difference in the rate of elimination of the metabolites. These findings will be discussed.

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The Conversion of *S-n*-Propyl-L-Cysteine into its Sulphoxide by Microsomal Preparations from Rat Liver

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The oxidation of thioethers to sulphoxides has been observed in biological systems (e.g. Salzman & Brodie, 1956; Burns *et al.* 1957). The sulphoxidation of 4,4'-diaminodiphenyl sulphide and chlorpromazine in the presence of guinea-pig liver microsomes was found to require NADPH and oxygen (Gillette & Kamm, 1960).

In the present work, microsomes were prepared from the livers of male Wistar albino rats (approx. 250g.) and were suspended in freshly oxygenated 0.25M-sucrose at a concentration of approx. 3mg. of N/ml. Incubations were performed in open flasks at 37° for 30min. with *S-n*-propyl-L-[³⁵S]-cysteine as substrate, EDTA (3mM) and either an NADPH-generating system (NADP⁺, glucose 6-phosphate and glucose 6-phosphate dehydrogenase) or NADH and CN⁻ (7.5mM). Samples of the reaction mixtures were pipetted directly on to Whatman no. 3 paper and were subjected to high-voltage electrophoresis at 100v/cm. in a formic acid-acetic acid mixture, pH 2.0. The electrophoretograms were scanned for radioactivity and the sulphoxide present was determined as a percentage of the total radioactivity measured on the scan.

The extent of conversion into sulphoxide was influenced by the concentrations of substrate and microsomal protein, but under comparable conditions, the following yields were obtained: with an NADPH-generating system, 160μmoles of sulphoxide/mg. of N/30min; with NADH-CN⁻, 340μmoles of sulphoxide/mg. of N/30min. The inclusion of CN⁻ (7.5mM) in the reaction mixture containing the NADPH-generating system gave a 50% increase in the yield of sulphoxide.

Sulphoxidation was not significantly inhibited by SKF 525A (0.4mM), sodium azide (3.0mM), 2,4-dichlorophenol (0.85mM) or *p*-chloromercuribenzoate (0.25mM), but 100% inhibition was observed with dimethyl-*p*-phenylenediamine (2.0mM) and 90% inhibition with CO.

Paper chromatography of the *S-n*-propyl-L-[³⁵S]-cysteine sulphoxide in butan-1-ol-water-acetic acid, (12:3:5, by vol.) showed that *S-n*-propyl-L-[³⁵S]cysteine (+)sulphoxide was the predominant diastereoisomer formed. This is consistent with the isolation of *S*-ethyl-L-cysteine (+)sulphoxide from the urine of rats dosed with bromoethane (Barnsley, Thomson & Young, 1964).

Evidence so far indicates that the present system that converts *S-n*-propyl-L-cysteine into its sulphoxide differs from the sulphoxidation system reported by Gillette & Kamm (1960). The possible roles of EDTA and the inhibitory effect of CO will be discussed.

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Genetic Variation of Cod and Coalfish Lactate Dehydrogenase

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Genetic variations (polymorphism) can be a useful tool in the study of the sub-unit composition of enzymes. This is particularly true when, as in the lactate dehydrogenase (LDH) of many fish species, a complex mixture of isoenzymes is present.

In cod (*Gadus morrhua*) a polymorphism of one LDH polypeptide can be demonstrated by starch-gel electrophoresis of tissue extracts from fish caught off the Atlantic coast of Canada (Odense, Leung & Allen, 1966) and also in fish caught within 40 miles of Aberdeen. The polymorphic polypeptide, which is abundant in the heart, is referred to as the H polypeptide and the corresponding genetic locus as *LDH_H*. The frequency of the more common allele in 184 of the Aberdeen cod was found to be 0.61. There was a slight but significant excess of homozygotes in this sample.

In coalfish (*Gadus virens*) obtained from fishing grounds off the west coast of Scotland, and also from Icelandic and Faroese waters, we have found a polymorphism of a different polypeptide, M, which occurs mainly in the skeletal muscle. The frequency

of the more common allele at the locus LDH_M was found to be 0.90 in all three fishing grounds. A total of 255 coalfish were typed. There is also a third polypeptide, L, which has not been found to vary genetically in either species.

