

Annual report—

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EDUCATION AND PUBLIC HEALTH DEPARTMENT

(Public Health)

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Annual Report of the Chemical Examiner's Department for the year 1941—Submitted.

No. 1035.

Dated Madras, 7th March 1942.

From

SRI S. RAJAGOPAL NAIDU, M.B.E.,
B.A., M.B., B.S., M.SC. (Lond.), F.R.C.
Chemical Examiner to Government,

To

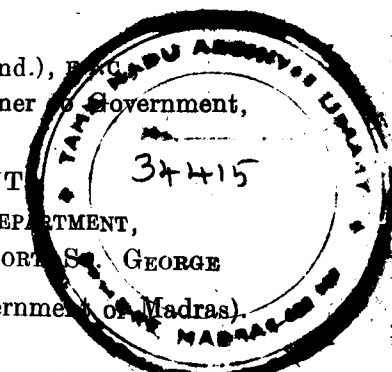
THE SECRETARY TO GOVERNMENT
EDUCATION AND PUBLIC HEALTH DEPARTMENT,
FORT ST. GEORGE

(Through the Surgeon-General with the Government of Madras).

Sir,

I have the honour to submit the Annual Report of the Chemical Examiner's Department for the year 1941.

I was in charge of the department throughout the year. Sri P. Venkat Rao, B.A., M.B., B.S., was my First Assistant during the period. Sri S. Raghavachari, my Second Assistant, was on leave from the 1st October to the end of the year during which period Sri S. Natarajan, B.Sc., my Third Assistant, acted as my Second Assistant and Sri R. Veeraraghavan, B.Sc., was appointed to act as Third Assistant. Sri C. A. Subrahmanyam, B.A. (Hons.) (Oxon.), my Assistant for Police Research, went on other duty on the 13th March and Sri N. Pitchandi, B.Sc., A.I.I.Sc., was appointed to act for him from the 24th June. Sri N. Verghese, B.Sc., M.B., B.S., was under training in this laboratory from the 4th August to the 29th November when he went on leave on medical certificate. Sri K. Subba Rao, B.A., M.B., B.S., was under training here from the 15th October to the 30th December. Sri C. Gopal Raj Chetti, B.A., M.B., B.S., D.P.H., a candidate deputed by the Government of Mysore for a course of training for a period of six months under me, joined this laboratory on the 1st September.



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The total number of cases examined during the year was 1,685 with 8,630 articles as compared with 1,765 cases and 9,474 articles in 1940.

HUMAN POISONING CASES.

The total number of human poisoning cases examined during the year was 432 cases with 2,101 articles as compared with 427 cases with 2,438 articles in 1940. Poison was detected in 230 cases or 53.2 per cent. The nature of the poisons detected is shown in the following table:—

POISONS DETECTED.

<i>Inorganic.</i>			
	CASES.		CASES.
Ammonium hydroxide ..	1	Mercury and its salts ..	10
Arsenic ..	8	Nitrite (sodium nitrite or	
Arsenic and mercury ..	3	potassium nitrite) ..	8
Calcium hydroxide ..	1	Nitric acid or nitrates ..	4
Copper or copper sulphate ..	20	Sodium hydroxide ..	1
Cyanide ..	12	Sulphuric acid or sulphates ..	10
Iodine ..	1		
Magnesium sulphate ..	1	Total ..	81
Manganese ..	1		

<i>Organic.</i>			
	CASES.		CASES.
Aconite ..	9	Nux vomica or strychnine ..	4
Aconite and tobacco ..	1	Odallam ..	2
Aconite and mercury ..	1	Odallam and alcohol ..	1
Alcohol ..	18	Oduvan ..	5
Chloroform ..	1	Oleander ..	26
Chloral hydrate ..	1	Opium or morphine ..	41
Cocaine ..	1	Opium and alcohol ..	1
Cresols ..	3	Opium and mercury ..	1
Datura or mydriatic alkaloid ..	15	Paraphenylene diamine ..	1
Essential oils ..	4	Phenol ..	1
Eucalyptus oil ..	1	Unidentified poisons ..	2
Formaldehyde ..	1	Veronal ..	1
Gloriosa superba ..	1		
Jatropha curcas ..	1	Total ..	149
Madar juice ..	5		

The vast majority of the poisons detected were organic poisons. The commonest poisons detected were opium or its alkaloids in 43 cases, oleander in 26 cases, copper or its salts in 20 cases, alcohol in 20 cases, datura or mydriatic alkaloid in 15 cases and cyanide in 12 cases.

A few cases are selected as of interest:—

Nitrite.—A woman was about twenty years old whereas her husband was twelve years old. They had been married a year before. The husband was still far from the age of puberty and deposed that he and his wife had never led a married life. This, however, had not prevented the woman from becoming the mother of a child who was three months old at the time. Her father-in-law who lived with them had, however, been a constant obstacle to her improper ways. One night when this father-in-law sat

down to dinner he was served with food by the woman. A grandchild of his, aged about two years and a half, living in the neighbourhood, happened to be there and the child was invited by the grandfather to share his food. The woman seeing this, snatched away the child and sent it to its parents' house through a servant. The child vomited and died soon after it reached home. The father-in-law got up from dinner, lay down on a cot, vomited, collapsed and died. The Police sent the viscera of the victims to us. We detected nitrite equivalent to about eighteen grains of sodium nitrite in the viscera of the father-in-law and nitrite equivalent to about one-fifth of a grain of sodium nitrite in the viscera of the child. We detected small quantities of nitrite in the washings of the vessel from which the food had been eaten and also in the stains on two cloths on which the two victims had vomited. A powder found in the possession of the accused was also sent to us and we identified it to be sodium nitrite weighing about an ounce and a quarter. The powder had been obtained by the woman from a dyeing yard. The excuse put up by the defence that the poison had been administered to the deceased as a potion to change his attitude towards his daughter-in-law, was not accepted by the judge who stated that the obvious intention of the woman had been to put the father-in-law out of the way. The woman was found guilty of murder but was sentenced to transportation for life as she was the mother of a suckling baby.

