ment of the modiolus and of the organ of Corti in the upper spirals of the cochlea (Albrecht, 1933; Altmann, 1950).

The deafness in our patients with ear-pits resembled in every way the hereditary hardness of hearing described by German authors, and it seems possible, by analogy, that it is to be ascribed to a malformation of the cochlea. How is the association with ear-pits to be explained?

There are several hypotheses to account for the ear-pits themselves (Monie, 1950). Wood-Jones and I-Chuan (1934) supported Heusinger's original suggestion (1864) that they represent a persistence of the dorsal end of the first ectodermal branchial groove; a popular alternative ascribes the pits to the failure of fusion of His's embryonic ear tubercles (Congdon *et al.*, 1932), but these do not in any case normally fuse.

Some members of our family, and of many others that have been described before, had abnormalities of branchial clefts other than the first. This might be taken to imply that the pits represented a persistence of the first cleft, but more serious malformations of the ear, such as microtia, may occasionally appear in families with pits (Schwendt, 1891; Edmonds and Keeler, 1940), and such malformations are not explained by either of the hypotheses outlined. Furthermore, neither will account for the deafness, unless one invokes Spemann's theory that the normal development of the labyrinth depends on its relation to neighbouring structures, which determine the differentiation of the labyrinth by producing organizer substances (Needham, 1942).

On the other hand, there need not be an anatomical connexion between the deafness and the ear-pits and other defects. The deafness appeared alone in some members of our family. Some instances of hereditary deafness may be associated with anatomically far removed lesions, for instance in the kidney (Reyersbach and Butler, 1954), not to mention what Darwin (1859, 1868) called the whimsical relation of deafness and blue eyes in white cats (Bamer, 1933). Needham (1942) quotes the genetic anomaly of sheep with persistent gill slits as an example of a gene which interferes with second-grade organizers in the head region. We suggest that the pits, the branchial fistulae, and the deafness in our family are the independent effects of a gene which may act in this way.

Summary

We record the pedigree of a family in whom ear-pits were associated with a hereditary deafness of the inner-ear type. Some members also had branchial fistulae. The three defects may be the independent effects of one dominant gene.

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SOME OBSERVATIONS ON LONDON FOG

BY

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During the winter of 1954-5 there were no long periods of dense fog in London, but visibility was reduced to less than 200 yards (183 metres) for a few hours at a time on several occasions. Generally, the relative humidity was then between 85 and 100%, and there were accompanying increases in the levels of smoke and sulphur dioxide. One such fog occurred during the night of December 15-16, when, in addition to an increase in the concentration of smoke and sulphur dioxide, sulphuric acid was detected in the water droplets in amounts representing a concentration of about 1 mg. per cubic metre of air.

On January 19 the visibility was reduced to as little as 70 yards (64 metres), although the relative humidity remained low, and no water droplets were present. The smoke concentration was exceptionally high. The Air Ministry's three-hourly summary of readings at Kingsway, London—1,500 yards (1,370 metres) from the hospital—is given in Table I.

These conditions were rather local in character, and affected several parts of London for limited periods. There was a definite smell of coal smoke, and it was noticeably irritant.

Methods

Measurements of smoke and sulphur dioxide were made using the standard D.S.I.R. instrument (Atmospheric Pollution in Leicester, 1945), but the interval between successive observations was reduced from twenty-four to three hours during the smoky period. Additional measurements of smoke were made over shorter periods by drawing air at 0.7 cu. ft. (0.02 cubic metre) a minute through a Whatman

TABLE I.—*Meteorological Conditions on January 19/20, 1955: Three-hourly Summary of Readings on Air Ministry Roof Kingsway (1,500 yards (1,370 metres) from the Hospital)*

	January 19						January 20	
	9 a.m.	12 noon	3 p.m.	6 p.m.	9 p.m.	12 mid.	3 a.m.	6 a.m.
Temperature: °F.	34.8	43.5	44.8	41.1	34.6	31.2	29.6	27.0
(°C.)	(1.6)	(6.4)	(7.1)	(5.0)	(1.4)	(-0.5)	(-1.5)	(-2.8)
Relative humidity (%)	71	52	50	57	76	81	79	89
Wind direction and speed	Calm	South, 2 Kts.	Calm	Calm	Calm	Calm	Calm	Calm
Visibility: Yards (Metres)	1,100 (1,008)	660 (604)	80 (73)	660 (604)	70 (64)	220 (201)	660 (604)	330 (302)

Smoke fog formed around midday and persisted, visibility varying between 70 and 700 yards (64 and 640 metres).

