

this effect upon him. One of the greatest dangers of alcohol was its power of bestowing a transitory feeling of well-being; yet it might be lessening the mental values and reducing the resistance to disease. Drug addiction was treated very seriously, though rare in this country, and yet little was done comparatively to control alcoholism, which was infinitely more common. The stresses of modern life, Sir Maurice continued, were many and severe, and no men had a greater share of them than those who worked amid the industrial difficulties and financial strain of our great cities. Therefore they must preserve their health in every way in their power. He advised them to watch their sleep, as this was the only thing that repaired fatigued tissue, but never to rely upon alcohol to get sleep. It was the worst form of sedative, for the dose required to be constantly increased. In the case of some persons it might overcome the early difficulties of defective sleep, but in the end not only failed to produce it, but aggravated the condition by bringing in other symptoms.

The Working of Tuberculosis Schemes.

It was reported to the London County Council on February 21st that the Minister of Health was unable to see his way to accede to a resolution supported by the council calling for the setting up of a departmental committee to inquire into the working of tuberculosis schemes throughout the country. The Minister stated that some of the matters in connexion with the treatment of tuberculosis which the council thought might be the subject of inquiry were scarcely appropriate for investigation by a departmental committee, and that if inquiry was needed on the point it should be undertaken by a medical committee. With regard to institutional accommodation for advanced cases and the appropriate duration of treatment for intermediate cases, the Minister stated that his views had already been given in circulars issued by his department, while as to the after-care and employment of tuberculous persons he was now in a position to encourage the provision of further workshops on an experimental basis in two or three large towns. He thought that any inquiry on the subject might be deferred until the result of these experiments was seen, and until further experience was available with regard to the village settlements and workshops already established.

Correspondence.

TETRA-ETHYL LEAD IN PETROL.

SIR.—Although no one here can pretend to expert knowledge of lead-petrol, yet I submit that we already know enough to condemn it provisionally on these three grounds:

- (1) That it can produce death or severe or mild poisoning.
- (2) That mild poisoning among the public will be unrecognizable by doctors.
- (3) That its motoring advantages can be attained otherwise and are incommensurate with the health risks. Aeroplanes may be in a different category; I do not know.

Point (1).—This is beyond dispute. Tetra-ethyl lead can be absorbed by the mouth, lungs, or skin. Although diluted 1 in 1,300 with petrol, the latter evaporates quickly, leaving a film of highly toxic tetra-ethyl lead for absorption through the skin. If this lead-petrol is let loose on the public, women will use it—innocently and dangerously—for cleaning purposes, in spite of warnings.

Point (2).—This is my chief point. Poisoning by tetra-ethyl lead is not branded by the old hall-marks on which a doctor relies to diagnose lead poisoning. Colic, blue line in gums, and wrist-drop do not occur. The symptoms are: "Drop of blood pressure, drop of body temperature, reduced pulse, sleeplessness, loss of weight, sometimes nausea, sometimes tremor, and, in most serious cases, delirium tremens. The first three symptoms are warnings, but are not serious."¹

¹ T. Midgley, *Industrial and Engineering Chemistry*, August, 1925, p. 287.

Now these acute symptoms may be enough to warn a vigilant works doctor in a tetra-ethyl lead factory; but I submit that mild poisoning, acute or chronic, of the ordinary citizen by tetra-ethyl lead cannot be diagnosed by a doctor. That, in my opinion, is the danger and treachery of this stuff.

The careful expert investigation and report to the American Surgeon-General (January, 1926), with faecal analyses and blood-stippling tests, discovered "no good grounds for prohibiting the use of ethyl-gasoline"; but the investigators go on to say that further experiments and larger experience may lead to recognizable lead poisoning or chronic degenerative diseases. Actually they did find slightly increased storage of lead in the employees of garages, etc., where lead-petrol was used.

Mr. Pryce-Jones kindly tested lead-petrol with sulphuretted hydrogen for me: no black sulphide was produced. Doubtless this is why no blue line is found in the gums with this non-ionized compound.

The Government proposes to appoint a strong committee to investigate lead-petrol, and meanwhile to permit its use. Surely this is the wrong order. A poison should be investigated before being let loose on the public. And the committee will take a year at least to report adequately; the American report took seven months, and found it too short a time.