Cyanide.—A man wanted to do away with his mistress in order to get hold of her property which was considerable in the shape of money and jewels. One day he took her in a bandy to see a local practitioner of indigenous medicine for the treatment of some ailment from which she was suffering. On the way he bought a tumblerful of soda water from a shop, took it to the bandy and gave it to her to drink. The man returned the tumbler to the shop-keeper after washing it carefully in a nearby tub of water. This significant, if small, circumstance was noted by the shop-keeper as no other customer of his had ever done this before. The woman made a gurgling sound and fell back in the cart. The man said she had a fit and hurried the bandy to the house of the physician. The physician found life extinct but advised the man to try a hospital for injections. The bandy was brought back home and a hospital compounder was sent for, who came and pronounced that life was extinct. The landlord, in whose house the woman had been a lodger, became suspicious and reported the matter to the Police. The viscera of the woman were sent to us and we detected in them cyanide equivalent to about one-half of a grain of potassium cyanide. The Police in the course of their

investigations found that the accused had obtained from a goldsmith some potassium cyanide of which the goldsmith had kept a stock for use in his professional work. A bottle seized from the goldsmith was sent to us and we found inside it about one and three-fourths grains of potassium cyanide. The accused was tried, convicted of murder and sentenced to death.

Arsenic.—A landowner in a village took to drinking and other evil ways after the death of his wife and wasted almost the whole of his ancestral property without any consideration for his two sons who were living with him. The maternal uncle of these sons along with a drinking companion of the landowner bought poison from a dealer stating that it was for killing a mad dog. They administered the poison to the landowner in arrack after drinking which he was taken seriously ill and died early next morning after complaining loudly to the villagers that he had been poisoned. In spite of this, friends and relations attended the funeral and buried the body without any one informing the Police. Rumour, however, spread quickly from village to village and a distant relation of the landowner living in a neighbouring village heard this rumour the same evening and immediately reported the matter to the Police. The body was exhumed the next day and the viscera were sent to us. We detected in the viscera arsenic equivalent to about one and one-third grains of white arsenic and in the urine in the bladder arsenic equivalent to about seven-tenths of a grain of white arsenic. The washings of the bottle from which the poisoned arrack had been administered yielded about one-sixth of a grain of white arsenic. The maternal uncle of the sons and the drinking companion of the deceased were both convicted of murder and sentenced to death.

Copper.—(1) The belief still persists in this country that the love and devotion of a man may be secured by a woman by the administration of a love potion. The potion is believed to lurk in the body of the victim and make him the woman's slave. A barber was very much in love with his wife and was not particularly devoted to his mother. His mother and maternal aunt decided that he was under the influence of a love potion administered by his wife and conspired to eject the potion lurking in his body. So one morning they persuaded him to swallow a drink prepared from copper-sulphate and lime juice. He was taken extremely ill with vomitings and purgings and died five days later. The viscera were sent to us and we detected in the stomach and contents, copper equivalent to about one-eighth of a grain of crystalline copper-sulphate, in the intestines copper equivalent to about three-fifths of a grain of crystalline copper-sulphate, in the liver copper equivalent to about two and four-fifths of a grain of

crystalline copper-sulphate and in one kidney copper equivalent to about one-sixteenth of a grain of crystalline copper-sulphate. Other poisons were looked for in the viscera but were not detected. Death was therefore due to copper-sulphate poisoning.

(2) A coolie married a second wife while his first wife was still living with him and thus courted trouble. The second wife had a baby. One day the two wives and their husband went out to work in a field after leaving the baby to sleep in a cradle improvised out of a cloth suspended from a neighbouring tree. After some time the first wife was seen approaching the cradle, taking out the baby and putting it back. No one attached any importance to these movements at the time. A little later, the child was heard crying. The mother ran to the child and found some greenish matter coming out of the child's mouth. She raised an alarm. The father of the child hurried to the spot and took out from the mouth of the child particles looking like copper-sulphate. He secured these particles and removed the child to a hospital where it died after some vomitings and purgings. The viscera were sent to us and we detected in them copper equivalent to about one and a half grains of crystalline copper sulphate. We found the matter taken out of the mouth of the child to be crystalline copper-sulphate weighing about four and two-fifths grains. The first wife was tried, convicted of murder and sentenced to death.

Chloroform.—A man was suspected to have committed suicide by drinking chloroform. The post-mortem examination showed eyes closed, some oily fluid coming out of the nostrils, rigor mortis present with the features relaxed and the pupils moderately dilated. The pericardium contained one ounce of a clear fluid and the heart was flabby with the right side dilated. The lungs were congested with petechial hæmorrhages present throughout. The liver showed fatty degeneration and the kidneys were congested. The stomach was red and congested with patches of necrosis and contained a mixture of yellowish and brownish red fluids smelling of chloroform. The upper portion of the small intestines was congested with patches of necrosis. The brain was congested. We detected in the viscera about two hundred and seventy-nine grains of chloroform.

Datura.—A coolie earned by manual labour four annas which was paid to him in the evening. A man who saw this wanted to rob the coolie of his hard-earned money and gave him some food to eat. After eating it the coolie became giddy and began to walk northwards in an unsteady manner. The culprit followed the coolie at a distance waiting for an opportunity to rob him. After walking

some distance the coolie felt unable to walk any further and cried out to some passers-by to hold him from falling and to catch hold of the culprit. The culprit was handed over to the Police who sent to us the faecal matter of the coolie and the remnants of the food seized from the culprit. We detected a mydriatic alkaloid in each of the two articles and identified under the microscope, particles with the characteristic structure of datura seed in each of them. The culprit was awarded rigorous imprisonment for four years.

