

# SWISS DENT

Thomas M. Marthaler  
(1929 – 2020)  
Pioneer of caries prevention  
Epidemiologist and statistician  
Memorial event  
Zurich, 4 September 2021

Swiss Journal of Oral  
Preventive and Curative  
Medicine

Schweizerische  
Zeitschrift  
für orale Präventiv-  
und Kurativmedizin

Revue suisse  
d'Odontostomatologie  
préventive  
et thérapeutique

Rivista svizzera  
di Odontologia  
e Stomatologia  
preventiva e terapeutica



1/22

# Hans R. Mühlemann

Pioneer in the Research of the  
Oral Diseases Caries and Periodontitis

«Companions Remember»

SWISS DENT 2/18

## Hans R. Mühlemann On his 100<sup>th</sup> birthday

\* August 26, 1917 in St. Moritz GR  
† June 1, 1997 in Zurich,  
Switzerland



## Pioneer in the Research of the Oral Diseases Caries and Periodontitis

### His Life – His Teaching – His Work

(Photo: Archives of Dr. med. dent.  
Herbert F. Wolf. CH-8134 Adliswil,  
Switzerland)

#### INTRODUCTION

Hans R. Mühlemann: Inspiration –  
Teacher – Example – Friend

– *Klaus G. König, Nijmegen NL*

#### CONTRIBUTIONS

Hans R. Mühlemann – His Life and  
His Work

– *Werner H. Mörmann, Zurich*

Hans R. Mühlemann – Pioneer in the  
Research of the Oral Diseases Caries and  
Periodontitis

The Liaison between Family and Science

– *Interview with Mrs. Marietta Jung-  
Mühlemann, Tarzis Jung-  
Mühlemann, Meilen, and Ulrich P. Saxer,  
Forch*

Hans R. Mühlemann – His Life

– *Source: Private archives of Mrs.  
Marietta Jung-Mühlemann, Meilen*

#### HANS R. MÜHLEMANN – COMPANIONS REMEMBER

Hans R. Mühlemann –  
Companions Remember

– *Thomas Imfeld, Stäfa ZH*

Hans R. Mühlemann

Professor Hans R. Mühlemann – ‚Chef‘,  
Mentor, Friend

– *Thomas M. Hassell, High Point,  
North Carolina, U.S.A.*

Hans R. Mühlemann

Who was «Mühli» for us?  
Personally, as our ‚Chef‘, as our Friend?

– *Thomas Imfeld, Stäfa ZH*

Hans R. Mühlemann

«Mühli» as ‚Chef‘, Team Leader,  
Friend and Companion in the Dental  
Practice – Two Former Team Members  
Remember

– *Bernhard Lüscher, Elgg*

– *Heinz Ochsenbein, Winterthur*

Hans R. Mühlemann

Thomas M. Marthaler and  
Klaus G. König – The «Twin Brothers»  
of Caries Prevention in Switzerland –  
Remember

– *Thomas M. Marthaler, Zurich*

– *Klaus G. König, Nijmegen NL*

Hans R. Mühlemann

Remembering Professor Hans R.  
Mühlemann and My Time at the  
«Zahnärztliches Institut der Universität  
Zürich» in 1971

– *Anna Matsuishi Pattison,  
Los Angeles, U.S.A.*

Hans R. Mühlemann

My Time with «Mühli»

– *Thomas Reich, Schwerzenbach*

Hans R. Mühlemann

My Memories of Working with «Mühli»

– *Heinz H. Renggli, Malden NL*

Hans R. Mühlemann

Pioneer in the Research of the Oral  
Diseases Caries and Periodontitis

Two Companions – Herbert F. Wolf  
and Ulrich P. Saxer – Report their  
Memories of their Great Teacher  
and Mentor

– *Discussion with Herbert F. Wolf,  
Adliswil, and Ulrich P. Saxer, Forch*

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## CONTENTS

Thomas M. Marthaler  
(1929 – 2020)  
Pioneer of caries prevention  
Epidemiologist and statistician



Memorial event  
Zurich, 4 September 2021  
Special Edition  
SWISS DENT 43 (2022) No. 1

### NOTICES FROM THE PUBLISHER

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Imprint 44

Front page – photo credit  
– *Thomas M. Marthaler, photographed on  
his 80th birthday*  
(Photo: Archive Marianne Marthaler)

Publishing Programme Inside Back Cover

### EDITORIAL

Prof. Dr. med. dent. Thomas M. Marthaler –  
grounded visionary and beacon of preven-  
tive dentistry  
– *Thomas Imfeld* 3

### MEMORIAL EVENT OF 4 SEPTEMBER 2021 SHORT ADDRESSES

Around 120 colleagues, musicians, friends,  
acquaintances and relatives met in Zurich  
on 4 September 2021 to remember the life  
of Thomas M. Marthaler  
– *Barbara Bulambo-Marthaler* 5

In memory of Thomas M. Marthaler  
(1929 – 2020)  
Who played a key role in global preven-  
tion research, improving the quality of life  
around the world  
– *Bärbel Kiene* 9

«Thomas Marthaler was a selfless and in-  
genious individual»  
– *Ulrich P. Saxer* 11

### REPRINT OF TEXTS IN SWISS DENT AND OTHER PUBLICATIONS RELATING TO THOMAS MARTHALER

Seen up close:  
Reminiscing on the life of Professor Th. M.  
Marthaler, Zurich, on his 60th birthday  
– *Klaus G. König* 19

With a probe and a clarinet at 80  
Professor Thomas M. Marthaler celebrates  
his 80th birthday  
– *Thomas Imfeld* 22

Changes in dental caries in Zurich school-  
children over a period of 45 years  
– *Steiner, Marcel; Menghini, Giorgio;*  
*Marthaler, Thomas M.; Imfeld, Thomas* 25

### THOMAS M. MARTHALER SALT FLUORIDATION WHO

Thomas M. Marthaler and salt fluoridation  
Literature references concerning his activi-  
ties in the service of WHO  
– *SWISS DENT editorial team* 36

### OBITUARIES

Prof. em. Dr. med. dent. Thomas M.  
Marthaler died on 13 November 2020 at  
the age of 91 after a long illness. He leaves  
behind an impressive life's work as a suc-  
cessful preventive dentist, epidemiologist  
and statistician. The good dental health  
enjoyed by the Swiss population today is  
thanks to his tireless work.  
– *Thomas Imfeld* 37

DGPZM mourns the loss of Prof. Dr. Thomas  
M. Marthaler  
– *Stefan Zimmer, German Society  
for Preventive Dentistry (DGPZM)* 39

Thomas Marthaler  
Scientist, Musician, Friend  
– *Klaus König, Walter Künzel,  
John Weatherell* 40

ORCA Has Lost One of Its Pioneers  
– *Christian Splieth, European Organisation  
for Caries Research (ORCA)* 41

«We've got a little book!»  
On the death of the Swiss oral epidemiol-  
ogist Prof. Dr. Thomas Marthaler  
– *Hanns-Werner Hey* 43

