretariat, Accounts and Electromechanical Services

MINISTRY OF HEALTH

STATE GENERAL LABORATORY

DIRECTOR
Dr Stelios Yiannopoulos

- Registry / Accountant
- Dr Stelios Yiannopoulos — Risk Assessment Unit
- Dr R. Kokkinofta — Research Unit / Funded Projects
- Mrs Ch. Frenaritou — European / International Issues / Communication with EFSA / Website
- Mr Christopher Papachrysostomou — EFSA Focal Point

CHIEF CHEMIST
Mrs Maria Aletrari

Mrs Maria Aletrari
Quality Assurance Unit (QA)

Section A
Mrs Ch. Frenaritou
Senior Chemist

- Mrs A. Oikonomidou — Food Composition & Quality, Nutritional Value | Lab 01
- Mrs Ch. Frenaritou — Food Customs Control & Other Samples — Lab 17
- Mrs E. Prokopiou — Food Additives & Special Analyses of Food | Lab 13**

Section B*
Senior Chemist

- Mrs E. Pampaka — Pharmaceuticals — Lab 04**
- Mrs M. Frantzi — Cosmetics & Food Supplements — Lab 19**
- Dr A. Katsonouri — Toxic Chemicals in Materials & Human Biomonitoring — Lab 11**

Section C
Mrs M. Aletrari
Chief Chemist

- Dr G. Kyriacou — General Water Analyses | Lab 02
- Dr M. Christofidou — Environmental Water Contamination — Lab 06
- Mrs E. Demetriou — Environmental Chemistry & Control of Effluents | Lab 10

Section D*

- Mrs D. Christodoulou — Pesticide Residues & POPs | Lab 08**
- Dr A. Achilleos — Food & Environmental Radioactivity — Lab 09**
- Mrs E. Christou — Environmental & Other Food Contamination & Natural Toxins — Lab 14**

Section E
Mrs M. Hadjigeorgiou
Senior Chemist

- Mrs S. Constantinou — Veterinary Drug Residues | Lab 05
- Mrs E. Vatyliotou — Food Contact Materials and Safety of Toys — Lab 12

Section F
Dr G. Papageorgiou
Senior Chemist

- Mrs A. Antoniou — Water& Drug Microbiology | Lab 15
- Water & Environmental Virology | Lab 18
- Mr Ch. Kourtis — Food Microbiology — Lab 16
- Mrs A. Tello — Food Molecular Biology & Technology | Lab 21
- Preparation Unit/ Sterility Lab
- Mr N. Pissarides — Ecotoxicology — Lab 07

Section G
Dr R. Kokkinofta
Senior Chemist

- Mrs M. Afxentiou — Forensic Chemistry & Toxicology | Lab 03
- Dr E. Papayianni — Food Authenticity – NMR | Lab20

Section H
Mrs A. Anastasi
Coordinator Chemist

- Information Technology Unit, IT EFSA, Stores
- Mrs T. Kyriakidou / Mrs P. Piera — Management of Tenders

Reception, Library, Support Staff

Laboratory of Electromechanical Services (EMS)

* Post to be filled.

** Labs 04&19, 08, 09&13, 14 and 11 are temporary under Section C, E and A respectively.

HUMAN RESOURCES

During 2020, the SGL's personnel consisted of 159 persons in total (see Chart 1):

- 59 Chemists, Microbiologists, Biologists, 3 clerks / secretarial staff, in permanent positions, as well as 22 persons as support staff.
- 46 Chemists, Microbiologists, Biologists, a Laboratory Technician and 7 clerks were employed on a temporary basis.
- 14 Chemists, 4 Microbiologists / Biologists and 2 service providers were employed on contract for the completion of research projects (including transition facility programme) as well as an Executive Assistant for managing research programmes.

It is also worth noting that:

- out of the 106 scientists, 82 (77%) were holders of at least one postgraduate degree (MSc) and several of them of a PhD degree. (see Chart 2).

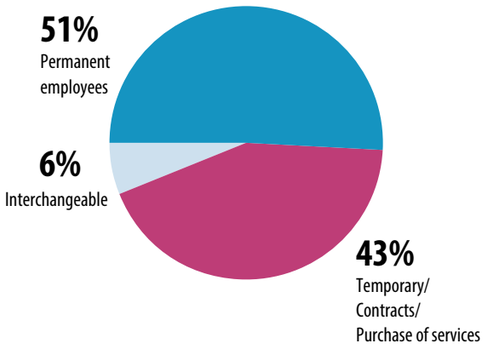


Chart 1:
Distribution of SGL's staff on all levels – 2020

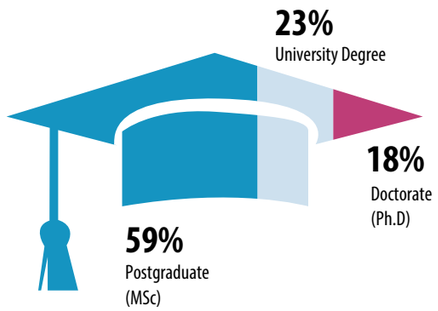


Chart 2:
Distribution of SGL's Scientific Staff according to academic qualifications – 2020

RESEARCH

APPLIED RESEARCH

Applied research is an important pillar of the continuous scientific and technological development of the SGL. Research carried out contributes towards problem-solving and prevention as well as supporting policy decisions and legislation, while boosting socioeconomic growth. The main areas of research cover especially food and water safety and quality, food authenticity and geographical origin, environment and health, consumer products as well as narcotics.

Research is carried out primarily with EU funds but also with national funds by the Research and Innovation Foundation (RIF) and the Ministry of Health. During 2020, the SGL utilised €373,792 from national and EU funds for research programmes.

The results of the above research activities have been presented at international conferences and published in international, well-established, scientific journals and magazines, as well as on the SGL's website and in the local mass media for keeping updated both the scientific community and the public at large.

In 2020, the SGL participated in the following 19 research projects/studies:

Two EU research programmes funded by the European Food Safety Authority:

1. EFSA Multi-Annual Focal Point Grant Agreement (2015-2022).

2. "Risk characterisation of Ciguatera food poisoning in Europe" signed under Framework Partnership Agreement GP/EFSA/AFSCO/2015/03 for the "Evaluation of ciguatoxins (ctxs) in seafood and the environment for the risk assessment of ciguatera fish poisoning (cfp), with the consequent obtainment of reference material (2016-2020).

Eight EU research programmes funded by the Research & Innovation Foundation(RIF), Horizon 2020, INTERREG, LIFE:

1. "European Human Biomonitoring Initiative (HBM4EU)" (2017-2021). The aim of the project is to provide scientific support for the safe management of chemical substances and the protection of human health by using biomonitoring studies to understand the exposure of humans to chemicals and the resulting health effects. The results are used in policy-making, in the assessment of existing measures and in the design of new policies.
2. "EuroBiotox" – European programme for the establishment of validated procedures for the detection and identification of biological toxins (2017-2022).
3. "AgroFOOD" (INTERREG V-A) (2017-2021). The aim of the project is to highlight traditional and local products of Cyprus and the North Aegean through identification of their authenticity, and to enhance their competitiveness.
4. "Carobs, the black gold of Cyprus" (2018-2021). The aim of the project is to create a "forest", organically grown, with 40,000 carob trees, for the production and processing of carobs as well as for the conduct of research and development for the production of carob-based products. The aim is the establishment of collaborations with international and local companies, both for the production of existing and conventional products, for which the market demand is increasing, and for the production of new innovative products, based on scientific studies.
5. "Carobs, the black gold of Cyprus – When science meets the industry" (2019-2022). The project is characterised by strong interdisciplinary synergy between its scientific, industrial and commercial works and aims to play an important role in the development and restoration of the carob industry in Cyprus, in a new modern form. The basic chemical, biochemical and biological properties of the Cyprus carobs will be highlighted through a broad scientific investigation, which can be, on the one hand, the basis for the production of new products and, on the other, the discovery of important factors that will determine the productivity of the Cyprus carob trees.
6. "Life with Vultures" (LIFE) (2019-2023). The project supports the overall effort to rescue the vulture (considered a "natural cleaner" of the countryside) and at the same time reduce the illegal use of poison bait in the Cypriot countryside, which has an impact on public health.
7. "NatCySoap Production of natural soap from plants of the genus Saponaria" (2019- 2021). The aim of the project is the isolation and study of saponin extracts from plants of the genus Saponaria, a common and endemic species of Cyprus, with the ultimate goal of developing antimicrobial soaps.
8. "DiTECT – DIgital TEChnologies as an enabler for a conTinuous transformation of food safety system" (2020-2023). DiTECT will develop an integrated framework for real-time detection, assessment and migration of biological, chemical and environmental contaminants throughout the food supply chain (food groups: corn, foods for young children, poultry, beef, milk and fish). Bringing together research, industrial and food authority partners representing the agro-food industry in the EU and China, DiTECT aspires to establish the foundation for future food safety monitoring platforms, through the development of a standards-based, modular, Big Data-enabled platform, capable of accurately predicting food safety parameters of a given food product based on data collected in real-time via cost-efficient sensors, at crop, grain storage, livestock and finally in the food supply, incorporating blockchain processes. DiTECT research programme is funded by the EU under "Horizon 2020".

National Research Programmes

Eight pilot research programmes funded by the Ministry of Health:

1. Standardisation of Cypriot products.
2. Development of NMR Database for controlled drugs using "Benchtop NMR".
3. Narcotest implementation: Detection of "classic" and synthetic cannabinoids.
4. Quality control of pharmaceuticals, cosmetics and food supplements.
5. Method development for the determination of Polycyclic Aromatic Hydrocarbons in sediments using "microwave extraction".
6. Control of consumer products for the enforcement of: (a) the European REACH Regulation (restricted substances in articles and mixtures) and (b) the European CLP Regulation (classification and labelling of household chemicals).
7. Legionella monitoring in public hospitals' distribution system.
8. Microbial monitoring of the drinking water distribution system and Haemodialysis Units of public hospitals.

