Government Laboratory of HKSAR

2015 Annual Report
Vision
To be recognised internationally as a laboratory providing world-class scientific services.

Mission
To provide our community with quality analytical, forensic, and advisory services, achieved through advancing measurement science and standards by a proud and committed work force.

Values
Integrity
We act honestly, ethically and impartially at all times.

Professionalism
We encourage self-improvement and aim for scientific excellence.

Quality Assurance
We ensure that all our work is carried out in accordance with recognised standards.

Teamwork
We recognise the participation, initiative and cooperation of all our staff as being essential to our success.

Client Focus
We strive to recognise and anticipate the needs of clients, working openly and cooperatively in setting work schedules and meeting targets.

Environmental Consciousness
We are committed to conducting all our work within the established guidelines for protection of the environment.
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The rapidly changing society in Hong Kong continued to pose new challenges to Government Laboratory in 2015. These in turn arose new opportunities enabling the Laboratory to keep moving forwards and further enhancing and optimizing our services. Reading through this annual report, I am proud of my colleagues who had paid dedicated and indispensable efforts to ensure that the Laboratory keeps serving the community with quality analytical, forensic, and advisory services as what we have committed. I am honoured to share with you the Laboratory’s achievements in 2015 in the following chapters.

Throughout the year, there were a number of high-publicity incidents pertaining to public health and safety happened in Hong Kong. The Laboratory’s round-the-clock services in emergency responses and crime scene investigation provided timely professional support in the form of on-site investigations and urgent laboratory examinations to client departments for facilitating the investigations. The Laboratory’s scientific inputs were critical elements of the investigations in probing the courses and causes of the incidents and in preventing further possible damages.

The Excessive Lead in Drinking-Water Incident, as highlighted in this report, was one of the challenging cases encountered by the Laboratory. Despite that providing technical support in testing drinking water samples and conducting on-site investigations of plumbing components are not within our regular programmes, the Laboratory had made flexible deployment of manpower and instrument resources in order to address the wider societal needs pertaining to the incident that lasted over the second half of 2015. During the incident, I appreciated that different levels of staff had fully demonstrated their professionalism, strong team cohesion and unselfish dedication in working towards a common goal.

In addition to the on-going analytical activities, the Laboratory provided a wide range of new scientific services covering the areas of food safety, environmental protection, consumer product protection and drug safety with a view to supporting the implementation
of new initiatives taken forwarded by various bureaux and departments in 2015.

The staff of the Laboratory continued to strive for further strengthening of our testing capabilities with an aim to meet the rising analytical challenges and increasing service needs with the aid of advanced analytical instrument and through related research and development activities.

My colleagues and I shall not get complacent from what we had achieved so far. Looking forward, we will continue to do our utmost to take on the challenges ahead and serve the community with steadfast commitment in a pragmatic and proactive manner. Last but not the least, I hope readers would enjoy this annual report and know more about the work of the Government Laboratory. Thank you.

Dr. Della WM Sin
Government Chemist
August 2016
Our Establishment

Government Laboratory had an establishment of 504 staff as at the end of 2015. The Laboratory is headed by the Government Chemist. There are two operational divisions, Analytical and Advisory Services Division and Forensic Science Division, strive to providing quality services to the community.
Government Laboratory (GL) had an establishment of 504 staff at the end of 2015, comprising 7 directorate staff, 148 professionals, 280 technical staff and 69 administrative and supporting staff. Many of them have numerous years of experience. For instance, in 2015, 2 and 14 colleagues received the 30 Years’ and 20 Years’ Long and Meritorious Service Awards respectively.

To meet the daily challenges and to achieve scientific excellence, we need a team of qualified and well trained staff members. Over the years, GL attracted many candidates with high qualifications to join the Laboratory. By the end of 2015, we have 109 professional staff with PhD degrees. Among the technical staff members, 71 and 106 have Master’s degrees and Bachelor’s degrees respectively.

To enhance professionalism, our colleagues continue to strive for self-improvement. We participate in international and regional conferences and overseas training programmes in areas that are related to our work.
GL’s headquarters in Homantin is a purpose-built laboratory where we moved in 1992. However, with the rapid increase in service demands from clients, the space in the headquarters became insufficient and GL kept seeking appropriate accommodation for the provision of new services and the number of satellite laboratory has increased to six. Besides, there was also significant increase in the number of staff members over the past 20 years. The number of staff increased from 311 at the time GL moved to the Homantin Headquarters to 504 as at the end of 2015.
Our Laboratories

PUBLIC HEALTH LABORATORY CENTRE

LA'I CH'I KOK GOVT. OFFICES

FOOD SAFETY LABORATORY

NEW TERRITORIES
Organization Chart

Criminalistics & Quality Management Group

- Biochemical Sciences A Section
- Biochemical Sciences B Section
- Chemical Sciences Section
- DNA Database Section
- Parentage Testing Section
- Physical Sciences Section
- Scene of Crime & Quality Management Section

Drugs, Toxicology & Documents Group

- Controlled Drugs A Section
- Controlled Drugs B Section
- Forensic Toxicology A Section
- Forensic Toxicology B Section
- Questioned Documents Section
Government Laboratory (GL) performs an important role in ensuring food safety in Hong Kong. Comprehensive analytical services are provided to the Food and Environmental Hygiene Department and the Agriculture, Fisheries and Conservation Department in support of the enforcement of various pertinent regulations under the Public Health and Municipal Services Ordinance, Pesticides Ordinance and Public Health (Animals and Birds) Ordinance. The GL also provides necessary analytical services for a wide range of chemicals in food products under the food surveillance programme. The scope of chemical
analysis ranges from food composition to additives, contaminants, pesticide residues and veterinary drug residues.

**Work Statistics**

In 2015, GL completed a total of 196,655 tests on a wide range of food samples, of which 316 tests pertaining to food incidents that required urgent analytical services. In the year, 98% (target: 95%) of the tests conducted were completed within the target reporting time and the average sample turnaround time was 15 working days which was well within the targeted 19 working days. The breakdown percentages of the 2015 total workload for food additives and composition, contaminants, pesticide and veterinary drug residues are 34%, 24% and 42% respectively.

