C. Cereals

Rice (polished)	0.20
„ (unpolished)	0.24
Moong dal (*Phaseolus mungo*)	0.11, 0.20
Masoor dal (*Lens esculentum*)	0.26, 0.21
Arhar dal (*Cazanus indicus*)	0.10
Kalai dal (*Phaseolus radiatus*)	0.10
Wheat flour (atta)	0.06
Gram or chhola (*Cicer arietinum*)	0.12
Soya bean (*Glycine hyspida*)	*Nil*

D. Fresh fruits

Orange (Darjeeling)	*Nil*
„ (Nagpur)	*Nil*
Mango (green)	0.008
Guava (*Psidium guyava*)	*Nil*
Banana or ripe plantain (Martaban variety)	0.04
Cucumber with skin (*Cucumis sativus*)	0.004
Tomato	*Nil*
Grapes	0.006
Apple with skin (imported)	0.01
Sankh aloo (a tuber) (*Pachyirhizus angulatus*)	*Nil*
Tamarind (green)	*Nil*

E. Dried fruits

Raisins	0.13
Walnut	0.54
Pistachio	0.24
Almond	0.18
Ground nut (*Arachis hypogea*)	0.11
Coconut (*Cocos nucifera*)	0.036

F. Fatty foods

Milk (cow)	0.11
„ (buffalo)	0.12
„ (human)	0.048
Condensed milk (country made)	0.19
Ghee	0.09
Butter (salted)	0.03
Mustard oil	0.12
Hydrogenated fats (Vanaspati)	0.06

G. Prepared foods

Biscuit (imported)	0.05
„ (country made)	0.06
Bread	0.06
Cake	0.12
Rasogolla	0.08
Kachuri	0.062
Sandesh with silver foil	0.08

H. Miscellaneous

Common salt (imported)	0.02
„ „ (country made)	0.06
Ginger	*Nil*
Red pepper	0.02
Turmeric	*Nil*
Tea	0.18, 0.21
Rum (Indian)	0.013
Beer (Japanese)	0.025
Water (Calcutta supply)	0.004
Tank water	0.008
Sea water (from Puri)	0.38
Aerated water (lemonade)	0.008
Baby food (imported)	0.02
Glucose powder (imported)	0.008
„ syrup (imported)	0.07
Corn syrup (imported)	0.05
Sugar (Indian)	0.05

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DETECTION OF ARSENIC IN BURNT HUMAN BONES AND ASHES

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Magistrates and judges often ask the question: 'Is it possible to detect arsenic in burnt bones and ashes?' In India, the practice of swift cremation is more prevalent than in any other country in the world, and this leaves a serious loophole for criminals. To avoid detection in cases of poisoning, criminals often resort to the practice of rapid cremation of the bodies of the poisoned persons. It is usually not possible to detect alkaloids and other organic or volatile poisons in burnt bones and ashes; and it is often contended on behalf of the accused that it is impossible to detect arsenic in burnt bones and ashes, as arsenic is a volatile poison and would be dissipated by fire and lost, beyond the possibility of detection, in anything reduced to ashes. That this contention is not quite correct is obvious from a careful study of the annual report of some chemical examiners (*Annual Report of the Chemical Examiner, Madras*, for the year 1902; *Annual Report of the Chemical Examiner, Punjab*, for the year 1931, page 11). Between 1924 and 1931, 92 samples of ashes and bones were examined in the Punjab and arsenic was detected in 10 of them. Between 1921 and 1940, 97 samples of ashes and bones were received for examination in the laboratory of the chemical examiner, United Provinces, Central Provinces and Agra, and arsenic was detected in 19 of them. The detection of arsenic, which would appear contrary to expectation to a lay mind, is really to be expected in genuine arsenical poisoning from a scientific point of view, for the following reasons:—

(1) Much of the arsenic in bones gets converted into arsenates, partially replacing the phosphates of the bones. Arsenates being non-volatile, arsenic can be detected in the bones even after strong heating for a long time.

