PROPHAGE INDUCTION OF "NON-INDUCIBLE" COLIPHAGE 186

Thesis submitted for the degree of

Doctor of Philosophy

by

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from

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DECEMBER, 1972.

PORTABLE INDEX

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SUMMARY

The thesis describes studies on the induction of "non-inducible" coliphage 186, its genetic map and the location of the prophage on the host chromosome.

Suppressor-sensitive mutants of phage 186 were isolated and preliminary experiments toward obtaining a genetic map for this phage performed.

Prophage 186 gives comparable yields to prophage λ when subjected to ultraviolet irradiation. However, the ultimate decrease in the optical density of the induced culture is slight for 186, and delayed, compared to that for λ. That other "non-inducible" phage do not show ultraviolet induction was confirmed. Induction by nalidixic acid, mitomycin C and the rate of spontaneous phage production itself, are similar for 186 and λ. A *recA*$^{+}$ host is required for induction.

A larger dose of UV radiation is necessary for 186 than for λ to yield a comparable degree of induction. Survival curves of irradiated 186 lysogens are identical to those for non-lysogens, in contrast to λ. As the irradiated lysogens also give rise to infectious centres, it appears that one cell can give rise to both a surviving colony and an infectious centre. The latent period of 186 ultraviolet induction is over twice as long as that for its heat induction, or following infection, whereas that for λ is only slightly increased. Phage 186 infection of irradiated cells has a delayed burst, whereas the latent period for

either λ or P2 infection is the same in irradiated and un-irradiated hosts.

The 186 attachment site (*att*186) is located between the origins of Hfr's KL16 and KL98, and enters just before *phe*A (50 min) in interrupted matings. Two factor P1 transductions put *att*186 at 51.1 min. Three factor P1 transductions involving *nal*B, *att*186 and *phe*A or *cys*C locate *nal*B at 51.5 min and *att*186 between *nal*B and *phe*A. Phage 186 is integrated between *nal*B and *phe*A causing loss of linkage between these markers.

Coliphage 186 is not zygotically inducible as evidenced by, (i) lack of effect on the gradient of transfer of adjacent markers; (ii) lack of effect on the transfer of distal markers; and (iii) no increase in phage titre relative to the transfer of an adjacent marker. These results are obtained regardless of the direction of transfer of the 186 prophage. Transfer of a 186 prophage carrying a suppressible clear plaque mutation of the *cI* gene from an su^+ male to an su^- female does not show zygotic induction. Phage 186 is not induced to display an infectious centre on ultraviolet irradiation of a conjugating female, whether present as prophage or introduced by conjugation. This result is obtained with either Hfr or F' mediated conjugation. Phage 186 shows neither zygotic nor indirect induction in F' mediated conjugation.

Phage 186 forms an ultraviolet inducible prophage. However, after irradiation, or conjugation, the bacterial cell is transiently refractory to 186 expression, which leads on the one hand

to a delayed lysis in ultraviolet induction, and on the other hand to the absence of zygotic induction with a prophage that is normally inducible.

STATEMENT

This thesis contains no material previously submitted for any other degree or diploma in any University, and, to the best of my knowledge and belief, no material previously published or written by any other person, except where due reference is made in the text.

W.H. WOODS.
DECEMBER, 1972.

ACKNOWLEDGEMENTS

I wish to thank Professor W.H. Elliott for sympathetic guidance and for permission to undertake this project in the Department of Biochemistry, University of Adelaide.

I am greatly indebted to my supervisor, Dr. J.B. Egan for his advice and criticisms during the course of this work and preparation of this thesis.

My thanks are due to all those who supplied me with strains. I should like to thank Margot Walker for introduction to bacterial conjugation techniques. I have especially appreciated discussions with Linda Pilarski, Peter Reeves, Roy Russell and Ron Skurray. My conclusions have benefitted from discussions and collaboration with other students of 186 in this laboratory; Roger Harlow, Vaughn Huddleston, Stephanie Hocking and Cliff Bradley. I am grateful to Peter Kretschmer for continued encouragement, to Moira Teisseire for preparation of media, and to Margaret Kalleske for typing this thesis.

Above all, I wish to thank my wife for help in preparing this thesis, and in so many other ways.

The project was carried out during the tenure of a CSIRO postgraduate studentship for which I am most grateful.

ABBREVIATIONS

The abbreviations used for bacterial genes are those of Taylor (1970). The abbreviations used for phage λ genes are summarised by Szybalski (1971), and the nomenclature adopted for phage 186 is based on these. Other abbreviations are listed below.

Where reference is made to another part of this thesis, this will be simply indicated by the designation of the particular section in parenthesis, for example, (3.2.a).

CAP	catabolite activator protein
cAMP	cyclic 3'5' adenosine monophosphate
DNA	deoxyribionucleic acid
MMS	methyl methane sulphonate
NNG	N-methyl-N'-nitro-N-nitrosoguanidine
OD	optical density
pfu/ml	plaque forming units per millilitre
UV	ultraviolet (radiation)