# Hans R. Mühlemann

Pionier der Erforschung der Mundkrankheiten  
Karies und Parodontitis

«Weggefährten erinnern sich»

SWISS DENT 1/18



Zum 100. Geburtstag  
\* 26. August 1917 in St. Moritz GR  
† 1. Juni 1997 in Zürich

(Bildnachweis: Archiv Dr. med. dent.  
Herbert F. Wolf, CH-8134 Adliswil)

## EINLEITUNG

Hans R. Mühlemann: Inspirator – Lehrer –  
Vorbild – Freund  
– *Klaus G. König, Nijmegen NL*

## BEITRÄGE

Hans R. Mühlemann – Leben und Werk  
– *Werner H. Mörmann, Zürich*

Hans R. Mühlemann – Pionier der  
Erforschung der Mundkrankheiten  
Karies und Parodontitis  
Der Spagat zwischen Familie und  
Wissenschaft  
– *Gespräch mit Frau Marietta Jung-  
Mühlemann, Tarzis Jung-Mühlemann,  
Meilen, und Ulrich P. Saxer, Forch*

Hans R. Mühlemann – Sein Lebenslauf  
– *Quelle: Privatarchiv von  
Frau Marietta Jung-Mühlemann,  
Meilen*

Hans R. Mühlemann – His Life  
– *Source: Private archives of  
Ms Marietta Jung-Mühlemann,  
Meilen*

## HANS R. MÜHLEMANN – WEGGEFÄHRTEN ERINNERN SICH

Hans R. Mühlemann –  
Weggefährten erinnern sich  
– *Thomas Imfeld, Stäfa ZH*

Hans R. Mühlemann  
Professor Hans R. Mühlemann –  
«Chef», Mentor, Freund  
– *Thomas M. Hassell, High Point,  
North Carolina, USA*

Hans R. Mühlemann  
Professor Hans R. Mühlemann –  
«Chef», Mentor, Friend  
– *Thomas M. Hassell, High Point,  
North Carolina, USA*

Hans R. Mühlemann  
Was war «Mühli» für uns? Persönlich,  
als Chef, als Freund?  
– *Thomas Imfeld, Stäfa ZH*

Hans R. Mühlemann  
«Mühli» als Chef, Teamleader, Freund  
und Begleiter in die Praxis –  
Zwei Ehemalige erinnern sich  
– *Bernhard Lüscher, Elgg  
– Heinz Ochsenben, Winterthur*

Hans R. Mühlemann  
Thomas M. Marthaler und  
Klaus G. König  
Zwei frühe (Zwillings-)Weggefährten  
erinnern sich  
– *Thomas M. Marthaler, Zürich  
– Klaus G. König, Nijmegen NL*

Hans R. Mühlemann  
Remembering Professor Hans R.  
Mühlemann and My Time at the  
«Zahnärztliches Institut der Universität  
Zürich» in 1972  
– *Anna Matsuishi Pattison, Los Angeles,  
USA*

Hans R. Mühlemann  
Meine Zeit bei «Mühli»  
– *Thomas Reich, Schwerzenbach ZH*

Hans R. Mühlemann  
Meine Erinnerungen an die Zusammen-  
arbeit mit «Mühli»  
– *Heinz H. Renggli, Malden NL*

Hans R. Mühlemann –  
Pionier der Erforschung der  
Mundkrankheiten Karies und Parodontitis

Zwei Weggefährten – Herbert F. Wolf  
und Ulrich P. Saxer – berichten über ihre  
Erinnerungen an ihren grossen Mentor  
und Lehrer  
– *Gespräch mit Herbert F. Wolf, Adliswil,  
und Ulrich P. Saxer, Forch*

## ORIGINALARBEITEN

Minimal invasive Rekonstruktionen mit  
Adhäsivbrücken  
– *Nicola U. Zitzmann, Basel*

Dental Fitness – Das zukünftige Modell  
einer nachhaltigen Zahnmedizin  
– *Ivo Krejci, Genf*

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Memorial event for Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020);  
Zurich, 4 September 2021



The author of the editorial in sporty attire. The picture was taken in July 2019 at the Blüemlisalp SAC hut at 2,840 metres above sea level. (Image: Carola Imfeld)

# Prof. Dr. med. dent. Thomas M. Marthaler – grounded visionary and beacon of preventive dentistry

Dear Reader

Thomas Marthaler passed away on 13 November 2020 at the age of 91 after a long illness. Few have made such a lasting difference to the oral health of the general population.

His pioneering work in group and collective caries prevention and his initiatives to introduce salt fluoridation in Switzerland, Europe and Central and South America made him the best known and most influential preventive dentist of his generation.

The memorial event on 4 September 2021 at the Zurich Zunfthaus zur Meisen and this special issue of SWISS DENT were both intended as a tribute to this very special individual.

The speeches, obituaries and other texts below document and honour Thomas Marthaler's impressive achievements and their national and international significance, but also his amiable personality. His family, friends and colleagues would all like to share some of these aspects with you in these texts.

We hope you enjoy reading, and invite you to take this opportunity to remember Thomas Marthaler as you do.



Prof. em. Dr. med. dent. Thomas Imfeld, MBA

# Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020) Pionier der Kariesprophylaxe – Epidemiologe und Statistiker

Gedenkfeier – Zürich, 4. September 2021

## SWISS DENT 1/21



### EDITORIAL

Prof. Dr. med. dent. Thomas M. Marthaler – geerdeter Visionär und Leuchtturm der Präventivzahnmedizin  
– *Thomas Imfeld*

### GEDENKFEIER VOM 4. SEPTEMBER 2021 GRUSSWORTE – KURZANSPRACHEN

Gedenkfeier für Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020)  
Rund 120 Berufskolleginnen und Berufskollegen, Musiker, Freunde, Bekannte und Verwandte trafen sich am 4. September 2021 in Zürich zu einer Gedenkfeier für Thomas M. Marthaler  
– *Barbara Bulambo-Marthaler*

Zum Gedenken an Professor Thomas M. Marthaler  
– *Grusswort von Regierungsrätin Natalie Rickli*

Zum Gedenken an Thomas M. Marthaler (1929 – 2020)  
Er prägte die weltweite Präventionsforschung und verbesserte damit die Lebensqualität auf der ganzen Welt  
– *Bärbel Kiene*

«Thomas Marthaler war ein selbstloser und genial denkender Mensch»  
– *Ulrich P. Saxer*

### NACHDRUCK VON BEITRÄGEN IN SWISS DENT UND ANDEREN ZEITSCHRIFTEN MIT BEZUG ZU THOMAS M. MARTHALER

Grenzen der Effizienz von Vorbeugungsprogrammen in Schule und Praxis  
– *Thomas M. Marthaler*

### Dentalhygiene

Zunehmender Stellenwert im Gesamtkonzept der Präventivzahnmedizin  
– *Gespräche im Anschluss an die Diplomfeier der Dentalhygiene-Schule Zürich vom 27. März 1981*  
*Gespräch mit Thomas M. Marthaler S. 27 f.*

Das neue Kochsalz mit 0,025% Fluorid  
Eine Sachinformation  
– *Thomas M. Marthaler*

