

Public Health Section

EPIDEMIC DROPSY IN BIHAR

By S. B. LAL

(Nutrition Officer, Public Health Laboratories, Patna 4)

Introductory

OUTBREAKS of epidemic dropsy have been reported from time to time by various workers. The history of the disease from 1877 has been described by Lal and Roy (1937) and Lal, Roy and Ghosal (1937). They mention the findings from their field investigations and also their laboratory results obtained with human volunteers as the experimental subjects. Lal *et al.* (1939) concluded that the toxic substance contained in mustard oil was derived from seeds of *Argemone mexicana*. Chopra *et al.* (1939) showed that oral administration of argemone oil produced symptoms resembling those of epidemic dropsy.

A severe outbreak of the disease was reported from Manbhum district (Bihar), in 1915 and 1934. Chopra and Chaudhuri (1935) refer to an outbreak in the camp of the engineering students at Purulia (Bihar). They state that 83 per cent of the Hindu students in the camp were affected while all the Muslims escaped. Roy (1936) reported an outbreak amongst the inmates of a leper colony at Purulia (Bihar). Mitra and Rao (1947) have described outbreaks of epidemic dropsy amongst the E. I. Railway employees.

The present paper deals with the outbreaks of the disease at Jhajha, Bhagalpore, Japla, Jhumri-Telaiya, Dinapore, Patna, Deoghar, Jamshedpore, and the results of field investigations. The details of the first two outbreaks have been collected from the previous records and the rest were investigated by the author.

Jhajha (Monghyr).—It is a small suburban town with a big colony of railway employees who are stationed there because it is a railway locomotive repairing and engine changing centre. It is situated on the main E. I. Railway line.

An outbreak of epidemic dropsy started amongst the railway workers of the place in 1945. The first case was recorded on 28th October, 1945. Most of the railway employees in the loco section suffered from the disease except the Europeans and Anglo-Indians. The superior staff too did not suffer from the disease. Two hundred and forty cases were recorded with 10 deaths.

A supply of mustard oil was received in the railway ration shop for the workers of a section in October 1945. On investigation it transpired that the sufferers had received their ration of mustard oil from that consignment. The

sufferers were from the middle and lower middle class families. The superior Indian staff were using the oil from other private sources in the local market. The European and Anglo-Indian communities did not use any oil at all. Gang coolies employed by the railway, on receiving their quota of mustard oil, used to sell it and none of them suffered. Samples of mustard oil were collected from the houses of affected and unaffected families and examined by the railway chemists at Allahabad. The samples of mustard oil collected from affected families were found to contain argemone oil to the extent of 10 per cent. The families who were suffering had used the same mustard oil consignment which was received in the middle of October and the labourers who did not take or actually consume their quota for the reason given above did not suffer. The oil supply of the local market was tested and found free from argemone oil. There were no cases reported from either the rest of the railway workers or the civilian population of the area. The ration of rice, pulse and wheat was supplied to all the workers from the ration shops.

Bhagalpore.—It is a big town having a population of nearly 100,000 persons. It is also the headquarters of the district.

The disease started in the last week of December 1945. The cases were confined to the Bengali and Bihari Hindus only. A detailed enquiry about their dietetic habits was made. Their diet consisted of parboiled undermilled rice, whole wheat, pulse, mustard oil and milk. Forty-six families were examined and inmates interrogated regarding their habits and information elicited as to the source from where the sufferers were receiving their mustard oil supplies. The mustard oil, being consumed by the people, was tested and argemone was found to be present in all the samples from the affected families. Fifteen oil vendor shops were visited and the mustard oil was found to contain argemone oil in 9 of them. The mustard oil produced by 3 mills was tested. In samples from 2 of them argemone was found to be present. The stocks of mustard cakes and mustard seeds from these 2 mills were also tested and argemone was found to be present in all of them.

Table I gives the incidence of the disease.