No. 1 filter. The density of the smoke stains was assessed by reflectometer, using the same calibration as for the standard method. Further smoke samples were collected with a high-volume sampler, in which air is drawn at about 45 cu. ft. (1.27 cubic metres) a minute through a filter paper made entirely of very fine glass fibre. Additional measurements of sulphur dioxide were made using a modification (Kirkham, 1954) of the fuchsin-formaldehyde method described by Steigmann (1942). A thermal precipitator and a cascade impactor having a membrane filter as a fifth stage were used to obtain samples for microscopical examination.

Results

The variation in smoke and sulphur dioxide observed during the episode is shown in Fig. 1. Between 2 and 4 p.m. the concentration of smoke increased tenfold, and

FIG. 1.—Concentration of smoke and sulphur dioxide on January 19, 1955.

another rapid rise occurred between 6 and 8 p.m., reaching a maximum figure of 6.5 mg. per cubic metre. The variation in sulphur dioxide was less marked, but the concentration reached a maximum level of 1 p.p.m.

It is possible to draw up a rough comparison between the three methods used for determining smoke concentration, and between the two used for the determination of sulphur dioxide, and Table II shows that there is fairly close agreement.

TABLE II.—Concentration of Smoke and Sulphur Dioxide on January 19/20, 1955. Comparison of Methods

Period*	Smoke Concentration, mg. per cubic metre			Sulphur Dioxide, p.p.m.	
	Standard D.S.I.R. Method	Short- period Filter Paper	High- volume Sampler	Standard D.S.I.R. Method	Short- period Colori- metric
11.30 a.m.—4 p.m.	1.35	1.94	—	0.44	—
4–7 p.m.	3.98	3.18	3.58	0.66	0.63
7–10 "	5.42	5.08	5.70	0.66	0.52
10 p.m.—10.30 a.m.	1.27	—	—	0.52	—

* The periods quoted here refer to those for the standard D.S.I.R. method. Those for the other two methods are similar, but the terminal times differ slightly in some cases.

Microscopical examination of thermal precipitator and cascade impactor samples showed that the suspended matter consisted almost entirely of black smoke particles. The concentration of particles under 0.32μ which could be counted under the light microscope increased in proportion with the measured smoke concentration. Although it was not possible at that time to obtain a detailed mass distribution, it appeared that most of the mass consisted of particles of less than 1μ diameter. No water droplets were

observed, and no sulphuric acid was detected in washings from impactor slides, although it is possible that any present in extremely fine droplets may have escaped collection.

The smoke collected on the plates of an electrostatic precipitator used here for air-conditioning (see below) contained 44% tarry matter soluble in acetone, and 7% incom-bustible ash. These figures do not differ greatly from those for other midwinter samples.

Clinical Observations

In parallel with our work on the physical and chemical nature of pollution, an assessment is being made of the clinical status of a series of patients with an established diagnosis of chronic bronchitis and emphysema who regularly attend a special clinic and who are subjected to periodic pulmonary function tests. The majority of these patients have been observed for five years. In October, 1954, they were given diaries in which they were asked to record their own assessment of their state of health day by day by means of a simple code. The code was as follows:

- A. Condition better than usual.
- B. Condition the same as usual.
- C. Condition worse than usual.
- D. Condition much worse than usual.
- E. Fog some time during the day.
- X. I have a cold.

Diary entries from 29 patients were available for the week including January 19, 1955, and Fig. 2 shows the number reporting either a deterioration or improvement in condition on each of seven days around January 19, as compared with the previous day. Relative humidity (mean of eight three-hourly readings), temperature (mean of day maximum and night minimum), and concentrations of smoke and sulphur dioxide (24- or 48-hour periods) are also shown.

It can be seen that a clinical deterioration in the condition of some patients coincided with the smoke "fog" on the 19th. It has not been possible to determine just how many of the 29 patients encountered any of the "smoke pockets" during the day, and so no reliable estimate can be made of the proportion affected amongst the total exposed. It was not unduly cold that day, nor was the relative humidity high.

It is also worth noting that exceptional weather conditions had been experienced in the London area during the week-end of January 15 to 16. The frozen snow which had been on the ground for several days began to melt during the afternoon of the 15th, and continued to thaw rapidly overnight. Slight fog had also been reported on the 15th, persisting throughout the day in some parts. On the 16th a cloud of smoke passed over London during the early afternoon, producing complete darkness for a period of about 10 minutes. This was followed by a sudden drop in temperature. It can be seen from Fig. 2 that several patients reported a deterioration in condition on the 16th. No detailed measurements of smoke were in progress during this brief interval, but there is no evidence to suggest that the smoke concentration near ground level was seriously affected when the smoke cloud passed over.