Thuner Rekrutenuntersuchung 1985  
Epidemiologische Untersuchung der oralen Verhältnisse von Rekruten der Schweizer Armee  
– *Gespräch mit Major N. P. Lang*  
– *Station «Karies», Gespräch mit Thomas M. Marthaler, S. 40*

Aus der Nähe betrachtet:  
Reminiszenzen zum 60 Geburtstag von Professor Th. M. Marthaler, Zürich  
– *Klaus G. König*

Mit Sonde und Klarinette zum Achtzigsten  
Prof. Thomas M. Marthaler feiert seinen 80. Geburtstag  
– *Thomas Imfeld*

Kariesverlauf über 45 Jahre bei Zürcher Schülern  
– *Steiner, Marcel; Menghini, Giorgio; Marthaler, Thomas M.; Imfeld, Thomas*

Changes in dental caries in Zurich school-children over a period of 45 years  
– *Steiner, Marcel; Menghini, Giorgio; Marthaler, Thomas M.; Imfeld, Thomas*

### TODESANZEIGE NACHRUFE

Prof. Dr. med. dent. Thomas M. Marthaler 31. März 1929 – 13. November 2020  
– *Todesanzeige in der NZZ vom 20. November 2020*

Prof. em. Dr. med. dent. Thomas M. Marthaler ist am 13. November 2020 nach langer Erkrankung im Alter von 91 Jahren gestorben. Er hinterlässt ein eindrucksvolles Lebenswerk als erfolgreicher Präventivzahnmediziner, Epidemiologe und Statistiker. Die heute gute Zahngesundheit der Schweizer Bevölkerung ist seinem unermüdlichen Schaffen zu verdanken.  
– *Thomas Imfeld*

DGPZM trauert um Prof. Dr. Thomas M. Marthaler  
– *Prof. Dr. S. Zimmer, Deutsche Gesellschaft für Präventivzahnmedizin e.V. (DGPZM)*

Thomas Marthaler:  
Scientist, Musician, Friend  
– *Klaus König, Walter Künzel, John Weatherell*

ORCA Hast Lost One of Its Pioneers  
– *Christian Splieth, The European Organisation for Caries Research (ORCA)*

«Mir hend es Büechli!»  
Zum Tod des Schweizer Oral-Epidemiologen Prof. Dr. Thomas Marthaler  
– *Hanns-W. Hey*

Memorial event for Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020);  
Zurich, 4 September 2021

# Around 120 colleagues, musicians, friends, acquaintances and relatives met in Zurich on 4 September 2021 to remember the life of Thomas M. Marthaler

Dr. med. Barbara Bulambo-Marthaler, Fribourg

*Thomas M. Marthaler passed away on 13 November 2020 after a long illness. The second Covid wave also had an influence on the timing of his passing, and prevented us from paying tribute to his scientific, socio-medical and musical achievements in an appropriate way. As social distancing rules were gradually relaxed, it became possible to organise a memorial event. Some 120 dental colleagues, fellow musicians, friends, acquaintances and relatives gathered at the invitation of the Marthaler family and in compliance with Covid requirements at the Zunfthaus zur Meisen in Zurich early in the afternoon of Saturday, 4 September 2021.*

## The Zunfthaus zur Meisen in Zurich – a historical meeting place

The rich and varied legacy of Thomas Marthaler was recalled in a bouquet of speeches and greetings, with Marianne Marthaler opening the event as the first speaker to look back over the life of her husband. As a decades-long aide and informal associate – editor, networker, «back office» manager – she set the stage for the tributes that followed, and for the event as a whole. An impressive array of memories of the scientist, colleague and pioneer of school dentistry were evoked in speeches by Peter Hotz, Professor of Preventive Dentistry in Bern, and by Professor Ulrich P. Saxer, a colleague of many years in Zurich. Bärbel Kiene, Director Scientific Affairs, Colgate-Palmolive Europe sàrl, Therwil, Switzerland, also spoke impressively of the researcher and individual from a broader professional perspective. They were followed by Dr Hanns-Werner Hey from Münsing, a valued advocate of salt fluoridation in Germany.

A series of greetings was then read out to the guests, starting with a thoughtful tribute by the current Head of the Department of Health for the Canton of Zurich, Government Councillor Natalie Rickli. César Mexia de Almeida, Professor of Preventive Dentistry,

got in touch from Portugal, followed by Klaus G. König in the Netherlands, «brother in arms» and long-time assistant at the Center of Dental Medicine in Zurich. Professor König was represented by his son Thomas, named in honour of Professor Marthaler. The warm greetings from another long-time colleague and friend, Ramon J. Baez in San Antonio, Texas, USA, are reproduced in the grey box as part of this article.

The contributions from Ulrich Saxer and Bärbel Kiene can be read as an English translation on the following pages of this issue of SWISS DENT 43 (2022) No. 1.

## Thomas M. Marthaler – man of many musical talents

An event held to commemorate Thomas Marthaler would not be complete without paying tribute to his musical achievements. Andreas Ambühl, clarinettist and the first recipient of a Masters in Performance Folk Music from the Lucerne School of Music, spoke of their time together as folk musicians. On the subject of music, former local councillor and jazz connoisseur Bruno Kammerer also provided a fascinating account of the Zurich jazz years of the young Thomas Marthaler in the 1940s and 50s. His short speech was con-



The Marthaler family chose a historic location for the memorial event for Thomas M. Marthaler on 4 September 2021: the Zunfthaus zur Meisen in the heart of the old town on Münsterplatz, directly opposite the Fraumünster Church. «Food and drink are very closely related to the vintners' guild. In 1757, the guild for innkeepers, painters and saddlers, founded in 1336, moved into its new guild house at one of the prime locations in Zurich.»

(Quote source: [www.zunfthaus-zur-meisen.ch](http://www.zunfthaus-zur-meisen.ch); image: Barbara Bulambo-Marthaler)





Marianne Marthaler – host of the memorial event for her husband, Thomas M. Marthaler. Taken on 4 September 2021. (Image: Milan Schijatschky)

cluded with an excerpt from a historic original recording of the «Porridge Brass Band», with Thomas Marthaler on the jazz clarinet. As with the private and professional aspects of his life, there would have been much more to say about his music, but there was unfortunately not enough time for it all.

### Moving on to the social part – a typical Marthaler blend of earnest and cheerful

The second part of the event was dedicated to socialising, and for many of those present it was the first time they had been able to



Prof. Dr. med. dent. Ulrich P. Saxer, a committed advocate of oral and general preventive medicine, in his short address to the participants of the memorial service for Thomas M. Marthaler on 4 September 2021.