The age distribution of the affected children was between 14 and 12 years. No cases were observed in children under 12 years.

Japla (Palamau).—It is a small village situated on the eastern bank of river Sone, with a population of about 6,000 persons. On the outskirts of the village is a big cement factory. The management of the factory has provided

TABLE I

Showing distribution of cases and consumption of mustard oil/consumption unit/day in oz.

Class of family	Number of persons in the family	NUMBER OF PERSONS IN THE FAMILY			NUMBER AFFECTED			PERCENTAGE OF PEOPLE SUFFERING			Mustard oil consumed
		Male	Female	Child	Male	Female	Child	Male	Female	Child	
Bengali Hindus	15	21	32	18	10	14	3	47.6	43.7	10.6	1.2
Bihari Hindus ..	10	14	23	15	5	8	..	35.7	34.3	..	1.1
Mohammedans, Marwaris and others.	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil	Nil
TOTAL ..	25	35	55	33	15	22	3	42.8	40.0	9.0	..

quarters for its superior staff. The labourers and inferior staff were drawn from the surrounding villages who went back to their homes after their duty hours. They came from a distance varying from 1 mile to 5 miles. Separate colonies of quarters were provided for the clerks and the inspecting higher staff in the premises of the factory. The factory management had opened ration shops for each colony. Rice, pulse and wheat were supplied by the government. Mustard oil was exclusively supplied by one B. Z. oil and flour mill located about half a mile away from the factory. Quota for each item of ration was fixed for each card holder.

Outbreak of epidemic dropsy started in early October 1948. The incidence of cases was 2 in October, 1 in November, 5 in December, 26 in January, 56 in February and nil in March 1949. All the cases were amongst the clerks including also the factory medical officer and lady doctor. The Europeans and highly paid Indian officers entirely escaped. Investigation revealed that all the labourers, being mostly aboriginals, were not purchasing the quota of mustard oil. Only a few of them used to purchase a part of their quota and that too not regularly every week. Of those who were purchasing, the consumption of mustard oil per consumption unit per day was only $\frac{1}{3}$ oz. It was further noticed that the oil

purchased by labourers was used more for rubbing on the body and head than for actual cooking purposes.

The Europeans and highly paid Indian officers were using mostly either butter, ghee or hydrogenated fat. There was no consumption of mustard oil amongst the Europeans, while amongst the Indians it was very low.

The monthly distribution of cases given above was collected from the factory hospital records, but when the history of onset from patients was elicited it was observed that the monthly distribution was 10 in November, 20 in December, 40 in January and 20 in February. The patients ignored the slight swelling of legs and consulted the doctor when their complaints increased. Table II gives the incidence of the disease.

No cases were reported from amongst the children, labourers or the Europeans.

A survey of the food intake of the families revealed that their diet consisted of parboiled undermilled rice, potato, satoo (gram flour), vegetable and mustard oil. Meat or fish was taken only once a week—on *hatia* (local market) day.

Hussainabad.—This small hamlet also had 4 cases. They were also consuming the mustard oil of the same oil mill. Four cases were also

TABLE II

Showing incidence of the disease and consumption of mustard oil per consumption unit/day in oz.

Class of family	Number of family	NUMBER IN THE FAMILY			NUMBER AFFECTED			PERCENTAGE AFFECTED			Consumption of mustard oil in oz. per c.u./day
		Male	Female	Child	Male	Female	Child	Male	Female	Child	
Bengali Hindus ..	21	60	40	40	40	20	Nil	66.6	5.0	Nil	2.0
Bihari Hindus ..	12	35	25	15	15	10	Nil	42.8	40.0	Nil	1.5
Mohammedans ..	4	12	9	10	3	2	Nil	25.0	22.2	Nil	1.4
TOTAL ..	37	107	74	65	58	32	Nil	55.6	43.2	Nil	..