Strychnine.—A man was suffering from venereal disease. One afternoon an enemy of his approached him in an ingratiating manner and told him that he would give him a dose of medicine which would cure him of venereal disease once for all. He advised the patient to keep the matter a close secret and gave him some medicine and a bottle of arrack. He advised his patient to go to the top of a lonely hill in the neighbourhood and there swallow the medicine first and then drink the arrack. The patient presumably drank the arrack first and then handed over the bottle of medicine to the Police. The medicine was sent to us and we detected in it strychnine weighing about one grain and a quarter, a lethal dose.

No poison.—A body was found floating in the Cooum river. The post-mortem examination did not reveal any sign of violence or of drowning. The viscera were examined by us but no poison was detected in them. The examination of the stomach contents, however, revealed diatoms similar to those found in the brackish waters of the Cooum. Examination of the mud sticking to the body of the deceased also revealed similar diatoms. It was therefore a case of drowning as it is well known the waters of the Cooum are not ordinarily drinkable. The method used by us to isolate the diatoms was to warm the material with dilute sulphuric acid and a slight excess of potassium permanganate to destroy most of the organic matter, decolourise the excess of permanganate with a little oxalic acid, centrifuge and examine the sediment under a microscope. (H. E. Cox.)

TOXICOLOGICAL NOTES.

The determination of lead.—The lead is precipitated as chromate from acetic acid solution. The lead chromate after washing is dissolved in sodium hydroxide solution in which it dissolves quite readily. The solution is made up to a known volume and an aliquot portion of this solution is treated with excess of potassium iodide and hydrochloric acid and the liberated iodine titrated with a standard thiosulphate solution. With small

quantities of lead, N/500 thiosulphate solution may be used. If preferred the lead may be determined colorimetrically in this alkaline solution either as chromate or as sulphide.

The action of some moulds on arsenic.—The moulds tried were those most commonly available here, viz., *Aspergillus glaucus*, *Penicillium glaucum* and *Rhizopus nigricans*. Solutions of arsenic trioxide of above 0.1 per cent were found to be toxic to the moulds. In concentrations below this the moulds were found to grow in glucose-broth containing arsenic. *Aspergillus glaucus* was found to be efficient in converting arsenic into volatile compounds with a garlic odour (Gosio gas) even after several sub-cultures whereas *Penicillium glaucum* and *Rhizopus nigricans* showed slight activity at first but lost this activity after some sub-cultures. The activity of *Aspergillus glaucus* which lasted for ten to fifteen days could be demonstrated on glucose-agar or on moist sterilized white bread, to which arsenic had been added after sterilization. White bread was chosen for the experiments as it was porous. Working with quantities of fifty to one hundred micromilligrams of arsenic trioxide in two to five grams of moist sterilized bread inoculated with *Aspergillus glaucus* in Kjeldahl flasks, it was found after the end of the activity that about two-thirds of the arsenic had been lost from the medium in the form of volatile compounds while about one-third still remained in the medium. In one experiment the arsenic thus lost was accounted for by absorbing the volatile products in concentrated arsenic-free sulphuric acid and determining by the Gutzeit method the volatile arsenic compounds absorbed by the sulphuric acid.

Pansupari.—The experiments on the toxicity of pansupari described in my last annual report were continued during the year:—

0.5 ml. of the essential oil from betel leaf given intravenously to an anaesthetised dog weighing 3.85 kg. caused an immediate fall of blood pressure and death. There was initial stimulation of respiration followed by marked depression and apnoea.

0.1 ml. of the oil treated with sodium hydroxide solution to the neutral point and injected intravenously into another animal produced a marked falling of blood pressure. The respiration was shallow with increase in frequency and decrease in amplitude. The intestinal movements were temporarily relaxed. 0.1 ml. of the oil treated with alkali as above and injected into the portal vein produced no appreciable change in blood pressure, respiration or intestinal movements. An equivalent amount of the alkali alone used in the above two instances injected as above as controls did not produce any appreciable effect. Negative results were obtained also when 0.1 ml. of the oil treated with alkali as above was introduced into the duodenum. The action on blood pressure, respiration and intestinal movements when similar quantities of the above

solution of the oil were given intraperitoneally were found to be well marked. They were less marked when given hypodermically and very slight when given intramuscularly.

Studies were made to find out whether the fall in the blood pressure was the result of vagal effect or not. With this object injections were given both before and after severing the vagi and also after paralysing the terminals by atropinisation. The results obtained were the same as those before vagal section or vagal paralysis.

The above experiments show that (1) large doses of the essential oil when absorbed into the blood produce falling of blood pressure and death through cardiac and respiratory failure; (2) small doses produce a fall in blood pressure, shallowing of respiration and temporary relaxation of the intestinal movements; (3) the oil appears to be detoxicated by the liver; and (4) vagal section or vagal paralysis has no influence on the toxic effects of the drug, viz., fall in blood pressure, shallowing of respiration and relaxation of intestinal movements.

It has been noted here that in the cases of persons affected by chewing pansupari, the victims were in a state of physical exhaustion at the time of chewing it and the symptoms noted in these cases have been profuse sweating and collapse.

Microscopy of *Nux vomica* bark.—The bark contains a layer of cork cells with a brown pigment. The cortex consists of thin walled parenchymatous cells containing prismatic crystals of calcium oxalate here and there. On the inner side of the cortex there is an unbroken band about 0.1 to 0.15 millimetre broad of a layer of sclerenchymatous cells with thick striated pitted walls. These cells are mostly polygonal in shape though a few are elongated. The walls of these cells are about 10 micromillimetres thick and the lumen is about 10 micromillimetres wide. In the bast tissue there are innumerable prismatic crystals of calcium oxalate. Most of these crystals are found surrounded by smaller prismatic satellite crystals. There are also scattered groups of sclerenchymatous cells similar to those in the band. The medullary rays are about five cells wide. Bast fibres are scanty and measure about 0.8 millimetre in length and fifteen micromillimetres in width with narrow lumen. Starch grains are present both in the cortex and in the bast but are scanty and measure about 4 micromillimetres in diameter. They are mostly spherical and simple but a few are compound. Sections of the bark mounted in dilute nitric acid (1:1) assume a bright orange-red colour and sections mounted in vanadic sulphuric acid assume a purple colour.

