

Derbyshire Royal Infirmary, Derby.—H.S. £200. Also Asst. H.S. and Cas. O. Each at rate of £150.

Durham County Council.—Dist. Tub. M.O. £600.

Exminster, Devon Mental Hospital.—Jun. M.O. £300.

Finchley Urban District, Ante-Natal Clinic.—Med. Practitioner required. 2 guineas per session.

Hackney Hospital, 230, High-street, Homerton.—Jun. Asst. M.O. £350.

Hospital for Consumption and Diseases of the Chest, Brompton, S.W.—H.P. for six months. £50.

Hospital for Diseases of the Throat, Golden-square, W.—Med. Reg.

Hospital for Epilepsy and Paralysis, Maida Vale, W.—Res. M.O. and H.P. At rate of £150 and £100 respectively.

Hospital for Sick Children, Great Ormond-street, W.C.—H.S., H.P., and Asst. Cas. O. £50 in each case.

Hospital of St. John and St. Elizabeth, 40, Grove End-road, N.W. Res. H.P. and H.S. At rate of £100 and £75 respectively.

Inverness, Northern Infirmary.—Jun. Med. Res. £100.

Lambeth Hospital, Brook-street, S.E.—Pathologist. £500.

London Temperance Hospital, Hampstead-road, N.W.—Surg. Reg. 40 guineas.

Manchester, Ancoats Hospital.—H.S. At rate of £100. Also Asst. M.O. in Ven. Clinic. £1 1s. per clinic.

Manchester Children's Hospital and Northern Hospital for Women and Children.—Pathologist. £400.

Manchester Royal Infirmary, Roby-street.—Res. M.O. Also Asst. M.O. At rate of £200 and £100 respectively.

Müller General Hospital for South-East London, Greenwich-road, S.E.—H.P., £125. Also Asst. in Out-patients' Dept. £150.

Oxford, Radcliffe Infirmary and County Hospital.—Hon. S., Hon. Asst. P., and Hon. Asst. S.

Paddington Green Children's Hospital, W.—H.P. and H.S. Each £150.

Parish of St. John, Hampstead, New End Hospital.—Sen. Res. Asst. M.O. £250.

Prince of Wales's General Hospital, Tottenham, N.—Two H.S.'s. and one H.P. At rate of £120. Also Jun. H.S. and Jun. H.P. At rate of £90.

Queen Charlotte's Maternity Hospital, Marylebone-road, N.W.—Asst. Res. M.O. At rate of £80.

Redhill, Surrey, Royal Earlswood Institution.—Jun. Asst. M.O. £250.

Royal Chest Hospital, City-road, E.C.—Res. M.O. and H.P. At rate of £150 and £100 respectively.

Royal National Orthopaedic Hospital, 234, Great Portland-street, W.—H.S. At rate of £150. Also Hon. Ophth. S. and Hon. Dental S.

St. Bartholomew's Hospital, E.C.—Rose Research Fellowship in Lymphadenoma. £600.

St. Leonards-on-Sea, Buchanan Hospital.—H.S. £150.

St. Mary's Hospital for Women and Children, Plaistow, E.—Asst. Res. M.O. At rate of £130.

St. Stephen's Hospital, 369, Fulham-road, S.W.—Third Asst. M.O. £300.

Southport Infirmary.—Hon. Asst. S.

Sunderland Borough Mental Hospital, Ryhope.—Asst. Med. Supt. £500.

Swansea Hospital.—H.S. £150.

University of London, King's College for Women.—Head of Dept. of Hygiene and Bacteriology, &c. £400.

Wallasey, Victoria Central Hospital.—Jun. H.S. £100.

West Ham County Borough.—Asst. M.O. £600.

West London Hospital, Hammersmith-road, W.—Hon. Med. Radiologist.

Winchester, Royal Hampshire County Hospital.—H.P. £150.

Wrexham and East Denbighshire War Memorial Hospital.—Sen. and Jun. H.S.'s. At rate of £120 and £80 respectively.

## Births, Marriages, and Deaths.

### BIRTHS.

ABRAHAMAS.—On March 21st, the wife of Dr. Adolphe Abrahamas, of Brook-street, W., of a daughter.

CURRIE.—On March 19th, at Morningside, Torquay, the wife of Dr. Currie, of a son.

RITCHIE.—On March 14th, at Douglas-crescent, Edinburgh, the wife of Dr. W. T. Ritchie, of a daughter.

### DEATHS.

ADAMS.—On March 20th, at Bussage, Brimscombe, Stroud, G. E. D'Arcy Adams, M.D., aged 79.

ARMSTRONG.—On March 17th, at Inglemere, Enfield, Arthur James Mackenzie Armstrong, M.R.C.S., L.R.C.P. (late of Southgate).

BARRY.—On March 18th, at Plymouth-road, Penarth, Glam., William Joseph Murphy Barry, M.D., F.R.C.P., aged 60 years.

FINLAYSON.—On March 19th, very suddenly, at his residence, Elson-road, Formby, Lanes, Harold Turner Finlayson, M.B., Ch.B., aged 36.

GOSLING.—On March 16th, suddenly, at his residence, Fivelands, Moseley, Birmingham, Charles Edward Gosling, M.D., in his 74th year.

HOPKINS.—On March 16th, at St. Matthew's-gardens, St. Leonards-on-Sea, Charles Leighton Hopkins, B.A., M.B. B.Ch. Camb., late Medical Superintendent, York City Mental Hospital.