- Continued its participation in the ongoing project "Monitoring of the enrichment of Ezousa ground water", along with other competent Authorities.

DEVELOPMENT POLICY AND STRATEGY

In the context of the Administrative Reform of the Public Sector, the SGL modified its strategic plan and connected it with its activities for implementation. At the same time, it has revised its performance indicators, which have now been linked to the more effective monitoring of budget implementation, in connection with its strategic planning.

The development policy and strategy of the SGL is based on its vision and mission and it sets the organisation's priorities, which aim towards:

- its contribution, through its scientific work, to the economic and social development of the country,
- its significant contribution, as a consultant of the State, in responding promptly and in a reliable manner to crises and problems that cover areas under its remit, having an active, scientifically robust and meaningful role in the implementation of the National Strategy,
- its sustainability, as a high quality and state-of-the-art centre of integrated services, expertise and applied research whose scientific contribution can be classified among the best in Europe, and,
- its development as a Centre of Excellence and Regional Reference Centre in the areas of its competence (food quality and safety, pharmaceuticals, consumer products, environmental protection and crime investigation).

COOPERATION

NATIONAL COOPERATION

In order to achieve its objectives, the SGL cooperates at national level with almost all Ministries and competent Authorities, municipalities, governmental and other organisations, universities and institutions and offers paid services to individuals.

EUROPEAN / INTERNATIONAL COOPERATION

The SGL expands its European and international cooperation so as to improve even further its scientific progress, to enhance capacity building and exploit sources of external funding. Through this cooperation, there is an exchange of knowledge and experience with other EU Member States and countries. At the same time, the SGL has the opportunity to demonstrate the activities and skills of a small Member State and its adaptability to cope with new requirements and challenges.

In 2020, the SGL actively participated in the following European Bodies / networks / meetings / programmes / studies:

- European Food Safety Authority (EFSA):
  - Advisory Forum (AF)
  - Focal Point (FP) https://cutt.ly/qpBudYg
  - Communication Experts Network (CEN)
  - Scientific Networks: Chemical Monitoring Data Collection (ChemMon), Food Consumption and Exposure Data, Emerging Risks Exchange Network (EMRISK), Food Contact Materials, Microbiological Risk Assessment, Risk Assessment of GMOs (Food and Feed), and Risk Assessment of Nanotechnologies in Food and Feed.
    - Expert Working Group on Analytical Methods of the European Chemicals Agency (ECHA)
    - European Reference Laboratories (EURL-NRL) meetings.
    - Collaborative studies on standardisation of methods (ISO) under the coordination of the competent EURLs.
    - Working Group for a guidance document on NRL involvement in the investigation of staphylococcal food poisoning outbreaks.
    - Working Group for the validation of a front line real-time PCR method for the characterisation of *Listeria monocytogenes*.
    - "Ring Tests" of the European Customs Laboratories CLEN for the harmonisation, integration and the publication of official CLEN methods.
    - EU Comitology expert groups and Standing Committees.
    - European Network of Forensic Science Institutes (ENFSI) for drugs, arson, gunshot residues and explosives.
    - Network of Official Medicines Control Laboratories of the Council of Europe (EDQM-OMCL) in cooperation with the European Medicines Agency (EMA), and other subcommittees of the Network.
    - Committee for Cosmetics and Consumer Health (CD-P-COS) and Committee of Experts on Cosmetic Products (P-SC-COS) of the Council of Europe.
    - Committee for Food Contact Materials and Articles (CD-P-MCA) of the Council of Europe.
- "Customs 2020" Programme:
  - EU Customs Laboratories European Network (CLEN) for harmonisation and joint actions, and Working Groups of the Programme (Actions 1 to 6)
  - EU Customs Laboratories Expert Team (CLET) on a programme to collect and exchange specific analytical experiences at EU level
  - EU Customs Working Groups (CLEN) Project Group on Compliance Assessment, Use of Precision Data and Statistics
- EU Customs Laboratories Working Groups dealing with new psychoactive substances

Furthermore, in 2020, the SGL:

- Continued participation in the following:
  - The evaluation of EU research proposals for funding and in the Programming Committee of the "Horizon2020" (Food Security, Sustainable Agriculture, Marine, Maritime and Inland Water Research and Bio-monitoring) for research, etc.
  - The Scientific Committee of the Ministry of Health for the development of a strategy for research, and the approval of applications for applied research within the various Departments of the Ministry.
  - The integration, enrichment and extension of the "European Bank for the Isotopic Characteristics of Wines" (as scientific coordinator of Cyprus and Greece), coordinated by the EU's Joint Research Centre (JRC) in implementation of Regulation (EC) 555/2008.
  - The Working Groups of the Council of the EU for the formation/modification of the European legislation.
  - The Management Board of the European Joint Research Programme on Human Biomonitoring (HBM4EU) representing the Ministry of Health, and being the Cyprus scientific coordinator of the project. It also represents HBM4EU in European and international forums on Mercury issues.

In terms of international cooperation, the SGL continued participation in the following:

- The Codex Alimentarius, the FAO and the WHO discussions in areas of its competence.
- The work of the World Wine Organization (OIV), mainly for the adoption of common legislation in the field of wines and wine products.
- WHO's "Environment and Health Process", as the National Contact Point of the Ministry of Health, as well as the National Focal Point (health sector) of the "European Environment and Health Task Force (EHTF)" - WHO Europe, for the implementation of the Ostrava Declaration on tackling environmental health impacts.
- The International Association of Forensic Toxicologists (TIAFT) working groups.
- The International Network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA).
- The evaluation of research papers (reviews) for their approval for publication in international reputable journals or books.
- International conferences with presentations of scientific papers and posters: "Regional Meeting of the HBM4EU National Hub Contact Points (Webinar)" and "EPRW 2020 at Home (web workshop)".

FINANCIAL RESOURCES AND BUDGET

Expenditures incurred by the SGL in 2020 amounted to € 8,068,819.

RELIABILITY AND EFFICIENCY

The efficiency and reliability of a dynamically evolving institution are fundamental conditions for its stability and growth. As a result of long-lasting efforts, the SGL has been able to simultaneously apply two quality management systems in order to guarantee a more integrated approach:

- **International standard EN ISO / IEC 17025:2017**: Since 2002 the SGL has been accredited with this standard by the Greek Accrediting Body (ESYD), and since 2015 it has been accredited by the National Accreditation Body ("The Cyprus Organisation for the Promotion of Quality (CYS-CYSAB)") - within the context of Regulation (EC) No. 765/2008, and
- **Common Assessment Framework (CAF):** It is also one of the first Services in Cyprus and the rest of Europe that started in 2005 the implementation of CAF, a system through which an organisation carries out self-evaluation and sets benchmarks for its performance.

To achieve the efficiency and reliability objectives it has set, the SGL has focused on the following:

- Quality Assurance - Accreditation System
- Implementation of Quality Management System
- Implementation of the Common Assessment Framework (CAF)
- Development and implementation of the Eco-Management and Audit Scheme (EMAS) which covers environmental factors

OBJECTIVES FULFILLED IN 2020

- Expansion of the control, monitoring and surveillance plans:
  - Full implementation of the monitoring/surveillance/control programmes (in all 59) covering a total of 21,024 analysed samples with 517,084 parameters in 2020 (compared to 2019 where 26,030 samples were analysed with 545,271 parameters tested). There was a decrease in the number of samples (around 19%) and a slight decrease in the number of parameters (around 5%), compared to 2019, due to the restrictive measures implemented to deal with the coronavirus pandemic.
  - The SGL continues to apply multi-residual methods to determine more parameters with fewer samples while giving a more representative picture of the sample's situation and more effective control at a reduced cost, and to cover new parameters on a prioritisation basis.
- Infrastructure development and advancement of laboratory equipment (a total of € 935,000 was spent in purchasing state-of-the-art equipment).

- Active contribution to dietary risk assessment at national and European level by processing and evaluating the actual food consumption data of Cypriots using its own upgraded deterministic model, "Improrisk".
- Further development of the Information Technology (IT) Unit's capacity and ability to:
  - technically respond to EFSA's requirements for data transmissions,
  - enhance the Laboratory Information Management System (LIMS) in order to improve the quality of the data, and
  - contribute to the Cyprus "OPEN DATA" platform.
- Effective contribution and support for the national policy/strategy in areas of its competence, among others, through its participation in relevant national Councils including the "Food Safety Council" and the "Cyprus National Addiction Authority", in national Committees and in Technical Committees & Working Groups.
- Communication/Dissemination of knowledge and information via specific publications e.g., "Human Biomonitoring in Europe – Science and Policy for a Healthy Future" (informative leaflet-2020)/website update/interviews to mass media/lectures and presentations in workshops & meetings (mainly on line)/ educational visits of universities students at the SGL's premises.