ANIMAL POISONING.

We received in the year 1941, thirty-three cases of animal poisoning with one hundred and sixty-two articles as compared with twenty-three cases with eighty-eight articles in 1940.

Poison was detected in thirteen cases or 39.4 per cent. The nature of the poisons detected is shown in the following table:—

	Cases.
Arsenic	10
Aconite	1
Oleander	2
Total ..	13

STAIN CASES.

One thousand and four cases were examined under this heading in 1941 as against one thousand and eighty-one cases in 1940. Nine hundred and seven cases were examined for blood and ninety-seven cases for semen with or without blood. The total number of articles examined under these headings was 5,637.

In the nine hundred and seven blood-stain cases examined, blood was detected in eight hundred and fifty-five cases or 34.3 per cent.

In the ninety-seven cases examined for semen with or without blood the detections were blood and semen in 31 cases, semen alone in 13 cases, gonococci and semen in two cases and gonococci alone in seven cases, the total detections being 53 cases or 54.6 per cent.

Four thousand five hundred and seventy-seven (4,577) specimens of stains in which blood was detected in this laboratory were sent to the Imperial Serologist, Calcutta, and the results of his examination are given below:—

	Number of articles.
Human blood	4,204
Human and bird's blood	1
Ruminant animal blood	10
Bird's blood	18
Human and ruminant animal blood	1
Bird's and ruminant animal blood	1
Disintegrated and origin not determined.	333
Too small	9

In addition to the above, three specimens of suspected blood-stains were sent to the Imperial Serologist, Calcutta, without further examination here, as the stains were exceedingly small and there was the risk of losing the stains for serological tests, if the preliminary examination for blood was done here. The results of the examination of these stains were—

	Number of articles.
Human	1
Disintegrated and origin not determined.	1
Blood stained but too small	1

A decomposed piece of tissue suspected to be tissue from the ear lobe was sent to the Imperial Serologist for the determination of its origin and it was reported by him to be so disintegrated that its origin could not be determined.

In one case a woman had been gagged and murdered. The piece of cloth suspected to have been used for gagging was sent to us for the detection of saliva on it. We found portions of the cloth to show a faint fluorescence under ultraviolet light similar to that shown by dried saliva on cloth and to give reactions showing the presence of amylase, phosphates and chlorides on it.

The Diastatic Activity (Lintner Value) of Saliva.—The diastatic activity of different specimens of human saliva was studied here by the method recommended by the Ministry of Agriculture and Fisheries of the United Kingdom (vide Analyst 1933, page 542). Sufficient quantities of saliva were used in the conversion solution to give a final titration value between 20 and 25 ml. for 5 ml. of Fehling's solution. N. Pitchandi examined several specimens of saliva by this method and found the Lintner Value to vary from person to person and also in the same person according to the time of day. The average value was found to be about 2 as calculated on fresh saliva and about 350 as calculated on its total solids. The highest values were 7.6 on fresh saliva or 1,070 as calculated on its total solids and the lowest corresponding figures were 0.08 and 20 respectively. Drying in the shade was found to decrease the Lintner Value. The drying of saliva on cotton for one day in the shade was found to reduce the Lintner Value to 35 per cent of the original value and drying for two days under similar conditions was found to reduce the Lintner Value to about 15 per cent of the original value. A week's drying at the laboratory temperature in a dessicator had resulted in the lowering of the Lintner Value to about 4 per cent of its original value.

Identification of hair.—Pieces of hair found sticking to weapons in blood-stain cases were studied with the following results:—

	Number of articles.			
Human hair	..	..	..	18
Sheep's hair	..	..	..	1

It is sometimes difficult to decide whether a small piece of hair belongs to a goat or to a sheep. In such cases we found that an examination of the medulla of the hair is helpful. The medulla is cleared by warming the piece of hair in 10 per cent caustic potash solution on a slide until the first bubble appears (vide Microscopy of Technical Products by Hanousek and Winton, first edition, page 134) and examining the slide under the microscope. The medullary cells in sheep's hair appear like a honeycomb with rounded cells whereas those in goat's hair appear as a network of flattened cells.

We are sometimes asked whether two specimens of hair belong to the same individual. Even when two specimens of hair are exactly alike in all respects it is not possible to assert that they

belong to the same individual as there may be several individuals possessing similar hair characteristics. Where the characteristics of the two specimens differ it is probable that they do not belong to the same individual but it is not possible to be certain even about this where the differences are slight or with single pieces of hair, as we have found that even in the same individual the hair may be of different tints (apart from any grey hair) and vary in structure as regards the relative width of the medulla, etc. Further, in this country, shades of hair are not so varied as in temperate climates, the main shades being black or grey with brown in some cases. From our experience, examination of hair under ultraviolet light is of little value in establishing identities. Tints of hair are best appreciated by mounting the hair in water and examining it under a microscope. Observations are made as to whether the darkness of the hair is a mixture of blue and black or brown and black and so on. The average diameter and the medullary index are also noted as well as any tapering in width if present. Cross-sections prepared and mounted as described in my previous annual report are examined with regard to the size and shape of the cross-sections, the ratio of the long diameter to the short diameter, the thickness of the cuticle, the nature of the pigment in the cortex and the appearance of the medulla. If all these factors are taken into consideration a certain amount of information is gained to enable one to conclude whether two specimens of hair could probably have belonged to the same person or not—

- (1) In a case of murder some pieces of hair were sticking to a bush and the Police wanted to know whether the hair belonged to the deceased. A sample of the hair of the deceased was sent for comparison. We reported that the two specimens of hair were similar in appearance and structure.
- (2) In another case some hair found at the scene of murder of a woman was sent to us along with a knife in the possession of the accused with some pieces of hair sticking to it and some ear-ornaments found in the possession of the accused with pieces of hair sticking to them. A request from us for specimens of hair from the accused and from the deceased for comparison with the above specimens of hair elicited the reply that the hair of the deceased could not be procured as the body had by that time been cremated and a specimen of hair of the accused was alone sent to us. We examined the specimens of hair and we gave as our opinion that none of the first three specimens of hair above belonged to the accused and that the three specimens of hair probably belonged to one individual but that this latter conclusion could not be affirmed with certainty.

