STATE GENERAL LABORATORY

REPUBLIC OF CYPRUS

STATE GENERAL LABORATORY

ANNUAL REPORT 2019

Abridged Version

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Excellence. The foundation to a better quality of life.

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, which with a deep sense of responsibility, the management team and its staff, completed during 2019. 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 2019.

2019 was a year with many challenges and obligations where, 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,
- 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,
- effectively utilise its financial resources and absorb national and European funds for applied research, for the benefit of its further development as an organisation,
- exploit all possible forms of cooperation at national, EU and international level to effectively achieve its goals.

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

The SGL, both as a Public Service Department and a well-recognised scientific research center, 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 2019, the SGL won the "Arne Anderson Award" in the field of Single Residues Methods, which is awarded every two years to the first ranking laboratory among all EU Official and Reference Laboratories participating in the EU Proficiency tests.

The most important activities that marked the work of the SGL in 2019, among others, were:

a) the 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,

(b) the continuation of its active involvement in EU research projects (e.g. Health risk assessment from combined human exposure to multiple food-born toxins, Human biomonitoring, Detection and identification of biological toxins, Identification of traditional and local products of Cyprus and the North Aegean, Carobs- the Black Gold of Cyprus, etc.),

c) its active contribution to dietary risk assessment at national and European level by processing and evaluating the nutritional data of Cypriots from the "National Dietary Survey of the Cyprus population", and the planning of risk assessment studies of the Cypriots, and therefore of the European citizens' exposure to various chemicals through food,

d) the expansion of the official control to new parameters and / or new categories and products,

e) the further expansion of the scope of its accreditation as regards the international standard EN ISO / IEC 17025: 2005 to new parameters, new product substrates and new analytical methods,

(f) its contribution to the effective response on food crises (e.g. food poisoning), environmental crises (e.g. marine pollution), and other emergencies (e.g. crime, murders, unnatural deaths, drug cases), antimicrobial resistance to antibiotics, the standardisation of traditional products of Cyprus,

g) its contribution to the classification of Cyprus as the first at European level in the microbiological purity of the bathing waters of its beaches,

h) the representation of Cyprus at European and international level, as being the Cyprus Contact Point, on issues of Food Safety and Quality, Human Biomonitoring, Environment and Health, etc

(i) the representation of the EU in European and international fora in areas such as human biomonitoring,

j) the organisation in Cyprus of important European conferences and meetings related to its responsibilities, such as the "European Network of Forensic Science Institutes".

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

The construction of its new building, among other things, will contribute its utmost 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 for its completion the year 2023 - the necessary procedures for the start of the implementation of the project were also continued during 2019.

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 achieves 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 SGL's vision as well as the actions taken and the goals achieved in 2019, make it a year of success, with a positive impact on the society and the economy of the country.

In conclusion, I do hope that 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

Excellence. The foundation to a better quality of life.

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ABOUT THE SGL

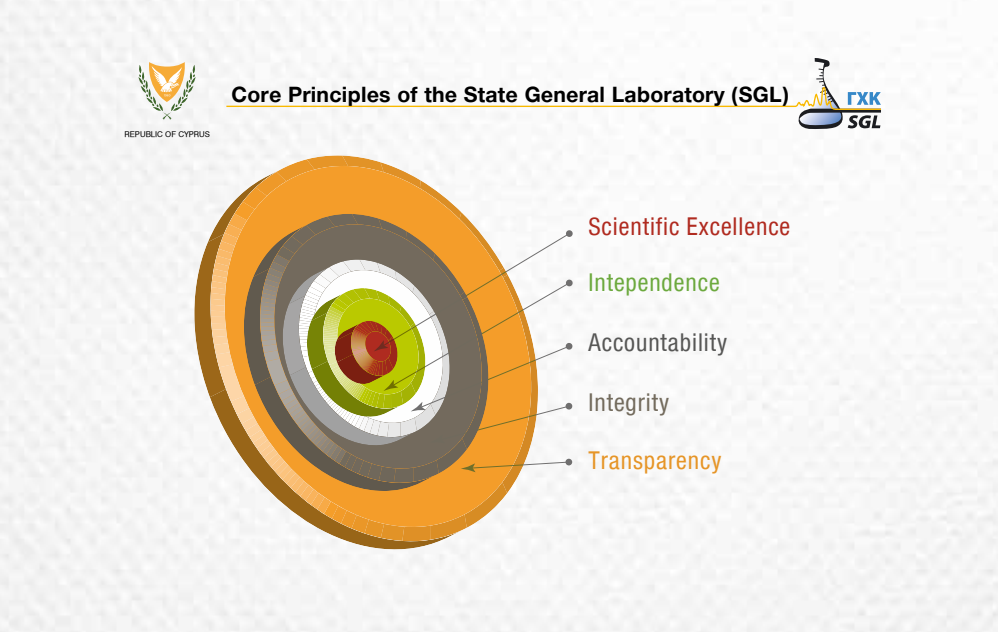
GENERAL SCOPE AND RESPONSIBILITIES

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 Center 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 and five Units.

All laboratories under the SGL are accredited according to the European Standard EN ISO/IEC 17025:2005 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.



Under the support and configuration of National Policy, within the framework of its responsibilities, the SGL's 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 Center of Information on Narcotics, ECOLABEL, UN-Children Rights on Health).

It is also, among others, at **European / international level**: 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 Health sector) on "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 a national but also at European level. Its constant contribution to the revision of food / water / consumer's 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, citizen's safety and consumers' rights mainly through prevention
2. To facilitate fair trade and 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 17025:2005 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 levels and 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 multivariate control methods by fully utilising the manpower, 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 centers 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.

THE SGL IN NUMBERS IN 2019

26,030 Analysed Samples

545,271 Analysed Parameters

136 Interlaboratory Skills Testing

951 Parameters Checked in Interlaboratory Skills Testing

59 National Control - Monitoring - Surveillance Programmes

19 Applied Research Programmes

8 Scientific Publications

26 Posters & Oral Presentations in international conferences

2 European and international conferences in Cyprus

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

1 European Award

21 Specialised Laboratories

€8,015,712 Budget implemented

ORGANISATIONAL STRUCTURE

The SGL has its own organisational structure, the Director and the Heads of Sectors comprising the management team, as shown in the 2019 Organisational Chart below. The SGL's wide range of analytical work is covered by 21 Laboratories that fall under eight sections which are being supported by the following five Units:

a. Cooperation with EFSA and Risk Assessment Unit

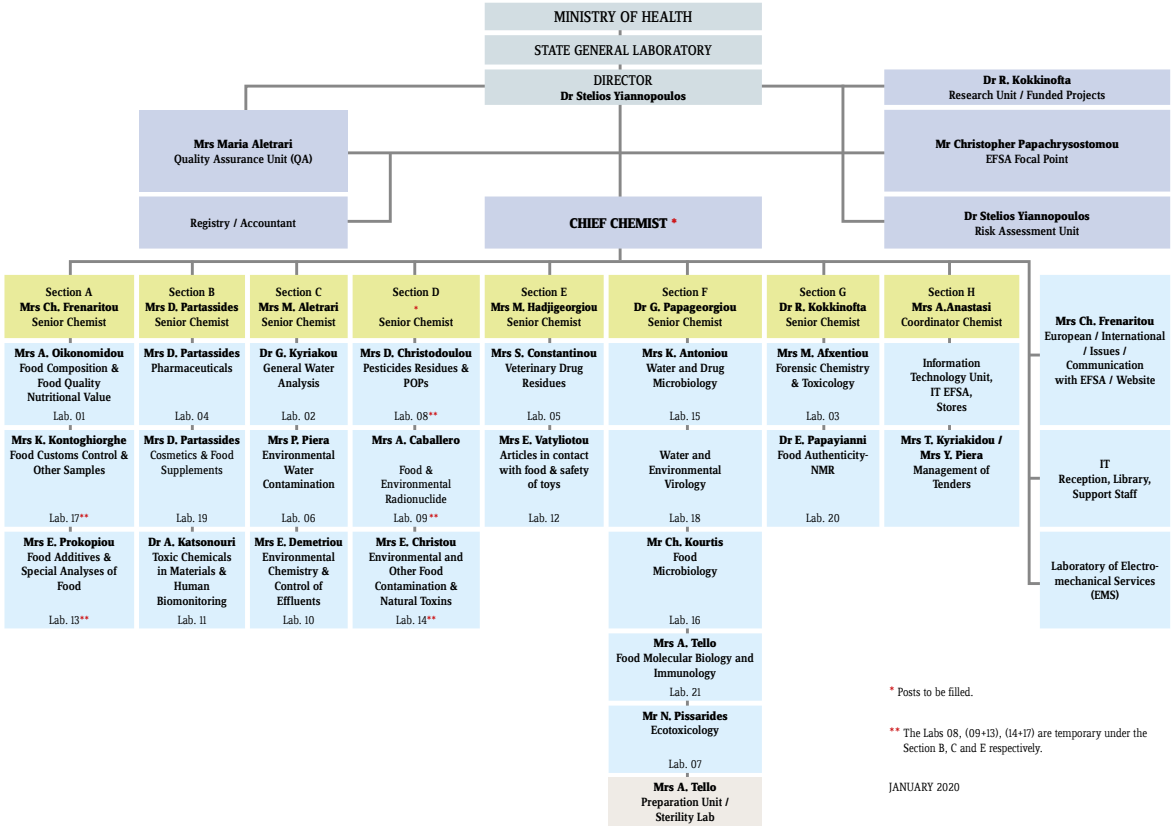
b. Quality Assurance Unit

c. Research and Funded Projects Unit

d. Information Technology Unit

e. European / International Issues, International Cooperation & Communication Unit

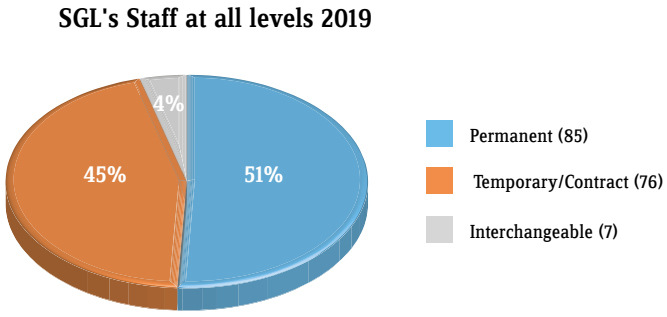
The following services assist the SGL in its day-to-day operation and implementation of its work: Registry, Stores, Library, Secretariat, Accounts and Electromechanical Services.



HUMAN RESOURCES

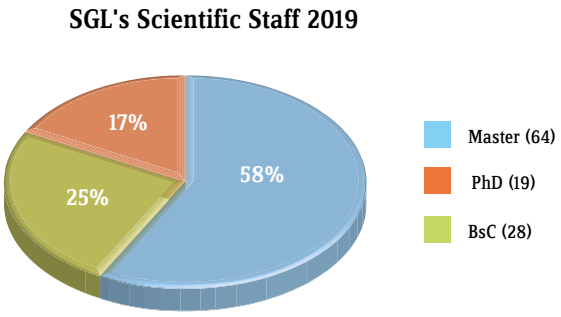
During 2019, the SGL's staff comprised 168 persons in total:

- 64 Chemists, Microbiologists, Biologists, four clerks and four persons from other departments as well as 24 support staff, in permanent positions.
- 47 Laboratory Technicians with high academic qualifications (such as Chemists, Microbiologists, Biologists) as well an Executive Assistant for managing research programmes and eight clerks were employed on temporary base.
- 19 Chemists / Microbiologists / Biologists, including a Data Base expert and an Executive Assistant for managing research programmes were employed on contract for the completion of the research projects.



SGL's staff at all levels - 2019

It is also worth noting that out of the 111 scientists, 83 of them (75%) held at least one postgraduate degree and several of them had a PhD.



SGL's Scientific Staff - 2019

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 safety and quality, food authenticity and geographical origin, water, 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 2019, the SGL utilised **€ 404,836** from national and EU funds for research programmes.

The SGL participates, through its Director, in the National Committee of Research and Innovation Coordinators (R&D) representing the Ministry of Health.

The results of the above research activities have been presented in 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 2019, the SGL started or continued the following **19** research projects / studies:

a) 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)

b) Eight EU Research programmes funded by the Research Promotion Foundation, Horizon2020, INTERREG, LIFE:

1. **"EuroMix: Horizon 2020 EU project:** Assessing the health risks of combined human exposure to multiple food-related toxic substances" (2015 - 2019)
2. **"European Human Biomonitoring Initiative (HBM4EU)"**. 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 (2017-2021).

3. **"EuroBiotox"** - European programme to establish validated procedures for the detection and identification of biological toxins (2017- 2022)
4. **"AGROFOOD"** (INTERREG V-A). The aim of the project is to highlight traditional and local products of Cyprus and the North Aegean through identification of their authenticity, and enhance their competitiveness (2017-2019).
5. **"Carobs, the black gold of Cyprus"**. 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 (2018-2021).
6. **"Carobs, the black gold of Cyprus – When science meets the industry"**. 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 (2019-2022).
7. **"Life with Vultures"** (LIFE). The Project supports the overall effort to rescue the Vulture (considered a "natural cleaner" of the countryside) and at the same time to reduce the illegal use of poison bait in the Cypriot countryside, which has an impact on public health (2019-2023).
8. **«NatCySoap Production of natural soap from plants of the genus Saponaria»**. 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" (2019-2021).

c) National Research Programmes:

i. Seven Pilot research programmes funded by the Ministry of Health.

1. Method development of comparing drug samples using quantitation data
2. Survey on the safety of cosmetic and food supplement products
3. Investigation of the presence of priority substances in treated domestic wastes used to enrich groundwater

4. Chemical safety of products from the market of the Republic of Cyprus: control of compliance according to the requirements of the REACH Regulation
5. Determination of Specific Migration of Substances from Materials in Contact with Food and/or Children Toys
6. Microbiological control of Cyprus sea water during the 2019 swimming period
7. Microbiological control of both dental units and distribution water of public hospitals, for the presence of Legionella

ii. Continued its participation in the ongoing projects:

1. **"Monitoring of the enrichment of Ezousa ground water"**
2. **"Prospects for the cultivation of stevia in Cyprus"**: A three-year research programme which has been launched in collaboration with the Agricultural Research Institute of the Ministry of Agriculture, Rural Development and Environment, for the determination of glycosides and the development of a methodology for the antioxidant properties of stevia leaves (2017-2019).