(Image: Milan Schijatschky)

### Thomas M. Marthaler Celebrating Life

*In early 1990's I participated as member of a team for training and calibrating examiners as prerequisite for development of a national oral health survey in a foreign country. The other experts were Herschel Horowitz and Thomas Marthaler (Tom). This was the beginning of a wonderful relationship; we realized that both of us had similar professional interests, and thus we communicated quite frequently by electronic means and very often personally. We worked together in the area of fluoridation for prevention of dental caries, mainly on the level of planning, systems surveillance and preparation of manuals that could facilitate monitoring, program effectiveness and safety. Together we supported the World Health Organization (WHO) and program administrators at national level in countries that planned, or had implemented programs using fluoride for dental caries prevention and prepared guidelines for effective and safe use. Tom contributed in an outstanding manner as an author and reviewer of countless scientific studies, and millions of people around the world benefited from his contributions.*

*In his personal life, he loved music and was a magnificent clarinet player. I was honored and fortunate for having become one of his close friends. We enjoyed family time in both Switzerland and the United States. When I last visited him in 2018, despite his memory difficulties he smiled when he saw me like when we saw each other in earlier times.*

*Tom was a great professional, I am honored by having been his friend; I learned and enjoyed working together and will miss him always. My prayers to the Lord for the repose of his soul.*

Ramon J. Baez

Former Professor, University of Texas Health Science Center, San Antonio, Texas, USA

meet in person since the Covid crisis began. The guests spent the rest of the afternoon enjoying delicious snacks, chatting and sharing memories. In keeping with Thomas Marthaler's love of delighting others – be they friends, relatives or participants at dental conferences – with his music, the event was accompanied by an upbeat and joyful selection of folk music from Graubünden and Central Switzerland. Long-time music colleagues Heinz Ambühl, Ueli Mooser, Hans A. Toggwiler, Johann Buchli and Andreas Hartmann played a selection of Thomas Marthaler's more than 150 original compositions until the last guests took their leave towards evening. The informal part of this impressive memorial event was thus also a reflection of the philanthropy, conviviality and serene cheerfulness of the deceased.

For his family, and certainly also for many of his colleagues and friends, it is extremely comforting that the legacy of Thomas Marthaler is receiving the attention it deserves, not only through the memorial event, but also with this special issue of SWISS DENT. To a certain extent it can be said that caries prevention in Switzerland has become a victim of its own extraordinary success – the term «prevention dilemma» has returned to public discussion, not least in connection with the coronavirus pandemic. Although the average Swiss population consumes far too much sugar in view of the advance of the food industry, the return of caries to epidemic proportions can be prevented thanks to the dental hygiene educa-

tion received by the current generation of parents. However, the arrival of large numbers of immigrants without a basic knowledge of dental hygiene calls for monitoring and targeted intervention among vulnerable groups of children. Such concepts were already suggested by Thomas Marthaler many years ago. Another concern is the trend towards the uncritical consumption of «natural» sweets, e.g. the popular cereal bars loaded with honey and sticky dried fruit.

Councillor Rickli summed up our hope that «both current and future generations will maintain the forward-looking spirit of Professor Marthaler, remain faithful to the successful direction and continue along the chosen path.»<sup>[1]</sup>

address: «Es wäre wünschenswert, dass die jetzige, aber auch zukünftige Generationen den vorausschauenden Geist von Prof. Marthaler aufnehmen, der erfolgreichen Richtung treu bleiben und den eingeschlagenen Weg weitergehen».

#### **Note from the editor**

This article was first published in German in SWISS DENT 42 (2021) No. 1, p. 5–8. The text published in this issue of SWISS DENT 43 (2022) No. 1, p. 5–8, is an English translation approved by the author.

#### **Notes**

[1] Rickli, Natalie: Zum Gedenken an Professor Thomas M. Marthaler, greeting by Cantonal Councillor Natalie Rickli, Saturday, 4 September 2021, Zunfthaus zur Meisen, Zurich, in: SWISS DENT 42 (2021) No. 1, page 9. The quote is a slightly adapted English translation of the following sentence in Natalie Rickli's welcome

#### **Contact**

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# **Orthopädie – Traumatologie – Chirurgie Arthroskopie – Sportmedizin**

**SWISS MED 1/11 (208 Seiten) Gespräche/Beiträge in SWISS MED  
aus den Jahren 1979 bis 2010**

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#### **Editorial**

Prof. Dr. med. André Gächter

Facharzt für Orthopädische Chirurgie und Traumatologie des Bewegungsapparates

Berit Klinik, 9052 Niedersteufeln (Schweiz)

Zitat aus dem Editorial:

«In diesem Erfahrungsschatz (SWISS MED 1/11; Red.) finden sich so viele Beiträge von prägenden «Grössen», auch von umstrittenen Persönlichkeiten oder Weggefährten, die ohne ein grosses Aufheben davon zu machen bedeutende Weichen gestellt haben: Eine wichtige Fundgrube für alle, die sich für die Entwicklung der Orthopädie und Chirurgie – sowie deren Unterspezialitäten – interessieren.»

#### **Gespräche / Beiträge**

Auf mehr als 200 Seiten findet die Leserin/der Leser

eine Kompilation der in SWISS MED seit der Gründung der Zeitschrift im Jahre 1979 bis und mit 2010 veröffentlichten Live-Interviews mit den damals aktiven Persönlichkeiten.

Zitat aus dem Editorial:

«Wir finden auch Perlen von Interviews und Beiträgen in dieser Ausgabe von SWISS MED (1/11; Red.) zu Themen wie der Entwicklung der Osteosynthese, der Arthroskopie, der Thromboseprophylaxe, der Technischen Orthopädie und Sportmedizin an den verschiedenen Kliniken von Fribourg bis nach St.Gallen.»

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Memorial event for Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020);  
Zurich, 4 September 2021

# In memory of Thomas M. Marthaler (1929 – 2020)

## Who played a key role in global prevention research, improving the quality of life around the world

Bärbel Kiene, Director Scientific Affairs, Colgate-Palmolive Europe sàrl, Therwil, Switzerland

*Dear Marthaler family, colleagues and friends from the dental world, ladies and gentlemen, honoured guests,*

The invitation to speak to you today is surely one of the most honourable of my career:

I started work at the Medical and Scientific Department of GABA in Lörrach in 1996 – at the time home to the German *elmex®* research facility. The first publications I read for my work there were Tomi's studies on *elmex®* and amine fluoride from the 1950s and 60s.

I was particularly impressed at the time by the study that began in 1958 concerning caries inhibition with amine fluoride toothpaste in schoolchildren, based on clinical and radiological data. The conclusions of the study were published in 1968 with seven-year data, making it the longest clinical caries study ever conducted worldwide to date. It showed 50% fewer dentin lesions and 30% fewer fillings following the use of amine fluoride toothpaste. Tomi's studies on *elmex®* gel in Germany and Switzerland also documented a reduction of almost 50% in caries within just a few years.

These data and Tomi's dedicated support for regular fluoride application in individual and group prophylaxis, for example in Swiss schools, but also elsewhere in Europe and ultimately worldwide, led in some cases to a decline of over 90% in caries. In doing so, Tomi not only shaped global prevention research, but also helped to improve quality of life around the world. For me, he was a pioneer and THE authority in prophylaxis at the time – I couldn't imagine having a «normal» conversation with him.