TAYLOR.—On March 15th, after a brief illness, Inglis Taylor, M.B., F.R.C.S. Edin., of 22A, Cavendish-square, London, W.1.

N.B.—A fee of 7s. 6d. is charged for the insertion of Notices of Births, Marriages, and Deaths.

## Notes, Comments, and Abstracts.

### PUBLIC HEALTH IN PERSIA.

1914-24.

BY A. R. NELIGAN, M.D. LOND., M.R.C.S.,  
D.T.M. & H. CAMB.,

PHYSICIAN TO H.M. LEGATION, TEHRAN; BRITISH REPRESENTATIVE  
TO THE PERSIAN SANITARY COUNCIL.

#### PART II.\*

##### *Epidemic and Endemic Diseases.*

PERSIA'S three long land frontiers run with those of countries liable to outbreaks of plague and cholera. In Iraq, for instance, the former disease is endemic. The ports on her seaboard in the Persian Gulf are in regular communication with Bombay and Karachi, where both diseases are endemic, and on the opposite shore of the Gulf, along the Arab coast, and perhaps in the interior, there are endemic plague centres. Russia and Trans-Caucasia are liable to cholera and typhus fever; Trans-Caspia, Turkestan, and the Astrakhan district to plague. Any account of Persia's epidemiological situation would, therefore, in view of the possibility of the country serving as a channel for the spread of disease to the west, lose in interest were outbreaks on her frontiers not mentioned.

In the following résumé of the appearances of plague and cholera during the years 1914 to 1924, names of places in Persia itself are printed in italics, of places in the neighbouring countries in ordinary type.

In this résumé it will be noted that all ship-borne cases removed to quarantine have been included. Further, that in spite of the regular appearance of plague on her frontiers, the name of only one place in Persia recurs with any frequency (Mohammerah), and that in the case of all other places where undoubted plague has appeared during the last 11 years the disease was imported, and, with a single exception to be noted below, *did not spread*. As regards Mohammerah, it used to be said that plague was always imported from Basra only 25 miles higher up the River Shat'l Arab, with communications by land as well as by water. It has been suggested that plague is by now endemic in Mohammerah town, but the facts are, on the whole, against this supposition.

Abadan town, on the island of that name six miles down stream from Mohammerah, has, however, come to cause anxiety. The name appears in the years 1923 and 1924 only, and yet some 700 cases have occurred there. The explanation is that between 1909 and 1912 the Anglo-Persian Oil Company set up a refinery on the island, and that, instead of a few huts, there is now a considerable town and several villages, with a total population of some 50,000 souls. In the early days of the rush of native labour and shopkeepers to the island, huts and bazaars sprang up on no definite plan on land outside the Company's control, and on which it was not allowed to interfere. When, therefore, plague was imported into Mohammerah in 1923 and thence spread to Abadan there was a sharp epidemic. The Company has taken most energetic measures since then. Side by side with its elaborate medical service it has organised a very complete sanitary section with port medical officer and assistants, isolation hospital, quarantine station, and disinfecting plant. In 1924 the number of cases was reduced by more than half. Between April and July more than 12,000 rats were destroyed by catchers brought from India.<sup>1</sup> The Company has for nearly a year now been building steel and brick huts for its labourers, of whom there are more than 10,000, on a site well away from the native town. Drainage is a difficult problem where the subsoil water is found at 2 feet, but it is being solved by means of pumps. Further, a piped water-supply was completed in December, 1924. The River Bameshir has been tapped four miles away by a 16-inch pipe, and a 2,000,000 gallon reservoir has been made, which will deliver filtered and chlorinated water to stand-pipes in the workers' village. The Company has also planned a site for a new town, and the inhabitants of the old are being encouraged to remove to it. A piped water-supply has been led to this site also. Everything possible is, therefore, being done to keep out cholera as well as plague. The problem is not an easy one on account of the communications by land and by small craft on the river.

##### *Plague in the Interior.*

The question naturally arises whether plague is ever likely to gain a footing on the Persian plateau. From the résumé it is clear that, during the 11 years under review, it did not spread from any of the points attacked in the low land along the shore of, and around the head of, the Gulf—the most

\* Part I. appeared in THE LANCET, March 20th, p. 635.

<sup>1</sup> The 1925 plague season has passed without a single case at either Mohammerah or Abadan, and only sporadic cases in Iraq.

Plague.