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 counsellor 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 center of integrated services, expertise and applied research whose scientific contribution can be classified among the best in Europe, and
- its development as a Center of Excellence and Regional Reference Center 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. It also offers paid services to individuals.

EUROPEAN / INTERNATIONAL COOPERATION

The SGL also 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 2019, 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/ufbWpcl
  - Communication Experts Network (CEN)
  - Scientific Networks: Chemical Occurrence Data, Pesticide Residues Monitoring, Veterinary Medicinal Products Residues, Food Consumption and Exposure Data, Emerging Risks Exchange Network (EMRISK), Food Contact Materials, Microbiological Risk Assessment, Risk Assessment of GMOs (Food & Feed)
- European Reference Laboratories (EURL-NRL) meetings
- Collaborative studies on standardisation of methods (ISO) under the coordination of the competent EURLs
- EU Comitology expert groups and Standing Committees
- "Ring Tests" of the European Customs Laboratories CLEN for the harmonisation, integration and the publication of official CLEN methods

- **"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
- European Network of Forensic Science Institutes (ENFSI) for drugs, arson, gunshot residues and explosives
- Expert Working Group on Analytical Methods of the European Chemicals Agency (ECHA)
- 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

Furthermore, in 2019, 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 Biomonitoring) 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 Center (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,
- 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) on 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 work of the World Wine Organization (OIV), mainly for the adoption of common legislation in the field of wines and wine products
- International conferences with presentations of scientific papers and posters (1st ISO-FOOD International Symposium- Piran-Slovenia, Climatico 2019 Conference-Limassol-Cyprus, International Conference on Mercury as a Global Pollutant (ICMGP 2019)-Krakow-Poland, 25th ENFSI DWG Workshop-Larnaca-Cyprus, European science engagement (ECSITE) 2019 Conference-Copenhagen-Denmark, 13th Cyprus-Greece Chemistry Conference-Nicosia-Cyprus, 7th Forensic Isotope Ratio Mass Spectrometry (FIRMS) Conference-Italy)
- The evaluation of research papers (reviews) for their approval for publication in international reputable journals or books

Furthermore, in 2019, the SGL:

- Actively participated in the organisation and realisation of the "13th Cyprus – Greece: Chemistry Conference", which was organised by the Pancyprian Union of Scientific Chemists, the Association of Greek Chemists and the Department of Chemistry of the University of Cyprus. The SGL as co-organiser chaired and coordinated the discussions on various scientific subjects such as: Food Chemistry, Safety & Health, and AGROFOOD (Nicosia, 31/10 - 3/11/2019).
- Chaired and coordinated the discussion in the session "Climate & Health" of the international Conference "CLIMATICO 2019", which aims to showcase the advances in science and technology driven by the Paris Climate Change Agreement with special focus on agricultural, food and health aspects of climate change impacts in the Mediterranean region, held in Limassol, Cyprus (April 2019).

FINANCIAL RESOURCES AND BUDGET

Expenditures incurred by the SGL in 2019 amounted to € 8,015,712.

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:

a) **International standard EN ISO / IEC 17025:2005:** 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 Organization for the Promotion of Quality (CYS-CYSAB)") - within the context of Regulation (EC) No. 765/2008,

and

b) **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 2019

- **Expansion of the control, monitoring and surveillance plans:** Full implementation of the monitoring/surveillance/control programmes (in all 60) covering a total of **26,030** analysed samples with **545,271** parameters in 2019 (compared to 2018 where 25,639 samples were analysed with 523,446 parameters tested). The fact that both the number of samples and the number of parameters is higher than in 2018 shows the intensification and increase of the official controls due to the implementation of stricter legislation and the need of more targeted controls by the SGL in cooperation with the competent Authorities. The SGL continues to use multi-residual methods that analyse 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.

- **Human Resource development** through trainings (Cyprus Academy of Public Administration, BTSF, EU-FORA etc.) and educational programmes (16).

- **Infrastructure development and advancement of laboratory equipment** (a total of € 796,900 was spent in purchasing state-of-the-art equipment or renewal of old equipment).

- **Enhancement of dietary risk assessment capacity** with the use of its own deterministic model, "ImproRisk", to assess the risk from several substances (such as Lead, Cadmium, Mercury, Nitrates, Acrylamide and Polycyclic Aromatic Hydrocarbons (PAHs), Aflatoxin B1 on food- the results were satisfactory and in line with EFSA's respective risk assessments for Cyprus). Furthermore, through the completion of EFSA's project "EU Menu" at national level in 2018, the SGL continued the processing and evaluation of Cypriot nutrition data and prepared a plan for conducting risk assessments through food with the actual food consumption data of the Cypriots.

- **Further development of the Information Technology (IT) Unit's capacity** and ability to: a) technically respond to EFSA's requirements for data transmissions, and b) enhance the Laboratory Information Management System (LIMS) in order to improve the quality of the data. Furthermore, in 2019, the SGL evaluated the offers made for the purchase of new version of LIMS system, and contributed 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 (10)-including the "Food Safety Council" and the "Cyprus National Addiction Authority", in national Committees (10) and in Technical Committees & Working Groups (6).

- **Communication / Dissemination of knowledge and information** via specific publications (2) and press releases) / website update / press conference of

the Minister of Health/ interviews to mass media (7)/ scientific conferences / educational workshops / lectures and presentations in workshops & meetings (24)/ educational visit of universities' students at the SGL's premises (1).

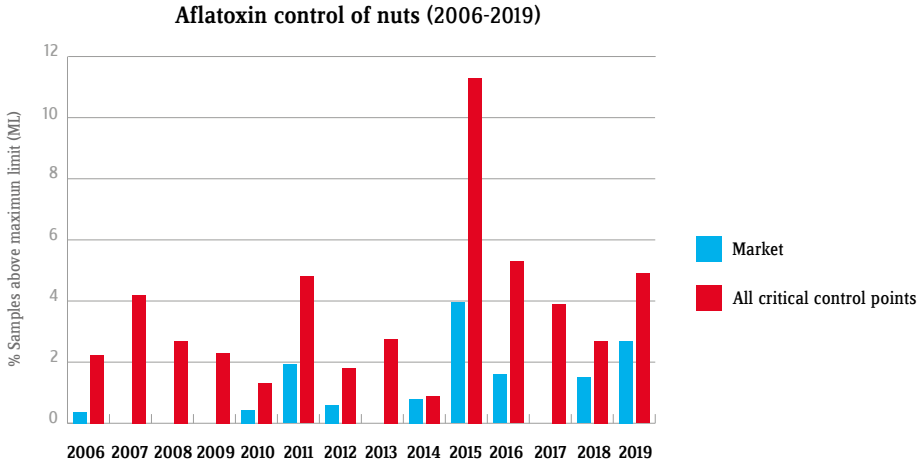
ACHIEVEMENTS - AWARDS

ACHIEVEMENTS-IMPLEMENTATION OF ACTIVITIES AND PROGRAMMES

During 2019 the SGL achieved the following:

A. 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), by using appropriate preventive and effective control programmes at critical control points (e.g. imports check points), and



Aflatoxin control of nuts (2006-2019)

- other **consumer products**, identifying and withdrawing inappropriate consumer products from the Cyprus market (e.g. toys, glues, rubber items) and communicating them to the EU Rapid Alert System for dangerous non-food products (RAPEX).

