
Crevice Fluid Updated

Monographs in Oral Science

Vol. 12

Editor

Howard M. Myers, Philadelphia, Pa.



S. Karger · Basel · München · Paris · London · New York · Sydney

Crevicular Fluid Updated

G. Cimasoni

Section of Dental Medicine, Faculty of Medicine,
University of Geneva, Geneva

40 figures and 5 tables, 1983



S. Karger · Basel · München · Paris · London · New York · Sydney

Monographs in Oral Science

National Library of Medicine, Cataloging in Publication

Cimasoni, G.

Crevicular fluid updated

G. Cimasoni; 2nd ed. – Basel, New York, Karger, 1983.

(Monographs in oral science; v. 12)

Rev. ed. of: *The crevicular fluid*. 1974.

1. Gingiva 2. Gingivitis – Diagnosis I. Title II. Series

W1 MO568E v. 12 [WU 240 C573c]

ISBN 3–8055–3705–0

Drug Dosage

The author and publisher have exerted every effort to ensure that drug selection and dosage set forth in this text are in accord with current recommendations and practice at the time of publication. However, in view of ongoing research, changes in government regulations, and the constant flow of information relating to drug therapy and drug reactions, the reader is urged to check the package insert for each drug for any change in indications and dosage and for added warnings and precautions. This is particularly important when the recommended agent is a new and/or infrequently employed drug.

All rights reserved

No part of this publication may be translated into other languages, reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, recording, microcopying, or by any information storage and retrieval system, without permission in writing from the publisher.

© Copyright 1983 by S. Karger AG, P.O. Box, CH–4009 Basel (Switzerland)

Printed in Switzerland by Boehm-Hutter AG, Reinach BL

ISBN 3–8055–3705–0

Contents

Acknowledgements	VII
Foreword	VIII
I. Introduction	1
II. The Gingival Sulcus	2
A. Gingival Sulcus – Gingival Pocket – Periodontal Pocket	4
B. Gingival Sulcus and Fluid	9
III. Gingival Vasculature and Crevicular Fluid	14
IV. The Permeability of Junctional and Oral Sulcular Epithelia	20
A. Passage from Connective Tissue into the Sulcus	20
B. Passage from the Sulcus into the Connective Tissue	21
C. Passage of Substances through Pathological or Experimentally Modified Gingival Sulcus	22
V. Recent Concepts on the Mechanism of Gingival Fluid Production	24
A. Effect of Histamine	26
B. Preinflammatory Gingival Fluid	27
C. Concentration of Proteins in Gingival Fluid	27
D. Passage of Fluid and Polymorphonuclear Leukocytes in the Sulcus	27
E. Inflammatory Changes of the Basal Membrane	27
F. Morphology of the Junctional Epithelium	28
G. Mechanical Stimuli and Gingival Fluid	28
VI. Methods of Collection	29
A. Sampling of Crevicular Fluid by Means of Absorbing Paper Strips	29
1. Evaluation of the Amount of Fluid Collected	30
2. Fluid Flow during the Collection	35
3. Contamination by Saliva	36
4. Evaporation	37
B. Sampling of Crevicular Fluid by Means of Micropipettes	37
C. Gingival Washings	38
1. The Method of Oppenheim	38
2. The Method of Skapski and Lehner	40
D. Other Methods	42
E. The Volume of Gingival Fluid	43
VII. Composition	45
A. Cellular Elements	45
1. Epithelial Cells	46
2. Leukocytes	47
3. Bacteria	53

