

T. M. Vogelsang

**Typhoid and Paratyphoid B Carriers
and their Treatment**

Universitetet i Bergen

Årbok 1950

Medisinsk rekke

Nr. 1

UNIVERSITETET I BERGEN
ARBOK 1950

Medisinsk rekke
Nr. 1

Typhoid and Paratyphoid B Carriers and their Treatment

Experiences from Western Norway

BY

TH. M. VOGELSÅNG, M. D.

Professor of Bacteriology and Serology,
University of Bergen
Director, Gade's Institute,
Bergen, Norway

WITH 3 FIGURES

Contents.

	Page
PREFACE	11

Section I.

THE CARRIER STATE

I. INTRODUCTION	13
II. HISTORICAL REVIEW	14
A. William Budd's Conception of Typhoid as a Contagious Disorder.....	14
B. Max von Pettenkofer's Theory	16
C. Current Opinion in Norway in the 1860ties.....	16
D. Homann's and Hartwig's Epidemiological Investigations	17
E. The Discovery of the Typhoid Bacillus	19
F. The Discovery of the Carrier State	20
G. The Discovery of the Paratyphoid B Bacillus	21
H. The Dissociation of the Paratyphoid B Bacillus from the Closely Related Meat-Poisoning Bacteria.....	23
III. TEMPORARY AND CHRONIC CARRIERS	25
A. Definition	25
B. Classification	26
C. Temporary Carriers	29
1. <i>Incubationary Carriers</i>	29
2. <i>Healthy Transient Carriers</i>	30
3. <i>Convalescent Carriers</i>	34
D. Chronic Carriers	35
E. Temporary versus Chronic Carriers	35
F. The Occurrence of Temporary and Chronic Carriers	35
G. The Duration of the Discharge of the Specific Organism	39
H. The Duration of the Chronic Carrier State.....	42
I. Late Spontaneous Recovery from the Carrier State.....	43
J. The Sex and Age of Temporary and Chronic Carriers.....	45
IV. THE SITE OF PROLIFERATION OF THE SPECIFIC GERM	48
A. Pathogenesis	48
B. The Discharge of <i>S.typhosa</i> and <i>S.schottmuelleri</i>	49
1. <i>Discharge of the Specific Germ with the Faeces</i>	49
a. Intestinal Carriers	50
b. Gall-Bladder Carriers	54
(1) Ascension from the Duodenum through the Bile Ducts.....	54
(2) The Hematogenous Route through the Gall-Bladder Wall.....	57

	Page
(3) The Lymphatic Route	60
(4) Infection by direct Extension	60
(5) Infection from the Liver through the Bile Stream.....	60
(6) The Development of the Gall-Bladder Carrier State.....	62
(7) Cholecystitis typhosa	63
(8) Cholelithiasis and the Carrier State.....	63
(9) The Age and Sex Distribution of Cholelithiasis	66
(10) Bacteriological Examinations of Gall-Bladders Containing Gall-Stones	67
c. Liver or Duct Carriers	67
d. Pancreatic Carriers.....	70
2. <i>Discharge of the Specific Germ with the Urine</i>	71
(1) Ascending Infection through the Urethra	72
(2) Hematogenous Infection of the Kidneys	73
(3) Nephritis or Pylonephritis typhosa suppurativa	74
(4) Infection of the Recesses of the Urinary Tract.....	78
3. <i>Discharge of the Specific Germ through Sinuses</i>	79
4. <i>Discharge of the Specific Germ in other Ways</i>	80
V. LABORATORY PROCEDURES IN THE DETECTION AND CONTROL OF THE CARRIER STATE.....	80
A. The Taking of Specimens for Bacteriological Examination.....	80
B. The Transport of Specimens for Bacteriological Examination.....	81
C. Isolation of the Specific Organism from Faeces and Urine.....	82
D. The Technique of Duodenal Tubage	84
E. Detection of Chronic Carriers by Duodenal Tubage	85
F. The Place of Duodenal Tubage in the Control of Convalescents.....	86
G. Identification of <i>S.typhosa</i> and <i>S.schottmuelleri</i>	88
H. Fermentative Types of <i>S.typhosa</i>	90
I. Fermentative Types of <i>S.schottmuelleri</i>	92
J. Phage-Typing of <i>S.typhosa</i>	94
K. Phage-Typing of <i>S.schottmuelleri</i>	96
L. Serological Typing of <i>S.typhosa</i>	97
M. Serological Typing of <i>S.schottmuelleri</i>	98
N. Detection of Chronic Carriers by Agglutination Tests.....	99
O. Special Widal Technique in the Detection of Chronic Carriers.....	101
P. The Importance of the Vi Agglutinin for the Detection of Chronic Typhoid Carriers	103
Q. Vi Agglutination in the Control of Typhoid Convalescents	104

Section II.