observed amongst the employees of the oil mill. There were all Mohammedans and were consuming the oil of the mill. The mustard oil supplied by the said mill was tested by the public analyst to the Government of Bihar and was found to contain 2 per cent of argemone oil. Samples of mustard oil obtained from the houses of patients were also found to contain argemone oil. In February 1949, the manager of the factory had circulated to the workers information to the effect that the mustard oil supplied contained argemone oil and dissuaded them from purchasing and consuming the oil already purchased. The oil supply to the shops from the said mill was also simultaneously stopped. The entire stock of oil present in the mill was seized by the district authorities. No fresh cases were recorded in March 1949. No deaths were reported.

December 1949 and January, February and March 1950 recorded 27, 64, 18, 9 and 8 cases respectively. The incidence of cases was as in table III.

Ages of the children affected were between 12 to 14 years. Investigation revealed that the Marwaris who were not consuming any oil and the Gujratis who consumed linseed oil completely escaped. The sufferers were from upper middle class families only.

The inspection of the rice and mustard oil of the families revealed that the rice used was parboiled undermilled. Mustard oil being consumed by the people was tested for the presence of argemone oil. Out of the 37 families, mustard oil from 15 only could be obtained and the samples were found to contain 2 per cent of argemone oil. The rest of the affected families could not produce any mustard oil at

TABLE III

Showing incidence of cases, consumption of mustard oil per consumption unit/day/in oz.

Class of family	Number of family	NUMBER IN THE FAMILY			NUMBER AFFECTED			PERCENTAGE AFFECTED			Consumption of mustard oil	Death
		Adult		Children	Adult		Children	Male	Female	Child		
		Male	Female	Male or female	Male	Female	Male or female					
Bengali Hindus ..	21	53	56	67	33	32	20	62.1	57.1	29.9	4.0	3
Bihari Hindus ..	12	35	23	33	16	5	3	45.7	21.7	9.1	3.0	1
Mohammedans ..	4	22	25	16	7	4	6	31.8	16.0	37.5	2.5	6
TOTAL ..	37	110	104	116	56	41	29	46.6	39.4	25.0	..	10

TABLE IV

Showing incidence and consumption of mustard oil/consumption unit/day in oz.

Class of family	Number of family	NUMBER OF PERSONS			NUMBER AFFECTED			PERCENTAGE AFFECTED			Number of deaths	Mustard oil consumed
		Adult		Children	Adult		Children	Adult		Children		
		Male	Female		Male	Female		Male	Female			
Bengali Hindus ..	42	84	62	83	45	34	16	53.6	54.8	19.1	Nil	1.5
Bihari Hindus ..	6	6	..	..	6	..	..	100.0	..	..	Nil	2.0
Mohammedans ..	9	15	9	6	11	6	1	73.3	66.6	16.6	Nil	1.7
TOTAL ..	57	105	71	89	62	40	17	59.05	56.3	19.11	Nil	..

Jhumri-Telaiya (Hazaribagh).—It is a small town with a population of about 40,000 persons. The surrounding areas have rich mica deposits and all shades of people reside here.

The first case was reported in the last week of November 1949. November 1949,

the time of visit. On further enquiry it was revealed that the oil supply of the suffering families was from 4 local shops. The mustard oil of those local shops was tested and found to contain argemone in proportion varying from 2 to 4 per cent. The linseed and mustard

oil of other shops when tested did not reveal any adulteration with argemone oil. There were no oil mills in the locality. All the oil was imported from outside the area, either Uttar Pradesh or Dinapore (Bihar).

The oil supply of the town was tested by the staff of the district health authorities, and those found to contain argemone oil were seized and either destroyed or rendered useless for human consumption.

Dinapore (Patna).—Dinapore is a small town about 6 miles west of Patna. Its importance is due to the military cantonment. It is also an oil distributing centre. There are a large number of mills expressing oil and supplying to various places. A bulk of its oil was used in Patna town.