Various encounters, especially at the annual ORCA meetings, soon proved me wrong. He was indeed a very «normal» person, and so much more than that: likeable, open, interested, friendly to a beginner in the field of prophylaxis. And a personality with a life «outside the oral cavity», as was often documented in a musical manner at the ORCA evening events. At many of these events I encountered him together with Professor Klaus König, rightly also known as his preventive «brother in arms».

We came into contact several times in connection with the Tooth-friendly campaign and many scientific events such as the 1998 symposium organised by GABA to mark the 40th anniversary

of Duraphat®. That evening I sat next to Professor Helmut M. F. Schmidt from Marburg, the inventor of Duraphat® varnish, at the time aged 79. He enthusiastically told me how honoured he felt to sit next to Tomi, also 79 at the time, who had been his idol since the beginning of his scientific career. On this evening, he described Tomi as «the man who made prevention public».

We then celebrated both birthdays, whose dates fell just before the symposium, in the evening.

The next memorable experience for me was a morning meeting at ORCA 2009 in Budapest. We met at the breakfast buffet and then enjoyed our meal together. He told me I should call him by his first name, and for me this felt like being officially accepted into the circle of prevention research, like receiving a kind of «dental knighthood».

The last time I met Tomi was in 2013, at the GABA event held to mark the 50th anniversary of amine fluoride in Basel. He and Professor König were our guests of honour, and we spent a wonderful day together. I would like to present you, Marianne and family, with a picture that was taken that evening.

We also continued to have regular contact thereafter, initially directly, and later mostly via Professor Jerome Rotgans in the context of the study on the efficacy and safety of *elmex®* children's toothpaste with 250 and 500 ppm in kindergarten children, which began in 1998 and was supported by GABA/Colgate.

I received my last personal e-mail from Tomi in 2016. He told of his worsening Parkinson's symptoms, which increasingly prevented him from cycling and hiking. This touched me very much, not least because my father was suffering from the same condition at the time.

The news of Tomi's death last year affected me deeply – for me it meant the loss of an exceptional professional and human role model. His loss is of course much more severe for the scientific community of caries research, but even this pales in comparison to the personal loss experienced by you, his relatives. My heartfelt sympathy goes out to you, Marianne, and to your three daughters and their respective families.



From right to left: Professor Thomas M. Marthaler, Bärbel Kiene (GABA/Colgate) and Professor Klaus G. König (Netherlands) at the «50 Years of Amine Fluoride» symposium in Basel, 2013. (Image: Colgate-Palmolive)

Ladies and gentlemen, let me conclude by thanking you for your attention, and by expressing my gratitude to the Marthaler family for their valued invitation to today's event. Without Tomi, the world would be different– worse. And that is so much more than can be said of almost anyone else. He will not be forgotten – not by me, or by my colleagues at GABA, now Colgate.

#### Note from the editor

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Memorial event for Prof. em. Dr. med. dent. Thomas M. Marthaler (1929 – 2020);  
Zurich, 4 September 2021

# «Thomas Marthaler was a selfless and ingenious individual»

Prof. Dr. med. dent. Ulrich P. Saxer (Forch, Canton Zurich)

Dear Marianne, Dear Guests

*Yes, he was a selfless and ingenious individual. It would be impossible to highlight all of his abilities in such a short time. I would like instead to use one example to show you how innovative and determined Marthaler was in the way he both thought and planned.*

Following his state examination and a year abroad in Boston, Tomi Marthaler worked at his father's dental practice not 500 metres from here, on Zurich's Paradeplatz behind Confiserie Sprüngli. Ever since the end of the Second World War, the scientific literature had been full of information on how to stem the tide of tooth decay in children and adults. Medically, it was a clear-cut case. In 1960, Professor Hans Mühlemann<sup>[1]</sup> and Klaus König<sup>[2]</sup> held an international symposium in Zurich to show all dentists, authorities and administrators in the health system what could be done against the «curse of caries».

## In the «pre-Marthaler» age: rampant tooth decay in children and adolescents

Figures 1 and 2 show the prevalence of caries among children and adolescents. Schoolchildren at that time in Switzerland – and almost everywhere in Europe – experienced huge levels of caries, on average four new lesions per year (Fig. 3). All dentists saw their order books for treatments fill up four to six months in advance. Emergency appointments for children were having to be squeezed in for a few minutes over lunchtime or in the evening. The result was usually the extraction of severely decayed teeth, including permanent teeth such as the 6-year molars.

This pained Professor Marthaler dearly! His boss, Prof. Dr. Hans R. Mühlemann, with whom Marthaler still held a part-time position,



Fig. 1: A 6.5-year-old pupil, Zurich 1964 – a normal condition during this period. (From the collection of Thomas M. Marthaler)



Fig. 2: A military recruit at the first Zurich recruit examination in 1971. In addition to significant inflammation of the gums (swelling and redness), the maxillary anterior teeth are heavily affected with open caries, especially the canines. (From the collection of Ulrich P. Saxer; epidemiological study of the Zurich military training school in 1971)

however, highlighted a possible approach to prevention. He provided information to his former fellow students and their wives in his «Study Club», and the children of these colleagues, on reaching the age of 20, showed 80% less tooth decay on average than young people in Zurich as a whole. Some of them even had no caries at all! It was the mothers who had achieved this, because they were not completely overloaded by work in a practice. They taught their children to brush their teeth with fluoride, and also made sure that sugar was consumed in moderation.

## The «Marthaler Plan» for putting prevention into practice

After all the reports on how prevention could be achieved, Marthaler had a plan. It was clearly not to be achieved via busy dentists in their practices. From clinical studies on schoolchildren aimed at testing the efficacy of a toothpaste, he already had experience of how an exact survey of caries prevalence should be carried out.

First, he informed the university and the Zurich cantonal government of his plan. Once the plan had been approved in principle, he began searching for 20 Zurich municipalities for his caries prevention experiment. In parallel, he also sought out control municipalities that did not want to introduce prevention. Through many individual conversations and information sessions, 16 test municipalities were found, as well as some as a control group. Next, the school authorities, parents and teachers needed to be informed about the concept and consent to the experiment.