ACHIEVEMENTS – AWARDS

ACHIEVEMENTS-IMPLEMENTATION OF ACTIVITIES AND PROGRAMMES

During 2020 the SGL achieved the following:

1. Great effectiveness, in cooperation with the respective Competent authorities, in detecting non-compliant:

   Foods: preventing their entry from third countries and EU Member States into the Cyprus and EU market (e.g. nuts, fish, sesame products), by using appropriate preventive and effective control programmes at critical control points (e.g. imports check points), and

   Other consumer products: identifying and withdrawing inappropriate consumer products from the Cyprus market (e.g. toys, thermal paper, leather articles, cement, air fresheners, glues, rubber items) and communicating them to the EU Rapid Alert System for dangerous non-food products (RAPEX).
2. Extension of the scope of its accreditation as regards international standard EN ISO / IEC 17025: 2017 to new methods, new substrates and new parameters. Some of these methods/ techniques are accredited with a flexible scope.
3. Expansion of the official controls to cover new parameters/ products/ categories such as:

   Foodstuffs' area:
   - Accreditation of the pesticide residues laboratory under flexible scope. Expansion of the analytical scope to new combinations of food/ pesticides.
   - Microbiological safety of infant food for special medical purposes and locally produced sprouted seeds from the market.
   - Microbiological safety of ready-to-eat dishes from brunch-serving cafes/restaurants.
   - Application of a new ELISA method for the detection and identification of botulinum toxin (BoNT) ("Eurobiotox" European programme).

   Consumer / industrial products safety
   - Determination of Chromium VI in cement and leather articles (e.g. shoes, safety gloves, belts).
   - Determination of bisphenols A, S and F in thermal paper.
   - Determination of DMFU, PAHS, VOCs and aromatic amines in leather articles (e.g. shoes, safety gloves, belts).

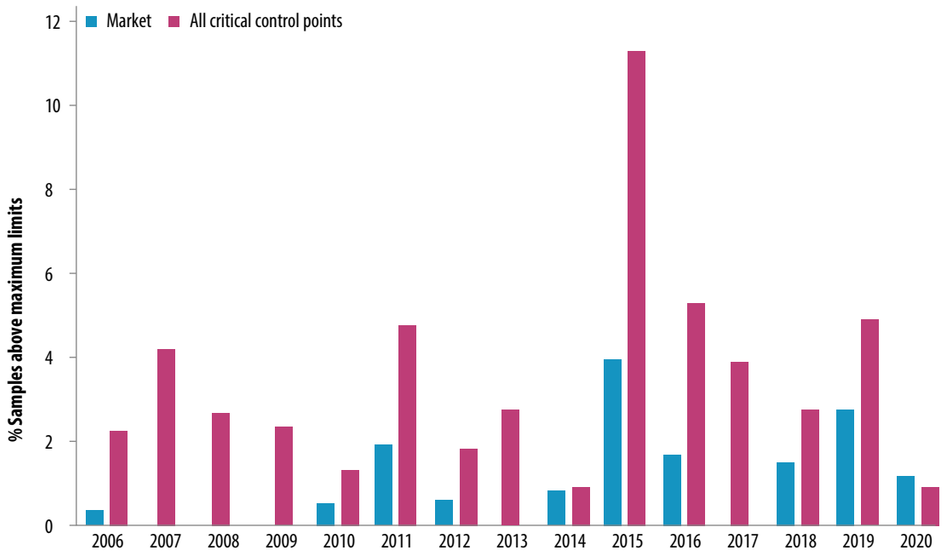


Chart 3: Aflatoxin control of nuts (2006-2020)

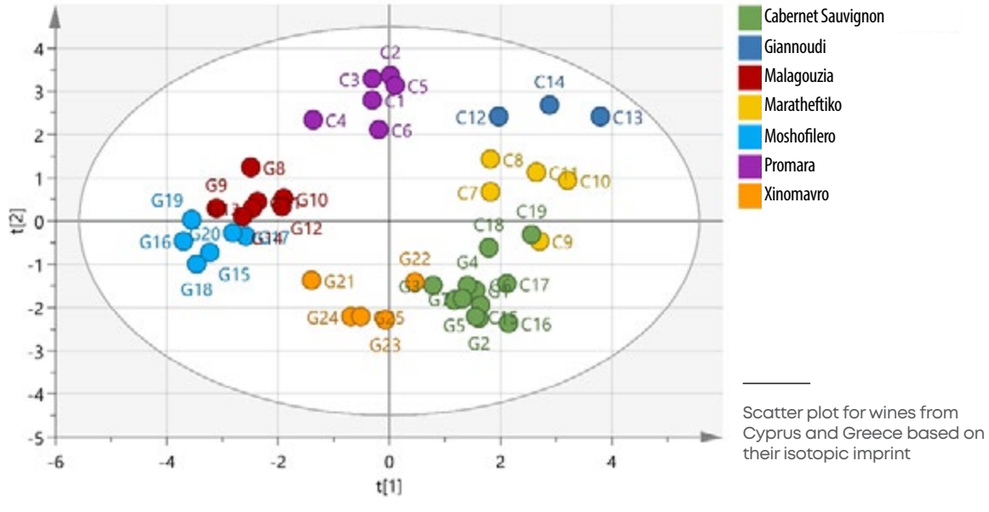
Forensic Chemistry and Toxicology

– Detection of four new psychoactive substances that were reported for the first time in Cyprus.

4. Prompt and effective response to food, environmental and other crises/ incidents that occurred in 2020, in cooperation with the respective competent authorities, such as:
   – Participation, in cooperation with the Environmental Health Services - Ministry of Health, in the works of the joined Europol-Interpol, in the Operation OPSON IX:
     • Alcoholic beverages analysis for their methanol content and verification of their authenticity
     • Analysis of all types of yoghurts for preservatives
   – Contribution to the investigation for the presence of petrol oil in the soil of the territory Souni-Zanatzia in cooperation with the Department of Environment (Ministry of Agriculture, Rural Development and Environment).
   – Contribution to the decision making of the relevant Authority in relation to the suitability of new groundwater boreholes and their use as drinking water.
   – Investigation and testing of drinking water from the Waterboard's network for the presence of petrol oil, following a complaint made by a consumer.
   – Study of the Nicosia Waterboard network in its entirety for its compliance with the legislative limits of total organic carbon and trihalomethane residues (THMs) (water organic chlorination multi-products).
   – Significant contribution to the decision making of the relevant authority in relation to the water suitability of the dam at Larnaca district by investigating a pollution incident through processing of chemical analyses of the dam's water for heavy metals determination.
   – Contribution to the proper operation of water refineries by identifying samples of drinking water in which the concentration of aluminum (a metal used as a flocculant in refineries) was higher than the legal limit.
   – Investigation and testing of samples of drinking water in order to find the cause of the presence of yellowish colour due to high concentration of iron (over the maximum permitted level).
   – Contribution to the investigation for the presence of suspended particles and soil in water from the Waterboard's network.
   – Monitoring of the Dhekelia refiners water quality following problems caused to the tubing and solar systems for water heating.
   – Response to 105 incidents of hospitals' Emergency and Intensive Care Departments.

   – Scientific support to the Police as regards the investigation of 25 murder /attempted murder cases with 80 samples.
   – Scientific support to the Police as regards the management of serious and major cases involving drugs, including a case of an illegal laboratory producing methamphetamine.
   – Contribution to the amendment of the Narcotics, Drugs and Psychotropic substances Law (N.29/77).
5. Continuous contribution to tackling Antimicrobial Resistance (AMR), with the intensive control of products of animal origin for veterinary drug residues, including antibiotics residues.
6. Continuous contribution, through the systematic microbiological monitoring of marine waters, towards the classification of Cyprus' waters among the cleanest bathing waters in the EU in recent years, within the framework of Directive 2006/7/EK and the "Blue Flag" EU programme. Especially in 2020, Cyprus continued for a third year to rank first in the European rankings.

7. The effective expansion of ammunition controls by the accreditation National Guard Laboratory, which has been set up and scientifically supported by the SGL since 2014, resulted in the completion of over 2,986 sample controls of smokeless powder (2014-2020).
8. Expansion of the "Isotopic Mapping of Cyprus Food and Drinks" to create databases, in order to certify their authenticity which contributes to their registration and promotion and facilitates the control of local and imported products in the Cyprus market.



Scatter plot for wines from Cyprus and Greece based on their isotopic imprint

9. Continuation of its participation in the project “AGROFOOD” (INTERREG IV 2014-2020) aiming to highlight traditional and local products of Cyprus and the North Aegean through identification of their authenticity, and enhance their competitiveness.
10. Continuation of its participation in the project “Black Gold: Analysis of carobs and carob-based products”, with the University of Cyprus which aims to boost carob production growth in Cyprus and to promote carob products with nutritional added value.
11. Alongside the above project, the SGL started work on the research project “Black Gold: When Science meets the Industry”, funded by the Research and Innovation Foundation and coordinated by the University of Cyprus with the collaboration of other bodies, to highlight the special properties of the Cypriot carobs that can be used in its production and processing, for the benefit of producers and consumers. To this end, it contributes to the standardisation of traditional carob products (e.g. carob syrup) as well as new products (e.g. alcoholic beverages and carob liqueur) through the study of their physical, chemical, isotopic and organoleptic characteristics, and the gathering of evidence proving the link to their geographical origin.
12. Substantial contribution to EFSA actions, within the context of Dietary Risk Assessment in particular. More specifically the SGL: a) using its “Improrisk” deterministic model for dietary risk exposure of the population at individual level, conducted dietary risk assessment for the Cypriot population (adolescents) exposure to chemicals, and b) contributed to the “Better Training for Safer Food (BTSF)” of the EU on “Chemical Risk Assessment” issues.
13. Continuation of the processing and evaluation of the nutritional data of the Cypriots after the completion of the “National Dietary Survey of the Cyprus population” in 2018, according to EFSA’s requirements. This survey is the first official national Cypriot survey on the diet of Cypriots from infancy to the age of 74 and it aimed at the harmonised collection of food consumption data in all EU Member States as regards the exposure of the population to toxic and other factors. A plan has been prepared by the SGL for conducting risk assessments from exposure to various chemicals through food, using the real food consumption data of the population of Cyprus.
14. Continuation of the collection and transmission of information on new psychoactive substances to the European Monitoring Centre for Drugs (EMCDDA), for the purpose of risk assessment of new psychoactive substances.
15. Continuation of the coordination at national level of the five-year Joint Research Programme “European initiative on Human Bio-monitoring - HBM4EU” (2017 - 2021), being the national focal point as well as the representative of the Ministry of Health at its Management Board. The SGL is also the Contact Point at European level responsible for the drafting of communication materials for participants and the Partner for the preparation of a sustainable HB programme in Europe. The SGL was also elected “Chemical Group Leader for mercury and its organic compounds (= 2nd round priority substances) of the HBM4EU.
16. Publications (six in total), in reputable international journals, of the results of research projects and on subjects relevant to its competence.
17. Participation in 19 research programmes: Eight programmes were funded by the EU (Horizon 2020, the Research and Innovation Foundation, INTERREG, LIFE) and two by EFSA, eight pilot research programmes were funded by the Ministry of Health and one from other national sources.