1914.			
Feb.	.. Persian Gulf	.. Debai.	<i>Lingah</i> : One case removed from ship to quarantine.
May	.. Persian Gulf	.. Basra	: One case.
June	.. Persian Gulf	.. Bahrein Island.	
May	.. Russia..	.. Baku.	
Oct. to			
Sept.	.. Mesopotamia	.. Bagdad, Kazimain, Kerbela, Badkuba, Kizzil Robat, Khanikin, Hillah.	
Nov.	.. Russia (Caucasus)	.. Moghan, Chakerlou.	
1915.			
April	.. Persian Gulf	.. Bunder Abbas	: Three cases from Bahrein I. removed to quarantine.
			<i>Bushire</i> : Three cases from Bahrein I. removed to quarantine.
May	.. Persian Gulf	.. Mohammerah	: Three cases.
June	.. Mesopotamia	.. Basra.	
1916.			
May	.. Persian Gulf	.. Mohammerah.	
1917.			
April	.. Persian Gulf	.. Mohammerah, Kharak I., Bahrein I.	
May	.. Persian Gulf	.. Mascot.	
1918.			
April	.. Mesopotamia	.. Basra.	
1919.			
May to			
July	.. Mesopotamia	.. Bagdad, Kazimain, Kurna, Kut, Mossaib, Hilla (523 cases notified).	
1920.			
Dec.	.. Mesopotamia	.. Basra.	
	.. Russia	.. Sarakhs (Transcaspia): Suspected.	
1921.			
Jan. and			
June	.. Kermanshah Province	.. Villages of <i>Maserai Bara</i> and <i>Chergha Narges</i> : Very doubtful.	
	.. Mesopotamia	.. 137 cases.	
Dec.	.. Khorassan Province	.. <i>Chinaran</i> : One case: very doubtful.	
1922.			
May	.. Mesopotamia	.. Basra	} 685 cases.
June	.. Mesopotamia	.. Bagdad	
	.. Persian Gulf	.. Mohammerah.	
1923.			
Jan.	.. Mesopotamia	.. Bagdad, Basra.	
March	.. Persian Gulf	.. Chahbar.	
April to			
July	.. Persian Gulf	.. Mohammerah	: 71 cases, 45 deaths.
May to			
July	.. Persian Gulf	.. Abadan	: 481 cases, 409 deaths.
	.. Mesopotamia	.. Basra and Bagdad and intervening places	: 708 cases, 413 deaths.
Dec.	.. Persian Gulf	.. <i>Lingah</i>	: Four cases from Arab coast: removed to quarantine.
1924.			
Jan.	.. Persian Gulf	.. Debai, Bahrein Island.	
	.. Mesopotamia	.. Bagdad, Basra.	
Feb.	.. Russia	.. Astrakhan.	
	.. Khuzistan Province	.. <i>Nasseri</i> : Doubtful.	
March	.. Persian Gulf	.. Bahrein Island.	
March to			
May	.. Persian Gulf	.. Abadan	: 233 cases.
			<i>Mohammerah</i> : 152 cases, 115 deaths.
April	.. Persian Gulf	.. <i>Kishm I.</i>	imported. <i>Chahbar</i> : Imported. <i>Geshui</i> : Small village five miles from port of Ganaveh; 17 cases, 14 deaths. Imported by pilgrims and labourers returning from Iraq by native craft.
May	.. Persian Gulf	.. Bunder Abbas	: 12 cases, 7 deaths; imported; either in quarantine station or located by M.O.
			<i>Bushire</i> : One case; quarantine station. <i>Lingah</i> : One case.
July			
10th	.. All ports of Persian Gulf	.. declared free of plague.	Disease practically at an end in Iraq.

threatened frontier, but also the best protected. Indeed, the country presents formidable natural obstacles to such spread. At the same time it has to be remembered that authorities have described two plague centres on the plateau, one in the mountains of Kurdistan (Tholozan), the other in Khorassan in North-East Persia. They have, however, been quiescent for the last 50 years, nor have there been any cases at Enzeli or Rasht on the Caspian for a like period, nor in Khuzistan, to which province plague was brought from Mesopotamia in 1876. The mention of suspected cases near Kermanshah and in Khorassan (1921) arrests attention, but there can be no doubt that the diagnosis was not correct.

Since the 'seventies plague has appeared in the interior twice. In 1904 in Laristan, imported from Lingah on the Gulf, an outbreak which quickly died out; in 1905 in Seistan, East Persia. The origin of this epidemic was obscure. It appeared among the lake-dwellers of the Helmund, and there was a good deal to be said for the ingenious theory of Captain Kelly, I.M.S., who suggested that wild duck (which are known to eat dead rats) brought infected fleas from Astrakhan, where plague was epidemic at the time, during

their migration. The evidence given of an epidemic in 1912 in the Sheikh Jam district of Khorassan, and of the finding of a single infected marmot, was not, in the writer's opinion, satisfactory.

Then as to carriers. On the plateau there are no rats, but there are house and field mice and jerboas. In Khorassan there is a species of marmot allied to the Manchurian tarabagan, and called by the Russians by that name.<sup>2</sup> There are rats in the southern ports and on the Caspian. The writer believes that Persia's relative freedom from plague will continue, and that she is not likely to serve as a channel by which it may spread towards the west. The introduction of railways may, however, quite well alter matters. Pneumonic plague has been reported in Mesopotamia, a country which is likely to be linked up with the Persian railway system of the future, and to which several thousand Persian pilgrims go every year.

A significant incident occurred at Tehran in 1921. During the unloading of a motor lorry from Bagdad a rat was seen to jump out none the worse for its long journey.

Cholera.