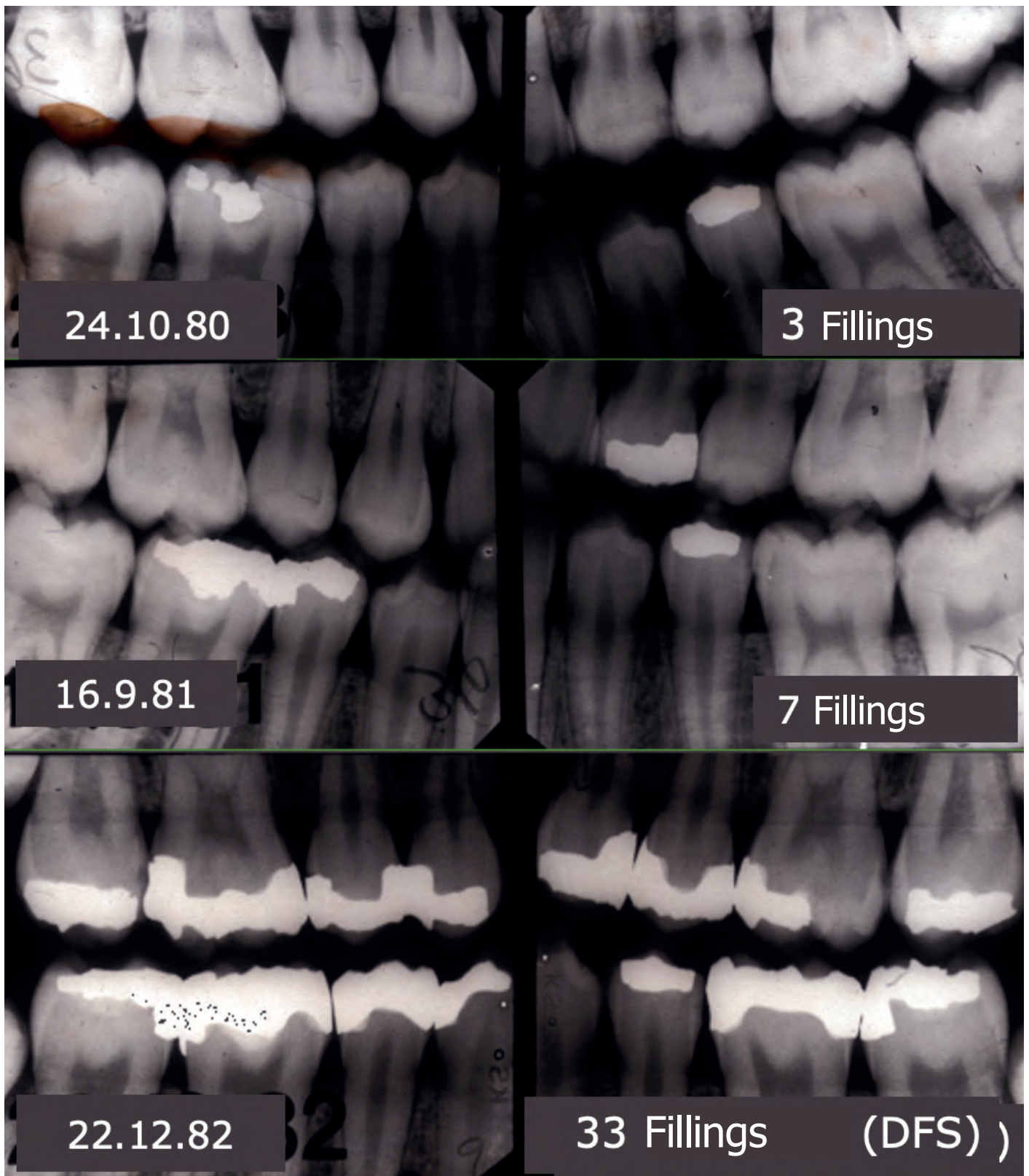


Fig. 3: Development of caries in the posterior region (radiologically) in a 12.5-year-old pupil in Zurich without a prevention campaign in the period from autumn 1980 to December 1982, shortly after leaving school: fillings = DFS, i.e. decayed (D) and filled (F) dental surfaces (S). (Image: Collection of Professor Z. Curilovic/Professor U. P. Saxer).

Those of you who know how difficult it is to introduce something to children at school can surely appreciate the effort involved. About 300 teachers (20 x 6–18), twenty school boards and the local school dentists needed to be informed, and ultimately gave their consent. Choosing the municipalities was not easy. For statistical and logistical reasons, they had to have at least 80, but no

more than 500 to 600 pupils. In 1963, there were around 5,000 schoolchildren in 16 rural municipalities. The infrastructure for dental examinations would have been available in school dental clinics in urban areas, but because of the well-known high turnover of children due to relocation, it would have been almost impossible to follow the children from the beginning of their school career until



Fig. 4: Professor Marthaler at a school, working at an improvised dental workstation with light, compressed air and all the necessary tools for examining a child.  
(Source of image unknown; data taken from: *SWISS DENT* 39 [2018] No. 1, page 75)

1963 and 2009. These data are all still available! Marthaler realised early on that he would have to record the permanent Swiss residents and the new arrivals (children who moved with their parents from abroad, mostly from Eastern countries, and neither they nor their parents understood the local language; see Fig. 9) in special categories. The school buildings were not suitable for clinical examinations, and the children could not be transported to the university in Zurich, so everyone had to be examined on site in temporary, almost «mobile», rooms set up at short notice to avoid disrupting lessons any longer than necessary. This called for improvised «clinical workstations», however, with compressed air, good light and good instruments to be able to collect accurate data on the increase caries (Fig. 4). The results had to be collected quickly, dictated and recorded in such a way that they could be evaluated by computer (after 1980, the data were entered directly into a computer on site). The children's teeth were X-rayed with a view to obtaining reliable caries data. Objections were raised by many of the children's parents, as you can imagine.

Marthaler needed personnel for this campaign. In addition to some women he trained as prevention assistants, mothers were also trained in the communities in two-day courses to spread the message of the campaign to the pupils (Fig. 5).

the end at 14/15 years of age. And this was, after all, the aim of this long-term caries study.

The school dental care campaign included the following points:

Up until 2009, around 5,000 children in the 16 municipalities mentioned had been re-examined every four years (i.e. eleven times). This corresponds to approximately 60,000 examinations between

Firstly, the children learned, first on models and then on themselves, exactly how to clean their teeth. They were informed about the regular use of fluoride products, and urged to consume sugar at mealtimes only.



Fig. 5: A prevention assistant instructing children at school.

(Image: Archive Marianne Marthaler)



Fig. 6: For the «School Dental Care Campaign», brochures were produced for the instruction of teachers, children and pupils in all languages commonly used in Switzerland. The brochures were subsequently also used in the individual «home countries» of Hungary, Czech Republic, etc. Note on the middle figure: «Zahnschäden sind vermeidbar» in English: Tooth damage is preventable. (Image: SWISS DENT)

Secondly, the children cleaned their teeth under supervision at school to make sure no teeth or surfaces were missed.

Marthaler had already carefully incorporated all of this in his 1960–1961 plan.

Thirdly, the children were regularly reminded of the importance of salt fluoridation.

The campaign had to be carried out by teachers and prevention assistants. In addition to the training for mothers, who mostly assisted at the schools attended by their own children, brochures and information booklets on the implementation of the campaign were produced, and made available in all possible languages: German,

Fourthly, the exact surveys mentioned above were carried out every four years.

