phos, acting as an inhibitor of the enzyme cannot be ruled out. Such inhibition by organophosphorus compounds is well known. Although the significance of the increase of lysosomal enzymes on the one hand and the selective release of some of them on the other in EAT cells is not known, lysosomal enzymes may be important in xenobiotic detoxification reactions.

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## TRACE METALS IN CANCER TISSUES

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CURIOSITY about the trace metal composition of cancer tissues was aroused by the accumulation of copper and certain other trace elements that one of us (TRD) had observed in the affected skin of cases of leprosy, leucoderma and eczema some time ago (unpublished). Reference to the literature gave very little information on the mineral profiles of cancerous tissues although several metals are implicated in carcinogenesis and allergy in humans and experimental animals[1]. We have analysed a number of cancerous and the corresponding normal tissues, procured through the courtesy of local hospitals, for certain physiologically important trace elements—Ca, Cd, Co, Cu, Fe, Mg, Mn and Zn. The results are presented in this communication.

The analyses have been completed in six cancer cases and an equal number of normals. In the cancer patients diagnosis had been confirmed on the basis of clinical and histological criteria. These include two cases each of cervical, oesophageal and gastric cancer. The normal cases were adjudged to be so on the basis of freedom from all overt clinical signs and symptoms of cancer or other diseases and the normal histological picture of the biopsy specimens of the specific tissues taken for analysis.

The tissues were excised by biopsy guided by endoscopy, parallel specimens being taken from the same area for histological examination. Tissues were preserved in absolute alcohol until analysis. They were dried, digested in a mixture of sulphuric and nitric acids[2], and made up to volume, and aliquots taken for estimation of the various mineral elements by atomic absorption spectrometry[2] (Perkin–Elmer Model 403 instrument). The same wet-digestion and subsequent analytical steps were followed with blood sera also.

The data are presented in table 1. The affected tissues in three cases of cancer of the colon and two cases of rectal cancer were also analysed, but as the corresponding normal tissues were not available, the data are not included here. There were no significant differences in the pattern of minerals assayed in blood sera between nine normal and six cancer cases and so they are also not reported here.

In spite of the wide individual variations, the trace metal spectra of the cancerous tissues examined, compared with those of the corresponding normal tissues (table 1), reveal several interesting features. The general trend of the results indicates that, in any given type of cancerous tissue, the sense of departure from the normal is the same for all the metals examined. Both cancerous cervix and cancerous oesophagus show decreases ranging from 25 to 80%, reckoned on the basis of the mean values. On the other hand, in cancerous gastric mucosa the concentration of the metals increases by two to seven times. That the former two tissues are ectodermal and the latter endodermal in origin may be a

**Table 1** *Trace metal profiles of some cancer and the corresponding normal tissues*

| Tissue | | Trace metal (μg/g tissue) Ca | Cd | Co | Cu | Fe | Mg | Mn | Zn |
|---|---|---|---|---|---|---|---|---|---|
| Cervix | N1 | 530 | 17 | 61 | 33 | 190 | 568 | 15 | 91 |
| | N2 | 1193 | 23 | 91 | 30 | 284 | 1136 | 23 | 634 |
| | C1 | 146 | 4 | 16 | 13 | 83 | 276 | 4 | 80 |
| | C2 | 285 | 16 | 43 | 17 | 100 | 446 | 7 | 185 |
| Oesophagus: | N3 | 1437 | 100 | 500 | 233 | 687 | 1500 | 125 | 1000 |
| | N4 | 2500 | 150 | 500 | 412 | 100 | 3125 | 125 | 1437 |
| | C3 | 1028 | 65 | 212 | 58 | 718 | 1283 | 40 | 514 |
| | C4 | 900 | 78 | 216 | 85 | 519 | 1028 | 31 | 700 |
| Gastric mucosa: | N5 | 1380 | 38 | 108 | 92 | 448 | 1708 | 20 | 341 |
| | N6 | 1120 | 71 | 142 | 100 | 552 | 1317 | 22 | 619 |
| | C5 | 6375 | 250 | 750 | 525 | 2000 | 7500 | 125 | 337 |
| | C6 | 13500 | 150 | 300 | 200 | 750 | 7750 | 100 | 3000 |

N, Normal; C, cancerous.

determining factor in this differential response to the oncogenic process. In both types, however, the maximum effect appears to be on calcium and manganese, followed by magnesium in the gastric mucosa, zinc in the cervix and cobalt in the oesophagus.

The absence of any significant change in the pattern of these minerals in serum indicates that the changes observed are localized to tissues and do not involve any disturbances in the general metabolism of the minerals.

The data appear to be interesting as first results, although the number of tissues of each type analysed is small to draw firm conclusions. They show the importance of minerals in oncology and underline the need for further extension of the analyses to a larger number and variety of tissues. These studies are in progress.

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## EFFECT OF POTASSIUM EMBELATE, AN ANALGESIC COMPOUND, ON BRAIN MONOAMINE UPTAKE

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It has been suggested that noradrenaline (NA) and 5-hydroxytryptamine (5-HT) play a major role in the transmission of nociceptive impulses in the brain. However, the opioid analgesics and antagonists are reported to interfere with NA and 5-HT inactivation by blockade of neuronal uptake[1-3]. The potassium salt of embelin (from *Embelia ribes* Burm.) is a new compound which has shown analgesic activity when administered orally to laboratory animals[4]. It was found to be centrally active but did not produce narcosis or show addictive property of morphine[4]. The present study was undertaken to assess any possible interaction of this drug with the uptake of monoamine transmitters in rat brain synaptosomes.

Male Charles–Foster rats (150–175 g), housed at constant temperature (28 ± 2°C) with free access to water and food, were divided into two groups of 12 animals each. One group of animals was administered potassium embelate orally (20 mg/kg body weight). The control group was given vehicle only, which consisted of distilled water and Tween-80. Thirty min after drug administration, animals were killed by decapitation, and the brains quickly removed and homogenized in ice-cold Krebs-Ringer buffer using a Teflon-fitted all-glass homogenizer. Synaptosomes were obtained as described by Gray