The first case was recorded in early January 1950. There were 70 cases in January and 49 in February of the year. Table IV gives the incidence of the disease.

Of the children affected, the incidence of cases in different age groups was as follows :—

Age	Number of cases
12-14 years ..	10
10-12 years ..	6
8-10 years ..	1

Out of the 57 families studied, mustard oil could be procured from 22 of them, which was tested and found to contain 2 to 3 per cent of argemone. No mustard oil could be procured for test at the time of visit from 25 families. All the consumers were questioned as to their source of mustard oil supply. When traced further it was revealed that the supply was from 3 local oil mills. The mills were visited and mustard oil as well as the mustard seeds were tested. They all were found to contain argemone oil or seeds. All the families came from upper middle class stratum of society.

Dinapore is divided into two areas, one civil and another the area of military cantonment. They are administered by two separate local bodies. There is a number of oil mills in the civil area while only one in the military area. The oil produced by the mill from the military area was also tested and found to contain no argemone.

A number of Anglo-Indian and Indian Christian communities live in the cantonment area. None of them were found to suffer from the disease. Nor were any cases recorded from amongst the military personnel.

The Anglo-Indians and Christians were also procuring their ration of rice, wheat, pulses, etc., from the civil area. The diet of the affected families and, as a matter of fact, of the whole town was basically the same, consisting of parboiled undermilled rice, pulse and mustard oil. The cereals were common to the Christians too. The ration of the military personnel was from an entirely independent source.

In early February 1950, all the mustard oil vendors and mills were visited by mobile squads. The samples found to contain argemone oil were seized and rendered useless for human consumption. No cases were observed from after the middle of February 1950.

Patna.—Patna is the capital town of the State of Bihar with a population of about 400,000.

The disease started in late November 1949. The cases were mostly confined to a few sectors (*mahallas*) of the town. All the cases were in the middle and upper middle class families, consisting of medical men, lawyers, professors of colleges, etc.

In all 168 cases were reported. The incidence of cases was 8 in November, 9 in December 1949, 91 in January, 60 in February and nil in March 1950. These cases were reported from a total of 55 families. The incidence of cases is given in table V.

The figure for children has not been given in table V as no cases were recorded from amongst them; all the sufferers being adults were in good health before they had this disease.

TABLE V

Showing incidence of cases, deaths and mustard oil consumed/consumption unit/day

Class of family	Number of families	NUMBER OF PERSONS IN THE FAMILY		NUMBER AFFECTED		PERCENTAGE AFFECTED		Death	Mustard oil consumed in oz./c.u./day
		Male	Female	Male	Female	Male	Female		
Bihari Hindus ..	34	120	85	70	40	58.3	47.0	2	2.0
Bengali Hindus ..	14	44	29	28	13	63.6	44.8	1	3.0
Mohammedans ..	7	25	14	11	6	44.0	42.8	1	2.0
TOTAL ..	55	189	128	109	59	57.6	46.1	4	..

No cases were reported from any other communities such as Marwaris, Punjabis, Anglo-Indians, etc.

Study of dietary habits revealed that the staple diet consisted of parboiled undermilled rice, wheat, pulses, vegetables, both leafy and non-leafy, milk, meat or fish, ghee and mustard oil.

All the affected families were visited to procure samples of mustard oil. The oil could be obtained from 28 families, which when tested was found to contain argemone oil. In the rest of the families the oil could not be obtained at the time of the visit. Enquiry was made from the consumers as to their source of oil and the same was then traced back to the place which supplied in bulk. I was found that in 40 out of 55 families, the source of oil could be definitely made out. The main sources were 4 mills at Dinapore. These mills were found to supply mustard oil adulterated with argemone oil.

A free testing centre for the presence of argemone in samples of mustard oil was opened in the author's laboratory on 5th February, 1950, to enable the public to first get their oil supply tested before consumption. The results are given in table VI.