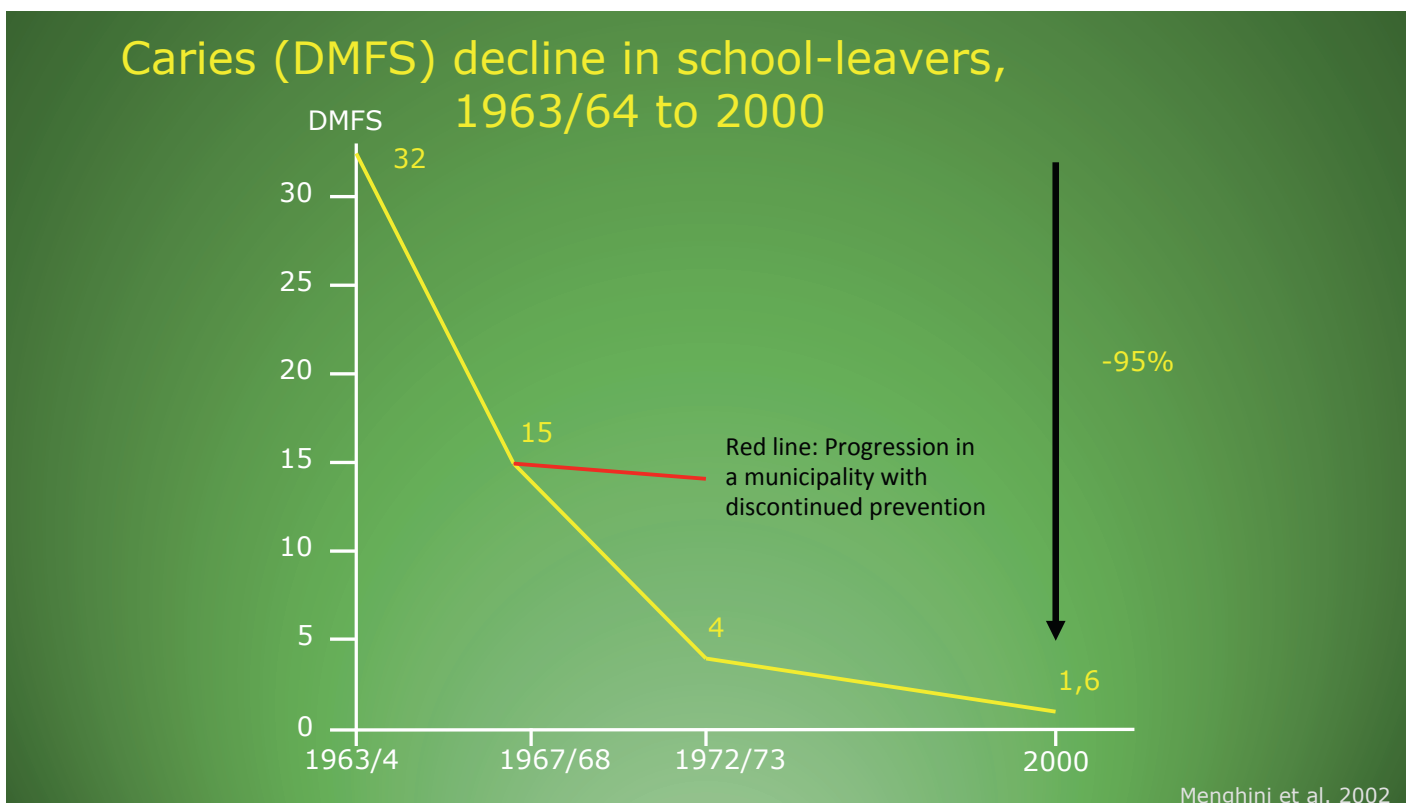


Fig. 7: Caries (DMFS) reduction at Zurich schools from 1963/64 to 2000. (Image: Ulrich P. Saxer; data from reports by Marthaler, Th. M., et al.)



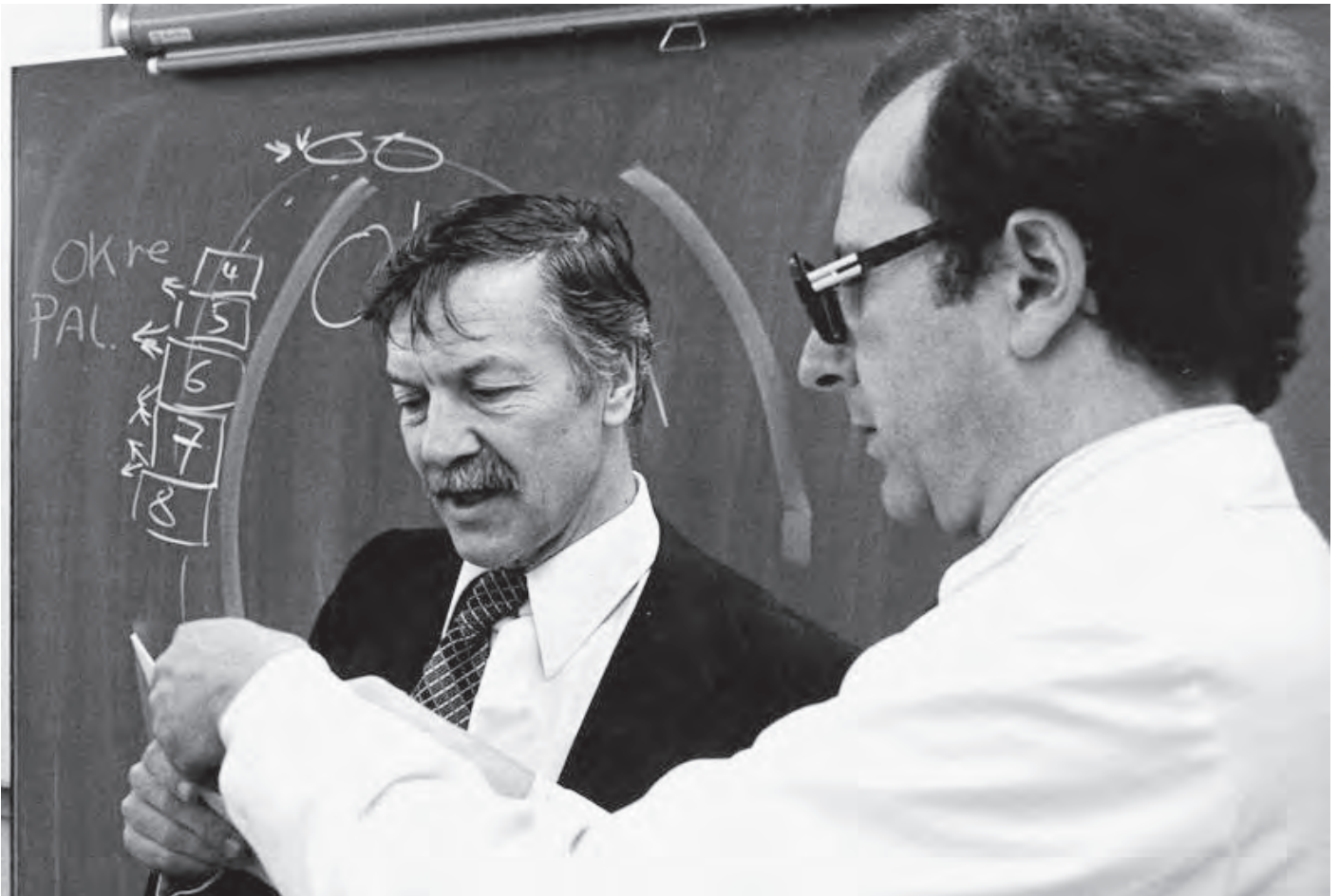


Fig. 8: Professor Thomas Marthaler talks to Dr. Ulrich P. Saxer. Taken approx. 1975.