The determination of fat or oil on hair.—In the examination of hair with a view to establishing its identity, the determination of the fat or oil on it and its qualitative examination would presumably provide useful information. A method was therefore devised

here for the micro-determination of fat or oil present in small quantities of hair using the microbalance and a simple micro-Soxhlet apparatus constructed in this laboratory. This apparatus consists of a glass tube of 3 mm. bore bent twice to form a syphon in the form of "N" of 5 cm. in height and prolonged at its lower end to a distance of 5 cm. The upper limb of the "N" is cut off at the middle of the "N" and joined to a tube of about 8 mm. bore and about 7.5 cm. in length. The wider tube is blown slightly above the point of junction. A plug of asbestos or defatted cotton wool is placed at the junction. 20 to 30 milligrams of hair are weighed out into the apparatus and a micro-fat-flask of suitable size is kept on a warm plate, the apparatus being fixed so that its lower end enters the mouth of the flask. A separating funnel with the stem bent twice into alternate right angles and with its tip drawn off to nearly a capillary is arranged to deliver ether into the upper opening of the apparatus at such a rate that syphonings occur each time after the ether in the flask has evaporated off. After a sufficient number of syphonings the dropping of ether is stopped, the ether evaporated off from the flask which is then cooled and weighed in the usual way. The flask is weighed again after rinsing it several times with light petroleum spirit, evaporating off the traces of petroleum spirit on the flask and cooling. The difference between the two weights gives the weight of the fat or oil. The petroleum spirit washings are evaporated to dryness over a small silica dish, and the dish with its contents is examined under ultraviolet light as well as chemically, colour tests being applied for those vegetable oils which yield such tests. Sesame oil if present may be detected by dissolving the residue in carbon tetrachloride and applying Baudouin's test using a reagent of cane sugar dissolved in hydrochloric acid. The test applied in this manner was found to be very delicate and to detect the presence of sesame oil in carbon tetrachloride solution even in such high dilutions as one in five hundred. Carbon tetrachloride does not interfere with the test.

This method was found by N. Pitchandi to give satisfactory results when tested with known weights of oil on defatted cotton wool. Sesame oil is the oil most commonly applied to hair for toilet purposes in these parts. The quantity of oil as determined by the above method was found to vary between 2 and 4 per cent in various individuals. In some of these, a positive Baudouin's test was obtained with solutions of the residue in carbon tetrachloride.

MISCELLANEOUS MEDICO-LEGAL CASES.

There were one hundred and fifteen (115) cases with six hundred and twenty-nine articles under this heading as against one hundred and forty-two cases with eight hundred and seventeen articles in the year 1940.

The nature of the articles examined is given below :—

	Cases.		Cases.
Firearms, bullets, etc., in shooting cases	30	Combustibles (incendiaries) ..	2
Bones and tissues, etc., for lead in shooting cases	5	Theft of telephone or telegraph wires	8
Bombs	17	Other thefts and cheating	6
Fireworks and other explosives	11	Tissues, bones and hair for identification of origin	14
Cases under Poison Act	6	Documents	2
Counterfeiting of coins and notes	3	Other cases	6
Acids or other corrosives	5	Total	115

Details of a few cases are given below :—

- (1) A bungalow was burgled during a night. A dirty white handkerchief had apparently been left by the burglar on the premises. There was a brownish stain on this handkerchief. The suspected burglar was arrested at a different place and there were similar brownish stains on his pyjamas and shirt. The Police wanted to know whether the stains on the handkerchief were from the same source as those on his clothing. On examination under the microscope partly gelatinised granules of ragi starch were found on the stained portion of each of the three articles but further examination revealed the presence of similar granules of ragi starch on the unaffected portions also of each of the three articles. The stains were slightly acidic in reaction but did not reveal citric, tartaric or oxalic acids. Further examination revealed the presence of tannin in the stains on each of the three articles as shown by an intensely black colour given with ferric chloride and a yellow colour with Braemer's reagent under the microscope. We therefore concluded that the stains had been caused by a solution containing tannin presumably tea. The presence of ragi starch on each of the three articles indicated that each of them had probably been laundered on the last occasion with ragi starch. The accused was convicted of theft and sentenced to one year rigorous imprisonment.
- (2) In another case a pair of shoes with an outer lining of black cloth and having a few whitish stains on the cloth lining at the back of the heel was sent to us to find out whether the stains on the shoes were due to rubbing against the paint on a bedstead. Scrapings of the paint on the bedstead were sent to us for comparison. We found the stains on the shoe to possess the same kind of fluorescence under ultraviolet light as the paint from the bedstead. We detected rubber and zinc oxide in the paint from the bedstead and also in the stains on the shoes but not on the unaffected portions of the shoes.
- (3) A man insured his life and produced as proof of his age a horoscope purporting to have been written forty-five years back at the time of his birth. The horoscope was suspected to be a piece of forgery and was sent to us for examination. The paper on which the horoscope was written,

was of a brownish tint as if due to age but was pliable and not brittle when folded. Examination of the surface, and of sections obtained by rolling a small bit and enclosing in pith, revealed the presence of (i) turmeric as shown by the starch grains and the curcumin reaction with sulphuric acid and (ii) lime as shown by alkalinity and micro-chemical tests for lime considered along with the absence of calcium carbonate sizing. The writing on the paper was in ordinary iron-gall blue-black ink. Portions of the writing on treatment with five per cent oxalic acid solution (as recommended by Mitchell) showed partial bleaching with diffusion of the dye into the solution. A portion of the writing on exposure to direct sunlight for ten days showed a considerable amount of bleaching. We concluded that the writing was not more than ten years old at the utmost and that the discolouration of the paper was due to application of a mixture of turmeric and lime.