B. Electrolytes	53
1. Sodium Concentration	54
2. Potassium Concentration	55
3. Sodium:Potassium Ratio	55
4. Fluoride in Gingival Fluid	58
5. The Concentration of Other Ions	59
C. Organic Compounds	60
1. Carbohydrates	61
2. Proteins	62
3. Lipids	68
D. Metabolic and Bacterial Products	69
1. Lactic Acid	69
2. Hydroxyproline	69
3. Prostaglandins	70
4. Urea and the pH of Gingival Fluid	70
5. Endotoxin	71
6. Cytotoxic Substances	72
7. Antibacterial Factors	72
E. Enzymes and Enzyme Inhibitors	74
1. Acid Phosphatase	75
2. Alkaline Phosphatase	77
3. Pyrophosphatase	79
4. β -Glucuronidase	79
5. Lysozyme	82
6. Hyaluronidase	83
7. Proteolytic Enzymes	84
8. Lactic Dehydrogenase	98
9. General Remarks	99
VIII. Clinical Significance	103
A. General Health and Gingival Fluid	103
1. Circadian Periodicity	103
2. Gingival Fluid Flow and Sex Hormones	103
3. Gingival Fluid in Diabetic Patients	106
B. Measurement of Gingival Inflammation	108
1. Presence or Absence of Fluid in Healthy Sulci	108
2. Gingival Fluid as a Sign of Subclinical Inflammation	110
3. Gingival Fluid Flow as Related to Histological Inflammatory Changes	110
4. Gingival Fluid Flow and Clinical Indices of Inflammation	111
C. Drugs in Gingival Fluid	116
D. Influence of Mechanical Stimuli	118
E. Periodontal Therapy and Crevicular Fluid	121
IX. Summary and Conclusions	124
References	126
Subject Index	146
Author Index	150

Acknowledgements

The investigations in the author's laboratory have been supported by grants of the University of Geneva, the Swiss National Fund for Scientific Research (No. 4908, 3.228.69, 3.663.71 and 3.604-0.75), the Swiss ARPA and the Swiss Odontological Society.

I wish to thank my former teacher Dr. *Howard Myers* for his assistance in editing the monograph.

Dr. *Rolf Attström* and Dr. *Mark Wilton* have kindly agreed to read the manuscript: I wish to thank them for the helpful criticism. I also thank Dr. *Michel Alfano* for his encouragement and his suggestions.

The research summarized in the present monograph represents the joint effort of many individuals: they are all mentioned in the book. I would like to express a special thanks to the technicians who have so actively helped through the last 20 years: *M. Tantardini*, *B. Wipperfurth*, *C. Schroeder*, *N. Léonard*, *E. Andersen* and *I. Condacci*. My secretary *H. Bosshard* has been able to type and retype the manuscript without any help of electronic machines.

Writing this monograph would not have been possible without the courtesy of the research workers who have kindly agreed to send their original documents. In order of their appearance in the book they are: Prof. *H. Schroeder*, Zürich; Prof. *N. Brill*, Oslo; Prof. *J. Egelberg*, Loma Linda; Prof. *R. Frank*, Strasbourg; Dr. *W. Goldberg*, Lyon; Prof. *J. Lindhe*, Gothenburg and Prof. *S. Socransky*, Boston.

Finally I am grateful to the staff of my division, especially to *Jacques Matter* and *Pierre Baehni*, for taking good care of the clinical teaching during these many months of writing.

Geneva, September 1982

Foreword

Nearly 10 years have passed since Prof. *Cimasoni* first presented his monograph on gingival fluid. Since then continuing studies of the cellular and humoral composition of the gingival fluid as well as the experimental and clinical use of gingival fluid flow measurements have contributed significantly to our understanding of the physiology of the dentogingival region. These studies have provided us with information regarding various aspects of periodontal health and disease and also given us a foundation for an understanding of pathologic processes in the dentogingival area.

The formation of gingival fluid appears to be a highly specialized function in the gingiva aiding in the defence of this region against bacterial attack but also, at the same time, forming the possible basis for some pathologic changes. In this second edition of his monograph, Prof. *Cimasoni* has himself added to the fundamental work on gingival fluid performed since he first published his monograph. He once again demonstrates in this new edition a penetrating and critical knowledge of the field. Of special interest is that experiments and methods used in the studies of gingival fluid are described in some detail. He has a particular ability to integrate his own pioneering research in this area with that of other investigators. The reader leaves the book with a deeper understanding of the gingival fluid, its composition and possible roles, both in gingival health and disease.

Periodontologists, both clinicians and research workers, will especially welcome this book which presents in an intelligent way the current knowledge of gingival fluid, but Prof. *Cimasoni* deserves thanks from all students of oral biology and from the dental profession at large for this excellent volume.

Rolf Attström

Department of Periodontology
School of Dentistry
Carl Gustavs väg 34
S-214 21 Malmö
Sweden

Mark Wilton

Department of Oral Immunology and
Microbiology
Guy's Hospital Medical and Dental School
London SE1 9RT
England