1914			
Oct.	.. Russia	.. Kherson, Dnieper Basin, Bessarabia, Ekaterinoslav.	
1915.			
August..	.. Russia	.. Baku, Alexandropol, Erivan, Julfa.	
	.. Azerbaijan	.. <i>Tabriz</i> : Russian soldiers; extension from Julfa. <i>Maragha, Khoi, Marand, Salmas.</i>	
Sept.	.. Gilan	.. (Extension from Baku) <i>Astara, Enzeli, Khoman, Rasht, Manjil, Talesh.</i>	
1916.			
May	.. Gilan	.. Disease lingered all winter and reappeared at <i>Enzeli</i> , whence it spread along main road to <i>Kazvin</i> and thence to	
August..	.. Hamadan	.. <i>Hamadan</i> , and towards Tehran	
Sept.	.. Tehran	.. <i>Jaffarabad</i> and <i>Shahzabdulazim</i> (six miles from Tehran). <i>Tehran</i> , 4 cases.	
Nov.	.. Mazanderan	.. <i>Amol</i> and <i>Caspian shore.</i>	
1917.			
June and	.. Mazanderan	.. <i>Amol, Sari, Barfarush, Bendergez, Astarabad.</i>	
July	.. Gilan	.. <i>Larijan, Yekshambeh Bazaar.</i>	
	.. Tehran	.. <i>Rudahin, Demavend, Khar.</i>	
	.. Khorassan	.. <i>Mesheh, Germez Teppeh, Shahrud, Savzewar.</i>	
	.. Seistan	..	
	.. Kerman	..	
	.. Fars..	..	
	.. Khuzistan	.. <i>Mohammerah.</i>	
1918.			
March	.. Gilan	.. <i>Astara, Enzeli, Rasht</i> (began among Russian soldiers).	
April	.. Azerbaijan	.. <i>Kazvin, Zanjan, Mianej, Ardebil, Tabriz.</i>	
	.. Kurdistan	..	
	.. Kermanshah	..	
	.. Aragh	.. <i>Kum, Sultanabad.</i>	
	.. Isfahan	..	
	.. Fars..	..	
	.. Yazd	..	
	.. Kerman	..	
	.. Russia	.. <i>Turkestan.</i>	
1920.			
	.. Mesopotamia	.. Basra (doubtful).	
1921.			
	.. Russia	.. Baku.	
1922.			
June	.. Russia	.. <i>Turkestan, Astrakhan, Baku, Lenkoran.</i>	
1923.			
August 3	.. Khuzistan	.. <i>Abadan</i> (992 deaths): Spread to Basra and <i>Mohammerah</i> (55 cases) and Iraq generally, as far north as Bagdad and lasted into the autumn (1583 cases). <i>Nasseri</i> (2 cases), <i>Masjidi Suleiman</i> (2 cases) (all on Perso-Iraqi frontier): 11 suspected cases.	
Oct.	.. Kermanshah	.. <i>Soumar, Kasri Shirin, Quraitu</i> (all on Perso-Iraqi frontier): 11 suspected cases.	
1924.			
June 7	.. Khuzistan	.. <i>Abadan</i> : One case.	
	.. Mesopotamia	.. Sporadic cases.	
August..	.. Russia	.. Astrakhan.	

Cholera is a much more anxious problem for Persia than plague. As far as she herself is concerned it can be definitely stated that there are no endemic centres in the country. It is the threat of introduction from outside that has to be feared, for, once having gained a footing, it is impossible to arrest. Here, again, the Persian Gulf ports, in constant communication with Bombay and Karachi, cause anxiety, but the coast is well protected, as was shown in the section on Public Health Services. The outbreak at Abadan in 1923, which led to a severe epidemic in Iraq, was started by a ship-borne case. The heavy pilgrim traffic through

<sup>2</sup> This marmot has been identified at the Natural History Museum, South Kensington, as *Citellus fulvus parthianus*.

Kermanshah and Kasri Shirin to the Shiah Holy places in Iraq, makes the sanitary situation there extremely important. The last real epidemic of Asiatic cholera was introduced by pilgrims returning to Persia by this route (1904).

The sanitary situation in Russia, and the reluctance of its new rulers to declare the existence of epidemic disease, have been further causes of anxiety. It will be noted that most of the places named in the above résumé are in north Persia. The disease was in every case brought in from Russia, in (it is true) the troublous war period, when there was constant going to and fro of military detachments. The epidemics were of a singularly mild character. They meandered slowly from town to village and town along the caravan routes; lingered, perhaps, during a winter, and revived in the spring.

The epidemic of 1916 was an instance. It came in from Baku in September, 1915, through the port of Enzeli, and in May, 1916, began to spread slowly up the 250 miles of main road to Tehran. By September the villages west of and close to the capital were attacked, and on the 23rd it was reported from the small town of Shahzabdulazim, six miles due south. The disease had passed round the outside of a city of 230,000 souls. On the 27th four cases were notified in Tehran, and the diagnosis was confirmed bacteriologically by the writer. They had come from Shahzabdulazim before communications were cut.

The disease in southern and central Persia in 1917 and 1918 was due to spread from the north. It presented similar low virulence. It is interesting to speculate as to what would have been the military and political consequences of the epidemic in southern Russia in 1915 if it had been one of true Asiatic cholera.

#### \* Typhus Fever and Relapsing Fever.

Both these fevers are endemic in Persia, but during the last 11 years they have only once become epidemic. Ordinarily, the cases are few and far between. Thus, the writer spent ten years in the country before he saw a case of typhus; this, sadly enough, was his Russian colleague at Tehran, and a year later the latter's successor died of the same disease. Both were working among Russian soldiers. Cases were notified to the Sanitary Council as follows:—

1914.			
Jan.	.. Typhus fever ..	Hamadan (Jewish quarter).	
Feb.	.. Typhus fever ..	Van.	
1917-18,			
winter of	Typhus and re-		
	lapsing fevers		A widespread epidemic.
1921.			
Dec.	.. Typhus fever ..	Ardebil.	
1922.			
Feb.	.. Typhus fever ..	Askabad.	
April*	.. Typhus fever ..	Tehran (30 cases).	
1923.			
April	.. Typhus fever ..	Astara.	
June	.. Typhus fever ..	Meshed.	
July*	.. Typhus fever ..	Tehran (7 cases).	
July	.. Typhus fever ..	Daragez.	
1924.			
Dec.	.. Relapsing fever	Tehran (11 cases).	
		Bakharz, Turbat - i - Shaikh, Iam, and Khaf districts and Khorassan province: A severe outbreak: nature not recognised until recrudescence in July, 1925.	