14,317 tests were performed in connection with the investigation of food complaint cases. 89% (target: 83%) of the cases were completed within the target reporting time. The average turnaround time was 20 working days which was within the targeted 25 working days. Besides, GL completed 35,248 tests for seepage and swimming pool samples in 2015 and 99% (target: 96%) of the analyses were completed within the pledged target reporting time of 10 working days.
In addition to the routine monitoring work, GL also rendered analytical support to the handling of various food incidents. In 2015, urgent analytical services were provided for the testing of coloring matters including Sudan dyes in soy products and Red 2G in buns, ethephon in durian, tertiary butylhydroquinone in potato chips, ethanol in drinks, mushroom toxins in mushroom and metallic contamination in foods. Other samples requiring urgent attention included detection of unlabelled milk allergen in coconut drinks; testing of pesticide residues in vegetables; the testing of veterinary drug residues in pork; food poisoning cases and other related investigations. Professional advice to a total of 8 requests on analytical methods and nomenclature in relation to the active ingredients of registered pesticide formulations was also provided in the year.
ENIRONMENTAL PROTECTION

Government Laboratory (GL) provides analytical and advisory services to the Environmental Protection Department in support of management and monitoring of air and water quality, implementation of various environmental programmes and the enforcement of pollution control and environmental protection legislations including the Air Pollution Control Ordinance, the Ozone Layer Protection Ordinance, the Waste
Disposal Ordinance, the Water Pollution Control Ordinance and the Hazardous Chemicals Control Ordinance. Environmental samples such as air, water, sediment, biota and waste of different nature and matrices are regularly submitted for analysis pertaining to various environmental programmes including the toxic air pollutants monitoring programme, the river and marine water quality monitoring programmes, the biological monitoring programme, the toxic substances monitoring programme and illegal discharge investigations. Testing of materials for asbestos and analyses of diesel, biodiesel, unleaded petrol, and marine fuel are also part of GL’s statutory functions. Other government departments to which analytical services relating to environmental monitoring were provided in the year included Agriculture, Fisheries and Conservation Department, Correctional Services Department, Electrical and Mechanical Services Department, Food and Environmental Hygiene Department and Leisure and Cultural Services Department. Technical support was also rendered to the Marine Department in identification of the sources of oil spills in enforcement of the Shipping and Port Control Ordinance.

**Work Statistics**

GL had achieved all the work targets set in 2015 related to environmental protection. The number of tests conducted in the year was 205,654. For air-related tests, 62,148 were
monitoring samples, 476 on ambient<br>field samples and 2,783 on litigation<br>samples, giving a total of 65,407 with<br>99% of the tests completed within the<br>pledged target reporting time.

For water, sediment and biota<br>samples, 128,920 tests involving<br>more than 100 different pollutants<br>including various nutrients, trace<br>metals and organic compounds in a<br>wide range of sample matrices such<br>as river water, marine water, sediment<br>and biological tissues were conducted<br>with 97% of the tests completed within<br>the pledged target reporting time.

Regarding waste samples covering<br>wastewater, leachates, livestock<br>waste, chemical wastes and<br>miscellaneous solid wastes, 10,799 tests were performed on<br>routine monitoring samples and<br>528 tests on regulatory samples, respectively with 98% and 100%<br>completed within the corresponding<br>target reporting times.

**CONSUMER PROTECTION**

Government Laboratory (GL) provides analytical and advisory<br>support to the Customs and Excise<br>Department (C&ED) and other<br>government departments in the<br>enforcement of legislation concerning<br>consumer protection. Analytical<br>services are provided to support their<br>statutory functions under various<br>regulations and ordinances.

The scientific services provided by<br>GL covered a large variety of<br>products including cigarettes, toys
and children’s products, consumer goods, dutiable commodities and miscellaneous commodities.

Besides, suspected counterfeit goods samples were also submitted for authenticity testing.

To provide timely analytical services for C&ED in the enforcement of the Toys and Children’s Products Safety Ordinance (TCPSO, Cap 424) with the new requirements of phthalate content in toys and children’s products, GL has extended the existing accredited testing scopes under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) of “Chemical Tests” to cover the...
phthalate analysis. Moreover, some children’s products, which are not listed in Schedule 2 of the TCPSO but possess functions to facilitate feeding, hygiene, relaxation, sleep, sucking or teething of a child under 4 years of age, have been controlled under the TCPSO since July 2014. These types of children’s products were submitted to GL for examination with respect to the “General Safety Requirement” as prescribed in the TCPSO.

During the year, GL continued to develop new test methods to broaden the scope of service provision concerning consumer protection, such as detection of rice adulteration, as well as authenticity testing of Panax species, Astragalus membranaceus, prawn and shrimp, Colla Corii Asini (Donkey glue), mushroom and crustacean.

In 2015, GL has acquired a set of instruments, including (i) an ion chromatograph equipped with an ultraviolet/visible detector
(IC-UV-Vis), (ii) a liquid chromatograph/an ion chromatograph coupled to an inductively coupled plasma-mass spectrometry system (LC/IC-ICPMS), (iii) a gas chromatograph-tandem mass spectrometry system (GC-MS/MS), (iv) an ultra-high performance liquid chromatograph-tandem mass spectrometry system (LC-MS/MS), and (v) a cold vapour atomic absorption spectrometer in support the new tests associated with the updating of the TCPSO in October 2015.

Under the newly implemented TCPSO, the number of concerned soluble elements has been increased from 8 to 18 and more stringent regulatory limits were launched with respect to different categories of toy materials. Moreover, the total content of chromium was required to be differentiated between chromium (III) and chromium (VI) species. Therefore, an integrated system of LC/IC-ICPMS and IC-UV-Vis was dedicated for the speciation analysis of chromium (III)/chromium (VI).
Work Statistics

During 2015, GL conducted a total of 5,948 tests on a variety of commodities for compliance assessment of the labelled claim or confirmation of their authenticity in support of the enforcement of the Trade Descriptions Ordinance, Cap. 362. Samples of consumer goods submitted for assessment of labelled claim included health supplement products, gold and silver articles. Testing on authenticity covered a wide variety of trading goods including Chinese medicine, dried seafood, and products of algal, fungal, plant or animal origin.

