

**SCIENTIFIC MEMORIES BY OFFICERS OF
THE MEDICAL AND SANITARY
DEPARTMENTS OF THE GOVERNMENT
OF INDIA, NO. 37: INVESTIGATIONS ON
BENGAL JAIL DIETARIES**

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649389995

Scientific Memories by Officers of the Medical and Sanitary Departments of the Government of India, No. 37: Investigations on Bengal Jail Diets by D. McCay

Except for use in any review, the reproduction or utilisation of this work in whole or in part in any form by any electronic, mechanical or other means, now known or hereafter invented, including xerography, photocopying and recording, or in any information storage or retrieval system, is forbidden without the permission of the publisher, Trieste Publishing Pty Ltd, PO Box 1576 Collingwood, Victoria 3066 Australia.

All rights reserved.

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

This book is sold subject to the condition that it shall not, by way of trade or otherwise, be lent, re-sold, hired out, or otherwise circulated without the publisher's prior consent in any form or binding or cover other than that in which it is published and without a similar condition including this condition being imposed on the subsequent purchaser.

www.triestepublishing.com

D. MCCAY

**SCIENTIFIC MEMORIES BY OFFICERS OF
THE MEDICAL AND SANITARY
DEPARTMENTS OF THE GOVERNMENT
OF INDIA, NO. 37: INVESTIGATIONS ON
BENGAL JAIL DIETARIES**

Barun Chandra Sen
College Road, Calcutta.

No. 37.

(NEW SERIES.)

SCIENTIFIC MEMOIRS

BY

OFFICERS OF THE MEDICAL AND SANITARY DEPARTMENTS

OF THE

GOVERNMENT OF INDIA.

INVESTIGATIONS ON

BENGAL JAIL DIETARIES

WITH SOME OBSERVATIONS ON THE INFLUENCE OF
DIETARY ON THE PHYSICAL DEVELOPMENT AND
WELL-BEING OF THE PEOPLE OF BENGAL.

BY

CAPTAIN D. McCAY, M.B., B.Ch., B.A.O., I.M.S.

Professor of Physiology, Medical College, Calcutta.

ISSUED UNDER THE AUTHORITY OF THE GOVERNMENT OF INDIA
BY THE SANITARY COMMISSIONER WITH THE GOVERNMENT
OF INDIA, SIMLA.



CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING OFFICE

1910

CONTENTS.

	PAGE
INTRODUCTION	1
HISTORICAL—	
Surgeon-Major I. B. Lyon's memorandum	2
Surgeon-Major T. B. Lewis's "	4
Major R. I. MacNamara's "	9
THE SCOPE OF THE PRESENT ENQUIRY	10
ACCOUNT OF WORK DONE	18
Methods of work	21

P A R T I.

CHAPTER I.

THE FOOD-STUFFS OF BENGAL JAIL DIETARIES	27
Chemical Analysis of Food-stuffs of Bengal Jails	32
Heat of combustion of Food-stuffs	38

CHAPTER II.

THE NUTRITIVE VALUE OF BENGAL JAIL DIETARIES	39
A.—BENGALI DIET	46
1. The value of this diet in proximate principles	41
2. The amount of nitrogen undergoing metabolism on the ordinary jail diet of Bengal	44
3. The effect on nitrogenous metabolism of varying the quantities of the components of the ordinary jail diet	57
4. The effects of varying the components, i.e., of adding wheat ata, fish or meat	75
Summary of results obtained	95
B.—BEHARI DIET	99
1. The value of the diet in proximate principles	100
2. The amount of nitrogen undergoing metabolism on the ordinary jail diet of Behar	102
3. The effect on nitrogenous metabolism of varying the quantities of the components of the ordinary jail dietaries of Behar	111
4. The effects of varying the components of the Behari diet, i.e., of adding an animal protein to it	150

	Page
5 (i) The relative value of Burma and Country rice	157
(ii) The relative value of the different dals	157
(iii) The relative value of wheat and makkai ata	158
GENERAL SUMMARY OF RESULTS OBTAINED	159

CHAPTER III.

REPORT ON SIX MONTHS' USE OF SPECIAL DIETS IN PURI JAIL	164
---	-----

CHAPTER IV.

THE EFFECTS OF THE LARGE QUANTITY OF SALT GIVEN IN BENGAL JAIL DIETARIES	169
--	-----

CHAPTER V.

SOME SIDE-ISSUES OF THE INVESTIGATION	183
1. The relationship between the quantity of rice in the diet and the quantity of urine passed	183
2. The influence of Burma and Country rice on the excretion of urine	188
3. The quantity of faeces passed by prisoners on Bengal jail dietaries	189
4. The average amount of nitrogen contained in the faeces	191
5. The average amount of uric acid excreted in the urine by prisoners on the Bengal Jail diets	191
6. The quantity of purins excreted	192
7. The percentage of urea to the total excretion of nitrogen	193
8. The relation of ammonia nitrogen to the total nitrogen of the urine	193
9. The relative absorption shown by Hindus and Mahomedans on an animal diet	196

PART II.