TABLE VI

Showing result of mustard oils tested for argemone

Month	Period	Number of samples received	Number found positive to argemone oil	Percentage positive
February 1950.	5th-11th	107	51	47.7
	12th-18th	49	5	10.1
	19th-25th	13	1	7.6
	26th-28th	12	1	8.3
March 1950.	1st week	16	1	6.2
	2nd week	8	Nil	0.0
	3rd week	10	Nil	0.0
	4th week	15	Nil	0.0

In early February 1950, a vigorous drive was launched by the Public Health Department to test and seize samples of mustard oil found to contain argemone oil. Mobile vans were testing the oil sold in shops, mills and retail vendors and wherever any sample was found to contain argemone the same was seized and destroyed.

The incidence of fresh cases stopped from 14th February, 1950. Table VI shows that after the 18th of February, 1950, the number of samples positive to argemone came down.

Deoghar (Santhal Parganas).—It is a small town. Its importance lies in the fact that it is an important religious place for Hindus. A large number of Bengalis came to the place from Calcutta in the last quarter of every year for change of climate.

Sporadic outbreak of epidemic dropsy was noted in the first week of January 1950. There were 27 cases in January and 11 in February, and no fresh cases were reported from after the middle of the month. Table VII shows the incidence of cases.

All the thirteen families were having their supply of mustard oil from one oil vendor 'R. K. Bhandar'. The oil sold by all the vendors of the place was tested for the presence of argemone and only that particular shop was found to be selling the mixed oil, the rest were all negative to test for the argemone oil. The age of the child affected by the disease was 10 years. Only one case was reported from the Bihari family. In the case of the Bengalis, the incidence of the disease was more in females. All the families belonged to upper middle class. The diet was very good, mixed and balanced, consisting of parboiled rice, wheat, butter, milk, etc.

Jamshedpore (Singhbhum).—It is the biggest industrial town in the State of Bihar. The famous Tata Steel Works are situated in this town. The population consists of all types and classes of people. Almost all shades of economic groups and Indians from the various States are living here. Being an industrial town, big business men specially Marwaris and Gujratis have made the place their permanent home. The disease started on the 2nd

TABLE VII

Showing incidence of cases and consumption of mustard oil/consumption unit/day in oz.

Class of family	Number of families	NUMBER OF PERSONS			NUMBER AFFECTED			PERCENTAGE AFFECTED			Death	Mustard oil consumed
		Male	Female	Child	Male	Female	Child	Male	Female	Child		
Bengali Hindus ..	12	54	42	66	16	21	1	30.2	50.0	1.5	Nil	2 oz.
Bihari Hindus ..	1	2	2	4	1	Nil	..	..	..	..	Nil	2 "
TOTAL ..	13	56	44	70	17	21	1	30.9	47.7	1.4	Nil	..

of January, 1950. Out of a total of 61 cases, 26 were recorded in January, 16 in February and 19 in March. No cases were recorded from after the middle of March 1950. The distribution of the incidence of diseases is given in table VIII.

Since only one case was recorded from amongst the Nepali and Oriya families and 2 from the Punjabi, it was thought unnecessary to calculate the percentage of morbidity because of the small number, the figures would not be comparable. The mustard oil of the consumers was tested and was found positive to test for argemone in 14, negative in 2, while no oil could be obtained in 25 cases. The families were interrogated as to the names of the oil vendors. The mustard oil sold by these vendors was tested for presence of argemone. In 27 instances, the mustard oil was found to be positive, negative in 3, while no oil could be obtained from 11 of them. Of the children affected, 8 were between the ages of 12 to 14 years and 5 between 10 to 12 years. All the

Illustrative cases

The histories of the following cases definitely incriminate mustard oil mixed with argemone oil as the causative agent of epidemic dropsy.