(2) Even if all the arsenic were to be present in the bones in the form of arsenic trioxide or some other volatile form, all arsenic is not likely

(*Continued from previous column*)

Bagchi, K. N., and Ganguly, H. D. (1937). *Indian Med. Gaz.*, **72**, 477.

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to be lost, as the conditions under which cremation is usually carried out in India do not favour complete combustion, and condensation of the volatilized arsenic on the cooler parts of the funeral pyre is liable to take place and its loss thus be prevented.

When arsenic trioxide (white arsenic) is heated with salts of sodium or alkaline earth group, part of the arsenic gets converted into arsenate and becomes non-volatile. Arsenic (2 mg.) was strongly heated in a furnace with (*i*) calcium phosphate, (*ii*) calcium carbonate, (*iii*) sodium phosphate, (*iv*) sodium carbonate and (*v*) sand. After the heating, arsenic was still detectable by Reinsch's test in all the cases except in the sand mixture.

The amounts of arsenic present in bones, before and after strong burning, were studied in a systematic manner in 13 cases of arsenical poisoning. The results obtained are outlined below :—

death in these cases was probably due to chronic arsenical poisoning. Arsenic is detectable in bones, especially in the spongy tissues of the skull and vertebral bones, long after the disappearance of all traces of arsenic from liver, spleen, kidneys or brain, and the proportion of arsenic in the bones to arsenic in viscera should be greater in cases of chronic poisoning than in cases of acute poisoning. This point is being investigated and an account of these investigations is reserved for a future communication.

Magistrates and police officers often ask the chemical examiner to determine quantitatively the amounts of arsenic present in burnt bones and ashes. Quantitative estimation of arsenic in burnt bones and ashes only is not likely to serve any useful purpose, as arsenic is present only in traces in the bones and as only a small proportion of the bones and ashes are sent to the chemical examiner. Moreover arsenic can

Case number	Amount of arsenic in the whole of the viscera received	Amount of arsenic per 100.0 gm. of viscera	Amount of arsenic per 100.0 gm. of bones received	
			Before burning	After burning
1 (from Aligarh)	1,515.0 mg. (23.3 grains).	400.9 mg. (6.17 grains).	0.88 mg.	0.75 mg.
2 (from Bahraich)	670.0 mg. (10.32 grains).	246.3 mg. (3.79 grains).	Skull—0.83 mg. Radius and ulna—1.96 mg.	0.50 mg. 1.79 mg.
3 (from Bulandshahr)	2,570.0 mg. (39.58 grains).	241.3 mg. (3.72 grains).	1.00 mg.	0.88 mg.
4 (from Kheri)	1.58 mg. (0.024 grain).	0.6 mg. (0.009 grain).	0.95 mg.	0.75 mg.
5 (from Bijnor)	155.0 mg. (2.38 grains).	17.6 mg. (0.27 grain).	0.80 mg.	0.70 mg.
6 (from Bara Banki)	4,883.2 mg. (75.19 grains).	506.0 mg. (7.79 grains).	1.75 mg.	0.75 mg.
7 (from Bijnor)	1,562.5 mg. (24.05 grains).	463.6 mg. (7.13 grains).	0.35 mg.	0.25 mg.
8 (from Bulandshahr)	125.0 mg. (1.92 grains).	13.7 mg. (0.21 grain).	1.38 mg.	0.88 mg.
9 (from Unao)	0.064 mg. (0.00098 grain).	..	0.53 mg.	..
10 (from Bijnor)	220.0 mg. (3.39 grains).	21.6 mg. (0.33 grain).	0.13 mg.	0.12 mg.
11 (from Bulandshahr)	0.25 mg. (0.0038 grain).	..	0.15 mg.	0.13 mg.
12 (from Roorkee)	329.3 mg. (5.07 grains).	30.2 mg. (0.47 grain).	0.18 mg.	0.05 mg.
13 (from Bijnor)	574.0 mg. (8.84 grains).	44.0 mg. (0.68 grain).	0.15 mg.	0.08 mg.

Arsenic was estimated by the electrolytic Marsh-Berzelius method after the decomposition of the bones by the nitric acid method.