THE RELATIONSHIP OF FOOD TO PHYSICAL DEVELOPMENT	199
Discussion of Chittenden's views on the level of nitrogenous metabolism in connection with the work in Bengal	199
The evidence afforded by the Bengali on the effects of a low protein absorption	204
The evidence afforded by the Behari on the effects of a low protein absorption	206
Examination of Dr. J. H. Kellogg's views as to the cause of the defective development of the Bengali	207
The evidence afforded by the Hill-tribes of Bengal on the effects of a low protein absorption	211
Conclusions regarding the relationship of food to physical development	220
Note on the aboriginal tribes of Chota Nagpur	222

David Baran, M.A. Key.
1 College Row, Calcutta.

BENGAL JAIL DIETARIES

With some observations on the Influence of Dietary on the Physical Development and Well-being of the People of Bengal.

INTRODUCTION.

THE investigations that have been engaging the attention of the staff* of the Physiological Department of the Medical College, Calcutta, have, we hope, shed a considerable amount of light on the nutritive value of Indian food-stuffs, and particularly on the nutritive value of jail dietaries in Bengal. They will also be found to have a very distinct bearing on the much discussed problems of nutrition.

The work recorded in this memoir has been carried out on the initiative and at the expense of the Sanitary Department of the Government of India. The importance of the subject of jail dietaries had been fully recognised by the Government of India. They had already caused certain enquiries to be made, which will be referred to, but had deferred further action until a suitable officer became available for the purpose of estimating the nutritive value of the different food-stuffs in the dietary of prisoners.

The present enquiry is limited to the jails of Bengal. The work began on the 1st February 1908 and has been going on practically continuously (so far as other official duties permitted) for the last eighteen months.

Historical.

It would not serve any useful purpose to go very deeply into the history of all the work that has been done on jail diets at Home and in India. Certain important papers will be referred to in so far as they are of interest in the light of present investigations; but all the work hitherto done has been based on the assumption that the chemical analysis of food-stuffs afforded a direct measure of their nutritive value. Further, the diet scales laid down for Indian prisons have all been calculated on the result of chemical analyses and not on the actual nutritive value of the food materials, *i.e.*, the percentage of their proximate principles that is capable of being absorbed by the intestinal tract of the prisoners

* Three Assistant Surgeons were employed on the enquiry, *viz.* :—

Satis Chandra Banerji, L.M.S., Assistant Professor of Physiology.

Lal Mohan Ghoshal, L.M.S. }

Madan Mohan Dutta, L.M.S. } Demonstrators, Physiological Department, Medical College, Calcutta.

The present enquiry aims at estimations of the actual amount of some of the proximate principles—especially protein—that are absorbed and assimilated, and for this reason the papers above referred to, while of great importance so far as they go, do not give much assistance in the present work.

Surgeon Major T. R. Lewis* writes: "A mere tabular statement of the several ingredients constituting the several diets would be of comparatively little value unless accompanied by a statement of their chemical composition; and, in order to judge of the comparative merits of dietaries so analysed, it is essential that a clear conception should be formed as to what particular portions are specially adapted to the nutrition of the body." To this we may add that it is of even more importance to know in what proportions the proximate principles of the different food-stuffs are absorbed and made use of in the economy.

It is futile, for example, to work out diet scales furnishing say 80 grammes of protein per man daily, if instead of 90 per cent. only 60 per cent. of this is absorbed, and then imagine that we have provided for the prisoners' physiological needs. Yet, so far as we have been able to find in the literature of this subject that is what has been done hitherto.

The diet scales would also appear to have been based on those in use in the prisons of European countries, an allowance being made for difference in weight.

So far back as 1881 Lewis wrote, and it is equally true to-day:—"So far as I am aware, no systematic series of observations has been conducted on the precise food-requirements of the inhabitants of this country when undergoing laborious exertion, as compared with the requirements when the body is at rest, so that all inferences as to what these requirements are, are based on experiments made in Europe and on people accustomed to a far larger proportion of animal food than the great majority of the inhabitants of Eastern countries."

The first work done on the subject by actual experiment, to which we have reference, is an able and interesting memorandum by Surgeon Major I. B. Lyon,† Chemical Analyser to Government, Bombay. From actual experience of native prisoners on hard labour in the Bombay House of Correction, Dr. Lyon devised three scales of diet, based on the analysis of the diet on which these prisoners had been working and which had proved sufficient.

We need not go into the details of this paper: it will be sufficient for our purpose to say that the work done by Dr. Lyon was carried out from the exactly opposite point of view to that recorded in this memoir.

Dr. Lyon found that native prisoners in the Bombay House of Correction increased in health, weight and physical development when sentenced to hard labour;

* A memorandum on the Dietaries of Labouring Prisoners in Indian Jails—*Annual Report of the Sanitary Commissioner with the Government of India for 1880*, page 159.