In 2015, 86 brands of best-selling cigarettes on sale in the local market were examined and their tar and nicotine yields determined were published on the website of GL for public browsing. In addition, GL carried out 350 tests on other tobacco products. For toys and children’s products, 20,400 tests were conducted in 2015. Items tested included festive toys, dolls and its accessories, block and stacking toys, beach toys, push and pull toys, bathing toys, simulate weapon and equipment toys, carry cots, crayons, baby walking frames, harnesses, safety barriers, children’s cots, playpen, strollers, bottle teats, domestic bunk beds, babies' dummies, etc. A wide variety of consumer goods including stainless steel cookware, children’s clothing, diapers, sanitary napkins, melamine tableware, school uniform, knitted gloves, hot water bottles, and cosmetics such as deodorant, hair colouring cream, lipstick, mascara, cream, lotion, nail polish and
mask, etc. were submitted to test for compliance with the statutory general safety requirements. These accounted for a total of 13,076 tests for this test category in the year. The workload on dutiable commodities for hydrocarbon oils and liquors were 1,870 and 972 tests, respectively.

For miscellaneous commodities, GL carried out 216 tests to check the integrity of flexible gas tubing under the requirements of the Gas Safety Ordinance (Cap 51). Besides, 540 tests on the gaseous composition of refrigerant samples were conducted for checking the presence of liquefied petroleum gas (LPG) in relation to the enforcement of the Gas Safety Ordinance, Cap 51. In the year, 126 tests were carried out for evaluation of government tenders. The items examined included rice, lime powder, toilet soap and bleaching solution. In addition, 823 tests were carried out in relation to investigation cases under the Import and Export Ordinance, Cap 60. The majority of goods tested included pesticide formulations, powdered formula and valuable articles such as gold, silver, copper and palladium slabs. In 2015, 325 tests were conducted for the investigation of suspected short weight of prepacked goods and for metrological verification of traders’ weighing equipment.
DRUG SAFETY

Government Laboratory (GL) works closely with the Department of Health (DH), the Government Logistics Department (GLD), the Hospital Authority (HA) and the Customs and Excise Department (C&ED) with a view to safeguarding public health and supporting the enforcement of the Antibiotic Ordinance, the Pharmacy and Poisons Ordinance, the Chinese Medicine Ordinance, and the Import and Export Ordinance and the Trade Ordinance. Professional services on pharmaceutical analyses mainly include the areas in supporting (i) the general control programme for pharmaceutical manufacture facilitating the tendering exercises of
procurement by the Government, (ii) the surveillance programme for registered pharmaceutical products sale in the market, and (iii) the investigation programme for exhibits from complaint cases, illegal trades including internet sales and possessing of unauthorized drugs and relevant certification of pharmaceuticals. Routine analyses for Chinese medicines included the testing of proprietary Chinese medicines (pCm) for western drug adulteration and contamination of toxic elements and pesticide residues as well as Chinese herbal medicines for contamination of toxic elements and pesticide residues.

Furthermore, GL has been providing full support to DH for urgent investigatory analysis of samples for (i) adverse reaction cases arising from the consumption of pCm containing western drug.
ingredients, and (ii) intoxication incidents related to substitution or contamination of Chinese material medica (CMM). GL also provides analytical and advisory support to DH for the formulation of the Hong Kong Chinese Materia Medica Standards (HKCMMS) for Chinese herbal medicines commonly used in Hong Kong. Work includes method verification and trial run studies. In 2015, GL further strengthened the analytical and advisory support to DH in the development of HKCMMS through the setting up of a dedicated workforce.

**Work Statistics**

In 2015, for western drugs GL conducted a total of 22,025 tests in the general control programme, and 37,929 tests in the surveillance and investigation programmes, with 99% and 98% of the tests completed respectively within the pledged targets. The total tests performed were increased by about 4% of the figures in 2014. GL also conducted 82,930 tests for Chinese medicines in 2015, with over 98% of samples met the pledged target turnaround time.
PUBLIC SAFETY

To support the Government in ensuring public safety, Government Laboratory (GL) is entrusted with the statutory role to provide analytical and advisory services. The scope of service includes providing analytical and advisory services for the Fire Services Department (FSD) and other government departments in the classification of dangerous goods (DG) and on matters relating to occupational safety and health; providing 24-hour emergency response service to support the FSD in handling of chemical incidents; collaborating with the Hong Kong Observatory (HKO) in monitoring radiation levels of environmental samples; rendering analytical support to the Food and Environmental Hygiene Department (FEHD) in the
surveillance of radioactive contamination of imported foodstuff; providing technical support to the Daya Bay Contingency Plan (DBCP) and the Nuclear Powered Vessel Contingency Plan for Public Safety During Visits of Nuclear Powered Warships “PORTSAFE” in Hong Kong; and the control of import and export of strategic commodities through the provision of professional services to the Trade & Industry Department (TID) and the Customs & Excise Department (C&ED) in the enforcement of the relevant local legislation.

Work Statistics

For the classification of dangerous goods under the Dangerous Goods Ordinance and its subsidiary regulations, GL conducted 4,983 tests in 2015. All the classification tests were completed within the pledged target reporting time and the average reporting time was 10 working days. In relation to occupational safety and health, GL completed 3,828 tests on 520 samples taken by the Labour Department (LD) and the Hong Kong Police Force (HKPF).

In 2015, GL completed 4,201 tests on sample pre-treatment for radioactivity measurement by HKO and conducted 974 radioactive contamination tests on imported food samples under FEHD food surveillance programme. None of the food samples tested was found to exceed the guideline levels stipulated in the Codex Alimentarius Commission for cross-border trade of foodstuffs in respect of 3 major
gamma-emitting radionuclides, namely I-131, Cs-134 and Cs-137. All the tests were completed within the pledged reporting time with the average reporting time of 7 working days.

Apart from testing services, GL also provides advisory services to client departments in support of law enforcement. In 2015, GL offered 296 pieces of professional advice relating to 1,204 items for classification under the Dangerous Goods Ordinance while 300 pieces of advice involving 527 items were provided pertaining to the implementation of the Import and Export (Strategic Commodities) Regulations and the Chemical Weapons (Convention) Ordinance.
Emergency Response Services

In 2015, the emergency response team (ERT) has handled 103 telephone enquiries relating to hazardous chemicals handling and provided on-site expert advisory services to the Fire Services Department (FSD) on 8 scenes where severe incidents involving hazardous chemicals were occurred. Among the said on-site advisory cases, the case of illegal over-storage of dangerous goods (DG) at Hung Lung Hang in Sheung Shui was the largest in scale on FSD’s record. The case involved illegal over-storage of enormous quantities of dangerous goods (over 70 varieties of hazardous chemicals under Category 2, 3, 4, 5 & 7). Fifteen site attendances by the ERT during the period from November 2014 to May 2015 were recorded for such a single incident. The ERT provided expert advice on the risk assessment of the over stored DG, the DG classification, proper DG storage methodologies, and handling as well as clean-up of chemical spillages. The owner of the premises was charged with illegal storage of DG without valid licenses.