At Patna: (a) L., brother of the writer, living in a separate establishment and three of the boys of the house, whose ages were 21, 19 and 17, suffered from the disease. When the disease broke out in Patna, the head of the family was warned not to take mustard oil but no heed was paid to the warning. There was one lady too in the house who also suffered. The people were very well off in life and their diet was of the best quality available and enough in quantity too. The rice consumed by them was always from their fields. The mustard oil was found to contain argemone oil. The wife of L. lived in her village home and she did not suffer. One member was on olive oil all the time and he did not suffer.

(b) D., a professor in the Medical College, Patna. His family consisted of seven persons

TABLE VIII

Showing incidence of cases and consumption of Mustard oil/consumption unit/day in oz.

Class of family	Number of families	NUMBER OF PERSONS IN THE FAMILY			NUMBER AFFECTED			PERCENTAGE AFFECTED			Death	Mustard oil consumed in oz./c.u./day
		Male	Female	Child	Male	Female	Child	Male	Female	Child		
Bengali Hindus ..	17	43	39	45	19	3	6	44.2	7.6	13.3	Nil	2.5
Bihari Hindus ..	7	14	11	19	5	2	3	35.7	18.1	15.8	Nil	1.5
Mohammedans ..	13	41	24	30	11	4	4	26.8	16.6	13.3	Nil	1.0
Nepali Hindus ..	1	1	1	1	..	1	..	..	..	..	Nil	1.0
Oriya Hindus ..	1	2	2	2	1	..	..	..	..	..	Nil	1.0
Punjabi Hindus ..	2	5	5	6	2	..	..	..	..	..	Nil	1.0
TOTAL ..	41	106	82	103	38	10	13	35.8	12.2	12.6	Nil	..

cases were from middle and upper middle class families, were non-vegetarians and consuming a good balanced diet like others mentioned earlier in this paper.

Manifestation of the disease

In all the epidemics, and in large majority of cases, the onset of the disease was with gastrointestinal disorder. The diarrhoea was like that of food poisoning, the latter signs noted were oedema of feet and legs, in some cases running up to the thighs. There was tachycardia, breathlessness and erythema of extremities—the blanching test being positive. In a few cases the ocular manifestations were of pain in eyeball, ophthalmoscopic examination revealed congestion of the disc. Some patients had swelling of hands too. The colour of the skin had become darker in a few of them. Death was due to acute dilatation of the heart.

including himself. Out of this, six suffered. One of his sons escaped the disease. On eliciting the history it transpired that the son, except for the morning breakfast, seldom took any other meals at home. The oil supply of his house was found to be positive to test for argemone.

(c) G., another professor in the local medical college. All the members of his family suffered and the oil of his house also was found to be positive to test for argemone oil.

The mustard oil supply of both (b) and (c) was from one shop. The mustard oil of that shop when tested was found to contain argemone oil to the extent of 5 per cent.

(d) A., a local newspaper reporter, himself out of the town for some time past, his wife alone living in the house suffered. She was consuming mustard oil which was found to contain argemone oil.

(e) S., inspector of boilers. His family consisted of seven persons and all were victims of the disease. The mustard oil which he was consuming and the source from where the same was purchased, both were found to contain argemone oil.

(f) Q., a local Muslim doctor. Seven persons in his family were suffering. The sample of oil used by him was tested in the author's laboratory and found to contain 3 per cent of argemone oil.

At *Jhumri-Telaiya*: (g) Dr. D., had 3 adults and 2 children in his family. All the adults suffered. The mustard oil was found to contain argemone.

(h) One Yakub, had 5 adults in his family, all suffered and one died of acute dilatation of the heart. The mustard oil was found to contain 5 per cent of argemone oil.