AWARDS

In October 2020, a certificate of excellent performance was awarded to the SGL because the laboratory was among the top-three laboratories with the lowest average z-score in the proficiency test: EURL-MN PT-2020-01: Fresh frozen fish, As, iAs, Cd, Pb, Hg and MeHg. The proficiency test was organised by the European Union reference laboratory for metals and nitrogenous compounds in feed and food.

CERTIFICATE

of excellent performance to

State General Laboratory

Cyprus

The laboratory was among the top-three laboratories with the lowest average z-score in the proficiency test:

EURL-MN PT-2020-01: Fresh frozen fish, As, iAs, Cd, Pb, Hg, and MeHg

Organized by the European Union reference laboratory for metals and nitrogenous compounds in feed and food

Jens J. Sloth, Director of EURL-MN

October 2020

European Commission

EURL-MN

FUTURE GOALS

The SGL, in view of continuous scientific challenges, new requirements of the EU legislation, various emerging issues and possible food/ environmental crises/incidences, seeks to substantially respond to these challenges, having as a driving force for the accomplishment of these targets its highly professional and dedicated staff.

Based on the above, the following future goals have been set by the SGL:

1. Response to increasing monitoring and control requirements in areas of its competence and continuous improvement of its services.
2. Continuous development of its human resources and completion of its reorganisation and consolidation of its scientific excellence with permanent scientific staff.
3. Continuous provision of timely, reliable, scientifically-based information to the competent Authorities, the Parliament, the media, various stakeholders and the public at large.
4. Expansion and support for the following:

– Targeted educational programmes for all stakeholders, including the private sector, with the aim of protecting public health through prevention and improving the socioeconomic development of the country.
– Networking with European centres of excellence and research institutes and organisations, with the aim of enhancing its scientific role at the EU level.
– Establishment of the SGL as a Centre of expertise and excellence at a national, regional and European level.

5. Further strengthening of the following:

– Coordination and collaboration between competent Authorities for more efficient and effective official controls.
– Food Safety Council’s (FSC) activities, especially with the continuous improvement of its “Improrisk” deterministic model for the food risk assessment of the population at individual level, as well as with the required risk assessment studies and better exploitation of the results of official controls.
– Cyprus National Addictions Authority activities.

- Applied research mostly through utilisation of EU funds (since 2004 the SGL has already absorbed over nine million euros).

6. Carrying out risk assessment studies for the Cypriot population exposure to various chemicals through food by processing and utilising the data extracted from the first official 'National Pan-Cyprian dietary survey, in the framework of the "EU MENU" project of EFSA (2013-2018)".
7. Close collaboration with academic centres for research projects aiming at the socioeconomic development of Cyprus and attracting new high qualified scientists.
8. Strengthening of the close cooperation with relevant competent Authorities to initiate the construction of the SGL's new building, decided in 2017. A new building will reflect its high scientific level as a centre of expertise and excellence at national, regional and European level.
9. Utilisation of the new Laboratory Information Management System (LIMS).
10. Continuous improvement of its credibility, transparency and responsiveness to crises with the aim of preserving the confidence that every Cypriot and European citizen has towards the SGL.

MAIN AREAS OF ACTIVITY

The wide range of the SGL responsibilities and competences is covered by the following four wide areas: Foodstuffs, the Environment, Consumer Products and Forensic Chemistry & Toxicology.

FOODSTUFFS

“Let food be thy medicine, and let medicine be thy food.”

—Hippocrates

Ensuring safe, healthy and quality food is a very important component of protecting public health. The SGL carries out regular official controls and surveillance on foodstuffs, covering all parts of the food production chain, “from the field or farm to the consumer’s table”. To this purpose, it carries out various national control programmes in cooperation with the competent authorities. Controls are of preventive nature and focus mainly on basic foods that are consumed frequently or may raise a specific problem and on foodstuffs expected to be consumed by vulnerable groups of the population such as children and pregnant women. The SGL goes one step further, beyond the analysis. It evaluates the degree of exposure to toxic substances and to related risks, therefore providing scientifically sound advice to competent Authorities for risk management through appropriate measures.

The SGL has been designated as the National Reference Laboratory (NRL) for a large area of food analyses and applies an Integrated Multiannual National Control Plan consisting of individual programmes for surveillance, monitoring and control, as well as applied research, focusing on:

- The prevention, investigation and problem-solving throughout the food chain for long-term food safety.
- The effective implementation of the EU legislation.
- The food risk assessment, the establishment of nutritional data as well as food composition data in order to achieve the stable supply of safe and wholesome food and healthy choices to consumers.
- The provision of valid information to consumers, based on scientific data, to form the correct nutritional/ eating habits.
- The analysis and characterisation of traditional or local food, standardisation and authenticity control.

The effectiveness of the 32 national control-monitoring-surveillance programmes on foodstuffs (chemical, microbiological, biological, radiological and physical safety), during 2020, managed to prevent the trade of non-compliant food both in the national and the EU market and to provide useful information for the compilation of future control programmes.

There are 16 specialised food laboratories in total which support and guarantee the extensive analytical control of the highest standards.

Surveillance and control is carried out based on annual and multiannual programmes in the areas of quality/authenticity and safety of foodstuffs:

QUALITY/AUTHENTICITY OF FOODSTUFFS

Nutritional value, composition, adulteration and authenticity of foodstuffs:

- Nutritional value and composition of foodstuffs (Moisture, Proteins, Fat, Carbohydrates, Salt, Total Dietary Fiber, Fatty acids, Cholesterol, ω3-ω6 fatty acids etc.).
- Milk and dairy products (Moisture, Fat, Proteins, Ash, Salt).
- Determination of milk identity (cow’s, sheep’s, goat’s) of dairy products, including cheeses bearing the Protected Designation of Origin (PDO) label.
- Honey (Sugars: fructose / glucose/ sucrose, Hydroxy-methyl-furfural, Diastase activity, Electrical conductivity, Iso-glucose).

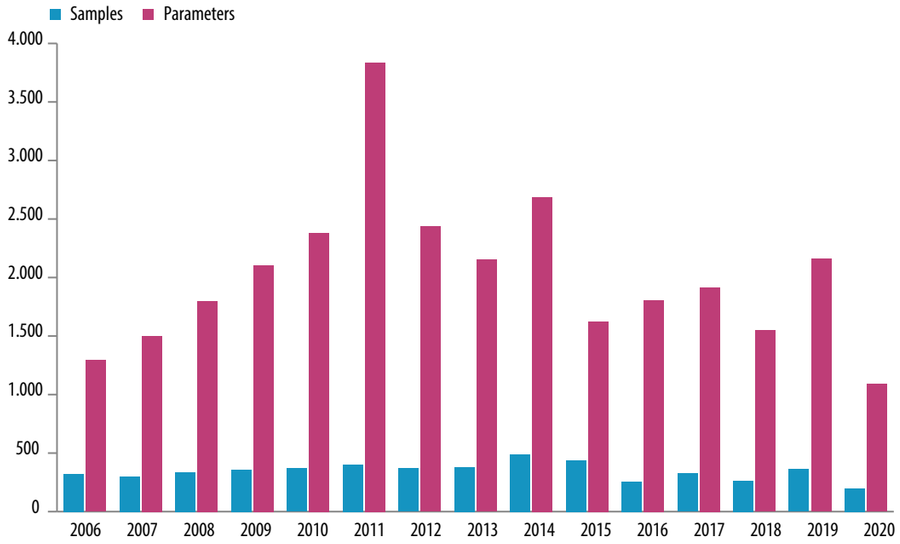


Chart 4: Identification of the authenticity of local products of Cyprus (2006-2020)

- Olive and vegetable oils (Acidity, Peroxide number, UV absorbance, ECN42, Fatty acid profile, Chlorophyll).
- Detection of animal DNA (Detection of cow, pork, chicken, horse DNA in meat products).
- Fish products (Histamine, total volatile base Nitrogen).
- Authenticity and geographical origin of foodstuffs (e.g. alcoholic beverages, wines, honey, fruit juices, vinegar, carob and carob based products (use of spectroscopic and isotopic techniques: SNIF-NMR, IR-MS, ICP, FTIR- NIR, and chemometrics), and fish (tuna and salmon) in terms of genus or species (use of molecular methods).
- Cyprus Food Composition Tables (macro & micro components: Moisture, Proteins, Fat, Carbohydrates, Salt, Total Dietary Fiber, Fatty acids, Cholesterol, ω3-ω6 fatty acids, Calcium, Magnesium, Iron, Zinc etc.)
- Food Customs control and other samples (e.g. chocolates, biscuits, cake mixtures, food supplements, drinks, flavoured drinks, food for special medical purposes, and any agricultural products of chapters 17-21 of the Combined Nomenclature which are imported from third countries), (parameters: Moisture, Total Fat, Butyric Acid Methyl Ester, Milk fat, Protein, Milk protein, Cocoa, Caffeine, Theobromine, Starch/ Glucose, Sucrose/ Isoglucose), juices and baby foods (sugars), nuts (Polyphenoloxidase, Peroxidase, Moisture, Salt), seaweeds (Brix, Salt, Moisture, Swelling properties), determination of aroma complex HPLC (Unsaturated Ketones & Heterocyclic substances) in dry/roasted nuts, determination of denaturants (Isopropanol, Methyl Ethyl Ketone and Bitrex) in denatured products, e.g. bioethanol.