A press conference jointly organized by the FSD and the GL was held in August 2015 elucidating the regulatory control of DG and operational strategies on handling of DG incidents. The provision of 24-hour emergency response service by the ERT of GL was introduced to the media at the press conference. The main duty of the ERT, which is composed of more than
30 professional staff, is to provide expert advice to the FSD on the handling of chemical spillage and related incidents. Upon request from the FSD, on-site advisory services, if required, will be provided to the FSD for dealing with the chemical spillage and subsequent clean-up. Demonstrations of the use of portable analytical equipment including Raman spectrometer, different types of toxic gas detectors and various test kits for on-site investigation were given in the event.
Incident of Excessive Lead in Drinking Water

Lead is a naturally occurring element which usually exists in very small amounts in the environment. Lead and its compounds may be found in products such as batteries, paints, ceramics, solder and leaded petrol. Long term exposure to lead, which when accumulated in large amounts in the body, may result in anaemia, increased blood pressure, brain and kidney damage. The World Health Organization’s Guidelines for Drinking-water Quality has set a provisional guideline value of not more than 10 micrograms per litre for lead.

In July 2015, media reported that drinking water samples taken from Kai Ching Estate contained elevated level of lead which aroused public concern about the safety of drinking water in public housing estates.
In the investigation of the incident of excessive lead in drinking water, Government Laboratory (GL) rendered full support to the Water Supplies Department (WSD) as well as other government bureaux and departments despite drinking water quality is not GL’s regular responsibilities. The support included testing of drinking water samples taken from public housing estates, kindergartens and welfare facilities as well as on-site investigations. The testing and investigation results were expeditiously reported to the Housing Department, WSD and other government departments on a 24-hour time schedule.

Though analysis of river water samples for lead by inductively coupled plasma-mass spectrometry is routinely conducted in GL, the sudden upsurge of sample volume and the extremely tight reporting schedule over a long period of time posed a great challenge to the testing capacity of the GL.

As the plumbing components under examination were part of the building installation and their removal might cause much inconvenience to the residents, the on-site investigatory work called for a fast and non-destructive analytical technique. As such, the use of a portable X-ray fluorescence spectrometer which was previously employed in preliminary testing of precious metals, was promptly developed and verified for screening of lead in plumbing components.
The Chief Secretary for Administration, Mrs Carrie LAM (upper left) visited the GL to understand more about the water testing and support services.
Testing of the last batch of drinking water samples were completed in December 2015. In a period of about six months, testing of 5,677 water samples and 26 solder samples as well as on-site investigations at 132 sites were conducted. Besides providing the much needed analytical support, we also participated in various inter-departmental meetings as well as in the Task Force on Investigation of Excessive Lead Content in Drinking Water. Redeployment of staff, instruments and other resources from other areas and arrangement of staff to work overtime and in shifts made available the resources required to meet the immense demand of such ad hoc work.

The staff of GL had made most efforts in responding to the incident, demonstrating both their commitment and professionalism. Once again, the quality and timely services of the Laboratory had provided an indispensable scientific support to the Government for maintaining public health and safety.
SCENE OF CRIME INVESTIGATION

Government Laboratory (GL) is committed to providing professional crime scene investigation services to law enforcement agencies in Hong Kong. A comprehensive range of 24-hour services is provided by a team of experienced Scientific Evidence Officers (SEOs) and trained Chemists from different operational sections. Scene investigative services include the identification, preservation and retrieval of relevant scientific evidence materials for examination, conducting professional evaluation of the gathered forensic evidence, reconstructing the sequence of events at the scene and presenting the evidence in court.
For cases requiring immediate attention and provision of imperative forensic evidence for criminal investigation and preliminary court proceedings, round-the-clock urgent laboratory examination and verbal expert advice are provided to assist law enforcement officers in crime investigations.

Besides the general crime scene investigation service, professional staff with specialist training also supports the four specialized scene investigation services. Fire Investigation to determine the course and cause of suspicious fires; Traffic Accident Reconstruction to assist in deciphering the possible cause of road traffic accidents; Bloodstain Pattern Analysis of serious crime scenes such as murder and serious wounding cases to assist in reconstructing possible events that had occurred at the crime scene; and investigation of illicit drug manufacturing/cultivation activities. Where necessary, scene officers for general crime scenes and specialist professional officers will conduct the investigation together as a comprehensive team.

**Work Statistics**

In 2015, staff attended a total of 346 crime scene visits comprising 147 general crime scenes, 5 scenes with bloodstain pattern analysis, 33 fire scenes, 152 traffic accident / vehicle-related scenes and 9 illicit drug-related scenes. Compared to 2014, the overall scene attendance decreased by around 24%.
Training to Client Departments

GL organises relevant training to various law enforcement departments and related parties with an aim to strengthen the quality of investigative services and reinforce the working cooperation. In 2015, a total of 2,253 participants from Hong Kong Police Force, Fire Services Department, Customs and Excise Department, Independent Commission Against Corruption, Immigration Department, Correctional Services Department, Department of Justice, Forensic Pathology Service and Social Welfare Department attended a total of 40 lectures and/or visits arranged by GL.
DNA EXAMINATION

Government Laboratory (GL) has 4 working Sections providing quality forensic DNA examination services to Hong Kong Police Force (HKPF) and other law enforcement agencies. The two Biochemical Sciences Sections (BSS) routinely analyzed 15 Short Tandem Repeats (STR) DNA systems along with one gender testing system on the DNA recovered from crime scene biological evidence materials with the aim to identify the person(s) relating to crime.

Set up in 2000, the DNA Database Section (DDS) maintains and updates a DNA database on behalf of the Commissioner of Police for DNA data of convicted offenders and suspects of serious criminal offences stored in the database.

The Parentage Testing Section (PTS) has been providing genetic testing services mainly to the Immigration Department for verifying claims of parent and child relationship in immigration-related cases since 2000.

Outstanding DNA profiles from the evidence materials are uploaded to the DNA database for regular comparison with the DNA data in the database with a view to locating any potential culprits involved.