Discussion

A study of all these outbreaks of the disease brought out certain salient common facts. These were:—

1. The disease had its onset either in the last or first quarter of the years.
2. Members of the middle class families only were affected.
3. The incidence was comparatively more in Bengalis than in others.
4. The incidence amongst females was comparatively less than in the males.
5. Children under 8 escaped from being victims of the disease.
6. The diet in all cases was similar and consisted of basically the same ingredients.
7. Those not accustomed to use mustard oil as their staple oil completely escaped.
8. The mustard oil of the consumers, the vendors and millers was found to be positive to tests for argemone oil. Mustard seeds inspected by the author in these mills were found to contain argemone seeds.
9. The clinical manifestations in each case were the same and could hardly be confused with wet beriberi.
10. Stopping the supply of mustard oil adulterated with argemone oil stopped the incidence of fresh cases.

Lal and Roy (1939) in the course of investigations noted pigmentation of the face of the sufferers. They also noted that children under 5 escaped, more males were affected, larger number of cases were amongst the Hindus and that the patients were from middle class families. Lal *et al.* (1940) further reported that well-balanced diet and adequate food did not afford any protection against the disease. The findings in all the epidemics described herein were similar.

The above facts and features noted in all these outbreaks no doubt strongly supported

the view held so far that *Argemone mexicana* oil mixed in mustard oil was the factor producing the disease. In spite of all this evidence it must be explained why the number of cases was so small when the large quantity of oil produced by the mills and sold by the vendors must have been consumed by a large number of persons. This may be due to the fact that the oil supply to the consumers may not be always from the same source (mill or vendor), and also that the quantity of the adulterated oil may not be adequate to produce the disease. This may be the reason why no cases were reported from amongst the poorer sections of the population. Another reason for the small number of cases was that the oil mills of the various places were checked and that in only a few cases the mustard oil was found to contain argemone oil. Lastly it was noticed in these outbreaks that the mustard seeds produced in Bihar did not contain any argemone seeds, while those imported from Uttar Pradesh did in some cases only. This adulterated oil, supplied from such mills, was found in the houses of the sufferers too.

The mustard seeds are first crushed in ordinary oil expressers, the resultant cakes still contain about 5 to 6 per cent of oil. These cakes are collected. While they are collected and stored, there is growth of fungus on them due to increased humidity during the rains. Suggestions have been made that as such cakes are pressed again to remove the remaining oil and as the resultant oil is toxic to animals, the fungus may be the causative factor of epidemic dropsy. This is also supported by the fact that outbreaks of the disease occur after the rains. It is difficult to say in the present state of our knowledge as to how far this is tenable but the epidemiological findings are against this theory. Still it is a problem which needs further elucidation.

Lal and Das Gupta (1942) have concluded that 'epidemic dropsy is subject to a definite seasonal incidence in Bengal and neighbouring provinces', the incidence being from June to November with highest peak in August. The explanation offered by them for the seasonal distribution was that since the seeds of mustard and argemone ripen in most parts about the same time or a little later, it takes about one to two months for crushing of seeds and 2 to 3 weeks for the incubation period, hence the seasonal rise was in July and August. Present findings were that the mustard seeds ripen in late February and March, while the argemone seeds ripen a month and a half later than mustard seeds in Bihar. A press statement issued by the Uttar Pradesh Government on the 24th April, 1950, stated that the seeds of argemone mature in late April. The seasonal incidence in the outbreaks studied was in the last and the first quarters of the year with a peak in December or January. The observations were not in conformity with the findings of Lal (*loc. cit.*).

Suggestions were also made in some quarters that white oil,* that was being used as an adulterant of mustard oil, may be the causative factor. Out of more than 2,000 samples of mustard oil in 1949 and 600 in the first quarter of 1950 that were tested in this laboratory, not one was found to contain white oil. Hence this suggestion could not stand.

The fact that emerged from the present investigation revealed that there could be no question that argemone seeds were found with mustard seeds, the oil of the former was found to be present in mustard oil and that finally such adulterated mustard oil caused the disease.

Summary

1. Eight outbreaks of epidemic dropsy, six of which were investigated by the author, have been described.

2. The clinical picture, sex and age incidence were the same as reported by previous authors. More males than females were affected. No cases were observed in children under 8 years of age.