CHRONIC TYPHOID AND PARATYPHOID B CARRIERS IN WESTERN NORWAY.

VI. THE OCCURRENCE OF TYPHOID AND PARATYPHOID B IN WESTERN NORWAY	106
A. The Geographical Scope of the Material.	106
B. The Number of Typhoid and Paratyphoid B Cases in Western Norway since 1900.....	107

	Page
C. Typhoid and Paratyphoid B in Western Norway during World War II....	110
D. The Distribution of Typhoid and Paratyphoid B in Western Norway.....	111
E. The Demonstration of the First Chronic Typhoid and Paratyphoid B carriers in Western Norway.....	111
F. The Guiding Principles for the Campaign against Typhoid and Paratyphoid B in Western Norway.....	112
G. The Causes of the Regression of Typhoid and Paratyphoid B in Western Norway.....	114
H. The Guiding Principles for the Further Campaign against Typhoid and Para- typhoid B in Western Norway.....	115
VII. THE CHRONIC TYPHOID AND PARATYPHOID B CARRIERS IN WES- TERN NORWAY.....	116
A. The Number of Chronic Carriers.....	116
B. The Sex and Age of the Chronic Carriers at the Time of Detection.....	119
C. The Sex and Age of the Chronic Carriers at the Time of Infection.....	120
D. The Interval between Infection and the Detection of the Carrier State....	123
E. The Occupation of the Chronic Carriers.....	125
F. The Transmission of the Infection by Chronic Carriers.....	128
1. <i>The Infectious Housewife</i>	128
2. <i>The Carrier in a Home not Infected Hitherto</i>	129
3. <i>Transmission of the Disease on Change of Address</i>	129
4. <i>The Domestic Servant Who Spread Infection in an Already Infected Di- strict</i>	130
5. <i>Infection through Food</i>	130
5. <i>Infection through Water</i>	131
7. <i>Infection through Milk</i>	132
8. <i>A Milk-Borne Typhoid Epidemic with Sporadic Cases</i>	132
9. <i>The Discovery of the Source of Infection of Milk-Borne Epidemics</i>	133
10. <i>When the Milk-Borne Character of an Epidemic is in Doubt</i>	134
11. <i>The Search for the Source of Infection of a Typhoid Epidemic</i>	135
12. <i>Infection from Different Sources</i>	137
G. Multiple Chronic Carriers.....	137
H. The Health of Chronic Carriers.....	139
I. Auto-Re-Infection.....	140
J. The Psychic Condition of Chronic Carriers.....	142
K. The Causes of Death of Chronic Carriers.....	143
VIII. NORWEGIAN PUBLIC HEALTH MEASURES AGAINST INFECTION BY KNOWN CARRIERS.....	145
A. Statement by A Person Discharging Typhoid or Paratyphoid Bacilli....	146
B. Infection by Carriers Known to be so Earlier.....	148

Section III.

TREATMENT OF CHRONIC CARRIERS.

IX. NON-SURGICAL TREATMENT OF FAECAL CARRIERS.....	150
A. Soluble Iodophthalein.....	150
B. Sulphonamide Preparations.....	154