Another fallacy is that the problem can be solved by chemical and medical investigation. I feel convinced that this is impossible in regard to slight or chronic poisoning effects. No investigators can report whether slow slight deterioration of arterioles or of nervous tissues occurs in the course of years in human beings. That is the main danger to the public, and, speaking medically, I would say it is certain to occur to some unknown extent. Urbanization and civilization already have sufficient drawbacks to health—for example, the smoke pall—without stupidly allowing another unseen, unrecognizable, insidious horror in our garages and in our streets, polluted with exhaust gases containing lead.

The public expect that an alert and intelligent Government will protect them against this, until investigators can assure them positively that there is no risk to public health. It can be said in advance that no men of wisdom who have experienced even the old form of lead poisoning can make such an unscientific statement. The least that they could say is that, while finding no positive evidence of danger, there may be protracted summative ill effects on health which baffle experimental investigation. The soothing parliamentary reply "no evidence of danger" is not enough, and yet positive elimination of all possible perils by experimental investigation is unattainable. I have read all the Blue Books on lead poisoning and know the difficulty of getting evidence.

Switzerland—an intelligent, well-educated country—has made lead-petrol illegal, and we should do the same provisionally. Another point is that the stuff should be called—compulsorily—by the warning name "lead-petrol" and not by the pretty euphemism of ethyl-petrol.

Point (3).—Turning now to the countervailing advantages for the motorist, I have inquired of experts, and find that the chief claim is elimination of "pinking" in high compression engines. But "pinking" may also be eliminated (in some cases better) by using a benzol mixture or by cleaning out carbon or tuning the ignition or carburettor. The use of this fuel in aeroplanes may be in a different category, and the public would not mind if it were allowed under supervision. But, so far as I can gather, the motoring advantages are not indispensable, and are small compared with the risks to health. Certainly I would not use it.

The problem is a confusing one to get into proper perspective. Neither the politician, nor chemist, nor motorist, nor the public is likely to see all round it. The medical profession alone can envisage its insidious dangers. They alone are aware of their powerlessness to answer a patient who asks "Am I suffering from mild poisoning from lead-petrol?" or "Will my health suffer if I work for months or years in a garage using lead-petrol?" Until, at any rate, they can answer these questions, doctors must

condemn the domestication of a deadly, insidious, and cumulative poison, even though it is highly diluted.

We should not pander to the crude mechanism of the motor at the risk of damaging the exquisite bodily machinery of our citizens and workmen.—I am, etc.,

Hull, March 1st.

FRANK C. EVE, M.D., F.R.C.P.

P.S.—The Ministerial reply (March 1st) that lead-petrol is to be allowed because latterly "no cases of poisoning" have occurred may be true and yet quite misleading. Translated medically, it may mean that in tetra-ethyl lead factories any man with suspicious symptoms is promptly changed to other work, while, outside factories, severe poisoning is unlikely to occur, and mild poisoning will not be recognizable. Hence "no cases of poisoning" are reported, though lots of minor poisoning may occur. The only safe course is to banish a poison until at least doctors can recognize its minor toxic effects, as they could with the old forms of lead poisoning.

** There is no doubt that pure tetra-ethyl lead very readily produces poisoning. The whole difficulty of the matter lies in the fact that at present there is not sufficient evidence that the use of lead-petrol leads to toxic effects. The forthcoming appointment by the Government (announced in our last issue at page 381) of an Interdepartmental Committee to investigate the subject is a step which will be generally welcomed.—Ed., B.M.J.

DEFECTIVE STRUCTURE OF TEETH.

SIR,—With regard to the questions asked in your annotation on defective structure of teeth in the *BRITISH MEDICAL JOURNAL* of February 11th (p. 229) may I first say how much I appreciate the frank and friendly criticism of points which are, as stated in the article, only side issues? In reference to these points I should like to make the following observations.

1. As to the possibility of error in my definition of hypoplasia. I think that the evidence I have adduced suggests very definitely that the normal dentine of both the dog and man does not contain "interglobular spaces." The late J. Howard Mummery, in his *Anatomy of the Teeth*, states that interglobular spaces are usually associated with very conspicuous defects in the enamel, and are probably occupied by the uncalcified ground substance of the dentine. The small spaces of the granular layer of Tomes are usually confined to the dentine beneath the cement, but may occasionally, though very rarely in man, be found under the enamel. In comparing interglobular spaces with the granular layer of Tomes, Mummery says:

"The fact that the tubes of the dentine communicate with the spaces of the granular layer, while in the larger spaces they form no such communication, would apparently point to the explanation that the spaces of the granular layer represent a normal and functional structure, while the larger spaces are due to a defect in calcification."