B. Extension of the scope of its accreditation as regards international standard EN ISO / IEC 17025: 2005 to new methods, new substrates and new parameters. Some of these methods are accredited with a flexible scope.

C. Expansion of the official controls to cover new parameters or categories such as:

Foodstuffs area:

- Application of chemo-metric techniques in spectroscopic and other control data to verify the authenticity of food and beverages
- Expansion of the scope of the method for the determination of pesticide residues in fruits and vegetables with 12 new analytes
- Development of a method for the determination of Colistin in products of animal origin.
- Detection of authenticity of sardines
- Detection of adulteration of squid foodstuff with trapsalo
- Detection of new allergens in foodstuffs
- Detection of new genetic modifications in foodstuffs
- Microbiological control of ready-to-eat seeds and cereal, pasteurised donkey and goat milk, fruit yoghurt for children, vegan "cheeses", frozen veggie burgers and seafood (from supermarkets), sandwiches from bakeries and kiosks, cheeses in brine from groceries and fresh eggs from hotels
- Microbiological control of packaged ground coconut and sesame seeds from the market for correlation to the relatively high incidence of salmonella in these foodstuffs at border inspection points

Consumer / Industrial Products Safety:

- Determination of polycyclic aromatic hydrocarbons in rubber products (e.g. safety tiles for playgrounds, steering wheel covers, gloves, shoes)

Forensic Chemistry and Toxicology:

- Detection of six New Psychoactive Substances that were reported for the first time in Cyprus
- Development of new multi-parametric methods in urine and blood using Liquid Chromatography with tandem mass spectrometry (LC-MS/MS)

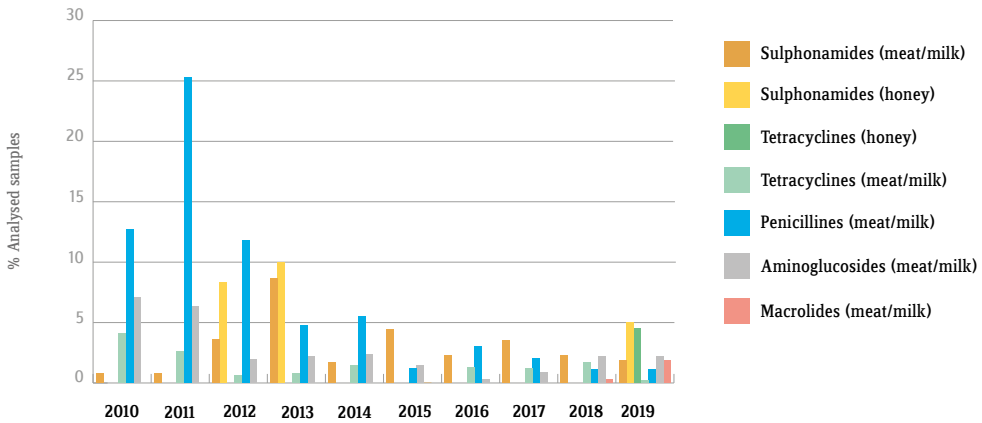
D. Prompt and effective response to food crises and other crises / incidents that occurred in 2019, in cooperation with the respective Competent authorities, such as:

- Contribution to the combat of food fraud by controlling a number of samples such as honey, olive oils and dairy products
- Participation, in cooperation with the Environmental Health Service - Ministry of Health, within the works of the joined Europol-Interpol Operation OPSON VIII, for adulteration control of Food Supplements intended for the loss of weight, with the substance 2,4-Dinitrophenol
- Participation, in cooperation with the Environmental Health Services - Ministry of Health, in the "EU Coordinated control plan with a view to establishing the prevalence of fraudulent practices in the marketing of herbs and spices (EU Food Fraud Network)" by carrying out analysis of herbs and spices for detection of unauthorised colours
- Participation, in collaboration with the Department of Agriculture of Ministry of Agriculture, Rural Development and Environment, in the EU project OPSON, for the controls for adulteration and authenticity of organic products
- By analysing a number of flour and dough samples from the market, in light of a major outbreak in North America from shiga toxin-producing *Escherichia coli* (STEC) in similar products, followed by a request by WHO for contribution of relevant data by EU countries
- Participation in the investigation of three local foodborne outbreaks (from shigella, staphylococcal enterotoxins and unknown etiology, respectively)
- Direct contribution to the investigation related to the crime at Memi Lake: Water samples taken from the Memi Lake at Xyliatos were presented for heavy metals determination in order to identify the danger of channeling that water to the environment and additionally in facilitating the missing persons search.
- Significant contribution to the decision making of the relevant authority in relation to the water suitability of the Kalavasos dam by investigating a pollution incident through processing of chemical analyses of the dam's water for heavy metals determination
- Direct contribution to the investigation of an emergency pollution incident due to toxicity of the lake at Athalassa's park that causes the death of its fish inhabitants. For this purpose, repetitive analyses were processed for determining pesticides, volatile organic compounds, polycyclic aromatic hydrocarbons as well as chlorination multi-products.
- Investigation of the toxicity of water from water refineries and water tanks in the Nicosia district
- Contribution to the decision making of the relevant Authority on the suitability of new groundwater boreholes and their use as drinking water
- Targeted control and investigation for the presence of polycyclic aromatic hydrocarbons (PAHs) in water originating from entry and exit points of water tanks and other network points in the Nicosia district that provide water supply to neighbourhoods
- Investigation and testing of drinking water from the waterboard's network for the presence of petrol oil, following a complaint made by a consumer

- Contribution to the rejection of samples from either tap water or bottled water of the market for complaints of odor, taste and colour or suspended particles and soil
- 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
- Contribution to the appropriate labelling of Natural Mineral Water with a concentration of Boron above the limit of the Codex Alimentarious for Natural Mineral Waters, by sending to the competent authority suggestions, based on the scientific opinion of EFSA on the relationship between the safety of natural mineral water consumption regarding the daily consumption
- Study of the Nicosia waterboard network in its entirety for its compliance with the legislative limits of trihalomethane residues (THMs) (water organic chlorination multi-products)
- Contribution to the investigation of the sea pollution by water flow from a canal in an area of Larnaca
- Response to a request from the Department of Public Works to investigate the geochemical background for pollution from the operation of the domestic waste treatment plant, after the demolition of the settlement of Verengaria in Kato Polemidia
- Scientific support to the Police as regards the management of serious and major cases involving drugs
- Scientific support to the Police as regards investigation of nine murder cases
- Response to 167 incidents of hospitals' Emergency and Intensive Care Departments
- Scientific support to a request from the Department of Public Works to check 10 samples from a demolished settlement for asbestos fibers presence

E. Continuous contribution to tackling Antimicrobial Resistance (AMR), with the intensive control of products of animal origin for antibiotics residues.

Distribution of non-compliant samples of animal product origin for Antibiotics over the years 2010-2019



Distribution of non-compliant samples of animal product origin for antibiotics over the years 2010-2019

F. Continuous contribution, through the systematic microbiological monitoring of marine waters it carries out, 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 2019, Cyprus continued for a second year to be first in the European rankings.

G. 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 to the completion of over 2,558 sample controls (2014-2019).

H. Continuous 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.

I. Continuation of its participation in the project "AGROFOOD" (INTERREG) aiming to highlight traditional and local products of Cyprus and the North Aegean through identification of their authenticity, and enhance their competitiveness.