	Page
1. <i>Sulphanilamide</i>	154
2. <i>Sulphapyridine</i>	155
3. <i>Sulphaguanidine</i>	155
4. <i>Succinylsulphathiazole</i>	157
C. Penicillin-Sulphathiazole	157
D. Other Antibiotics	160
1. <i>Streptomycin and Aureomycin</i>	160
2. <i>Chloromycetin (Chloramphenicol)</i>	161
E. Present Considerations	162
X. SURGICAL TREATMENT OF FAECAL CARRIERS	163
A. An Operation on Account of Attacks of Biliary Colic	164
B. An Operation on Account of the Carrier State	165
1. <i>Cholecystotomy</i>	166
2. <i>Cholecystectomy</i>	166
3. <i>Drainage</i>	166
4. <i>Cholecystgastrostomy</i>	168
5. <i>Appendectomy</i>	168
C. Results	169
XI. OPERATIONS ON CHRONIC FAECAL CARRIERS IN WESTERN NORWAY	175
A. Cholecystotomy	175
B. Cholecystectomy of Chronic Typhoid Carriers	177
C. Cholecystectomy of Chronic Paratyphoid B Carriers	190
D. The Results of Cholecystectomy	191
E. The Interval between Infection and Operation	192
F. Symptoms Referable to the Bile Passages Before Operation	195
G. Operation Findings	196
1. <i>Adhesions about the Gall-Bladder</i>	196
2. <i>The Histology of the Gall-Bladder</i>	198
3. Gall-Stones	199
4. <i>The Bacteriology of the Gall-Bladder Contents</i>	200
H. Two Chronic Typhoid Carriers with no Pathological Changes in the Sterile Gall-Bladder.	201
I. A Comparison of the Histology of the Gall-Bladder with Gall-Stone Formation	201
J. A Comparison of the Roentgenological Findings Before Operation with the Gall-Bladder Findings at Operation	203
XII. BACTERIOLOGICAL EXAMINATIONS AFTER THE OPERATION	205
A. Chronic Carriers with only Negative Bacteriological Examinations after the Operation	205
B. Bacteriological Examinations of the Faeces after the Operation	207
C. Bacteriological Examinations of the Duodenal Contents after the Operation	210
D. Bacteriological Examinations of the Bile Fistula after the Operation	212
E. A Comparison of the Duration of the Positive Faeces or Duodenal Contents with the Duration of the Positive Bile Fistula after the Operation	216
F. Negative Tests Required before the Carriers are Considered Cured after the Operation	217
G. Could the Operation have been Avoided in Any of the Cases in Which it Proved Unsuccessful?	220

	Page
H. Where is the Focus of Infection Situated When Chronic Carriers Continue as Such after the Operation?	221
I. Is it Likely that Some of the Chronic Carriers Undergoing an Operation would have been Cured without It?.....	222
J. The Indications and Time for Operation	224
XIII. THE TREATMENT OF URINARY CARRIERS	225
A. Non-Surgical Treatment.....	225
1. <i>Urinary Antiseptics</i>	225
2. <i>Antibiotics</i>	227
3. <i>Vaccine Treatment</i>	228
B. Surgical Treatment	228
XIV. THE TREATMENT OF TYPHOID AND PARATYPHOID B SINUSES ..	233
A. Surgical Treatment	234
B. Vaccine Treatment.....	235
C. Antibiotics	238

Section IV.

CASE REPORTS OF OPERATED FAECAL CARRIERS IN WESTERN NORWAY	239
SUMMARY AND CONCLUSIONS	348
BIBLIOGRAPHY	356

UNIVERSITETET I BERGEN
ARBOK 1950

Medisinsk rekke
Nr. 1

Typhoid and Paratyphoid B Carriers and their Treatment

Experiences from Western Norway

BY

TH. M. VOGELSÅNG, M. D.

Professor of Bacteriology and Serology,
University of Bergen
Director, Gade's Institute,
Bergen, Norway

WITH 3 FIGURES

Printed November 1950.

A.S. JOHN GRIEGS BOKTRYKKERI

Nr. 1172.

*This publication is dedicated to
the memory of my former chief*

Magnus Haaland, M. D.

Contents.

	Page
PREFACE	11

Section I.

THE CARRIER STATE

I. INTRODUCTION	13
II. HISTORICAL REVIEW	14
A. William Budd's Conception of Typhoid as a Contagious Disorder.....	14
B. Max von Pettenkofer's Theory	16
C. Current Opinion in Norway in the 1860ties.....	16
D. Homann's and Hartwig's Epidemiological Investigations	17
E. The Discovery of the Typhoid Bacillus	19
F. The Discovery of the Carrier State	20
G. The Discovery of the Paratyphoid B Bacillus	21
H. The Dissociation of the Paratyphoid B Bacillus from the Closely Related Meat-Poisoning Bacteria.....	23
III. TEMPORARY AND CHRONIC CARRIERS	25
A. Definition	25
B. Classification	26
C. Temporary Carriers	29
1. <i>Incubationary Carriers</i>	29
2. <i>Healthy Transient Carriers</i>	30
3. <i>Convalescent Carriers</i>	34
D. Chronic Carriers	35
E. Temporary versus Chronic Carriers	35
F. The Occurrence of Temporary and Chronic Carriers	35
G. The Duration of the Discharge of the Specific Organism	39
H. The Duration of the Chronic Carrier State.....	42
I. Late Spontaneous Recovery from the Carrier State.....	43
J. The Sex and Age of Temporary and Chronic Carriers.....	45
IV. THE SITE OF PROLIFERATION OF THE SPECIFIC GERM	48
A. Pathogenesis	48
B. The Discharge of <i>S.typhosa</i> and <i>S.schottmuelleri</i>	49
1. <i>Discharge of the Specific Germ with the Faeces</i>	49
a. Intestinal Carriers	50
b. Gall-Bladder Carriers	54
(1) Ascension from the Duodenum through the Bile Ducts.....	54
(2) The Hematogenous Route through the Gall-Bladder Wall.....	57