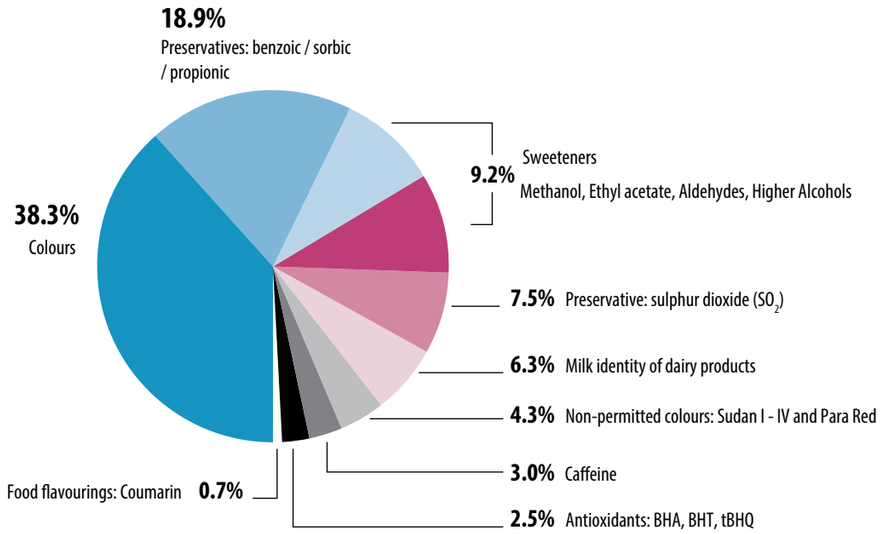


Chart 5: Food additives and special analysis of foodstuff

SAFETY OF FOODSTUFFS

Food additives: Preservatives (Sulphur dioxide, Benzoic/Sorbic acid, Propionic acid, Nitrates/ Nitrites), natural and water soluble synthetic colours (Tartrazine, Carmoisine, Ponceau 4R, Allura Red AC, Carmines etc.), synthetic colours (Sudan I, II, III, IV, Para Red), sweeteners (Acesulfame potassium, Aspartame, Saccharin, Cyclamates, Steviol Glycosides, Sucralose), antioxidants (BHA, BHT, tBHQ, Ascorbic acid), flavouring enhancers (Glutamic acid), food flavourings (Coumarin), caffeine.

Methanol in spirits: (gin, vodka, zivania, ouzo, whisky, tsipouro).

Pesticides residues: More than 400 pesticides (Organophosphorous, Organochlorines, Carbamates, Pyrethroides, Amides, Strobilurines, Dinitroanilines, Triazoles, Benzimidazoles, Neonocotinoides, Phenylureas, Benzoylureas, Triazines, Dithiocarbamates, and other pesticides) are analysed in food samples.

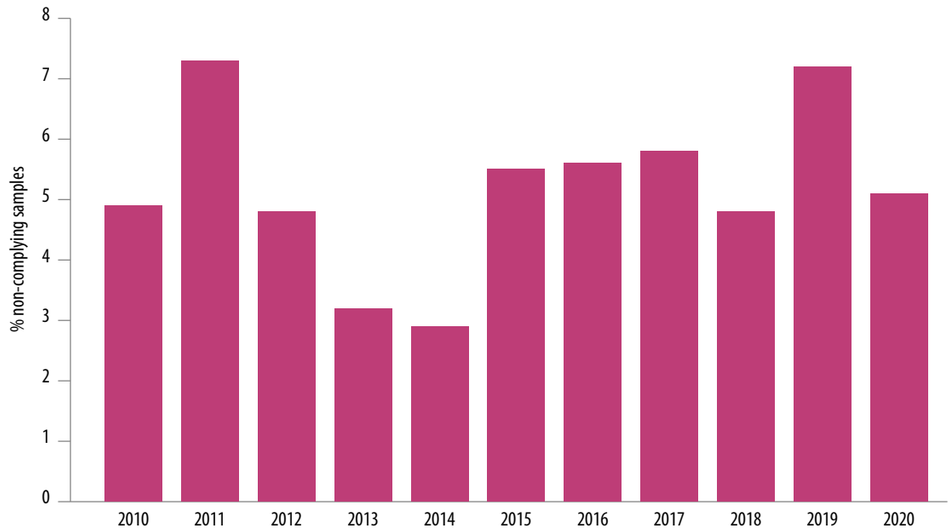


Chart 6: Percentage of non-complying plant origin samples for pesticides residues over the years 2010-2020

Veterinary drug residues in meat and animal products: (Tetracyclines, Sulphonamides, Penicillins, Cephalosporines, Aminoglucosides, Quinolones, Chloramphenicol, Nitrofurans, Carbadox, Olaquindox, Dyes, Nitroimidazoles, Coccidiostats, Anthelmintics, Tranquillizers, Zearanols, NSAIDs, β-Agonists, Hormones, Anabolic substances, Thyreostats, Gestagens, Corticosteroids, Colistin).

Environmental and other contaminants in foodstuffs and natural toxins: (Aflatoxins B1, B2, G1 and G2, total AFLs, Aflatoxin M1, Ochratoxin A, Zearalenone, Deoxynivalenol, Fumonisins B1 and B2, Toxins T2 and HT2, Patulin, Citrinin, Alternaria Toxins [AOH, ALT, AME, TEN, TEA], Tropane Alkaloids [Atropine, Scopolamine], Ergot alkaloids, Enniatins and Beauvericin, Pyrrolizidines Alkaloids (PAs), Chemical Elements [Al, Cr, Mn, Fe, Co, Ni, Cu, Zn, Se, Sn], Heavy Metals [Pb, Cd, Hg, As, etc.], Nitrates/Nitrites, Polycyclic Aromatic Hydrocarbons-PAHs, Furan, Acrylamide, 3-MCPD and glycidyl esters, Ethyl Carbamate, etc.), Dioxins and PCBs.

Radioactivity levels in foodstuffs: (Gamma Radionuclides, such as Cs-137, Cs-134, K-40 and Sr-90 in milk).

Materials and products in contact with food and various substances, including endocrine disrupters (Overall & specific migration of substances: Polyadipates, Cadmium, Lead, Aluminum, Barium, Cobalt, Copper, Iron, Lithium, Manganese, Zinc, Nickel, Formaldehyde, Phthalates, Primary Aromatic Amines, Melamine, Styrene, Bisphenol A, etc.).

Genetically Modified Organisms (Detection of GMOs in food and feed containing soya, maize, rice, honey, papaya, oilseed rape, flax).

Meat fraud (Beef, pork, chicken-poultry, horse, turkey, fish).

Allergens (Milk, soya, egg, fish, crustacean, peanut, mustard, celery, hazelnut, almond, walnut, pistachio, gluten, sesame, lupin, mollusks and cashew).

Microbiological quality of foodstuffs (*Salmonella* spp., *Listeria monocytogenes*, *Campylobacter* spp., *Cronobacter* spp., coagulase-positive staphylococci, staphylococcal enterotoxins, *Bacillus cereus*, *Enterobacteriaceae*, *Escherichia coli*, Shiga toxin - producing *E. coli*, *E. coli* O157, *Clostridium perfringens*, aerobic and anaerobic colony count, yeasts and moulds).

Food supplements (Anabolic Steroids, Stimulants, Vitamins, Heavy metals, PDE-5 analogs, pharmaceutical substances for weight loss (Sibutramine HCl, Synephrine, Hydrochlorothiazide, Caffeine, Phenolphthalein, Triamterene, 2,4-Dinitrophenol), 1,3-DMAA (1,3-Dimethylamylamine) and other pharmaceutical substances as Levodopa in food supplements)

Novel Foods / Nutrition and health claims of foodstuffs (according to EU Regulations 2283/2015 and 1924/2006 respectively)

