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STUDIES ON CHROMIUM-CONTAINING FRACTIONS
IN YEAST AND THEIR RELATION TO THE PROPOSED
GLUCOSE TOLERANCE FACTOR

A thesis presented in partial
fulfilment of the requirements for the
degree of

Doctor of Philosophy
in Chemistry
at
Massey University
New Zealand

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1981

ABSTRACT

Chromium-containing fractions were isolated both from whole yeast cells and yeast extracts in attempts to isolate the glucose tolerance factor (GTF).

Techniques for the isolation of chromium-containing fractions from whole yeast cells were investigated by first identifying the chromium fractions by means of chromium-51 labelling. An anionic complex was isolated from yeast cells which had been supplemented in a medium with high levels of chromium chloride. This complex was identified as a chromium-glucose complex but did not show any of the properties expected for the GTF.

An isolation procedure based on ion-exchange chromatography achieved the isolation of eleven apparently discrete chromium-containing fractions from yeast extract. The activity determination of these fractions, by use of a yeast-fermentation assay, resulted in generally only the cationic fractions showing high activity levels.

The origin of the isolated fractions was investigated by determining which fractions resulted from reaction with media components and those which probably resulted from association with yeast. These investigations showed that the majority of complexes formed were not synthesized by the yeast cells but were a result of reaction with media components. After these studies only two cationic fractions remained as possible candidates for the glucose tolerance factor.

The cationic chromium-containing fractions from black peppercorns, sage, pork kidney powder, wheat bran and molasses were investigated. The cationic fractions obtained from these samples were identified as all having different ion-exchange elution positions and all having widely varying activities. Hence there did not appear to be a single discrete chromium-containing fraction which was capable of being identified with the glucose tolerance factor.

Preincubation of chromium-deficient yeast in media containing chromium was undertaken in an attempt to demonstrate some requirement of the yeast for chromium. No such requirement could be demonstrated.

On further purification of the active-cationic fractions the activity was shown to separate from the chromium but the factor causing the activity could not be identified.

Collectively these results support the existence of a non-chromium containing factor, capable of increasing the rate of fermentation of yeast and hence a factor, which apart from the lack of a chromium atom, shows close similarity to the glucose tolerance factor as reported by Schwarz and Mertz.

ACKNOWLEDGEMENTS

I wish to thank my supervisors Dr Len F. Blackwell and Dr Paul D. Buckley for their expert advice and assistance and the encouragement offered throughout the course of this study.

Thanks are also extended to all members of the Chemistry, Biochemistry and Biophysics Department and the Microbiology Department for their help especially:

Dr Roy J. Thornton for his valuable advice and assistance in techniques involving yeast.

Professor Dick Hodges for his assistance in determining mass spectra.

Dr Ken W. Jolley for his assistance in determining nmr spectra.

Dr Graeme G. Midwinter for his assistance in various biochemical techniques.

Thanks also to friends and family for the support and encouragement received during this study.

Finally, I would like to thank Mrs Chris Ormsby for typing this thesis.

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