† Memorandum by Surgeon Major I. B. Lyon, F.C.S.—*Gazette of India*, 19th May 1877.

be very properly analysed the diet on which this was possible, and found it to contain quantities of nitrogen and carbon which (when allowance is made for difference in weight) were practically identical with Letheby's estimate for ordinary labour in England, and of the same value as the hard labour diet of English convicts. On the basis of this experience his three scales of diet were formulated :—

No. 1 Scale.—The labour scale ; is simply the Bombay House of Correction scale raised or lowered proportionally to the weight of the individuals to be fed.

No. 2 Scale.—The light labour scale ; is scale No. 1 reduced in the proportion that the light labour diet of English convicts is lower than English convict hard labour diet.

No. 3 Scale.—The bare sustenance scale ; is scale No. 1 reduced in the proportion that a mean between Edwin Smith and Letheby's estimates for bare sustenance is lower than English convict hard labour diet.

Dr. Lyon, therefore, devised his diets by working back from an analysed diet which had proved itself sufficient for all physiological purposes, *i.e.*, a diet from which enough of the different proximate principles was absorbed to supply the needs of the body. The ultimate object of the present investigation is to devise diet scales in which the several ingredients are so combined that the maximum absorption is obtained with a minimum of waste—a point not taken notice of in either Lyon's diets or any other diet scales that have been framed for Indian jails.

The reason why dietaries for prisoners in India have all been worked out from the chemical analyses of the foods in use appears to be that, from the investigations that have been carried out in Europe and America on the percentage absorption of the proximate principles, a fairly fixed proportion of these was found to be absorbed, *i.e.*, above 90 per cent. in a mixed animal diet and above 85 per cent. in a so-called vegetable diet. So that, by assuming these percentages to hold good for Indian food-stuffs, the framers of the different diets estimated that between 85 and 90 per cent. of the proximate principles found by chemical analysis in the diets would be absorbed. This we shall show is not by any means the case ; and, further, we shall give abundant evidence that the actual amount of absorption does not vary directly with the quantity of the proximate principles contained in the diet ; this at least we can strongly assert is so in the case of the most important of the proximate principles—protein. It was a very natural assumption to make and, so far as we know, the fallacy was not discovered until actual examination* of the excreta of prisoners on a known jail diet proved that a comparatively poor absorption of protein takes place when the actual amount of protein offered in the diet is taken into consideration.

* Scientific Memoirs No. 31.—Standards of the Constituents of the Blood and Urine and the Bearing of the Metabolism of the Bengali on the Problems of Nutrition.

The next paper to which we wish to refer is Surgeon-Major T. B. Lewis's Memorandum * on the Dietsaries of Labouring Prisoners in Indian Jails. This is a most important and comprehensive discussion of the whole subject of Indian jail dietaries. Dr. Lewis evidently clearly foresaw the importance of the absorbability of a diet, for in discussing the nutritive value of the diet scales of labouring prisoners he says: "There are practical difficulties in deciding the equivalent values of these various food-stuffs, not only because the chemical analyses which have been made of many of them are not so complete as desirable, but there is also a want of definite knowledge as to their exact position as true aliments based on their adaptability for being assimilated."

This valuable memorandum traces the history of the different scales of diet for Indian prisons and gives their values in the principal alimentary constituents.

Thus the Government of Bengal in 1860 adopted certain scales on the recommendation of Dr. Mouat. The interesting point regarding these diets for labouring and under-trial prisoners is that animal food was included. These diets appear to have been in force in Lower Bengal for eighteen years. Their chief constituents are worth recording:—

Rice	20·5 ozs.	Rice	20·5 ozs.
Meat	4·1 ,, (4 days).	Fish	4·1 ,, (4 days).
Dal	4·1 ,,	Dal	4·1 ,,
Vegetables	4·1 ,, (8·2 ozs. 3 days).	Vegetables	4·1 ,, (8·2 ozs. 3 days).

Computed by Lewis to be equivalent to practically 14 grammes of nitrogen or 87·50 grammes of protein daily.

When compared with the scales of diet which have been adapted from the English local prison scale for men of an average weight of 110 lbs., it will be found that the amount of nitrogen in each day's food in the scale for Bengalis is precisely the same as is contained in the "adapted" maximum scale, 205 grains. The amount of carbon is greater by over 800 grains.

The diet scale for natives of Behar is considerably more liberal as 10 ozs. of wheat was substituted for 8 ozs. of rice. The chief constituents of these diets are also of interest:—

Rice	12·3 ozs.	Rice	12·3 ozs.
Wheat Ata	10·2 ,,	Wheat Ata	10·2 ,,
Meat	4·1 ,, (4 days).	Fish	4·1 ,, (4 days).
Pulse (Dal)	2·0 ,, (4 days).	Pulse (Dal)	2·0 ,, (4 days).
	6·1 ,, (3 days).		6·1 ,, (3 days).
Vegetables	4·1 ,,	Vegetables	4·1 ,,

Computed by Lewis to be equivalent to 16·80 grammes of nitrogen or 105 grammes of protein daily.