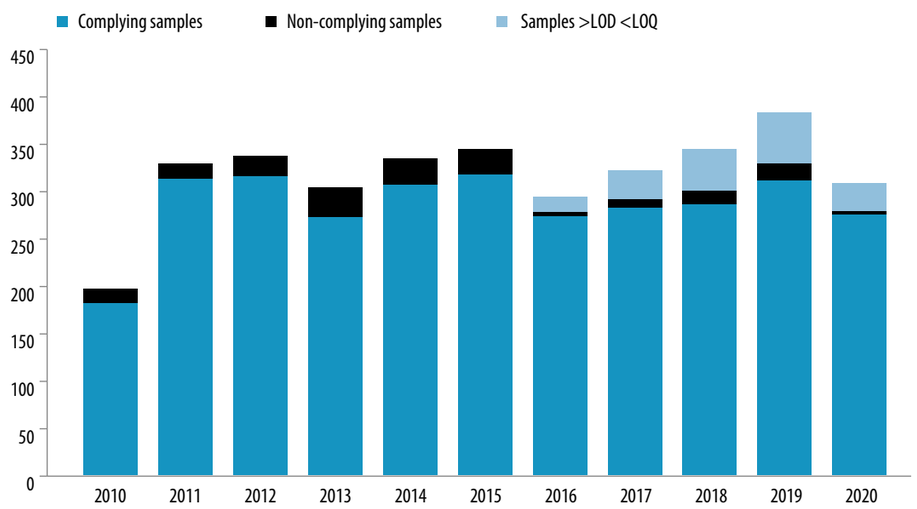
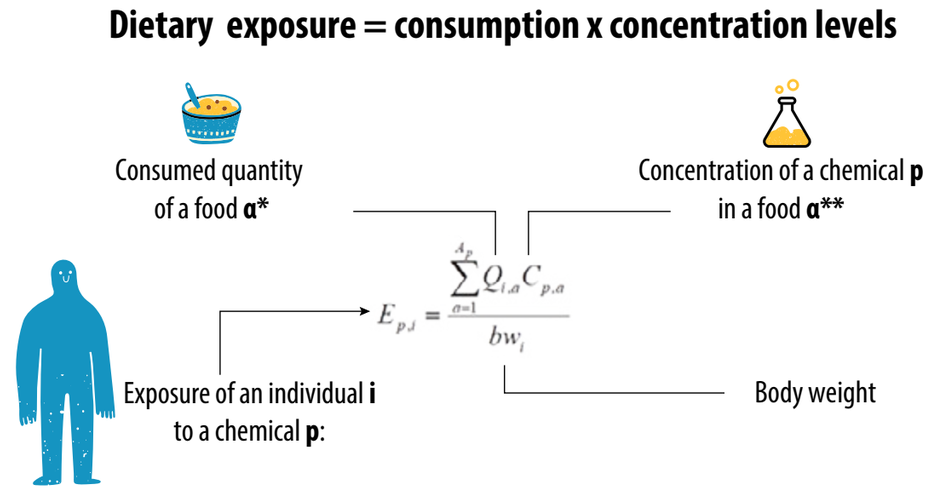


Chart 7: Foodstuffs control for allergens (2010-2020)

DIETARY RISK ASSESSMENT

The SGL carries out risk assessment for the dietary exposure of the Cyprus population to chemical substances (Regulation No. 178/2002), within the framework of its participation in the National Food Safety Council. The Risk Assessment capacity is continuously enhanced with the SGL's participation in EFSA's Advisory Forum, Focal Point and EFSA's Networks.

The SGL substantially contributed to EFSA actions, within the context of the Dietary Risk Assessment in particular. More specifically, the SGL: a) using its "Improrisk" deterministic model for dietary risk exposure of the population at individual level, conducted dietary risk assessment for the Cypriot population (adolescents) exposure to chemicals, and b) contributed to the "Better Training for Safer Food (BTSF)" of the EU on "Chemical Risk Assessment" issues.



* National Dietary Survey (2013-2018)
** National monitoring programmes of chemical substances

Since 2004, the SGL has been conducting dietary exposure assessment of the population to pesticides for acute risk. In 2020, exposure assessment for 17 cases of legal violations was carried out using EFSA's deterministic model Primo v 3.1. In all cases, the exposure of the population was below the acute health-based reference value.

ENVIRONMENT

“Nature is an important ally in the fight against climate change.”

—EU Green Deal

The EU strategy for the Environment and Sustainable Development is a framework for a long-term vision of sustainable development, where economic growth, social cohesion and environmental protection go hand in hand and are mutually supporting. To face these new challenges, the European Commission announced, in December 2019, the “European Green Deal” which is a set of policy initiatives with the overarching aim of making Europe climate neutral in 2050. An impact assessment plan will also be presented to increase the EU’s greenhouse gas emission reduction target for 2030. The substantial contribution to the implementation of such policy is one of the key objectives of the SGL. The recovery plan “Next Generation EU” (NGEU) is a European Union economic recovery package to support Member States adversely impacted by the COVID-19 pandemic. Agreed to by the European Council on July 2020, the fund will operate from 2021-2023. The European Commission published a proposal for an 8th EU Environmental Action Programme (EAP) on October 2020 following the 7th EAP (2012-2020). The proposal supports the environment and climate action objectives of the European Green Deal.

During 2020, the SGL contributed significantly to pollution prevention and effective treatment having developed 20 control-monitoring-surveillance programmes that meet the EU environmental legislation and enable the early identification of accidental or malicious contamination. Surveillance and control is carried out based on annual and multiannual programmes, in cooperation with the competent authorities, in the areas of Water, Effluents and Atmospheric Air.

It has a unique infrastructure to cover chemical, microbiological, biological, eco-toxicological and radiological aspects of environmental monitoring and pollution control of water as well as Human biomonitoring to detect the environmental impact to human health.

Seven specialised laboratories provide a wide range of highly sophisticated analytical services, which keep abreast with the latest worldwide scientific and technological trends.

The SGL, as a vital supporting service of the environmental authorities, utilises its state-of-the-art infrastructure and expertise aiming at the following:

- Continuous support, development and implementation of the environmental policy and legislation by providing reliable laboratory results and expertise.
- Development of effective mechanisms for the early detection of pollution. The ultimate goal is to contribute to the prevention and the long-term safety and sustainability of the water resources.
- Investigation of the links between environment and health and, in particular, the effects of pollution on health, which aim at the prevention and reduction of potential health hazards originating from environmental factors, as well as support of political decisions. Emphasis is also given to the quality of indoor air and the effects of toxic substances on children. In addition, human biomonitoring is being developed in order to investigate the real levels of toxic substances in the human body.
- Furthermore, new programmes are being developed that focus on new potentially dangerous substances and emerging hazards, such as pharmaceuticals in waste water.

WATER

Drinking water, bottled water (including natural mineral water)

- Physicochemical parameters / Anions / Cations (Conductivity, pH, Chlorides, Sulphates, Nitrates, Nitrites, Sodium, Boron, Ammonium, Fluorides, Total Organic Carbon, Cyanides), heavy metals (Lead, Cadmium, Chromium, Nickel, Arsenic, Selenium, Antimony, Mercury, Manganese, Copper, Aluminium, Iron, Barium).
- Organic pollutants (THMs, pesticides, VOCs, PAHs, organic micropollutants)
- Radioactivity levels (Gamma Radionuclides such as Am-241, Co-60, Cs-137, Cs-134, K-40, Gross α/β-activity, Uranium radioisotopes)
- Microbiological control (Total coliforms, *Escherichia coli*, *Enterococci*, *Pseudomonas aeruginosa*, Total Bacterial Count at 22 & 37°C, Sulphite reducing clostridia, *Clostridium perfringens*, *Legionella* species.
- Determination of toxicity (Tap water: Microtox Test using *Vibrio fischeri* (EC10-TU10 measured at 5', 15' and 30' / Water from water refineries: {EC20-TU20 or (depending on the stage of the process) EC10-TU10 measured at 5', 15' and 30'}).

Surface and Ground water (dams, rivers, freshwater, underground water, boreholes, salt lakes)

- Chemical control (pH, Conductivity, Sodium, Potassium, Calcium, Magnesium, Chromium, Zinc, Copper, BOD5 , COD, Mercury, Cadmium, Lead, Nickel, Boron, Barium, Iron, Manganese, Cobalt, Arsenic, Total Phosphorus, Free Ammonium, Total Ammonium, Chlorides, Sulfates, Fluorides, Silicates, Total Hardness Carbonates, Bicarbonates, Nitrites, Total Alkalinity, Total residual chlorine, Suspended solids, Total Organic Carbon (TOC), VOCs, Pesticides, PAHs, Organic micro- pollutants, PCBs, Dissolved Organic Carbon (DOC) and Nitrates).
- PAHs have also been determined in sediments and sea water. (Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrenebenzo(a)Anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k) fluoranthene, Benzo(a)pyrene, Dibenzo(a,h)anthracene, Benzo(g,h,i,)perylene, Indeno(1,2,3C,D) pyrene) as well as metals (Arsenic, Cadmium, Manganese, Nickel, Zinc, Lead, Copper, Chromium, Mercury)
- Microbiological control (Total coliforms, *Escherichia coli*, *Enterococci*)
- Determination of toxicity (Microtox Test using *Vibrio fischeri* (EC20-TU20 measured at 5', 15' and 30'), Daphtox Test using *Daphnia magna* (EC50-TU50 measured at 24 and 48 hours), Algaltox test using *Pseudoklebsiella subcapitata* (EbC50-TU50 measured at 72))
- Environmental biomonitoring (Spectrophotometric determination of Chlorophyll a)
- Radioactivity levels (Gamma Radionuclides such as Am-241, Co-60, Cs-137, Cs-134, K-40, Gross a/b-activity, Uranium radioisotopes)

Monitoring of Ezousa's and Acrotiri's underground water

- Chemical control (Nitrates, Total Phosphorous, Ammonium, TOC, BOD5, COD, total Nitrogen, Suspended solids, Arsenic, Lead, Cadmium, Mercury, Chromium, Copper, Manganese, Nickel, Zinc, Trichloroethylene, Tetrachloroethylene, pesticides residues, organic pollutants)
- Microbiological control (*Escherichia coli*, *Somatic coliphages*)
- Determination of toxicity (Microtox Test using Vibrio fischeri (EC20-TU20 measured at 5', 15' and 30'), Daphtox Test using Daphnia magna (EC50-TU50 measured at 24 and 48 hours), Algaltox test using Pseudoklebsiella subcapitata (EC50-TU50 measured at 72 hours)

Seawater / Costal sea water

- Chemical control (Nickel, Cadmium, Lead, Mercury)
- Microbiological control (*Escherichia coli*, *Enterococci*)
- Radioactivity levels (Gamma Radionuclides such as Cs-137)

Swimming pool water

- Chemical control (Conductivity, pH, Total Residual Chlorine, Free Chlorine, Total Alkalinity)
- Microbiological control (Total coliforms, *Escherichia coli*, Total Bacteria Count 37°C, *Staphylococci* species, *Pseudomonas aeruginosa*).