J. Continuation of its participation in the project "Black Gold: Analysis of carobs and carob-based products", of the University of Cyprus which aims to boost carob production growth in Cyprus and to promote carob products with nutritional added value.

K. Alongside with the above project, the SGL started the elaboration of 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 with their geographical origin.

L. 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.

M. 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 aimed at the harmonised collection of food consumption data in all EU Member States for the purpose of exposing 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.

N. The use of the Common Assessment Framework (CAF) by the SGL since 2005, as a quality management tool designed specifically for the public sector, starting with the self-assessment of its performance, has been considered a successful example of total quality management in the public sector. Therefore, the way it has been implemented by the SGL has been presented in various training seminars, conferences, workshops as an example of good implementation of the CAF, receiving excellent reviews. As a result, the SGL contributed substantially to the planning and preparation of a proposal made by the Cyprus Academy of Public Administration (CAPA) to the "European Community Fund", for a €3 million project co-financing for the implementation of the CAF in 20 public sector Departments of Cyprus, which was approved. This project started in September 2018 and was completed in December 2019. Today, the innovative and successful way of implementing the CAF by the SGL, is now used by CAPA for the other Departments of the public sector.

O. Continuation of the coordination at national level of the five-year Joint Research Programme "European initiative on Human Biomonitoring - HBM4EU" (2017 - 2021) being the national focal point as well as the representative of the Ministry of Health at its Management Board. The SGL also has the role of the contact point at European level to prepare communication materials for the participants and the partner for the preparation of a sustainable HB programme in Europe. The SGL has been also elected as the "Chemical Group Leader for mercury and its organic compounds (= 2nd round priority substances) of the HBM4EU.

P. Continuation of the collection and transmission of information on new psychoactive substances to the European Monitoring Center for Drugs (EMCDDA), for the purpose of risk assessment of new psychoactive substances.

Q. Publications (eight in total) in reputable international journals of the results of research projects on the following subjects: a) "A combined spectroscopic and chemometric approach to the authenticity of traditional Greek spirits Ouzo and Tsipouro", b) "LC-ESI-MS/MS determination of oxyhalides (chlorate, perchlorate and bromate) in food and water samples, and chlorate on household water treatment devices along with perchlorate in plants", c) "Challenges in implementing of school-based recruitment for human biomonitoring research", d) "Nanomaterials in Food – Prioritisation & Assessment", e) "Scoping Document on Mercury and its Organic Compounds", f) "Focus on Mercury: Human exposure to mercury and HBM4EU action", g) "Survey design and fieldwork preparation: 2nd set of materials for communication to participants, including informed consent".

R. 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, seven pilot research programmes were funded by the Ministry of Health and two from other national sources.

AWARDS

In 2019, the "Pesticide Residues Laboratory" of the SGL won the "Arne Anderson Award" in the field of Single Residues Methods. The "Arne Anderson Award" is awarded every two years to the first ranking laboratory among all EU Official and Reference Laboratories participating in the EU Proficiency tests.

FUTURE GOALS

The SGL, in front of the continuous scientific challenges, the new requirements of the EU legislation, the various emerging issues and possible food/ environmental crises/ incidences, seeks to substantially respond while 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 centers 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 Center 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 of nine million euros)
6. Carrying out food risk assessment for the Cypriot population 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): its data are used in risk assessment studies for the Cypriot population exposure to various chemicals through food.
7. Strengthening 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 center of expertise and excellence at national, regional and European level.
8. Supply and installation of the new Laboratory Information Management System (LIMS)
9. Continuous improvement of its credibility, transparency and responsiveness to crises with the aim of preserving the confidence that every Cypriot and European citizen has in the SGL

MAIN AREAS OF ACTIVITY

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

FOODSTUFFS

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". For this purpose, it carries out various national control programmes with the cooperation of the competent Authorities. Controls are of a preventive nature and focus mainly on basic foods that are consumed frequently or may raise a specific problem, and on foodstuffs expected to be

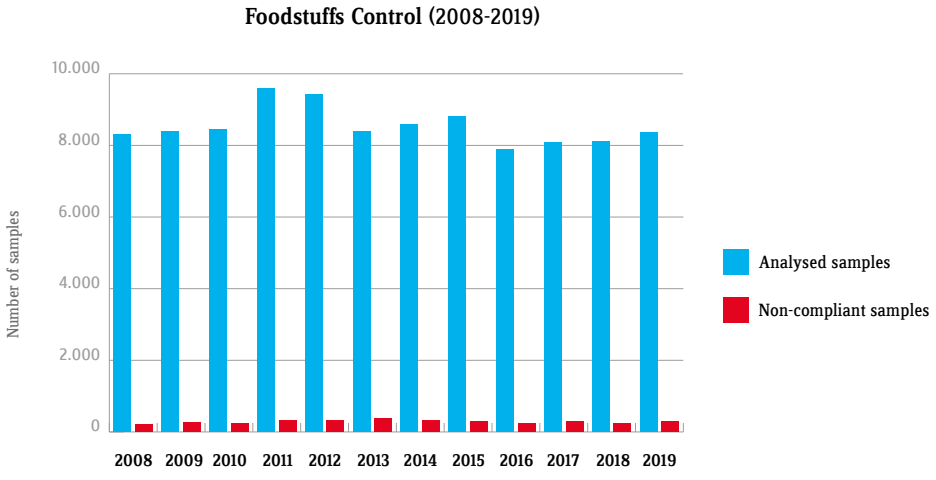
consumed by vulnerable groups of the population such as children and pregnant women. The SGL goes one step beyond the analysis. It evaluates the degree of exposure to toxic substances and to related risks, therefore providing scientifically sound advice to competent Authorities for risk management through 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 programmes, 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 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, characterisation and authenticity of traditional or local food

The effectiveness of the **32** national control-monitoring-surveillance programmes on foodstuffs (chemical, microbiological, biological, radiological and physical safety) managed to prevent the trade of non-compliant food, both in the national and 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.



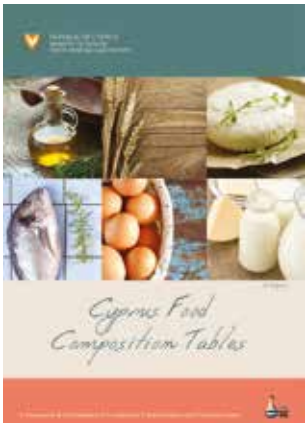
Foodstuffs Control (Chemical, Microbiological, Biological, Radiological, Physical Safety) (2008-2019)

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:

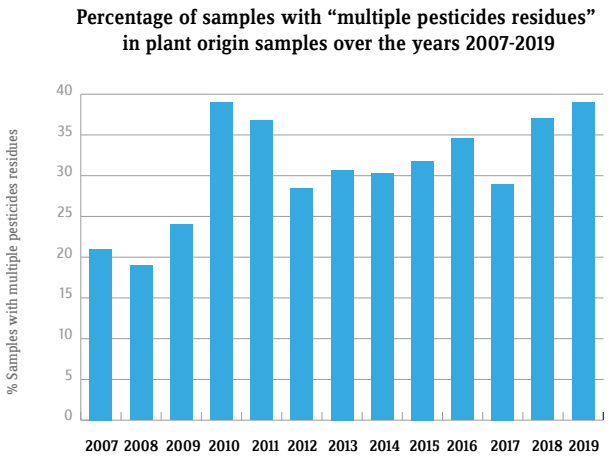
- **Nutritional value and composition of foodstuffs** (Moisture, Proteins, Fat, Carbohydrates, Salt, Total Dietary Fiber, Fatty acids, Cholesterol, ω3-ω6 fatty acids etc.)
- **Milk and dairy products** (Moisture, Fat, Proteins, Ash, Salt)
- **Determination of milk identity** (cow's, sheep's, goat's) 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)
- **Olive and vegetable oils** (Acidity, Peroxide number, UV absorbance, ECN42, Fatty acid profile, Chlorophyll)
- **Detection of animal DNA** (Detection of horse DNA in meat products)
- **Fish products** (Histamine, total volatile base Nitrogen)
- **Authenticity and geographical origin of foodstuffs** (e.g. alcoholic beverages, wines, honey, 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

Safety of foodstuffs

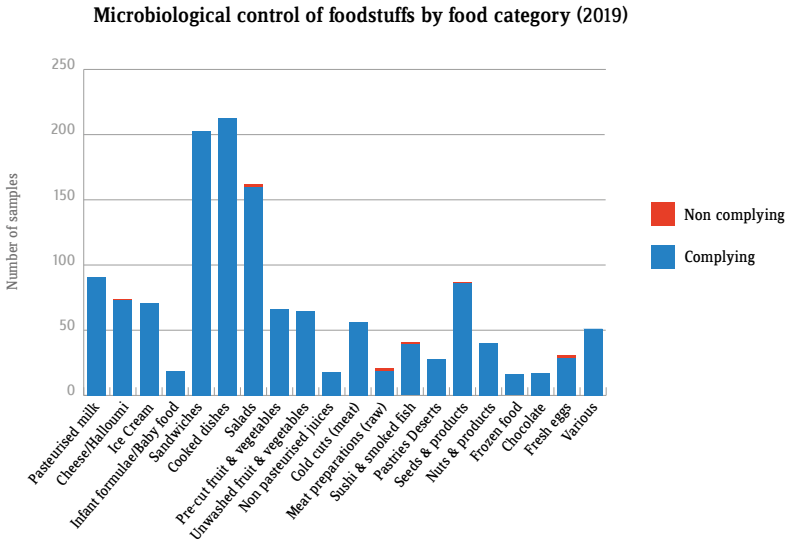
- **Food additives:** Preservatives (Sulphur dioxide, Benzoic/Sorbic acid, Propionic acid, Nitrates/ Nitrites), **natural and watersoluble synthetic colours** (Tartrazine, Carmoisine, Ponceau 4R, Allura Red AC, Carmines etc.), **synthetic colours** (Sudan I, II, III, IV, Para Red), **sweeteners** (Acesulfame potassium, Aspartame, Saccharin, Cyclamates, Steviol Glycosides, Sucralose), **antioxidants** (BHA, BHT, tBHQ, Ascorbic acid), **flavouring enhancers** (Glutamic acid), **food flavourings** (Coumarin), caffeine
- **Methanol in spirits**
- **Pesticides residues** mainly in fruit and vegetables, cereals, pulses, baby foods, biological products, products of animal origin and oils, wines and honey (Organophosphorous, Organochlorines, Carbamates, Pyrethroides, Amides, Strobilurines, Dinitroanilines, Triazoles, Benzimidazoles, Neonocotinoides, Phenylureas, Benzoylureas, Dithiocarbamates, Chlormequat, Mepiquat and other pesticides including highly polar pesticides)



Percentage of plant origin samples with multiple pesticides residues over the years 2007-2019

- **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, 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, 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, PFOA and PFOS, Furan, Acrylamide, 3-MCPD, Ethyl Carbamate, etc.)
- **Radioactivity levels in foodstuffs** (Gamma Radionuclides, Sr-90)

- **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 molds, noroviruses, hepatitis A virus)



Microbiological control of Foodstuffs by food category - 2019

- **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)

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 its participation in the National Food Safety Council. The Risk Assessment capacity is continuously enhanced with SGL's participation in EFSA's Advisory Forum, Focal Point and EFSA's Networks.

The SGL has developed its own risk assessment model called "ImproRisk" since 2014, by which it can perform accurate food risk assessments using: (a) the diachronic chemical occurrence data collected at the SGL, in combination with b) food consumption data of the Cypriot population, produced by the "National Dietary Survey of the Cyprus Population " in the context of the research project «EU MENU» of EFSA.

From 2008 to 2019, the SGL, based on its laboratory data collected over the years on contaminants in food, has conducted dietary exposure assessment of the Cyprus population (adolescents), to lead, cadmium, mercury, nitrates, acrylamide, polycyclic aromatic hydrocarbons (PAHs) and aflatoxin B1. The results were satisfactory and are consistent with the respective EFSA risk assessments for Cyprus.

Dietary Exposure = consumption x concentration levels

National Dietary Survey

National monitoring programmes of chemical substances

Consumed quantity of a food a

Concentrationof a chemical p in a food a

Exposure of an individual i to a chemical p :

$$E_{p,i} = \frac{\sum_{a=1}^{A_p} Q_{i,a} C_{p,a}}{bw_i}$$

Body weight

ENVIRONMENT

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 this end, the 7th EU Environment Action Programme (2012- 2020) includes a comprehensive environmental policy to be implemented according to the principles of sustainability, prevention, the principle of "the polluter pays" and the reparation of the pollution at source. The substantial contribution to the implementation of such policy is one of the key objectives of the SGL.

The SGL contributes 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 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.

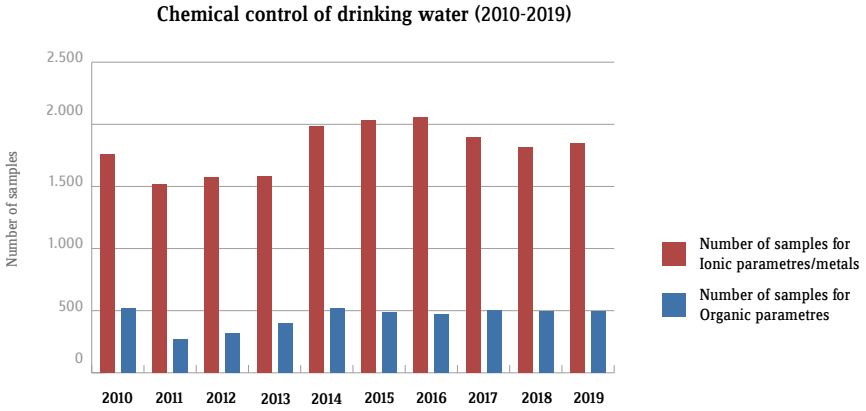
The SGL, as a vital supporting service of the environmental authorities, utilises its state-of-the-art infrastructure and expertise aiming at the following:

- 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

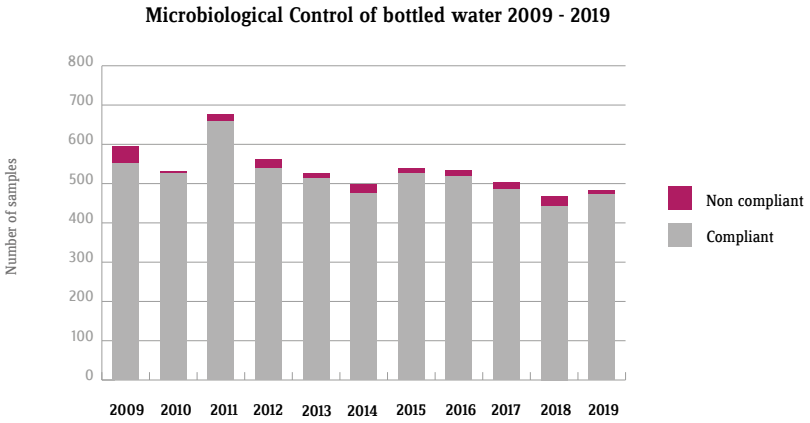
Drinking water, bottled water (including natural mineral water)

- **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)



Chemical control of Drinking Water over the years 2010-2019

- **Organic pollutants** (THMs, pesticides, VOCs, PAHs, organic micropollutants)
- **Radioactivity levels** (Gamma Radionuclides, Gross α/β- activity, Uranium radioisotopes)
- **Microbiological control** (Total coliforms, *Escherichia coli, Enterococci, Pseudomonas aeruginosa*, Total Bacterial Count at 22 & 37oC, Sulphite reducing clostridia, *Clostridium perfringens*, Legionella species)



Microbiological control of Bottled water over the years 2009 - 2019

- **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'}]. Also Thamnotox test using Thamnocephalus platyurus is applied on tap water and water from water refineries {LC50-TU50 measured at 24Hrs})

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, Maganese, 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)
- **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 α)
- **Radioactivity levels** (Gamma Radionuclides, Gross a/b-activity, Uranium radioisotopes)

Monitoring of the Ezousa and Akrotiri underground water

- **Chemical control** (Nitrates, Total Phosphorous, Ammonium, TOC, Kjeldhal-N, BOD5, COD, total Nitrogen, Suspended solids, Arsenic, Lead, Cadmium, Mercury, 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** (Chromium, Iron, Nickel, Copper, Cadmium, Zinc, Lead, Mercury)
- **Microbiological control** (*Escherichia coli, Enterococci*)
- **Radioactivity levels** (Gamma Radionuclides)

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*)

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 Colids, Chlorides, Nitrates, Sulphates, Boron, total Phosphorus, Kjeldahl-Nitrogen, metals (Calcium, Magnesium, Potassium, Sodium, Zinc, Copper, Lead, Cadmium, Mercury, Chromium, Nickel), Carbonates, Bicarbonates, pesticides and Polycyclic Aromatic Hydrocarbons (PAHs), in total 20 compounds, in treated domestic wastes. PAHs have also been determined in sediments using another method
- **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, Titanium, Vanadium, Chromium, Maganese, Nickel, Cobalt, Copper, Arsenic, Cadmium, Tin, Barium, Mercury, Lead), Anions (Fluorides, Chlorides, Bromides, Nitrates, Phosphates, Sulphates), Cations (Lithium, Sodium, Ammonium, Potassium, Magnesium, Calcium), Polycyclic Aromatic Hydrocarbons (PAHs) (Benzo(α)anthracene, Benzo(j)fluoranthene, Benzo(b) fluoranthene, Benzo(k)fluoranthene, Benzo(α) pyrene, dibenzo(a,h)anthracene, Benzo(g,h,i) perylene,indeno(1,2,3-cd)pyrene)
- **Radioactivity levels** (Gamma Radionuclides, 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 the SGL:

- From 2004 to 2016, 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).
- From 2017, participates and coordinates at 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 2019 the SGL:
  - 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 biomonitoring research, the general public),
  - 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, and
  - continued the coordination, at national level, of the implementation of the "Ostrava Declaration (2017)" on the Environmental Impact on Health.

CONSUMER PRODUCTS

The laboratory testing of consumer products (pharmaceuticals (for human and veterinary use), cosmetics, toys, textiles, adhesives, chemical mixtures for household use and air fresheners), and customs samples is carried out by five specialised laboratories of the SGL having developed seven control-monitoring-surveillance programmes in the framework of national and EU legislation.

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.

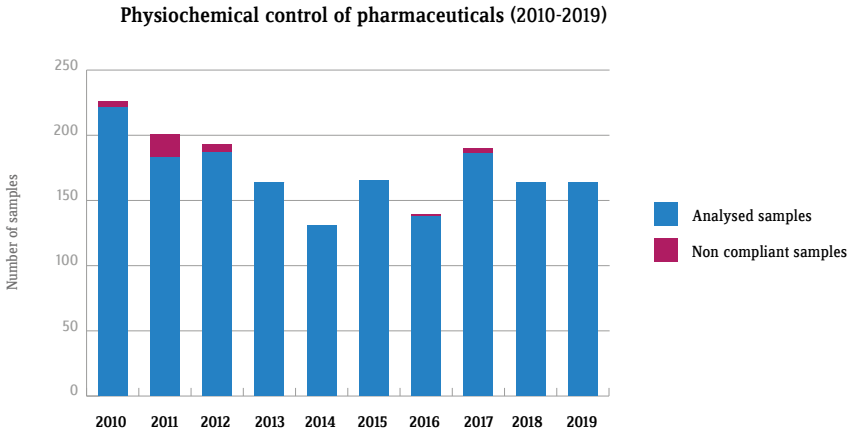
In order to protect public health, the SGL performs quality control of pharmaceuticals for human and veterinary use to evaluate their quality, safety and efficiency according to the specifications of the finished product dossier of the MAH (Manufacturers Authorization Holder) and/or official compendial 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



Physiochemical control of Pharmaceuticals over the years 2010-2019

- **Microbiological control** (Sterility test, *Limulus amoebocyte* lysate endotoxin test, Bioassay, Presence/absence of *Escherichia coli*, Total aerobic microbial count, Total yeast and molds count)

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.

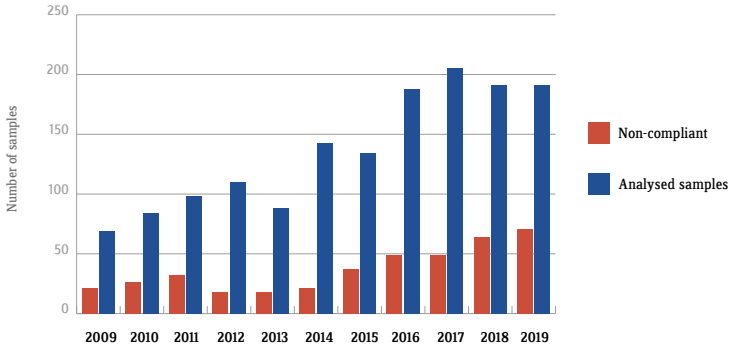
- **Chemical control** (Determination of preservatives (methyl-, ethyl-, propyl-, isopropyl-, butyl- and isobutyl- parabens, sorbic and benzoic acid), presence of Phthallic Esters, Glycols (Ethylene glycol, Diethylene glycol), Fluoride, Oxidative dyes, bleaching agents (such as Hydroquinone, Hydroquinone - 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*, Presence/absence of *Staphylococcus aureus*, presence/absence *Pseudomonas aeruginosa*, presence/absence of *Candida albicans*, total aerobic microbial count)

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

Chemical / Mechanical control of children toys over the years (2009-2019)



Chemical / mechanical control of children's' Toys over the years 2009-2019)

Other consumer products

The SGL collaborates with the Cyprus competent authority (Department of Labour's Inspection of the Ministry of Labour, Welfare and Social Insurance) for the implementation of the Chemical Substances Law of 2010 (N.78(I)/2010), the European Regulation (EC) 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.