	Page
(3) The Lymphatic Route	60
(4) Infection by direct Extension	60
(5) Infection from the Liver through the Bile Stream.....	60
(6) The Development of the Gall-Bladder Carrier State.....	62
(7) Cholecystitis typhosa	63
(8) Cholelithiasis and the Carrier State.....	63
(9) The Age and Sex Distribution of Cholelithiasis	66
(10) Bacteriological Examinations of Gall-Bladders Containing Gall-Stones	67
c. Liver or Duct Carriers	67
d. Pancreatic Carriers.....	70
2. <i>Discharge of the Specific Germ with the Urine</i>	71
(1) Ascending Infection through the Urethra	72
(2) Hematogenous Infection of the Kidneys	73
(3) Nephritis or Pylonephritis typhosa suppurativa	74
(4) Infection of the Recesses of the Urinary Tract.....	78
3. <i>Discharge of the Specific Germ through Sinuses</i>	79
4. <i>Discharge of the Specific Germ in other Ways</i>	80
V. LABORATORY PROCEDURES IN THE DETECTION AND CONTROL OF THE CARRIER STATE.....	80
A. The Taking of Specimens for Bacteriological Examination.....	80
B. The Transport of Specimens for Bacteriological Examination.....	81
C. Isolation of the Specific Organism from Faeces and Urine.....	82
D. The Technique of Duodenal Tubage	84
E. Detection of Chronic Carriers by Duodenal Tubage	85
F. The Place of Duodenal Tubage in the Control of Convalescents.....	86
G. Identification of <i>S.typhosa</i> and <i>S.schottmuelleri</i>	88
H. Fermentative Types of <i>S.typhosa</i>	90
I. Fermentative Types of <i>S.schottmuelleri</i>	92
J. Phage-Typing of <i>S.typhosa</i>	94
K. Phage-Typing of <i>S.schottmuelleri</i>	96
L. Serological Typing of <i>S.typhosa</i>	97
M. Serological Typing of <i>S.schottmuelleri</i>	98
N. Detection of Chronic Carriers by Agglutination Tests.....	99
O. Special Widal Technique in the Detection of Chronic Carriers.....	101
P. The Importance of the Vi Agglutinin for the Detection of Chronic Typhoid Carriers	103
Q. Vi Agglutination in the Control of Typhoid Convalescents	104

Section II.

CHRONIC TYPHOID AND PARATYPHOID B CARRIERS IN WESTERN NORWAY.

VI. THE OCCURRENCE OF TYPHOID AND PARATYPHOID B IN WESTERN NORWAY	106
A. The Geographical Scope of the Material.	106
B. The Number of Typhoid and Paratyphoid B Cases in Western Norway since 1900.....	107

	Page
C. Typhoid and Paratyphoid B in Western Norway during World War II....	110
D. The Distribution of Typhoid and Paratyphoid B in Western Norway.....	111
E. The Demonstration of the First Chronic Typhoid and Paratyphoid B carriers in Western Norway.....	111
F. The Guiding Principles for the Campaign against Typhoid and Paratyphoid B in Western Norway.....	112
G. The Causes of the Regression of Typhoid and Paratyphoid B in Western Norway.....	114
H. The Guiding Principles for the Further Campaign against Typhoid and Para- typhoid B in Western Norway.....	115
VII. THE CHRONIC TYPHOID AND PARATYPHOID B CARRIERS IN WES- TERN NORWAY.....	116
A. The Number of Chronic Carriers.....	116
B. The Sex and Age of the Chronic Carriers at the Time of Detection.....	119
C. The Sex and Age of the Chronic Carriers at the Time of Infection.....	120
D. The Interval between Infection and the Detection of the Carrier State....	123
E. The Occupation of the Chronic Carriers.....	125
F. The Transmission of the Infection by Chronic Carriers.....	128
1. <i>The Infectious Housewife</i>	128
2. <i>The Carrier in a Home not Infected Hitherto</i>	129
3. <i>Transmission of the Disease on Change of Address</i>	129
4. <i>The Domestic Servant Who Spread Infection in an Already Infected Di- strict</i>	130
5. <i>Infection through Food</i>	130
5. <i>Infection through Water</i>	131
7. <i>Infection through Milk</i>	132
8. <i>A Milk-Borne Typhoid Epidemic with Sporadic Cases</i>	132
9. <i>The Discovery of the Source of Infection of Milk-Borne Epidemics</i>	133
10. <i>When the Milk-Borne Character of an Epidemic is in Doubt</i>	134
11. <i>The Search for the Source of Infection of a Typhoid Epidemic</i>	135
12. <i>Infection from Different Sources</i>	137
G. Multiple Chronic Carriers.....	137
H. The Health of Chronic Carriers.....	139
I. Auto-Re-Infection.....	140
J. The Psychic Condition of Chronic Carriers.....	142
K. The Causes of Death of Chronic Carriers.....	143
VIII. NORWEGIAN PUBLIC HEALTH MEASURES AGAINST INFECTION BY KNOWN CARRIERS.....	145
A. Statement by A Person Discharging Typhoid or Paratyphoid Bacilli....	146
B. Infection by Carriers Known to be so Earlier.....	148