A large number of outstanding crime scene DNA profiles have been matched and subsequently led to further investigations by law enforcement officers in otherwise unsolved crime cases.
Work Statistics

In 2015, BSS completed examination of a total of 1,811 non-complicated and complicated cases involving 8,817 exhibit items related to crime scene biological evidence materials. When compared to 2014, the number of exhibit examined slightly decreased by about 0.8%, whereas a mild increase by about 2.7% in the number of completed cases was observed. About 99% (597 out of 603) of the non-complicated cases for DNA analysis of crime scene biological evidence were completed within the target turnaround time of 66 working days, whereas about 98% (1,184 out of 1,208) of the complicated cases met the target turnaround time of 130 working days.

For case submission, the number has increased by about 8.4% as compared with last year (1,851 cases in 2015 versus 1,708 cases in 2014). By the end of 2015, BSS had 365 outstanding cases and this represented a mild increase of about 2% as compared to 2014. Under the scope of “round-the-clock testing services”, four high profile cases have been examined and the preliminary findings of which have been delivered within three days.

DDS examined 2,906 cases with 98% of cases completed within the target turnaround time of 22 working days in 2015. In comparison with the figures in 2014, the number of cases examined is decreased by about 5% while the percentage meeting target is slightly decreased by 1%. By the end of 2015, the number of relevant DNA data stored in the database had increased to 49,466.
In 2015, the use of the database has resulted in 215 and 19 pairs of matches between data from crime scene exhibits with offenders/suspects and amongst crime scene exhibits respectively. These matching results have provided important clues for the law enforcement agencies to further investigate unsolved crime cases.

In connection with the Certificate of Entitlement (CoE) applications pursuant to the Immigration (Amendment) Ordinance 2001, PTS has completed 2,361 reports in 2015, about 13% decrease compared with the figure in 2014. The performance is comparable to that in 2014, i.e. the percentage of cases completed within the target turnaround time of 22 working days remained at 97% this year. The average positive parentage matching rate in 2015 was about 97%, a slight increase of 1% as compared with the rate in 2014.
Apart from the CoE applications, GL has also offered genetic testing services to other sections in the Immigration Department such as Right of Abode section and the Birth and Death General Register Office. GL has assisted in 88 such cases in 2015.

The Immigration Department continues to assist the Mainland authorities in processing the One Way Permit (OWP) applications of eligible Mainland “overage children”. Due to poor health of some Hong Kong parents of “overage children” who are unable to attend the Exit-Entry Administration of the Public Security Bureau to provide specimens, the Immigration Department assists these OWP applications by collecting specimens from the claimed parents in Hong Kong and submitting the specimens to GL to conduct the genetic tests. In 2015, GL has completed 22 cases under this category.

CONTACT & PHYSICAL EVIDENCE

Government Laboratory (GL) provides examination services on trace evidence including the examination of textile fibres, paint and/or glass transfer evidence as well as identification of flammable and explosive residues from exhibits seized from crime scenes and individuals in connection with crime cases. The identification/comparison of such trace evidence renders clues to associate a suspect with a victim.
or other individuals and with a crime scene.

Fire scene and traffic accident investigation are currently included under GL’s 24-hour services. The former is to determine the course and cause of the fire of suspicion in origin, whilst the latter is to assist the police in the reconstruction of the traffic accident.

GL’s forensic physical examination services include traffic accident reconstruction (TAR), tyre examination, vehicle number restoration, forgery and counterfeit items and cases involving marks and impressions evidence. The latter can help associate physical contact of objects such as tools and shoes with toolmarks and shoeprints recovered at crime scenes and associate a vehicle with a victim and the scene of an accident.

Different from chemical analysis, TAR involves the application of various scientific disciplines including mathematics, physics, automotive engineering, forensic video analysis and scene investigation techniques in deciphering possible cause of road traffic accidents. Examination of failed tyres often provides useful information in determining whether their deflation causes the accident or is a consequence of the accident. Vehicle number examination and restoration entails, as the name suggests, the discovery and retrieval of numbers unique to the vehicles concerned as a means of detecting unauthorized vehicle-taking or modification.
Work Statistics

In 2015, GL examined a total of 661 cases involving 3,672 exhibit items related to trace evidence recovered from scenes of crime. Amongst these, 338 cases (of 2,170 items) 294 cases (of 1,211 items) and 29 cases (of 291 items) were examined in the area of trace evidence, miscellaneous chemical investigation and fire investigation, respectively. There were 97%, 96% and 97% of the reported trace evidence, miscellaneous chemical investigation and fire investigation cases being completed within the performance pledges of 66, 33 and 88 working days respectively. When compared to 2014, the numbers of completed cases and exhibit items examined had increased by about 6% and 7% respectively.

By the end of 2015, GL had 101 active cases still undergoing trace evidence examination and miscellaneous chemical investigation and fire investigation, representing an increase of about 12% when compared to 2014.

For physical examination, GL examined a total of 670 cases involving 1,462 exhibit items in relation to marks & impressions evidence, traffic accident related investigation and miscellaneous physical investigation in 2015. Among these, 102 cases (of 153 items), 179 cases (of 785 items) and 389 cases (of 524 items) were examined in the areas of TAR, marks and impressions evidence examination, and miscellaneous physical investigation respectively.
For those reported cases involving TAR, marks and impressions evidence and miscellaneous physical investigation, 91%, 91% and 99% of them were completed within the target turnaround of 66, 66 and 33 working days respectively. As compared with the figures in 2014, there was a decrease of about 16% in both the number of completed cases and the number of exhibit items examined. By the end of 2015, GL had 101 active cases still undergoing marks & impressions evidence examination, traffic accident related investigation and miscellaneous physical investigation, which were approximately the same as those in 2014.

**Incident of Vehicle Repair Workshop Explosion**

On 26 April 2015, a tragic explosion incident happened in a vehicle repair workshop on the ground floor of a residential building in Wong Tai Sin area, claiming three lives.

In the aftermath, the GL was requested by the HKPF and FSD to attend the scene for investigating the cause and course of the deadly incident from a forensic perspective. The incident caused destructive damage to the workshop together with a stationary LPG taxi inside.