\* To end of year.

The epidemic of 1917-18 followed two years of drought and famine. The poor were all heavily louse-infected.

A troublesome sequela of typhus fever, and one observed for two to three years after this epidemic, was necrosis of the rib cartilages.

Much confusion was, and is still, caused when any attempts are made to collect mortality statistics, by the fact that Persians use the same name for both typhoid and typhus: *haspeh*, an Arabic word signifying "spotted." There are two separate words in Arabic: *motbegheh*, typhoid; and *mohregheh*, typhus.

As to relapsing fever, only three cases verified by the microscope had been brought to the writer's notice during the previous 12 years, and they were in such widely separated centres as Tehran, Isfahan, and Hamadan. The spirillum found during the big epidemic resembled that described by Obermeier. *Salvarsan* and its substitutes were the only remedies found effective. The writer has failed to trace a connexion between *argas persicus*, the "stranger biter" of the Persians, and the accepted form of relapsing fever. Cases of fever attributed to its bites, seen by him at Tehran, have, in several instances, proved to be malaria. He has produced spirillosis of fowls with specimens of the tick obtained from Mianeh, its historical home, but has failed to infect man.

#### Influenza.

Persia suffered severely in the pandemic of 1918-19.<sup>2</sup> Coming as it did after two years of scarcity and epidemics of

typhus and relapsing fever, the disease caused a great number of deaths. Accurate figures were impossible to obtain, but estimates of the mortality in various towns ranged from 1 to 10 per cent. of the population, and in the country districts it was even higher. Those who had chronic malaria offered little resistance; thus a military post of Indian and Persian troops lost 31 per cent. of its strength, and another post lost 72 per cent. The effect of slow (caravan) and rapid (motor-car) methods of travelling on the rate of spread was marked. Since the epidemic there has been every autumn and winter a great number of cases of severe respiratory catarrh, especially affecting the trachea, and liable to pass on to bronchitis and pneumonia.

#### Malaria.

By far the most serious disease in Persia is malaria. It causes heavy mortality every year, and keeps the inhabitants of whole districts in a low physical condition, which makes them an easy prey to other infections, such as tuberculosis, pneumonia, or influenza. That this should be the case in the Caspian provinces (Gilan, Mazanderan, Astarabad) is not surprising. The Caspian Sea itself is 84 feet below sea-level. Along it there is a belt of rice, cotton, and marsh country varying from two to 40 miles in width, with dense forest. The forest climbs up the foothills of the Elburz range to the summer quarters, where the trees gradually thin out and finally the bare mountains of the Persian plateau are reached, running up to an average altitude of 10,000 feet. Great masses of clouds, carried by the prevailing north-west wind, are continually rolling up against this huge barrier to deposit their moisture. The rainfall is high, 50 to 60 inches. There are innumerable rivers, moderate temperatures, mist, perpetual dampness, and rank vegetation—in a word, all the conditions that go to make up a malarial country.

The people as a whole are anæmic and distressful looking. Their life would be an easy one were it not for the wild pig which destroy their crops. As it is their rice fields provide most of what they and their animals need; fuel can be had for the cutting, and food is cheap and abundant, including game, wild fowl, and fish. But for these aids to resistance one feels that long ago the clouds of mosquitoes would have been left the forests to themselves. In the summer quarters the writer found that 100 per cent. of the children under 10 years of age had enlarged spleens. It was the same in the low country. At Mahmoudabad, a beautiful spot on the coast, said to be a particularly healthy village and to be comparatively free from mosquitoes, 60 per cent. of the children in the school had enlarged spleens. The raised sleeping platform for the summer months is the only means of prevention in use. There are no doctors except in the few towns, and there is very little quinine. When used it is taken haphazard and stopped when the fever ceases. The writer intends to publish at a later date notes on the anopheline species found in the Kujur and Nur districts.

#### Conditions on the Plateau.

The Caspian provinces, however, form but a comparatively small part of Persia, and the short description of the great central plateau, where there is no rain between May and October, and the total fall is only 8 to 10 inches, would suggest comparative freedom from malaria. It is true that the central desert (Dashti Lut and Dashti Kavir) escapes, but everywhere else in the mountains and valleys and plains there are heavily infected districts, some as heavily infected as the provinces described above. Water storage and irrigation methods and the nature of the rivers provide the explanation. In towns such as Tehran every house and every garden has at least one tank for irrigation, domestic purposes, and religious ablutions. In addition, many houses have underground cisterns for storing drinking water, which are filled from surface channels. All these tanks and cisterns are so many breeding places for mosquitoes.

As regards the rivers on the plateau, most of them end in the desert, forming swamps. They are tapped by irrigation channels leading to the different villages in the district, and these give rise to secondary smaller swamps or collections of standing water. A notable instance in the Tehran province is the district of Shahriar, a very fertile region to the south-west of the town, which it supplies with corn, fruit, and vegetables. It is watered by a stream from the southern slopes of the Elburz. Of late years so many of the men have died that the villagers have petitioned the Government to do something for them. The problem is an engineering one, not of great difficulty, but for which there are no funds available. The big landowners are not far-seeing enough to take the matter up. A little quinine has been distributed, and much advice. There is a district named Khar to the south-east of Tehran, where a certain amount of rice is grown, and similar conditions prevail. The villagers are heavily infected and are sallow and lethargic, very different from the sturdy hillmen a few miles to the north.