Section III.

TREATMENT OF CHRONIC CARRIERS.

IX. NON-SURGICAL TREATMENT OF FAECAL CARRIERS.....	150
A. Soluble Iodophthalein.....	150
B. Sulphonamide Preparations.....	154

	Page
1. <i>Sulphanilamide</i>	154
2. <i>Sulphapyridine</i>	155
3. <i>Sulphaguanidine</i>	155
4. <i>Succinylsulphathiazole</i>	157
C. Penicillin-Sulphathiazole	157
D. Other Antibiotics	160
1. <i>Streptomycin and Aureomycin</i>	160
2. <i>Chloromycetin (Chloramphenicol)</i>	161
E. Present Considerations	162
X. SURGICAL TREATMENT OF FAECAL CARRIERS	163
A. An Operation on Account of Attacks of Biliary Colic	164
B. An Operation on Account of the Carrier State	165
1. <i>Cholecystotomy</i>	166
2. <i>Cholecystectomy</i>	166
3. <i>Drainage</i>	166
4. <i>Cholecystgastrostomy</i>	168
5. <i>Appendectomy</i>	168
C. Results	169
XI. OPERATIONS ON CHRONIC FAECAL CARRIERS IN WESTERN NORWAY	175
A. Cholecystotomy	175
B. Cholecystectomy of Chronic Typhoid Carriers	177
C. Cholecystectomy of Chronic Paratyphoid B Carriers	190
D. The Results of Cholecystectomy	191
E. The Interval between Infection and Operation	192
F. Symptoms Referable to the Bile Passages Before Operation	195
G. Operation Findings	196
1. <i>Adhesions about the Gall-Bladder</i>	196
2. <i>The Histology of the Gall-Bladder</i>	198
3. Gall-Stones	199
4. <i>The Bacteriology of the Gall-Bladder Contents</i>	200
H. Two Chronic Typhoid Carriers with no Pathological Changes in the Sterile Gall-Bladder.	201
I. A Comparison of the Histology of the Gall-Bladder with Gall-Stone Formation	201
J. A Comparison of the Roentgenological Findings Before Operation with the Gall-Bladder Findings at Operation	203
XII. BACTERIOLOGICAL EXAMINATIONS AFTER THE OPERATION	205
A. Chronic Carriers with only Negative Bacteriological Examinations after the Operation	205
B. Bacteriological Examinations of the Faeces after the Operation	207
C. Bacteriological Examinations of the Duodenal Contents after the Operation	210
D. Bacteriological Examinations of the Bile Fistula after the Operation	212
E. A Comparison of the Duration of the Positive Faeces or Duodenal Contents with the Duration of the Positive Bile Fistula after the Operation	216
F. Negative Tests Required before the Carriers are Considered Cured after the Operation	217
G. Could the Operation have been Avoided in Any of the Cases in Which it Proved Unsuccessful?	220

	Page
H. Where is the Focus of Infection Situated When Chronic Carriers Continue as Such after the Operation?	221
I. Is it Likely that Some of the Chronic Carriers Undergoing an Operation would have been Cured without It?.....	222
J. The Indications and Time for Operation	224
XIII. THE TREATMENT OF URINARY CARRIERS	225
A. Non-Surgical Treatment.....	225
1. <i>Urinary Antiseptics</i>	225
2. <i>Antibiotics</i>	227
3. <i>Vaccine Treatment</i>	228
B. Surgical Treatment	228
XIV. THE TREATMENT OF TYPHOID AND PARATYPHOID B SINUSES ..	233
A. Surgical Treatment	234
B. Vaccine Treatment.....	235
C. Antibiotics	238

Section IV.

CASE REPORTS OF OPERATED FAECAL CARRIERS IN WESTERN NORWAY	239
SUMMARY AND CONCLUSIONS	348
BIBLIOGRAPHY	356