The spaces to which I referred resemble interglobular spaces, and not those of the granular layer of Tomes.

You cite cetacea as creatures whose teeth show large numbers of interglobular spaces. As far as my knowledge goes, these animals are degenerate land animals whose teeth, when present, are often greatly modified. Cetacea occupy such an exceptional position in nature that arguments based on the structure of their teeth can be of little significance; moreover, the "spaces" in their dentine resemble those of the granular layer of Tomes rather than interglobular spaces. In some other animals interglobular spaces are seen occasionally—for instance, in horses, rabbits, and monkeys. Certainly in rabbits and rats they are easily produced by diets similar to those used in the puppy experiments, and they are equally easily prevented by adequate diets. Interglobular spaces are, however, rare in animals living under their natural conditions; but the teeth of civilized man, who lives under artificial conditions, usually, in my experience, display such spaces.

2. You suggest that Fig. 14 indicates that environment is more important than structure in producing caries. This is not, I think, a correct interpretation of the illustration. As is usual in the teeth I have examined there

is some normal dentine near the amelo-dentinal junction; this is well shown in Fig. 14. When the dentine is decalcified by acids the "spaces" often appear to be obliterated, as might be expected. This tendency is indicated in Fig. 14. In this figure the part of the tooth chosen for photographing was that in which caries was least extensive, as the object of the section was to show the structure of the dentine, and not to indicate the presence of caries. The greater part of the tooth was, in fact, carious.

3. From the evidence I have of calcification in puppies' teeth it seems clear to me that in those regions where calcification usually takes place most quickly the dentine tends to be worst calcified.

4. Fat-soluble vitamins have been shown to play a part in the resistance of teeth to caries.¹ The fact that the mother sacrifices her tissues to a certain extent for the sake of the developing offspring needs no comment. Experiments mentioned in the paper show that when a bitch is fed during pregnancy and lactation on a diet deficient in fat-soluble vitamins the deciduous teeth of the offspring are not as badly calcified as the permanent teeth would be if the same diet were given to the puppies after weaning. (Puppies' deciduous teeth are all erupted before weaning.) From this it seems probable that the mother has sacrificed some at least of her store of calcifying vitamin. If, as I have indicated, fat-soluble vitamins are of importance in resistance to caries, then the teeth of the pregnant woman might be expected to be more liable to caries than those of the non-pregnant, other things being equal.—I am, etc.,

MAY MELLANBY.

Pharmacology Department, Sheffield University,
March 3rd.

CHEMISTRY AND PHARMACOLOGY OF ERGOT.

SIR,—In the article on ergot poisoning among rye bread consumers (February 25th, p. 302) we noted with surprise that the authors claim that "extracts from the rye were also tested physiologically for ergot, and the results were positive."

One of us (J. G.) prepared an extract from 600 grams (roughly 20 oz.) of the suspect flour, using the approved method of the U.S.P. X for "Fluidextractum ergotae." The neutralized extract was tested by the other (A. D. M.) on the isolated virgin guinea-pig and rat uteri, the blood pressure of the spinal cat, and also by the more specific test of intramuscular injection in the white Leghorn cock. The extract contained a histamine-like substance, but there was no evidence of ergotamine. Another extract, supplied by the city analyst, was even less active, so that our observations were diametrically opposed to your authors' conclusions, quoted above.

Microscopic examination, while revealing moulds, was similarly negative as regards ergot.—We are, etc.,

A. D. MACDONALD.

JAMES GRIER.

The Victoria University of Manchester,
March 6th.

SIR,—In the interesting article on ergot poisoning among rye bread consumers by Drs. Robertson and Ashby, published in your issue of February 25th (p. 302), the following statement occurs:

"The three chief constituents of ergot are sphacelinic acid, cornutine, and ergotine. However, ergot is not as yet definitely split up into its component parts or active constituents, and little is at present known of them specifically."

This statement does not quite accurately represent the present position of the chemistry and pharmacology of ergot. From 1906 onwards chemical and pharmacological investigations conducted in our experimental department at Dartford and at the Wellcome Physiological Research Laboratories have shown that ergot contains the active alkaloid ergotoxine and the closely related inactive alkaloid ergotinine. Associated with these are a number of "putrefactive bases" produced by the action of the fungus on the proteins of rye grain, the most important of these being histamine ("ergamine") and "tyramine." In 1922 Spiro and Stoll isolated from ergot a new alkaloid

¹ *British Dental Journal*, October 1st, 1926, and December 15th, 1927.