It is the same everywhere on the plateau, in spite of its magnificent climate, and malarial centres may be found in

<sup>2</sup> Loc. cit.

varying degree of intensity, in the towns, in mountain valleys where suitable conditions hold, and in the plains where rivers debouch.

In the north-east there is much malaria in the province of Khorassan. In the north-west, in the Urumiah district of the province of Azerbaijan, an interesting change has come about as a result of the war. I have it on the authority of Dr. Packard, of the American Presbyterian Mission, that until the Turks invaded Persia malaria was rather rare and of a benign type. Since then it has become much more common and pernicious forms are frequently seen. In the west (Kurdistan, Luristan, Kermanshah, and Hamadan provinces) there is much malaria. The Marivan district of Kurdistan, for instance, where rice is cultivated, is particularly bad. In Khuzistan malaria is severe in the low-lying country along the rivers; the towns of Ahwaz, Shuster, and Dizful are, however, little affected. In the south the Gulf towns are heavily infected. Malarial districts are found in the central provinces of Isfahan, Yazd, and Kerman, and in Fars. In the east, in Seistan and Baluchistan, malaria is not prevalent.

#### *Malaria in Tehran.*

In the Tehran district, 3000 to 5000 feet above sea-level, with which the writer is most familiar, it is safe to say that few Persians escape infection at one time or another. The climate is so good, however, that a considerable measure of resistance is established, and chronic forms are not nearly so common as this statement would suggest. There are, nevertheless, districts, villages, and gardens, where malaria is particularly severe; none of the inhabitants escape, and many develop cachexia. Moreover, the district is in constant communication with the Caspian provinces through caravans bringing rice, charcoal, and milk products. Fresh infections begin to appear in May, and there is a great increase in the number of new cases, as well as of relapses, which begins at the end of July and continues during August and September. The mean average temperatures for these three months are: 84.24°, 79.34°, and 72.95° F. There are also years when, as in 1922, there is a great increase in the number and severity of the cases. It has been noted that such epidemics go with higher air temperatures.

All the three forms of malaria occur, but quartan infection is not common. The rise in the number of cases in August and September is almost entirely due to subtertian infection. The parasite is frequently associated with the benign tertian form. Pernicious attacks are frequently seen among labourers and the poorer pilgrims in epidemic years, resulting in coma, jaundice, and hæmorrhages. Hæmoglobinuria is extremely rare however; the writer has seen only one case in 19 years. All the usual complications of acute cases are seen, including a dysenteric form.

Chronic and relapsing malaria has to be constantly borne in mind in diagnosing and treating the most varied ailments. All the patients say they have had malaria; some have had dysentery or chronic bowel complaints. Persians in the towns are constantly taking quinine, and this practice often renders the diagnosis of acute fevers difficult, especially in the case of enteric, which not infrequently has an abrupt onset with rigors.

Persian doctors use inadequate doses of quinine, and a patient is rarely treated after the temperature has fallen. The custom of waiting until the temperature drops to normal before giving quinine is widespread, and is disastrous in the case of continuous pernicious forms. Another class of patient from whom quinine is withheld are pregnant women. The most intense and rapidly fatal cases of anæmia are seen among them. Administration of quinine by injection is far too common, and, unfortunately, the injection is frequently badly made. Patients, however, think that there is special virtue in the syringe, and *injection* has become a Persian word.

#### *The Problem of Prevention.*

The malaria problem is a huge and difficult one. Individual effort is lacking, and prophylactic measures are not being taken by the Government, even to the extent of making quinine easily and cheaply obtainable. Even in the large towns where malaria is almost entirely "man made" (in Tehran entirely so), little or nothing is done. Indeed, in the capital the municipality has distinguished itself by constructing a series of small tanks from which the streets are watered, and which serve as additional breeding-places.

Shortly after his arrival in Tehran in 1906, the writer proved the efficiency of gold fish as larvicides after experiments made in the garden of the British Legation. Gold fish and mosquito larvæ are completely incompatible; they have never been seen together. Domestic ducks have been found of some use in clearing tanks, but frogs of none. The practice of keeping gold fish in tanks has steadily spread since then, but it is a long way from having become universal. Unfortunately, the gold fish have their enemies too—cats which wait patiently on the edge of a tank for a rise and crows which swoop and carry off young fry.

If, moreover, the outlets of tanks be not protected with a strainer, fish will escape and be lost when the water is changed. With a proper sanitary organisation, furnished with police powers, malaria could be stamped out in towns like Tehran, where the only natural mosquito breeding-places are rare temporary collections of water the result of occasional storms, and the rest are entirely artificial and easily controllable. Personal prophylaxis is confined to the use of nets by the better-to-do classes, and the irregular eating of quinine for all and every indisposition and febrile disturbance.

The British and British-Indian forces on service in western and north-western Persia in 1918 and 1919 suffered severely from malaria. Had the advice of local practitioners been sought in advance they would not have failed to urge the adoption of prophylactic measures.

The following species of anopheline mosquitoes have been found at Tehran: *A. maculipennis*, *A. plumbeus*, *A. bifurcatus*, *A. pyretophorus*. They are distributed in a curiously irregular way, and are much easier to find outside the city than in it. A certain room was found one summer to be harbouring large numbers of anopheles. All the possible near-by breeding-places were excluded, and at length a newly-formed hidden one was found where an occasional water channel disappeared under ground and had scoured out a pocket. The next summer, during a corresponding period of seven weeks, 135 culex and only three anopheles were caught in the same room. Culex larvæ have been found in the Elburz range north of the city at an altitude of 9000 feet.