3. The disease was entirely confined to the middle class people and occurred more amongst the Bengalis than other communities.

4. The outbreak was characterized by sudden onset involving a number of people in a family.

5. The incidence of the disease was in the last or first quarter of the year.

6. The cause was found to be the consumption of mustard oil containing argemone oil. The source of that oil too when traced was found to contain argemone oil. Stopping the supply of such adulterated mustard oil stopped the incidence of fresh cases.

7. The epidemiological findings confirm the previous views that consumption of argemone oil mixed in mustard oil was the causative factor of epidemic dropsy.

I am grateful to Lieut.-Colonel A. N. Duggal, Director of Public Health, Bihar, for his help in collecting data and to Dr. K. Mitra, Nutrition Adviser, Government of India, for his advice and suggestions, as also for his encouragement to carry on the investigation. I am obliged to the health officers of the various local bodies for their help.

REFERENCES

- CHOPRA, R. N., and CHAUDHURI, R. N. *Indian Med. Gaz.*, **70**, 481. (1935).
- CHOPRA, R. N., PASRICHA, C. L., GOYAL, R. K., LAL, S., and SEN, A. K. (1939). *Ibid.*, **74**, 193.
- LAL, R. B., and DAS GUPTA, A. C. (1942). *Indian J. Med. Res.*, **30**, 145.
- LAL, R. B., MUKHERJEE, S. P., DAS GUPTA, A. C., and CHATTERJEE, S. R. (1940). *Ibid.*, **28**, 163.

* A variety of mineral oil, allied to liquid paraffin devoid of odour and colour, and much cheaper than mustard oil.

- LAL, R. B., MUKHERJEE, S. P., ROY, S. C., and SANKARAN, G. (1939). *Indian J. Med. Res.*, **27**, 207.
- LAL, R. B., and ROY, S. C. (1937). *Ibid.*, **25**, 163. 177, 233, 239.
- Idem* (1939). *Ibid.*, **27**, 191.
- LAL, R. B., ROY, S. C., and GHOSAL, S. C. (1937). *Ibid.*, **25**, 215.
- MITRA, K., and RAO, K. K. P. N. (1947). *J. Indian Med. Assoc.*, **16**, 303.
- ROY, A. T. (1936). *Antiseptic*, **33**, 292.

BIBLIOGRAPHY

- SARKAR, S. L. (1915). *Indian Med. Gaz.*, **50**, 368, 417.

The Indian Medical Gazette Fifty Years Ago

THE ANNUAL REPORT OF THE SANITARY COMMISSIONER WITH THE GOVERN- MENT OF INDIA

(From the *Indian Medical Gazette*, February 1901, Vol. **36**, p. 61)

NEVER before, perhaps since this Annual Report was first issued, has it been possible to review it at such an early date. This year it was signed on the 10th December, a date much earlier than usual, and one which reflects much credit on the staff of the Director-General's office, for as the Provincial Reports, on which this one is founded, seldom reach the Simla office till past the middle of the year, it has never before been possible to get this report out before well on in the succeeding year.

It is not possible for us here to review all the mass of statistics and commentary contained in this large and valuable report; we purpose, therefore, confining ourselves at present to a consideration of one of its most interesting and suggestive sections.

Section X of the report is devoted to a résumé of recent progress in our knowledge of the fevers and diseases of India, a subject which has often occupied these columns.

This section begins by noting that the brilliant researches of Ross and Manson, confirmed as they have been by the work of Koch and the Italian observers, have had a marked influence in inciting recent workers in India to the pursuit of observations in the field of parasitology thus opened up. Mention is made of the valuable researches of Captain S. P. James, I.M.S. (in our columns), on the metamorphosis of the filaria in the anopheles; the report then passes on to a consideration of certain aspects of the malaria question, and