- (4) A dealer in motor spirit and kerosene oil was suspected to be mixing kerosene oil with motor spirit and selling the mixture as genuine motor spirit to the public. The suspected specimen of motor spirit as sold by him was sent to us by the distributing company along with genuine specimens of motor spirit and kerosene oil. When examined in silica test tubes under ultraviolet light the suspected and genuine samples of motor spirit showed no noticeable fluorescence whereas the specimen of kerosene oil showed marked fluorescence. Specimens of the genuine motor spirit mixed even with very small quantities of the kerosene oil showed marked fluorescence. The specific gravity of the suspected and genuine samples at 15.5° C. were found to be 0.740 and 0.751 respectively whereas the specific gravity of the sample of kerosene oil at 15.5° C. was found to be 0.812. The boiling ranges of the suspected and genuine samples of motor spirit were found to be 55° C. to 150° C. and 50° C. to 150° C. respectively, whereas the boiling range of the specimen of kerosene oil was found to be 140° C. to 270° C. the fraction of kerosene oil boiling below 150° C. being found to be extremely negligible. There was, therefore, nothing to indicate that the suspected sample of motor spirit was an adulterated specimen.

The effect of burial on cotton and gunny.—The experiments described in my previous annual report were continued on pieces of cotton and gunny by burying them in the soil at depths of six inches, one foot, two feet and three feet and keeping the soil moist by daily watering. The disintegration of each was observed after one month's burial by digging up the pieces carefully and examining them. The extent of disintegration was found to be greater in pieces buried at depths of six inches and one foot than in pieces buried at depths of two feet and three feet. Both cotton and gunny were found invaded by moulds and lower forms of animal life. The anatomical changes due to disintegration in the

fibres of cotton and gunny were similar to those mentioned in my previous annual report. The margins of the fibres showed corrosion to a greater extent at depths of six inches and one foot than at the lower depths.

The moulds attacking cotton and gunny were found to be mostly of the *Aspergillus* type, the mycelia of which were found not only in the interspaces between the fibres but also in the body of the fibres. The lower forms of animal life attacking the fabrics consisted of ciliate protozoa and soil nematodes of microscopic size belonging to the *Anguillulidae* type (eel-worms). These nematodes measured on the average about two hundred micromillimetres in length and about eight micromillimetres in width. The above forms of vegetable and animal life were more plentiful in pieces of cotton and gunny fabrics buried at depths of six inches and one foot than in those buried at the lower depths.

The disintegration of cotton and gunny fabrics in the superficial layers of the soil, as observed in this instance, appears to be mainly due to moulds, ciliate protozoa and soil nematodes.

Theft of telephonic and telegraphic wires.—In cases of theft of wires we are sometimes asked whether some suspected pieces of wire have been cut by a suspected pair of pliers. The following method of examination is useful in such cases. The pliers are secured in a vice with one of the cutting edges horizontal and facing upwards. A long narrow sheet of lead about one or two millimetres thick and as broad as the cutting edge is pressed firmly against the cutting edge, pressure being applied by a flat piece of wood. The sheet is then drawn in a direction at right angles to the cutting edge so as to leave on the surface of the lead lands and grooves corresponding to the irregularities of the cutting edge. The lands and grooves thus obtained on the sheet of lead are compared under the comparison microscope portion after portion with the lands and grooves on the cut end of the wire. The same process is repeated with the other cutting edge of the pliers. The examination is possible only where there are clear markings of lands and grooves on the cut ends of the wires. Such markings are sometimes absent on the cut ends if torsion has been used along with cutting.

Examination of fired cartridge-cases.—In the examination of fired cartridge-cases with a view to establishing the identity of the firearm used, apart from other markings present on the cartridge-case the most important evidence is furnished by the striker-pin impression. The tip of the striker-pin in every case is a surface and not a point when viewed under the microscope and irregularities on this surface as seen under the microscope are found imprinted on the striker-pin impression. Microscopic examination of the striker-pin and test cartridge-cases along with the suspected cartridge-case gives extremely valuable evidence.

GENERAL ANALYSES.

One hundred and one articles were examined under this heading during the year under report as against ninety-two articles in 1940. These comprised eighty-one articles for Madras Government departments, three articles for the Central Government and seventeen articles for private parties.

OFFICE AND STAFF.

The service books of the establishment are up to date and the inventory of the valuable stock has been kept and duly checked.

The members of the staff have all performed their duties satisfactorily during the year.

I have to tender my thanks to the Professors of Bacteriology and Medical Jurisprudence and the Lecturer in Biology, Medical College, Madras, the Officer in charge of the Pharmacological Research Unit, Medical College, Madras, the Principal, Agricultural College, Coimbatore, and the Deputy Inspector-General of Police, Railways and Criminal Investigation Department, Madras, for assistance in certain special cases.

I have the honour to be,

Sir,

Your most obedient servant,

S. RAJAGOPAL NAIDU,
Chemical Examiner to Government.

APPENDIX.

TABLE I.—Summary of work done.

	1940.		1941.	
	Number of cases investigated.	Number of articles examined.	Number of cases investigated.	Number of articles examined.
Medico-legal investigations—				
Human poisoning cases [(a) in Table II] ..	427	2,438	432	2,101
Animal poisoning cases [(b) in Table II] ..	23	88	33	162
Stain cases [(c) in Table II] ..	1,081	6,039	1,004	5,637
Miscellaneous medico-legal [(d) in Table II] ..	142	817	115	629
Total, Medico-legal ..	1,673	9,382	1,584	8,529
General Analyses ..	92	92	101	101
Grand total ..	1,765	9,474	1,685	8,630

TABLE II.—Showing results of medico-legal analyses according to cases.