#### *Tuberculosis.*

That tuberculosis in all its forms is steadily increasing in Tehran, as well as in other towns, is a frequently expressed opinion. It is seen also in the villages as well as among wandering tribes. The reasons for this are: (1) Overcrowding in the towns. (2) Absence of ventilation in the houses. (3) The use of wadded quilts which are never washed and which go from one person to another. (4) Ignorance of methods of prophylaxis. So great is the dread of the disease that knowledge of their condition is kept as long as possible from the afflicted. (5) Underfeeding and malaria. (6) Late diagnosis. The Persian's resistance is small, and it is doubtful if he ever recovers in his own country from the pulmonary form. Bone and joint disease is very common in spite of the fact that milk is never drunk unboiled. There are no means of isolating "open" cases. The treatment of surgical tuberculosis is very far behind modern requirements and hospital accommodation is lacking. The dry air and abundant sunshine make the plateau an ideal place for heliotherapy.

#### *Venereal Disease.*

Venereal disease is widespread among all classes. The following points only will be noted.

Though gonorrhœa is generally insufficiently treated, and chronic urethritis its usual sequel, stricture of the urethra is not at all common. Gonorrhœa is a cause of much sterility. Syphilis is, on the whole, of a mild type, and attacks the cardio-vascular system, the nervous system, and the skin, with nothing like the same frequency as in Europe. Aneurysm is one of the rarest clinical conditions seen, and general paralysis is also very uncommon. Hereditary syphilis is curiously infrequent in face of the great amount of the acquired disease seen.

#### *Small-pox.*

Small-pox is endemic in Persia. There have been no big outbreaks during the period under review, but prevalence has been reported from numerous scattered districts. In 1920, and again in 1922-23, reports of this nature were received. That the disease has greatly diminished in the districts served by the public vaccination service is certain, but unfortunately there are no statistics to support this statement. In Tehran during the last four years, 370 deaths from variola have been reported—not an excessive number in an Eastern city of some 230,000 inhabitants.

#### *Leprosy.*

Leprosy occurs in the provinces of Khorassan, Azerbaijan, Gilan, Kermanshah, and Kurdistan. Little is done in the way of care beyond making the advanced cases live in villages by themselves, and that in the two first-named provinces only. There they cultivate the soil and receive an allowance of corn from the Government. Their families accompany them. The disease does not, however, appear to be increasing. There is only one leper village in the populous province of Azerbaijan, for instance, and it contains only some 35 cases, a number which remains fairly constant. Not all the lepers in the province are in it, however, for people in the early stages may be seen elsewhere. Nothing would appear to prevent lepers leaving their districts and moving about the country if so minded, and cases from distant parts, and not all of them in the early stages, have been seen in Tehran. Persia was represented at the International Conference on Leprosy held at Strassburg in 1923.

*Other Infectious Diseases.*

*Amœbic dysentery* is endemic. The bacillary form (Flexner) occurs at Tehran and, no doubt, elsewhere. No epidemics have been reported in the period under review.

The *enteric group* of fevers is endemic, but does not cause as much illness among Persians as the sanitary conditions in which they live would suggest. They believe themselves to have acquired a considerable degree of immunity through long drinking of contaminated water, and it is a very reasonable supposition. Fifteen years ago enteric fever was common in the scattered European colonies. Now, as a result of efficient inoculation, it is rare. There is a spring and an autumn rise in the number of cases, but no severe outbreaks have been reported.

*Sprue* occurs in Persia. Foreigners, Europeans, and Americans provide most of the cases. Good results have been reported from treatment with calcium salts and parathyroid gland.

*Encephalitis Lethargica*.—The writer reported a case from Tehran in January, 1922, and since then has seen two other acute cases. A number of cases of "Parkinsonisme" in young adults have, however, been seen both at Tehran and Isfahan. They came almost altogether from the country districts between the two towns. Cases of epidemic hiccough were seen at Tehran during the winters of 1923 and 1924.

*Anthrax*.—Infection of the skin is very common, and every summer there are larger or smaller outbreaks, generally in the villages. It seems to be a singularly benign disease in Persians. A well-digger, with a huge pustule on his face, has been known to walk three miles a day to and from his work and attend hospital for his dressing on the way. Anthrax in animals will be noticed in a later section.

*Leishmaniasis*.—*Leishmania tropica*, called by Persians *salek*, the diminutive of *sal* (year), is very common in some districts and does not occur at all in others. In Tehran, for instance, it is rare to see a Persian who has not had it; in Tabriz it does not exist. There is no lack of sand-flies in either city. Infection generally takes place in the autumn. Street dogs in Tehran and other places are often seen with the ulcers of the disease on their faces, generally on the nose, lips, or eyelids. A case of general infection (canine kala-azar) was found by the writer at Tehran, but he has not seen a human case. Though Europeans living in the city of Tehran are not seldom infected with *salek*, the writer, during 19 years residence in the grounds of the British Legation, has had only one member of the staff to treat—this although the houses have no immunity from sand-flies nor the numerous dogs from *salek*. The dogs have, however, always been shut up, and their sores destroyed with the actual cautery as soon as their nature has been settled by a microscopic examination. The police have been encouraged to destroy street dogs with sores, but not officially or with invariable success. These points are mentioned merely on account of certain gaps in our knowledge of the ætiology of leishmaniasis.

*Trachoma*.—Trachoma is widespread and a great cause of suffering and blindness.