Whilst it is realized that the number of patients whose condition deteriorated on the 19th is not spectacular, these results, taken in conjunction with clinical impressions reported by physicians seeing out-patients in this and another hospital, leave no doubt in our minds that this smoke was deleterious. The effects noted included exacerbations of chronic bronchitis, the occurrence of bronchospasm, and, in one case, a marked alteration in the character of the sputum, from mucoid to frankly purulent.

One patient, with chronic bronchitis, emphysema, and cor pulmonale, who was considered to be susceptible to smog, was removed to a single-bed room off the main ward,

equipped with a small electrostatic precipitator for removing particulate matter. The intake of this unit was in the main ward, and it can be seen from Table III that the smoke concentration there followed the outdoor level very closely, whilst in the air-conditioned room the concentration was 28% of that in the main ward.

FIG. 2.—Day-to-day changes in the condition of 29 chronic bronchitics, and daily levels of pollution, temperature, and humidity.

TABLE III.—Concentration of Smoke in Air-conditioned Room, January 19/20

Period	Smoke Concentration, mg. per Cubic Metre		
	Outdoor	Main Ward	Air-conditioned Room
4-10 p.m.	4.70	4.69	1.31
10 p.m.—10.30 a.m.	1.27	1.12	0.33

This reduction, which was sufficient to make the air noticeably clearer, might have been greater had it been possible to keep the door closed all the time. In addition, a simple device which recirculated the air through soda lime was started, to reduce the concentration of acid pollutants. The patient in this room showed no distress whatever, but we do not claim that this is significant.

Discussion

The smoke "fog" reported here differed from ordinary London fog in that it was dry, and appeared to be free from sulphuric acid. It did, nevertheless, have a marked effect on some chronic bronchitics who were exposed to it. Its chief feature was the rapid variation in smoke concentration, and the very high peaks reached. It is worth considering this in relation to the London fog of December, 1952.

Observations of pollution at that time have been reported by Wilkins (1954), and an official report on the episode has been published (Ministry of Health, 1954). The maximum concentration of sulphur dioxide recorded was 1.34 p.p.m. (roof of County Hall, Westminster), and the corresponding smoke level was 4.46 mg. per cubic metre. These figures represented mean values over a 48-hour period. Little is known of the variation within that period, but hourly observations of smoke at Teddington—11 miles (17.7 km.) from Central London—show that the concentration re-

mained constant for 24 hours during the middle of the fog period (E. T. Wilkins, personal communication to us). However, there was a marked peak at Teddington just before that, and it is possible that, in Central London, concentrations of smoke and sulphur dioxide were considerably above the 48-hour averages at some time during the episode.

Summary and Conclusions

Visibility may be greatly reduced in London by smoke, in the absence of fog.

On January 19, 1955, very wide variations in the concentration of smoke were observed, and a tenfold increase occurred over a period of two hours. There was also an increase in sulphur dioxide, but no sulphuric acid was detected by the methods used, although traces might have been present in the form of minute droplets.

A temporary deterioration in the clinical condition of some patients with chronic bronchitis and emphysema coincided with this episode.

The results emphasize that measurements of pollution over 24- or 48-hour periods do not necessarily indicate the hazard to which the population may be exposed.

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CHRONIC PERIONYCHIA

AETIOLOGY AND TREATMENT

BY

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Chronic perionychnia is a painful and disfiguring condition, and is frequently difficult to cure. One's impression in a dermatological out-patient department is that it is becoming more common, but this may only be because sufferers are now more prepared to seek a specialist's opinion. The condition is only briefly dealt with in many dermatological textbooks, though some contain more adequate accounts—for example, Ormsby and Montgomery (1948) and Ingram and Brain (1955). Surgical textbooks rarely deal with the fundamental aetiology, and usually advocate mutilating surgical procedures which are unnecessary and unsatisfactory. Thus Handfield-Jones and Porritt (1948) state: "Treatment in the early stages consists in an incision in the skin at the site of the infection to expose the nail-root on that side and a small segment is removed. When the infection has spread around the nail, two parallel cuts are made so that a flap of skin can be dissected off the nail-root."

In my experience many of these patients are not properly treated, and this has led me to describe some general lines of treatment—which, though not original, have on the whole been fairly successful—in the hope that they may be helpful to practitioners generally.

Chronic perionychnia may be secondary to some systemic condition, such as syringomyelia or Raynaud's disease, or associated with a chronic eczema of the