Chart 8: % Percentage of non-complying samples of drinking water (2009-2020)

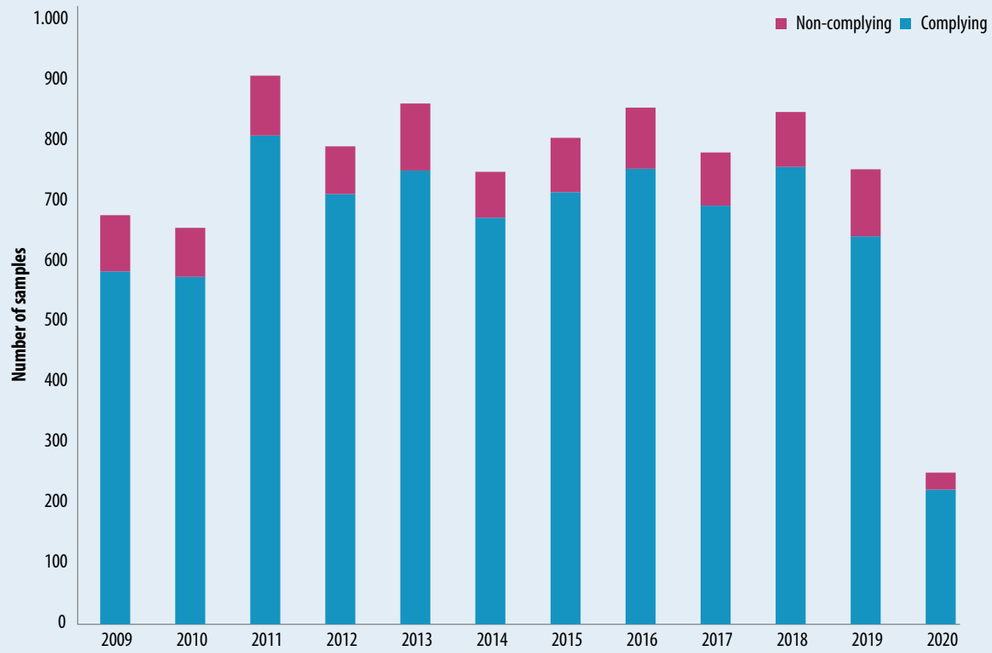


Chart 9: Microbiological control of swimming pool water (2009-2020)

EFFLUENTS

Domestic effluents - treated water

Water scarcity and increased needs due to population growth as well as lifestyle and climate changes make the safe reuse of recycled water from liquid municipal waste extremely important for the water balance of Cyprus.

An important prerequisite for the use of recycled water is strict quality control to ensure the protection of human health and the environment from possible effects of the long-term use as well as to address the concerns and bias of citizens towards the use of recycled water.

The quality control of recycled water includes both chemical and toxicity control:

- Chemical control (pH, conductivity, residual Chlorine, BOD5, COD, Suspended Solids, Chlorides, Nitrates, Sulphates, Boron, total Phosphorus, Total-Nitrogen, metals (Calcium, Magnesium, Potassium, Sodium, Zinc, Copper, Lead, Cadmium, Mercury, Chromium, Nickel, Arsenic, Boron), Carbonates, Bicarbonates, pesticides (aldrin, endrin, dieldrin, trifluralin, simazine, atrazine, chlorpyrifos, dicofol, alachor, chlorfenviphos) and Polycyclic Aromatic Hydrocarbons (PAHs), in treated domestic wastes.
- Determination of toxicity (Recycled water of tertiary wastewater treatment plants: Microtox Test using *Vibrio fischeri* (EC50-TU50 measured at 5', 15' and 30'), Daphtox Test using *Daphnia magna* (EC50-TU50 measured at 24 and 48 hours), Algaltox test using *Pseudoklebsiella subcapitata* (EC50-TU50 measured at 72 hours))

ATMOSPHERIC AIR

Quality of outdoor air

- Chemical control (Metals (Aluminium, Calcium, Iron, Potassium, Magnesium, Sodium, Zinc, Vanadium, Chromium, Manganese, Nickel, Copper, Arsenic, Cadmium, Lead), Anions (Chlorides, Nitrates, Sulphates), Cations (Sodium, Ammonium, Potassium, Magnesium, Calcium), Polycyclic Aromatic Hydrocarbons (PAHs) (Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, dibenzo(a,h) anthracene, Benzo(g,h,i) perylene, indeno(1,2,3-cd)pyrene)
- Radioactivity levels (Gamma Radionuclides such as Am-241, Co-60, Cs-137, Cs-134, Ru-106, Be-7, Gross β- activity, Gross alpha activity, Ruthenium-106).

ENVIRONMENT AND HEALTH

According to the World Health Organization (WHO), many diseases are associated with human exposure to environmental factors, such as toxic chemicals in the food chain, the environment and consumer products. These diseases are often chronic (e.g. cancer, allergies, asthma, neuro-developmental abnormalities, disorders of the reproductive system) and influence healthy ageing.

In addition, the fiscal constraints of the European countries, socioeconomic inequalities, gender inequalities, extreme climatic events, the increase of non-communicable diseases, the ageing of the population and the unprecedented migration between and within countries, exacerbate these factors. There is therefore an urgent need to continue and strengthen efforts to address environmental factors that affect health.

Recognising that the study of the relationship between environment and health can lead to better public health policy and the prevention of diseases, the SGL implemented several actions in response to commitments arising from European, international and national strategies and action plans, as well as from other national priorities.

More specifically:

- Since 2017, the SGL participates and coordinates at the national level the European Joint Research Programme on "Human Biomonitoring for Europe (HBM4EU)" (2017-2021), co-funded by "Horizon 2020" and the 28 participating countries. The main aim of the HBM4EU initiative is to coordinate and advance human biomonitoring in Europe and provide better evidence of the actual exposure of citizens to chemicals and the possible health effects to support policymaking.

Furthermore, in 2020 the SGL:

1. As the "Chemical Group Leader" for mercury and its organic compounds (=2nd round priority substances) of the HBM4EU, contributed to the creation of a sustainable framework for European biomonitoring and to the investigation of the correlations between chemical exposure and human health effects. This work resulted in a series of deliverables, tools and scientific announcements, developed for the needs of specialised stakeholders (policy makers, scientists, citizens who voluntarily participate in human bio-monitoring research, the general public).
2. Under HBM4EU analysed, in cooperation with other certified European laboratories, 120 biological urine samples for 2,200 parameters to measure the exposure of the population of Cyprus to phthalates, bisphenols, cadmium, PAH's and Organophosphate Flame Retardants (OPFRs).
3. Participated in the Steering Group for the development of a new "European Partnership for Chemical Risk Assessment", under the upcoming new seven years' European research project "Horizon Europe", which is expected to start in 2022.
4. Continued the coordination, at national level, of the implementation of the "Ostrava Declaration (2017)" on the Environmental Impact on Health.

- From 2004 to 2017, the SGL has been actively involved in five research programmes related to "Environment and Health" with funding from the 6th and 7th EU Framework Programmes for Research (ESBIO, COPHES), the EU's Life + programme (DEMOCOPHES), the SINPHONIE programme of DG SANTE, the Research Promotion Foundation programme (Homes and Tobacco Free Vehicles), and the Cyprus Ministry of Health (Biomonitoring Programme for Young Children's' Exposure to Cigarette Tobacco).

- It coordinates at European level the "HBM4EU-mom" European study, which aims to prevent prenatal exposure to mercury, through simple dietary recommendations for healthy fish consumption during pregnancy. Specifically, 600 European pregnant women in Cyprus, Greece, Spain, Portugal and Iceland were recruited in this research through their health care providers. The recruited participants provide hair samples to measure their exposure to mercury and personal information about their diet and lifestyle, which will be correlated with their analytical results. The research will be completed in 2022 and it is expected to support policy decisions and to provide tools to health professionals and women, in order to receive the nutritional benefits of fish during pregnancy and lactation, while minimizing exposure to mercury.

CONSUMER PRODUCTS

During 2020, in cooperation with the competent Authorities, testing of consumer products was carried out by five specialised laboratories of the SGL having developed eight control-monitoring-surveillance programmes in the framework of national and EU legislation. The consumer products tested were pharmaceuticals (for human and veterinary use), cosmetics, children's toys, industrial products (household chemical preparations, thermal paper, adhesives, air fresheners, leather articles etc.).

PHARMACEUTICALS

The control of pharmaceuticals, along with the foodstuffs control, was one of the first priorities of the SGL, since its foundation in 1932. The SGL contributed over time to ensure the quality, efficacy and safety of pharmaceuticals traded in the domestic market or produced by the Cypriot pharmaceutical industry for export. Furthermore, the frequent laboratory control contributed to the qualitative development of the Cypriot pharmaceutical industry as well as to the trade improvement of pharmaceuticals.

In order to protect public health, the SGL performs quality control of pharmaceuticals for human and veterinary use, in collaboration with the competent Authorities (Pharmaceutical Services of the Ministry of Health and veterinary Services of the Ministry of Agriculture, Rural Development and Environment), to evaluate their quality, safety and efficiency according to the specifications of the finished product dossier of the Manufacturers Authorization Holder(MHA) and/or official compendial method.

- **Physicochemical and pharmaceutical specifications that are usually tested:**

  Quality: Identification, uniformity of weight, assay of the active ingredient, uniformity of content, pH, water determination, optical rotation, clarity and degree of opalescence of liquids, refractive index.