A team of fire Investigation experts from the GL conducted a thorough and meticulous scene examination and identified crucial physical evidence shedding light on the cause and course of the incident.
CONTROLLED DRUGS

Government Laboratory (GL) provides comprehensive analytical services for enforcing the control of drugs and their chemical precursors involved in the contravention of the Dangerous Drugs Ordinance, the Pharmacy and Poisons Ordinance, the Antibiotics Ordinance or the Control of Chemicals Ordinance. These services are mainly provided to the HKPF and the Customs and Excise Department as well as other law enforcement departments.
Work Statistics

In 2015, GL examined 5,060 drug cases involving 19,556 items which declined slightly in number compared with 5,152 cases involving 20,941 items examined in 2014. 93% of the routine cases were completed within the target of 11 working days; 93% of the major seizure/manufacturing cases were completed within the target of 44 working days and 94% of the cases involving other illegal drug activities (cases with large seizures of pharmaceutical products) were completed within the target of 120 working days.

GL continues to assist the policy bureau and law enforcement departments to monitor the trends in drug abuse in Hong Kong. Among the cases examined in 2015, methamphetamine hydrochloride was the most common drug of abuse, representing about 26% of the total cases examined; ketamine, cocaine and heroin accounted for 24%, 12% and 10% of the total cases respectively. Compared with 2014, the number of ketamine and heroin cases examined in 2015 slightly decreased by 3% and 1% respectively, whereas there was a slight increase of 2% and 1% in cases of methamphetamine hydrochloride and cocaine respectively.

According to the analysis conducted in 2015, the monthly average purity of ketamine was found to vary in the range of 50-73% while the heroin purity was 58-68%. For methamphetamine hydrochloride, the purity remained high as in previous years ranging from...
96-98% while the purity of cocaine crack varied considerably from 56% to 83%.

In response to the trends of new abused drugs and the implementation of new legislation in relation to drug control, GL strived to develop new analytical methods for new drugs identification. Meanwhile, the Laboratory continued to offer technical advice to the policy bureau in relation with the review and amendment of legislation for the control of new abused drugs.

**FORENSIC TOXICOLOGY**

Forensic toxicology services provided by the Government Laboratory (GL) encompass five operational areas: Analytical Toxicology, Urinalysis, Drink Driving, Drug Driving and Hair Drug Testing.

**Analytical Toxicology Service**

Biological specimens from the deceased, suspects or victims as well as relevant exhibits seized at death/crime scenes are examined for drugs and poisons so as to assist the judiciary, coroners, pathologists and the HKPF in death inquiries and criminal investigations.
**Urinalysis Service**

Drugs of abuse are examined in urine samples collected by the Social Welfare Department, the Correctional Services Department, the Methadone Clinics and the HKPF (under the Superintendent Discretion Scheme), as well as the non-government organisations and schools (under the Healthy School Programme of the Narcotics Division) in their respective drug use surveillance programmes.

**Druck Driving Service**

Alcohol concentrations in blood or urine of drivers are determined so as to assist the HKPF to take enforcement action in accordance to the drink driving provisions in the Road Traffic Ordinance.

**Drug Driving Service**

Blood and urine samples of drivers are examined for the presence of drugs including the six "specified illicit drugs" of zero-tolerance so as to assist the HKPF to take enforcement action in accordance to the Road Traffic (Amendment) Ordinance 2011.

**Hair Drug Testing Service**

Drugs of abuse are examined in hair samples collected by non-government organisations in collaboration with schools under the Healthy School Programme.
**Work Statistics**

*Analytical Toxicology –*

In 2015, a total of 2,428 cases involving 9,338 samples were examined for analytical toxicology, decreasing by 4% and 5% respectively as compared to last year. The majority of the cases were from the Forensic Pathology Service with 1,934 cases involving 8,027 samples, equivalent to 80% and 86% of the total cases and samples respectively. Other cases were mainly from the HKPF, with 325 cases involving 1,036 samples, equivalent to 13% and 11% of the total cases and samples respectively. Amongst these examined cases in 2015, about 58% were found to have drugs or poisons.
Urinalysis –
In 2015, this service conducted 147,308 tests for abused drugs on 32,180 urine samples, which corresponds to a decrease by 17% and 13% respectively as compared to 2014. About 5% of the tests performed for judiciary purpose were positive, amongst which methamphetamine and ketamine were the most commonly found.

Drug Driving –
In 2015, this service handled 31 cases, 30 of which gave positive results for drug(s)/drug metabolite(s). Amongst these 30 cases, 27 of them involved specified illicit drugs and 3 involved other drugs.

Drink Driving Service –
In 2015, this service handled 61 cases for alcohol determinations and one case for expert opinion on alcohol pharmacokinetics. Of the 61 cases, 42 cases (69%) had alcohol concentrations exceeding the statutory prescribed limit.

Hair Drug Testing Service -
This service examined a total of 849 hair samples for Healthy School Programme in 2015. None of these samples gave positive results for abused drugs.
QUESTIONED DOCUMENTS

Government Laboratory (GL) provides services to law enforcement departments on the determination of the authorship of questioned handwriting and signatures, the authenticity and/or alteration of questioned documents. The HKPF remained the major client – being
the source of over 74% of cases submitted in 2015.

“Express Service” for urgent examination of the authenticity of travel and identity documents was also provided in the year. 78% of the express cases were received from HKPF and the remaining 22% of cases were submitted by the Immigration Department (ImmD). The Hong Kong Smart Identity Card (HKSID) remained the most prominent type of questioned documents for the Express Service, amounting to 79% of the express cases received in 2015.

GL also provided technical expertise to the Government Logistics Department (GLD) and ImmD in conducting testing for security paper and HKSID respectively.

**Work Statistics**

In 2015, GL handled a total of 355 normal document examination cases and 216 Express Service cases. As in the previous year, all pertinent pledged performance targets were met in 2015. 96% of the counterfeit/forgery cases (target: 90% completed within 33 working days), 95% of handwriting cases (target: 85% completed within 66 working days) and 100% of the Express Service cases (target: 99% completed within 1 working day) were completed within the target reporting times.

To provide quality and efficient services to client departments, from 2016 onwards, the turnaround time of the counterfeiting/forgery cases is shortened from 33 to 30 working days.
The Food and Drugs (Composition and Labelling) (Amendment) (No. 2) Regulation 2014 (Cap 132W) has commenced on 13 December 2015 regarding new requirements on the nutritional composition and nutrition labelling of infant formula (IF). The requirements on nutrition labelling of follow-up formula and prepackaged food for infants and young children will come into operation on June 13, 2016. To support FEHD on the enforcement of the Regulation, GL has developed a series of new analytical methods for the analyses of vitamins, nutrients and elements. These methods involve various chemical and microbiological techniques and they have been employed for the routine analyses of IF.