The M-polypeptide polymorphism of coalfish seems to provide suitable material for a detailed biochemical analysis of a genetic difference, and the work is being continued with that end in view.

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Isolation and Characterization of a Sialic Acid-Free β_1 -Glycoprotein of Normal Human Plasma

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A hitherto unknown β_1 -glycoprotein was discovered among the very soluble proteins of Cohn fraction VI of pooled normal human plasma. The aim of the present report is to describe the isolation and characterization of this globulin.

By chromatography on DEAE-cellulose, fractional precipitation in the presence of ethanol and zinc acetate at low temperature, and filtration through Sephadex G-100, a glycoprotein was isolated from the above-mentioned plasma-protein fraction that appeared homogeneous on starch-gel and disc electrophoresis at pH 8.6. However, at pH 5, near its isoelectric point, this globulin was resolved into three bands, which suggested the presence of variants.

Characterization of this β_1 -glycoprotein revealed the following physicochemical and chemical properties: mol.wt., approx. 30 000; sedimentation coefficient, 2.9s; isoelectric point, pH 4.4; isoionic point, pH 4.9. The carbohydrate moiety accounted for approximately 30%, and consisted of galactose, mannose, fucose and glucosamine but lacked neuraminic acid. The N-terminal amino acid appeared to be blocked as it did not react with fluorodinitrobenzene. Optical rotatory dispersion of the native protein showed a maximum of the trough at 231 m μ , but in the presence of 50% 2-chloroethanol or 7 M-urea, this maximum shifted to 233 or 224 m μ , respectively.

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The Presence of a Predominantly $\beta(1\rightarrow6)$ Component in Preparations of Yeast Glucan

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Several methylation studies have been made of 'yeast glucan'; these all indicate that the main linkage is $\beta(1\rightarrow3)$ but disagree over other features. Undermethylation could explain some differences, e.g. over the nature of branch points, but probably not the failure by Misaki, Johnson, Kirkwood, Scaletti & Smith (1968), to detect substantial unsubstituted sequences of $\beta(1\rightarrow6)$ glucan, the presence of which had been supported by studies of partial hydrolysis by acid (Peat, Whelan & Edwards, 1958) and by glucanases (Tanaka, quoted by Phaff, 1963).

The starting point of most studies is commercial pressed bakers' yeast, which is extracted first with hot dilute aqueous alkali and then with dilute acetic acid for various periods at temperatures from 75° to 90°. Most workers use the insoluble product, which contains a little chitin and some unidentified impurities, but Misaki *et al.* (1968) used instead the part of their residue (about 90%) that dissolved in dimethylsulphoxide and was precipitated by water.

We have found that during the extraction of alkali-extracted yeast with acetic acid under the conditions of Misaki *et al.* (1968) a water-soluble $\beta(1\rightarrow6)$ glucan appears with the glycogen. [A similar glucan has been described by Bishop, Blank & Gardner (1960) in alkali extracts of a pathogenic yeast, *Candida albicans*.] The failure of this wall component to dissolve during the preliminary alkali extraction, like the insolubility of the main glucan fraction (cf. Northcote, 1953), is difficult to explain.

The $\beta(1\rightarrow6)$ glucan was first noticed as a product of action of a commercial chitinase preparation (Koch-Light & Co. Ltd., Colnbrook, Bucks.) on alkali-extracted yeast, suggesting either that it is retained by a chitinous membrane, or that it is itself part of a larger molecule that is degraded by an impurity in the enzyme preparation. It is unlikely that it is the backbone of the main glucan component (cf. Manners & Patterson, 1966) because the $\beta(1\rightarrow3)$ glucanase action is very weak and most of the glucan remains insoluble under these conditions.

We therefore suggest that the discrepancies between the structures proposed for yeast glucan are caused by the presence of varying amounts of a predominantly $\beta(1\rightarrow6)$ glucan in the material studied. An elucidation of its structure might permit the attribution to the major glucan component of much longer $\beta(1\rightarrow3)$ sequences, and so help to explain its insolubility and the high yield