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
- **Felt-tip pens, markers and correction fluids** for chloroform, toluene and benzene
- **Air fresheners** for 1,4-dichlorobenzene and other restricted chemicals and allergens
- **Rubber safety floors** for 18 Polycyclic Aromatic Hydrocarbons-PAHs (Naphthalene, Acenaphthylene, Acenaphthene, Fluorene, Phenanthrene, Anthracene, Fluoranthene, Pyrene, Benz(a)anthracene, Chrysene, Benzo-(b)-fluoranthene, Benzo-(k)-fluoranthene, Benzo-(j)-fluoranthene, Benzo(a)pyrene, Benzo(e)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene, Benzo(g,h,i)perylene)
- **Household chemical preparations** to determine pH
- **Various other products** for targeted investigations
- **Children's nightwear** for flammability test

FORENSIC CHEMISTRY AND TOXICOLOGY

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. The laboratory through the toxicological analysis results, it supports doctors to treat emergency patients.

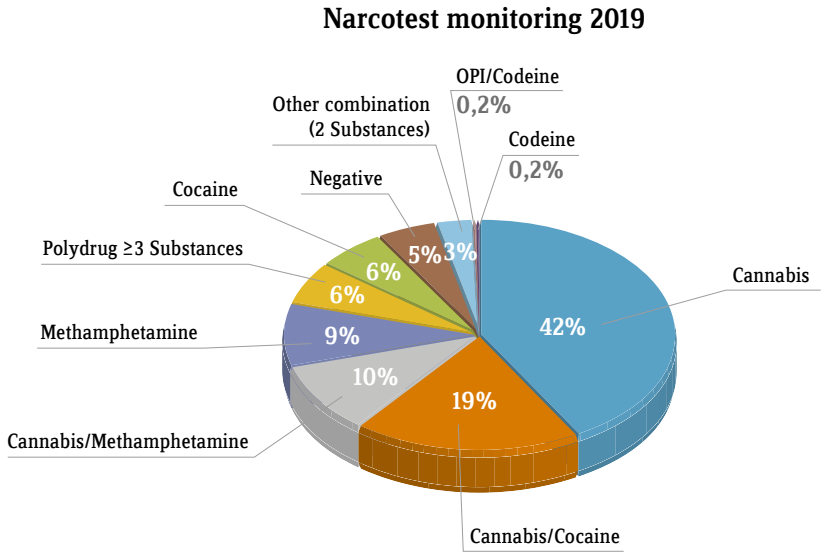
Forensic Chemistry

- **Controlled drugs** (cannabis, heroin, cocaine, and new synthetic drugs: synthetic cannabinoids, cathinones, benzofurans etc.)
- **Tetrahydrocannabinol** 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** (α-chloroacetophenone, 2-Chlorobenzalmalononitrile, Capsaicine, Nonivamide, etc.)

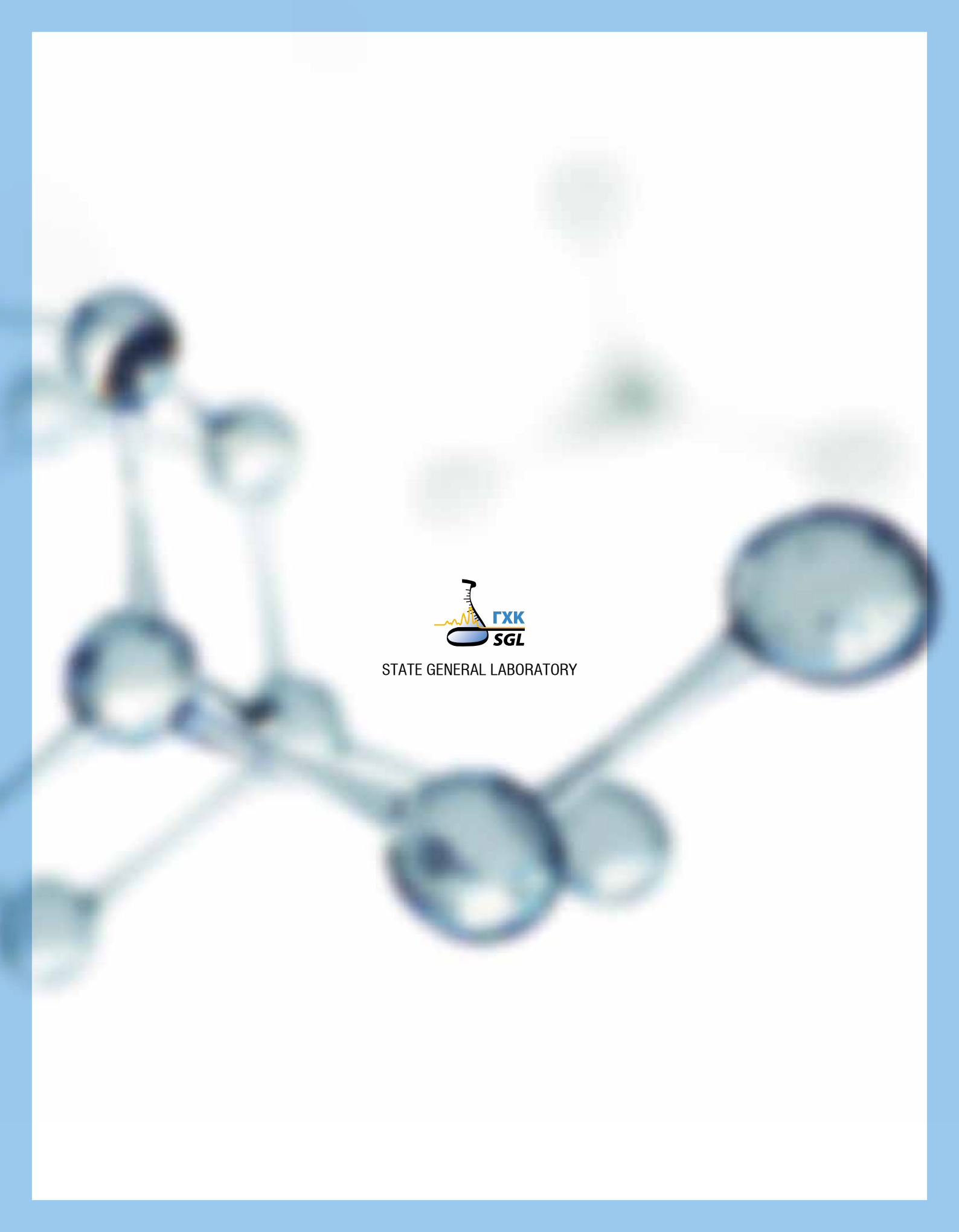
Forensic Toxicology on police and hospital samples:

- **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).

The scientific results are utilised both by the Police and coroners to cast light on unnatural deaths. In certain cases, when samples are sent from hospitals, the results provide profound information for the treatment of patients in intensive care units.



Percentage of drugged drivers related to substance use in oral fluid samples 2019



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