In supporting the implementation of the Pesticide Residues in Food Regulation (Cap. 132CM) in August 2014, GL has developed more advanced analytical methods by the employment of sophisticated instruments, such as high resolution quadrupole-time of flight tandem mass spectrometers for both gas and liquid chromatography amenable pesticide residues. Accreditation for these newly developed methods is underway. With the application of advanced instrumentation in recent years, the analytical capability in residues analysis has been further broadened and enhanced.

On genetically modified (GM) food, the analytical capability was extended to two new events, maize GM event
MIR162 and rice GM event LLRICE62 using real-time PCR.

In supporting local laboratories to keep abreast of the updated food testing technology, GL co-organized a technical workshop with the Hong Kong Accreditation Service in 2015 on Food Testing Quality Assurance and Method Validation. During which, GL presented two talks on (i) Overview of testing methods for edible oil and (ii) Method validation and verification.

GL continued to outsource certain
routine food testing work to commercial testing laboratories in 2015. The scope covered the testing of residues of pesticides and veterinary drugs, preservatives, heavy metals and other contaminants. The released resources were deployed to cater for new work arising from the amendments of food legislation, development of new testing methods and other duties including handling of food incidents, management of outsourcing activities and chemical metrology work as well as enhancing the testing capability of the local laboratories. A technical briefing had been given to commercial testing laboratories in 2015 to keep abreast of the technological development in pesticide residues analysis.

On international comparisons, GL coordinated a CCQM key comparison and a pilot study (CCQM-K125 and CCQM-P159) on the determination of elements in infant formula. Preparation of the final report is in progress. Besides, GL coordinated a CCQM key comparison and a pilot study (CCQM-K126 and CCQM-P161) on the analysis of carbamazepine in surface water and the final report is now under preparation.

**DRUG SAFETY**

There has been a continuous increase in the number of urgent test requests from Department of Health (DH) in response to the public concern over the safety of pharmaceutical products in recent years. GL strives to provide the highest standard of service for this category of test requests as timely reporting of results to DH is of
paramount importance to safeguarding public health. Many of these cases involved products of undeclared drug adulterants, illegal selling of suspected pharmaceutical products via the internet, and malpractices of local pharmacy stores. Moreover, the introduction of new anti-obesity and sexual enhancement drugs such as benzyl-sibutramine, hydroxythiohomosildenafil, etc. adulterated in pCms and health products has posed additional technological challenge to the provision of the related services that demand an upgrade of analytical instruments. In 2015, one liquid chromatography-tandem mass spectrometry (LC-MS/MS) and one liquid chromatography quadrupole time-of-flight mass spectrometer (LC-QTOF) were acquired to expand the service scope and enhance the efficiency of the testing services concerned.

Test requests for e-cigarette continued to increase in 2015. GL had developed some fast and rapid LC-MS/MS methods for the analysis of nicotine and formaldehyde in e-cigarette’s cartridges and liquid as well as in the e-cigarette aerosol. Apart from the surveillance testing of registered pharmaceuticals, several research projects have been conducted aiming to extend the scope of service for pharmaceutical analysis. These include identification of macromolecules such as somatropin and interferon-1a beta, and analysis of new generation of anti-cancer drugs such as crizotinib, imatinib, trastuzumab and vermurafenib. In addition, the development work on the analysis of botulinum neurotoxin A using MALDI-TOF and LC-MS/MS had
passed an important milestone on the provision of the concerned analytical services.

The analytical demand for testing of chemical markers for certification of suspected unregistered pCms continued to increase in 2015. GL always accorded top priority and has deployed extra resources to the analysis of these litigation samples so as to deliver timely results in facilitating client department to take required legal actions and protect the general public. To strengthen the analytical support, GL has acquired advanced instruments and extended the accreditation scope to cover the analysis of various chemical markers and toxic ingredients such as aconitine alkaloids in pCms and CMMs. Furthermore, GL has developed a new
analytical method to enhance the determination of residues of organochlorine pesticides in CMMs by gas chromatography-tandem mass spectrometry. HOKLAS accreditation for the method has also been obtained.

FORENSIC DNA EXAMINATION

DNA quantification plays an essential role in the overall DNA profiling process as it not only allows a preliminary assessment on DNA extraction efficiency, but also a determination of how much DNA template to be added into the downstream analysis. Having launched a study on the precision of several commercially available DNA quantification kits, our laboratory has demonstrated that one of the tested quantification systems exhibited a higher precision and consistency than the others; hence, offering a more accurate prediction on the profiling results of low level touch DNA evidence. The research findings have been accepted for publication in an internationally recognized scientific journal.

Undeniably, latent fingerprint and touch DNA are the two important contact evidence for individualization in forensic science. These testing techniques have been widely employed in dealing with a variety of crimes such as burglary, robbery, drug related offences and etc. because of their strong ability in establishing evidential linkage and identification of
culprit(s). On most occasions, these evidence usually coexist on exhibit surface, DNA sampling technique such as swabbing could cause disturbance on fingerprint details. In an effort to retrieve both evidence as far as possible, the laboratory launched an extensive study in collaboration with the Identification Bureau (IB) of the HKPF to evaluate the chemical compatibility of various fingerprint treatment techniques with the automatic DNA extraction systems that are currently in use in our laboratory. The research outcome would facilitate us to formulate the best examination strategy in attempt to maximize recovery for both fingerprint and DNA evidence from exhibits.

Management System (LIMS) has been purchased with customization to suit operational needs and was actively tested in this year with a view to put into operation in 2016.

In 2015, an in-depth study of an insertion/deletion polymorphisms amplification kit has been performed to evaluate the effectiveness of this new amplification kit and the findings demonstrated that this kit may serve as a supplementary tool for genetic testing services. With the dis-continuation of some amplification kits, a validation study is underway to determine the applicability of an alternative kit in verifying kinship in complicated cases.