  Efficiency: Disintegration of tablets, capsules and suppositories, dissolution test for solid dosage forms.

  Safety: Related substances, impurities, degradation products, visible and sub-visible particles in parenteral preparations.
- **Microbiological control:** Sterility test, Limulus amoebocyte lysate endotoxin test, Bioassay

COSMETICS

The SGL is also the official laboratory for the quality control of cosmetics, in collaboration with the Pharmaceutical Services of the Ministry of Health.

- Chemical control (Determination of preservatives (methyl-, ethyl-, propyl-, isopropyl-, butyl- and isobutyl- parabens, sorbic and benzoic acid), presence of Phthallic Esters, Glycols (Ethylene glycol, Diethylene glycol), Fluoride, Oxidative dyes, Bleaching agents (such as Hydroquinone, Hydroquinone - monomethyl ether, 29 Hydroquinone-monobenzyl ether), Lidocaine, Benzocaine, heavy metals, NDELA, Free Formaldehyde, Para-Phenylenediamine (PPD), Allergens, Hydrogen Peroxide, Triclosan, Methylchloroisothiazolinone / Methylisothiazolinone (MCI/MI), Acetone in acetone-free nail polish removers.
- Microbiological control (Presence/absence of *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Candida albicans* and enumeration of total aerobic mesopholic bacteria).

CHILDREN'S TOYS

The main purpose of the control of children's toys is to protect children and infants from exposure to chemical risks i.e. chemicals (heavy metals, phthalates, etc.) found in toys, as well as from risks from poor mechanical/physical properties or flammability. Children may be at risk from poor quality materials or poor construction of toys, which can result in injury or choking of a child.

- Mechanical properties (Drop test, impact tests etc.)
- Chemical control (Phthalate esters, migration of certain elements from wooden and metallic toys with painted surfaces, plasteline, crayons, coloured pencils and watercolours)
- Flammability test in toys intended to be entered by a child such as toy tents and play tunnels.

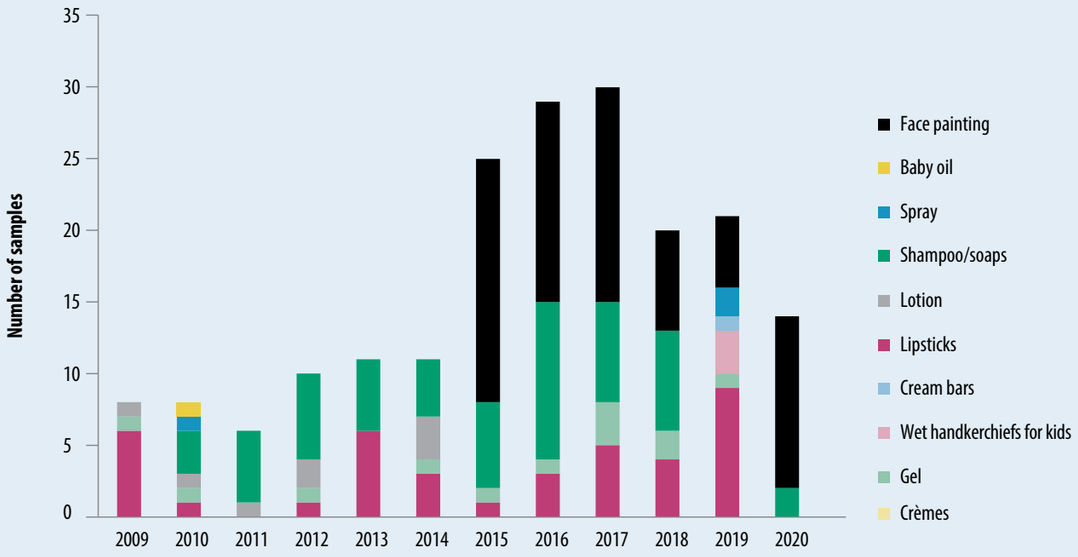


Chart 10: Microbiological control of cosmetics (2009-2020)

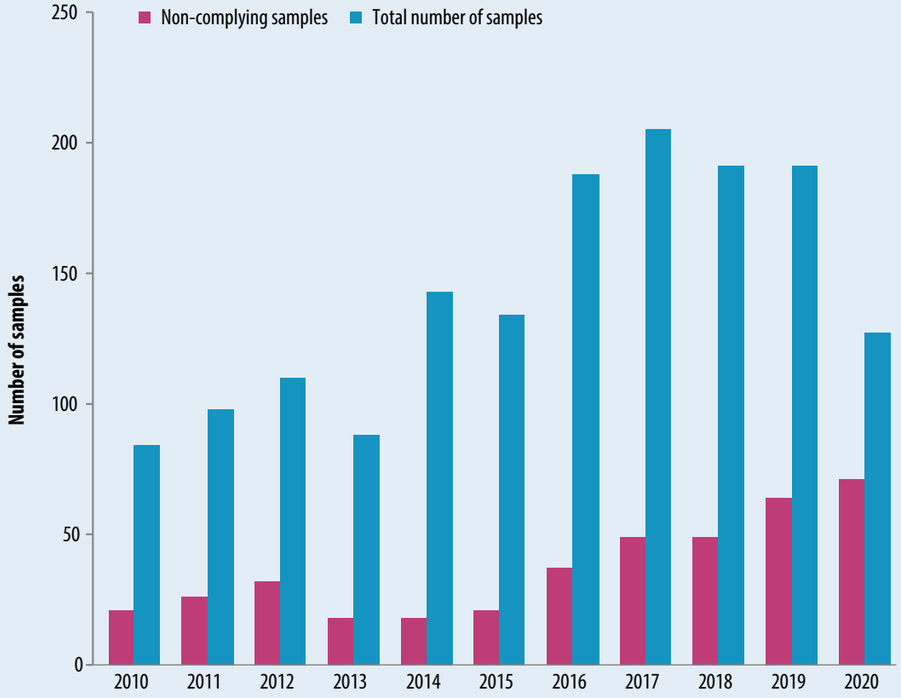


Chart 11: Chemical/mechanical control of children's toys over the years 2010-2020

OTHER CONSUMER PRODUCTS

The SGL collaborates with Cyprus' competent Authorities:

- Department of Labour's Inspection, of the Ministry of Labour, Welfare and Social Insurance) for the implementation of the Chemical Substances Law of 2020 (N.119(I)/2020), the European Regulation (EE) 1907/2006 (REACH) for the control of dangerous chemicals in various consumer products and the European Regulation (EC) 1272/2008 (CLP) for the classification, labeling and packaging of chemical substances and mixtures.
- Consumer Protection Service, of the Ministry of Energy, Commerce and Industry for the General Safety of Products Law of 2004 up to 2010 (harmonisation with Directive 2001/95/EC)

The following categories of consumer products from the Cypriot market are analysed within the framework of the above regulations:

- Adhesives for chloroform, toluene, benzene and 1,2-dichloroethane.
- Air fresheners for 1,4-dichlorobenzene, chloroform, benzene and other restricted chemicals and allergens.
- Household chemical preparations to determine pH.
- Leather articles for DMFU (Dimethyl Fumarate), PAHS (Polycyclic Aromatic Hydrocarbons), VOCS (Volatile Organic Compounds), chromium VI and aromatic amines.
- Thermal paper for Bisphenol A, F and S.
- Cement for Chromium VI.
- Various other products for targeted investigations.

FORENSIC CHEMISTRY AND TOXICOLOGY

''Punish no one without examination.''

—Socrates

The Forensic Chemistry and Forensic Toxicology Laboratory is the official Government laboratory in Cyprus to perform analyses of police exhibits in relation to trafficking and use of drugs, arson, explosive materials and residues, traffic accidents, malicious damages, unnatural deaths, poisoning cases, murders, rapes, etc.

Through the analyses performed and the interpretation of results, the laboratory provides scientific evidence to the police and medical examiners to investigate cases for judicial proceedings. Through the toxicological analysis results, the laboratory supports doctors to treat emergency patients.

FORENSIC CHEMISTRY

- Controlled drugs (cannabis, heroin, cocaine, and new synthetic drugs: synthetic cannabinoids, cathinones, benzofurans, etc.)
- Tetrahydrocannabinol in food products and cosmetics
- Ignitable liquids (petrol, diesel, kerosene, thinners and other ignitable liquids)
- Explosives and explosives residues (organic and inorganic explosives and pyrotechnic compositions)
- Scanning Electron Microscope (gunshot residues, hair, etc.)
- Tear gases (a-chloroacetophenone, 2-Chlorobenzalmalononitrile, Capsaicine, Nonivamide, etc.)

FORENSIC TOXICOLOGY ON POLICE AND HOSPITAL SAMPLES

- Qualitative analysis (Toxicological analysis for the presence of controlled drugs, medicines and pesticides in various biological samples).
- Quantitative analysis (Alcohol in blood and eye fluid and medicines in blood).

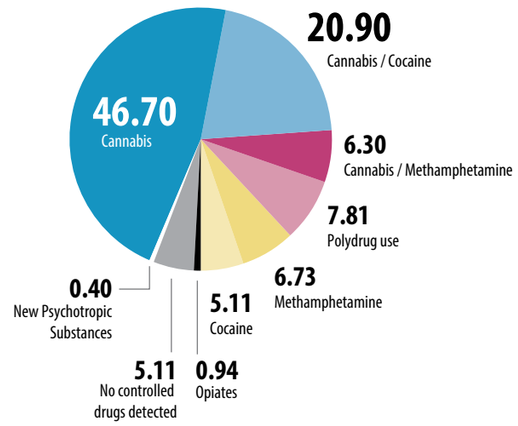


Chart 12: % Percentage of drugged drivers related to substance use in oral fluid samples (narcotest) 2020