Nature of exhibits.	1940.			1941.		
	Total number of cases investigated.	Number of cases detected.	Total number of articles examined.	Total number of cases investigated.	Number of cases detected.	Total number of articles examined.
<i>General.</i>						
1 Cases in which viscera and contents were tested for poison ..	276	147	1,187	265	148	1,072
The viscera of individuals—						
Poisons detected ..	142					
Poison not detected. ..	115					
2 Cases in which tissues other than viscera were tested for poison ..	1	..	6	..	..	..
3 Cases in which excreta, vomit, dejecta or stomach contents received without viscera were tested for poison ..	124	79	213	151	80	217
4 Cases in which only miscellaneous articles were received ..	19	9	46	10	1	25
5 Miscellaneous articles received with cases under entries Nos. 1, 2 and 3 ..	..	..	951	..	..	756
<i>Abortion.</i>						
6 Cases in which viscera or contents were examined ..	7	..	26	6	1	25
7 Cases in which only miscellaneous articles were received ..	..	..	..	..	..	..
8 Miscellaneous articles received with cases under entry 6 ..	..	..	9	..	..	6
Total (a) ..	427	235	2,438	432	230	2,101

(a) Human poisoning.

TABLE II.—Showing results of medico-legal analyses according to cases—*cont.*

Nature of exhibits.	1940.			1941.		
	Total number of cases investi-gated.	Number of cases detected.	Total number of articles exam-ined.	Total number of cases investi-gated.	Number of cases detected.	Total number of articles exam-ined.
(b) Animal poisoning.						
9 Cases in which viscera and contents from horned cattle were tested for poison	16	10	54	24	7	99
The viscera of cattle—						
Poison detected	7					
Poison not detected. 19						
10 Cases in which viscera and contents from animals other than horned cattle were tested for poison				2		6
11 Cases in which tissues other than viscera were tested for poison						
12 Cases in which animal excreta, dejecta or stomach contents forwarded without viscera were tested for poison	1	1	2			
13 Cases of animal poisoning in which only miscellaneous articles were received	6	5	6	7	6	22
14 Miscellaneous articles received with cases under entries 9 to 12			26			35
Total (b)	23	16	88	33	13	162
(c) Stains.						
15 Blood stain cases other than 16	1,000	947	5,786	907	855	5,360
16 Blood stain, rape and un-natural crime cases	3	2	12	3	2	10
17 Seminal stain cases	45	19	118	62	20	115
18 Mixed blood and seminal stain cases	33	30	123	32	31	152
19 Other stain cases						
Total (c)	1,081	998	6,039	1,004	908	5,637
(d) Miscellaneous.						
20 Cases in which human bones, hair, etc., were received	142		817	115		629
Total (d)	142		817	115		629
Grand total	1,673	1,249	9,382	1,584	1,151	8,529

TABLE III.—Statement of poisons detected in the articles received under heading 1 to 14 of Table II.

Poisons.	Human poisoning.				Cattle poisoning.			
	In viscera and con-tents.	In tissue other than viscera.	In excreta or stomach contents.	In miscellaneous arti-cles.	In viscera and con-tents.	In tissue other than viscera.	In excreta or stomach contents.	In miscellaneous arti-cles.
Ammonium hydroxide	4		1	4				
Arsenic	28		22	45	12			
Arsenic and mercury	11		1	27				
Calcium hydroxide			1	1				
Copper or copper sulphate	13		22	26				
Cyanide	45		8	23				
Iodine			1	1				
Magnesium sulphate	3		2	3				
Manganese	3			1				
Mercury and its salts	23		11	15				
Nitrite (sodium nitrite or potas-sium nitrite)	29		7	27				
Nitric acid or nitrates			5	6				
Sodium hydroxide			1	1				
Sulphuric acid or sulphates	14		9	11				
Aconite	30		12	70				1
Aconite and tobacco				3				
Aconite and mercury			4	7				
Alcohol	27		22	24				
Chloroform	5		2	1				
Chloral hydrate	4		1	2				
Cocaine	2		2	2				
Cresols	1		6	3				
Datura or mydriatic alkaloid	4		35	40				
Eucalyptus oil			1	1				
Essential oils			4	4				
Formaldehyde	4			1				
Gloriosa superba	4			8				
Jatropha curcas			1	2				
Madar Juice	10		4	7				
Nux vomica or strychnine	8		2	8				
Odallam	6		4	4				
Odallam and alcohol	3		2	5				
Oduvan	17		3	8				
Oleander	73		20	33	2		3	3
Opium or morphine	123		34	53				
Opium and alcohol	4		1	1				
Opium and mercury	4			1				
Paraphenylene diamine			1	7				
Phenol	4			1				
Veronal	3		1	1				
Unidentified poisons			1	3				
Poison detected	509		255	496	14		16	30
Poison not detected	390		160	291	39		36	27
Total	899		415	787	53		52	57

TABLE IV.—Showing the places from which cases, in which articles were tested for poison, have been received during the year 1941.