*Epizootic Diseases.*

Persia has suffered severely of recent years from outbreaks of disease among flocks and herds.

*Cattle Plague and Anthrax*.—In 1919 there was a widespread outbreak of cattle plague, which was particularly severe in the Tehran district and in the province of Fars. The diagnosis was confirmed by English and Swedish veterinary surgeons. Captain Lawrence, R.A.V.S., on service in Iraq, was, at the request of the Persian Government, authorised to visit the Kermanshah, Hamadan, Kazvin, and Tehran districts. He made a report and detailed recommendations. Subsequently, severe outbreaks were reported as follows:—

1920	..	Cattle plague	.. ..	Tehran, Khonsar, Kerman, Hamadan.
		Anthrax	.. ..	Tehran.
1921	..	Anthrax	.. ..	Tehran.
1922	..	Anthrax	.. ..	Hamadan, Kurdistan, Dehkurd.
		Cattle plague	.. ..	Mazanderan, Kermanshah.
1923	..	Cattle plague	.. ..	Hamadan, Kurdistan, Tehran, Gulpaigan.
		Anthrax	.. ..	Mazanderan.
1924	..	Cattle plague and anthrax	.. ..	killed thousands of animals in the Tehran, Hamadan, Isfahan, and Sultanabad districts. The losses to landlords and peasants were very heavy, and the autumn ploughing could not be done in places.

Persia is essentially an agricultural country, and each province is largely dependent on itself for its food-supply, on account of the high cost of transport. The problem as to how to deal with these ever-recurring epizootics has become most urgent, and it is rendered doubly difficult by lack of funds. The Pasteur Institute at Tehran has shown

the efficacy of prophylactic inoculation against anthrax, but has not had the means for carrying it out on a really large scale. (In 1924, 60,000 inoculations were done in the Tehran neighbourhood, and 4000 army horses were protected.) In view of the country's financial difficulties, it would appear profitable for the great landowners to finance the Institute for this part of its work, but they have not done so. The Persian Government has now decided to engage a French veterinary surgeon, and has voted £6000 for starting a veterinary service and institute.

*Glanders* is common in Persia, especially in the cities. In Tehran, where there are cavalry regiments, hundreds of two-horse cabs and a horse tram service, to say nothing of privately-owned horses and thousands of transport mules and donkeys, little is done outside the army in the way of prophylaxis. The writer has seen several human cases, all rapidly fatal.

(To be concluded.)

## CORRIGENDUM.

To the Editor of THE LANCET.

SIR,—May I trouble you to correct a mistake in the notice *re* the Status Lymphaticus Investigation, printed in your issue of March 6th, p. 506, for which I supplied information. The interim report of the original investigation was published in the *Journal of Pathology and Bacteriology* for January, 1925, not April, 1925.

I am, Sir, yours faithfully,

Liverpool, March 10th, 1926. W. HOWEL EVANS,  
Secretary.

## ARSENIC IN APPLES.

To the current number of the *Analyst* a paper is contributed by Dr. H. E. Cox, public analyst for Hampstead, who examined apples which were the subject of recent prosecutions. He points out that Dr. Voelcker's experiments at Woburn have shown that vegetables grown in arsenic-contaminated soil do not contain arsenic and he also states that there is clear evidence that arsenic is not natural to apples. The presence of lead with arsenic in or on the apples is fairly conclusive evidence as to the source. Dr. Cox found that 48 hours after spraying the interior of the sprayed apples contained from 1.3 to 3.3 parts per million of arsenic. It is unlikely that rain would remove all the lead arsenate from the surface of apples, but it appears that washing and rubbing in 2 per cent. caustic soda solution would do so. In the discussion which followed the reading of this paper before the Society of Analysts, sympathy was expressed with English retailers, as well as some curiosity as to the law in America regulating the use and sale of poisons. Opinions as to the efficacy of washing were varied.

## IRRITATION THERAPY.

WE have received a long communication from Prof. Dollken of Leipzig entitled "Vaccineurin: a Neurotropic Remedy." The paper proposes to show that non-specific agents may irritate the cells of affected organs, and thus bring about a reactive inflammation mobilising the curative agents of Nature to restore the normal functions of the cell. The definite irritation bodies which have in practice proved efficient in this way as a remedial agent for certain affections are some colloidal metals, milk injections, typhoid vaccine (in its American use for arthritis), and turpentine. Prof. Dollken holds that a preparation now produced at the Serum Works of Saxony, Dresden, under the name of Vaccineurin is of powerful therapeutic efficiency in this way. He describes it as an "autolysate of bacillus prodigiosus and staphylococcus mixed in a definite ratio," and considers his theories to be confirmed by successes in a large number of cases treated—the manuscript mentions 100,000 cases yearly, but this may be an error of typing. The injection can be made either directly into the blood circulation—the cubital vein is suggested as the site—or given intramuscularly, when a dose of 1.5 c.cm. of the solution produces a hardly noticeable local reaction. The pain of a neuralgia will thus be moderately increased either in intensity or frequency for some hours, but after every succeeding injection the reaction grows, it is stated, less intense. The treatment is recommended for various forms of neuralgia, the primary cause being considered irrelevant, and details of a number of successful cases are appended to the paper. As the treatment appears not to be dangerous within the suggested dose, a trial might be made of the preparation, but in view of the suggestion of the small part which ætiology plays in the theories for its employment, the desirability becomes obvious that these theories should be discussed by expert pathologists. We do not gather that Prof. Dollken has submitted his views to any scientific medical jury.