To further enhance the management and administration of the work in the DNA Database Section (DDS), a new version of Laboratory Information
<table>
<thead>
<tr>
<th>Title</th>
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<tr>
<td>1 “Use of assigned reference values: Revisiting a small scale inter-laboratory comparison for residual pesticides in tea”</td>
<td>DWM Sin and YC Wong</td>
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<tr>
<td>2 Certification of alpha-endosulfan, beta-endosulfan and endosulfan sulfate in a candidate certified reference material (organochlorine pesticides in tea) by isotope dilution gas chromatography-mass spectrometry</td>
<td>DWM Sin, YL Wong, ECC Cheng, MF Lo, Clare Ho, CS Mok, SK Wong</td>
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<tr>
<td>3 “Validation of pedestrian throw equations by video footage of real life pedestrian/vehicle collisions”</td>
<td>YK Cheng, KH Wong, CN Tam, YY Tam, TW Wong, CH Tao</td>
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<td>4 Development of a valid database for the authentication of fresh/ chilled and frozen pork using hydroxylacyl–CoA–dehydrogenases (HADH) assay</td>
<td>TC Cheung, CC Cheng, HY Chan, SK Tong, PK Chan, FW Lee, YC Wong and DWM Sin</td>
</tr>
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<td>5 “Phenylboronic Acid Solid Phase Extraction Cleanup and Isotope Dilution Liquid Chromatography-Tandem Mass Spectrometry for the Determination of Florfenicol Amine in Fish Muscles (invited publication)”</td>
<td>Della WM Sin, Clare Ho, YT Wong</td>
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<td>6 “Organising a proficiency testing program on Chinese handwriting and signature examination in accordance with ISO/IEC 17043 requirements”</td>
<td>CK Li, LP Chan and SK Wong</td>
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<td>7 “An evaluation of the performance of five extraction methods: Chelex® 100, QIAamp® DNA Blood Mini Kit, QIAamp® DNA Investigator Kit, QIA Symphony® DNA Investigator® Kit and DNA IQ™”</td>
<td>SCY Ip, SW Lin, KM Lai</td>
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<td>Topic</td>
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<tr>
<td>1 Application of Gas Chromatography Negative Chemical Ionization Tandem Mass Spectrometry in the Analysis of Drug and Pesticide Residues in Food</td>
<td>Hong Kong Society of Mass Spectrometry Symposium 2015</td>
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<tr>
<td>2 Development of a LC-MS/MS method for the identification of botulinum neurotoxin A in pharmaceutical injections</td>
<td>42th HPLC International Symposium (Geneva, Switzerland)</td>
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<td>3 Forensic DNA Testing and DNA Database Development in Hong Kong</td>
<td>4th National Congress of Forensic DNA Database (Chongqing , China)</td>
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<tr>
<td>4 How can footwear impressions contribute to solve a crime when shoes from suspect are no longer available for test?</td>
<td>The 7th European Academy of Forensic Science Conference (Prague,Czech Republic)</td>
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<tr>
<td>5 Organising a proficiency testing programme on Chinese handwriting and signature examination in accordance with ISO/IEC 17043 requirements</td>
<td>73rd Annual Meeting of American Society of Questioned Document Examiners (Toronto , Canada)</td>
</tr>
<tr>
<td>6 Techniques in Pesticide Residue Analysis in relation to Regulation in Hong Kong</td>
<td>Technical Exchange Meeting for Shenzhen, Hong Kong and Macao Food Inspection Agencies and Technical Seminar for the Food Testing Laboratory Union on Mainland Food Importing to Hong Kong (Shenzhen, China)</td>
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<td>7 Traceability of food safety testing results</td>
<td>ditto</td>
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<td>8 Metrology in Chemistry and its Scientific Support to the Local Testing Community</td>
<td>Seminar on the World Metrology Day (WMD), World Accreditation Day(WAD) and World Standards Day (WSD) 2015 in Hong Kong</td>
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<td>9 Organisation of Proficiency Testing Programmes and Reference Material Production in Accordance with ISO Requirements</td>
<td>Seminar on International Metrology and Testing Services</td>
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<td>10 Laboratory Quality Management and Control – The Need for Improvement in Proficiency Testing</td>
<td>The 22nd Tripartite Technical Support Meeting (Shantou, China)</td>
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Our visitors in 2015

9 January 2015
Mr. Chris Hefford (right)
Forensic Science South Australia

13 January 2015
Dr. Michael Walker (LGC, UK) (2nd from right)
Dr. Brett Phinney (University of California at Davis, USA) (2nd left)

16 January 2015
Attachment Visit of Mainland Officials of Justice
Departments/Bureaus under their Cooperation Agreement with DoJ
Dr. Deepak Gyawali (2nd from right)
Nepal Bureau of Standards and Metrology

12 February 2015
6 March 2015
13 April 2015

Mr. Sun Mao-li (2nd from left)
Director of Legislative Affairs Bureau,
Ministry of Public Security of the PRC

Visitors from Criminal Investigation Department,
Ministry of Public Security of the PRC
Our visitors in 2015

Mr. Teng Jia-cai (5th from left)
Vice Minister, China Food and Drug Administration

Mrs. Cherry TSE (right front)
Permanent Secretary for Food and Health (Food)

15 April 2015

21 April 2015

8 May 2015

Mr. An Xiao-hui (2nd from right)
Deputy Director, Criminal Investigation Department, Ministry of Public Security of the PRC
Mrs. Carrie LAM (middle front)
Chief Secretary for Administration

Ms. Christine LOH Kung-wai (2nd from left)
Under Secretary for the Environment

13 August 2015
14 September 2015
30 September 2015

Mr. Zheng Zhi-qiang (3rd from left, front row)
Deputy Director of Narcotics Control Bureau of
Guangdong Provincial Public Security Department

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Our visitors in 2015

Mr. Luo Jie (4th from right)
Director,
China Food and Drug Administration

22 October 2015

Dr. Derek Craston (middle), Chief Scientific Officer and Managing Director of Science and Innovation at LGC, UK

22 October 2015

Dr. Marion Healy (right)
Deputy Chief Executive and Chief Scientist (DCEO), Food Standards Australia New Zealand (FSANZ)

28 October 2015

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Ms Wang Ming-zhu (left)
Vice Minister,
China Food and Drug Administration

21 November 2015

Mr. Liu Zhong-yi (3rd from right)
Deputy Director, Criminal Investigation Department,
Ministry of Public Security of the PRC

26 November 2015
Government Laboratory

Website:  www.govtlab.gov.hk