It is obvious from these results that arsenic can always be detected in cases of arsenical poisoning in burnt bones. Arsenic is in all probability present in the burnt bones in the form of arsenates.

In cases 4, 9 and 11, arsenic was detected in the bones although only minute quantities were found in the viscera, thus indicating that

enter the body in a great variety of ways in food, drink and medicines, and it has particularly to be remembered that arsenic may be detected in burnt bones of persons who die of a disease for which arsenic is, quite legitimately, being administered. How futile quantitative estimation of arsenic in burnt bones would be, will be evident from the following table, which gives the results of analysis of bones of 14 different persons (requisitioned for control blank experiments) *who had died of accidents* :—

Case number.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Nature of bone.	Skull	Cap of skull	Cap of skull	Cap of skull	Skull	Cap of skull	Cap of skull	Femur	Jaws and teeth	Humerus	Sternum	Cap of skull	Cap of skull	Cap of skull
Amount of arsenic in mg. per 100.0 gm.	11.89	0.42	0.56	2.88	1.06	1.19	1.31	1.25	9.76	2.05	71.88	0.98	1.06	1.14

It is also obvious from these results that when arsenic is detected in bones, criminal proceedings should be instituted only when other circumstantial evidence (*e.g.*, other incriminating articles containing arsenic, symptoms of arsenical poisoning observed before death, etc.) are also found.

It is often asserted in the courts on behalf of the accused that arsenic is a normal constituent of the human body. This statement is not quite correct. We test the viscera of about 200 human bodies every year for the presence of arsenic, but arsenic is found only in a small proportion, and in the cases where arsenic is detected, symptoms of arsenical poisoning are generally present.

Arsenic is usually present in minute quantities in the soil in India. The following table gives the arsenic contents of some of the representative samples of earth obtained from the various districts of the United Provinces :—

Serial number	District from which the earth was received	Amount of arsenic in grains per pound of earth
1	Agra	0.055
2	Agra (from a different part of the district).	0.070
3	Allahabad	0.052
4	Bareilly	0.067
5	Benares	0.077
6	Bijnor	0.020
7	Bijnor (from a different part of the district).	0.070
8	Bulandshahr	0.098
9	Cawnpore	0.126
10	Cawnpore (from a different part of the district).	0.099
11	Etawah	0.140
12	Etawah (from a different part of the district).	0.120
13	Etah	0.070
14	Farrukhabad	0.087
15	Gorakhpur	0.042
16	Gorakhpur (from a different part of the district).	0.032
17	Kheri	0.025
18	Kheri (from a different part of the district).	0.056
19	Lucknow	0.098
20	Meerut	0.070
21	Meerut (from a different part of the district).	0.051
22	Moradabad	0.056
23	Muzaffarnagar	0.070
24	Muzaffarnagar (from a different part of the district).	0.044
25	Naini Tal	0.017
26	Pilibhit	0.061
27	Rae Bareli	0.067
28	Saharanpur	0.084
29	Saharanpur (from a different part of the district).	0.060
30	Shahjahanpur	0.070
31	Shahjahanpur (from a different part of the district).	0.018
32	Sitapur	0.075
33	Sultanpur	0.123
34	Unao	0.052

It should be obvious from these results that a blank test should invariably be done (and the necessary deductions made) in all those cases where ashes, vomits or purgings are received mixed with earth.

COMBINED DIGITALIS AND RAUWOLFIA POISONING IN A HUMAN SUBJECT

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THE symptoms and signs of the toxic effects of digitalis are well known to the medical profession, on account of the cumulative action of the drug during its routine administration in cases of cardiac failure. Reference to poisoning with the drug by self-administration with a view to committing suicide has not been found in the literature; neither is there a record of such a large quantity as 1½ ounces of Digifortis (Parke, Davis & Co.) being swallowed by a human subject in a single dose.

Rauwolfia is an Indian drug which enjoys the reputation of being useful in lowering the range of blood pressure and also as a sedative to an excitable nervous system. An overdose, or a large dose administered over a prolonged period, has been known to lower the blood pressure much more than one would desire, producing