	Human.				Cattle.			
	In viscera.		Other articles.		In viscera.		Other articles.	
	Number of cases.	Number of detections.	Number of cases.	Number of detections.	Number of cases.	Number of detections.	Number of cases.	Number of detections.
Anantapur ..	5	1	2	1	3	..	..	..
Arcot, North ..	3	2	2	2	3	2	1	1
Arcot, South ..	11	6	1	1	..	..	..	..
Bellary ..	3	..	1	..	..	..	..	..
Chingleput ..	8	4	2	..	..	..	..	..
Chittoor ..	2	2	2	2	..	..	..	..
Coimbatore ..	9	6	5	2	1	..	..	..
Cuddapah ..	3	3	..	..	1	..	..	..
Godavari, West ..	20	15	1	..	2	..	1	1
Godavari, East ..	32	23	4	1	4	..	..	..
Guntur ..	16	6	6	1	..	..	..	..
Kanara, South ..	2	1	2	..	..	..	..	..
Kistna ..	8	5	2	2	2	1	1	1
Kurnool ..	4	2	4	3	..	..	..	..
Madras ..	41	20	102	51	4	3	2	2
Madura ..	7	5	5	2	..	..	..	..
Malabar ..	11	6	1	..	..	..	1	..
Nellore ..	4	3	..	..	1	..	..	..
Nilgiris ..	2	2	..	..	..	..	..	..
Ramnad ..	10	5	2	2	..	..	..	..
Salem ..	21	9	4	2	..	..	..	..
Tanjore ..	6	3	3	2	..	..	..	..
Tinnevely ..	10	6	1	1	..	..	..	..
Trichinopoly ..	10	2	4	2	1	1	..	..
Vizagapatam ..	16	9	1	1	2	..	1	1
Foreign ..	7	3	4	3	..	..	..	..
Total ..	271	149	161	81	26	7	7	6

TABLE V.—General analyses for Government departments, etc.—cont.

Received from	Nature of substance.	Number of examinations.	Total for the year.
Madras Government departments—			
Superintendent, Government Press, Madras.	Type metal	1	1
Director of Public Health, Madras.	{ Paris green	2	3
	{ Pyrethrum flowers for pyrethrin content	1	
Superintendent, General Hospital, Madras.	{ Ethocaine solutions	3	6
	{ Nail clippings, hair and urine for arsenic.	3	
Superintendent of Stationery, Madras.	Inks	53	53
Superintendent, Headquarters Hospital, Salem.	Calcium gluconate	2	2
Curator, Record Office, Madras.	Dextrin Paste	2	2
Inspector-General of Prisons, Madras.	Inks	8	8
Superintendent, Special Branch C.I.D., Madras	{ Pill for analysis	1	2
	{ Powder for analysis	1	
Principal, Indian Medical School, Madras.	Thalaka Bhasmam	1	1
Chief Inspector of Factories, Madras.	Type metal	1	1
Superintendent, Stanley Hospital, Madras.	Glucose solution	1	1
Registrar, High Court, Madras.	Dextrin Paste	1	1
Total, Madras Government ..			81
Private parties	{ Inks	14	17
	{ Petroleum	3	
Total, private parties ..			17

TABLE V.—General analyses for Government departments, etc.

Received from	Nature of substance.	Number of examinations.	Total for the year.
Central Government departments—			
Officer Commanding, No. 2, Prisoners of War Camp Hospital, Bangalore.	Powder for analysis ..	1	1
Civil Surgeon of Coorg, Mercara.	Chloroform	2	2
Total for Central Government departments ..			3

Government of Madras

EDUCATION AND PUBLIC HEALTH DEPARTMENT
(Public Health)

G.O. No. 1505, 18th May 1942

Report—Chemical Examiner's Department—Administration
Report, 1941—Reviewed.

READ—the following paper :—

From the Surgeon-General, dated 9th March 1942,
Ref. No. 18785-1-M.

Order—No. 1505, P.H., dated 18th May 1942.

Recorded.

2. The number of articles examined fell from 9,474 in the previous year to 8,630 in the year under review.

3. Cases of human poisoning examined increased from 427 to 432 ; but the percentage of cases in which poison was detected fell from 55 to 53·2.

4. Animal poisoning cases examined numbered 33 as against 23 in the previous year. Poison was detected in 13 cases.

The number of stain cases examined decreased from 1,081 to 1,004.

5. Miscellaneous medico-legal cases involving the examination of fire arms, bombs, explosives, bones, theft of telephone and telegraph wires, etc., decreased from 142 to 115.

No. 1505, P.H., 18TH MAY 1942

6. The report contains as usual much interesting matter.

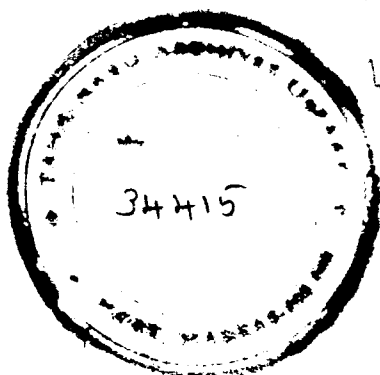
(By order of His Excellency the Governor)

M. V. SUBRAHMANYAM,
Secretary to Government.

To the Surgeon-General.

- „ the Director of Public Health.
- „ the Chemical Examiner (through the Surgeon-General).
- „ the Inspector-General of Police.
- „ the Director of King Institute, Guindy.
- „ the Library of the Madras Legislature.
- „ the Secretariat Library.
- „ the Officer-in-charge, Presidency Administration Report, Public Department.
- „ the Secretary, Madras Medical Association.
- „ the Registrar, University of Madras
- „ the Registrar, Andhra University
- „ the Registrar, Annamalai University
- „ the Librarian, Connemara Public Library.
- „ the Board of Revenue (Excise Branch).
- „ the Development Department.
- „ the Home Department.
- „ the Public (Press) Department.
- „ the Legal Department.
- „ the Secretary, Madras Chamber of Commerce.
- „ the Secretary, South Indian Chamber of Commerce.
- „ the Secretary to the Government of India, Department of Education, Health and Lands (with C.L.).
- „ the Secretary, Madras Public Service Commission (with C.L.).
- „ all District Magistrates.
- „ all Sessions Judges.
- „ the Deputy Director of Agriculture, Cinchona.
- „ the Crown Prosecutor.
- „ the Hon'ble the Chief Justice, Madras (with C.L.).
- „ the Chief Presidency Magistrate.
- „ the Superintendent, Government Press (for distribution in accordance with G.O. No. 442, P.H. dated 29th January 1941).

Press.



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