(Image: Archive Milan Schijatschky)

Italian, French, Czech, Hungarian, Turkish, Croatian, Serbian, Portuguese, etc. (Fig. 6).

### Initial success – and the subsequent outstanding achievements of the caries prevention experiment!

After just the first control examination in 1967/1968, a 25–30% caries reduction compared to the control municipalities and the baseline condition became apparent. With younger children the success came more quickly, and by the second check-up the reduction had already reached 50% compared to the baseline (Fig. 7).

Excited by the data, I travelled to the north and east of Germany with lectures and presented Marthaler's successful results. He even attended one of the events in person. Once I was finished, he came up and asked me: «Are you so sure that's all true?» (Fig. 8) Yes I was sure, because I had been able to compare a larger number of bitewing X-rays myself in the course of a double follow-up examination (1963/64 versus 1971/72). Tomi's extraordinary modesty and restraint amazed and impressed me.

Almost at the same time, while reviewing the data, I had noticed that in a Zurich municipality the caries reduction rate had not improved in any of the pupils since the 1967/68 study. The caries prevalence in this municipality was not heading downwards, but horizontally. When I asked Professor Marthaler what had happened, he explained that the teachers were overloaded with ever more work, and could no longer find time to support the campaign. Since the allocation of responsibilities was a matter for the municipal authorities, this could not be changed for the time being. In discussions with the cantonal government of Zurich and the municipalities, a

new solution only emerged once this important work was redistributed within the municipality concerned. Prevention was then reintroduced just the following year. An example that impressively demonstrates the value of these regular examinations. Unfortunately, however, they are no longer carried out today.

Further check-ups every four years until 2009 showed an extraordinary success with a 96% reduction in caries in the 16 selected municipalities in the canton of Zurich (Fig. 9). The examinations involving the X-ray images also proved that the data were consistent with the clinical examinations (Fig. 10).

The caries prevention experiment called for extraordinary stamina, and constant reaction to obstacles. The success described above was only possible because enough women, the children's mothers, could always be recruited and trained at short notice to work in the schools. These considerable efforts were not always well-received and supported at all levels – including authorities, teachers, dentists and university. Tomi Marthaler felt this often, and it was difficult for him.

From this time until his retirement, Marthaler gave lectures at public evenings held in many municipalities, not only in Zurich but throughout Switzerland. Of course, he also unpacked his *Schwyzler-örgeli* (diatonic button accordion) to finish off these evening events, and played a few tunes for those assembled.

Other cantons heard about the success in Zurich early on. The canton of St. Gallen had already introduced prevention programmes in individual communities thanks to dentists such as Dr. Marc Frey-Nyitrai in Ebnat-Kappel. These school programmes were subsequently introduced throughout Switzerland, including

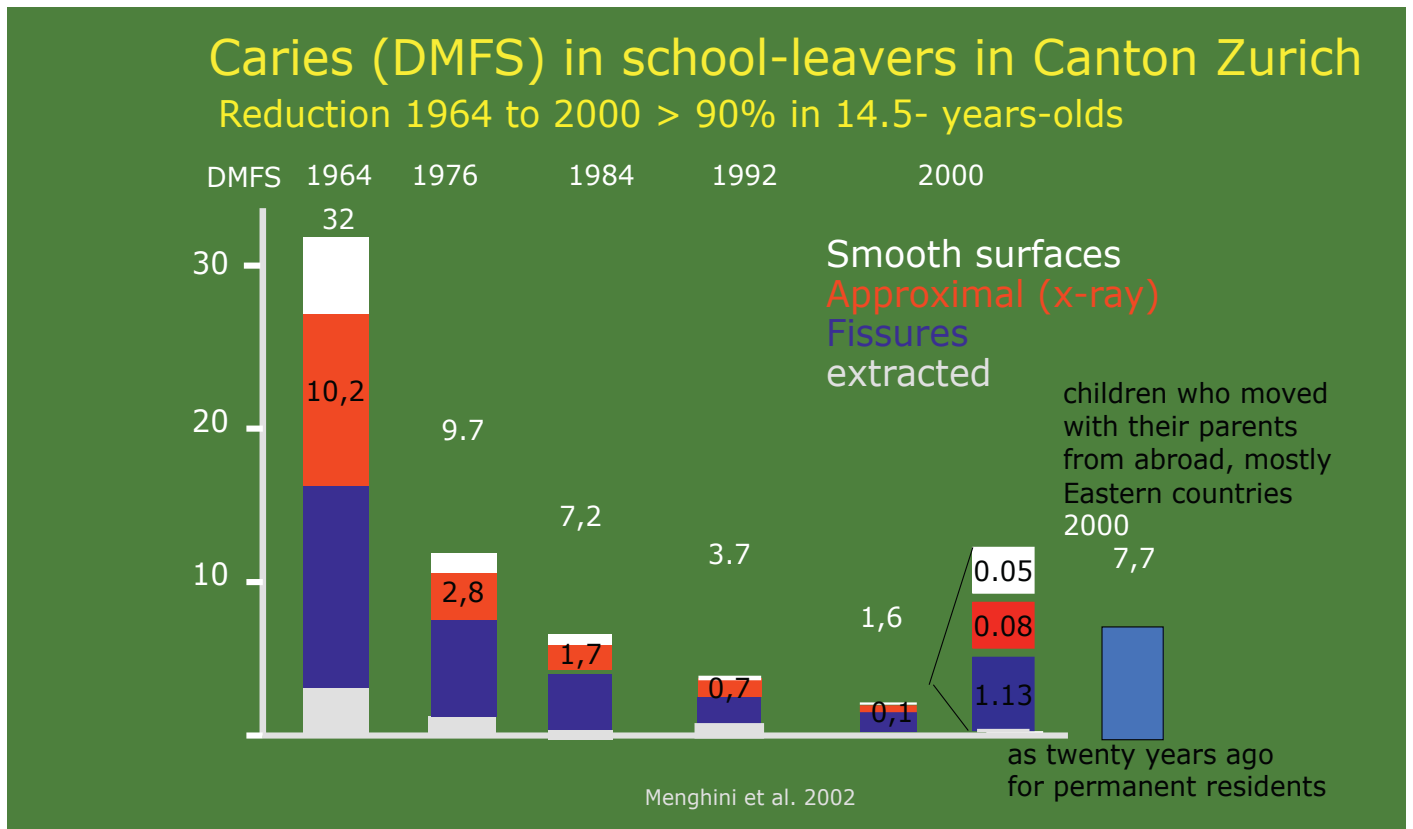


Fig. 9: Caries reduction (DMFS) 1964 2000: with details of the individual tooth surfaces (smooth surfaces and anterior teeth: white column elements; interdental spaces, radiologically evaluated: approximal (red) and fissures (grooves, blue), grey: extracted teeth. (Image: Ulrich P. Saxer; data from reports by Marthaler, Th. M.; Steiner, M.; Menghini, G., et al.; various years)

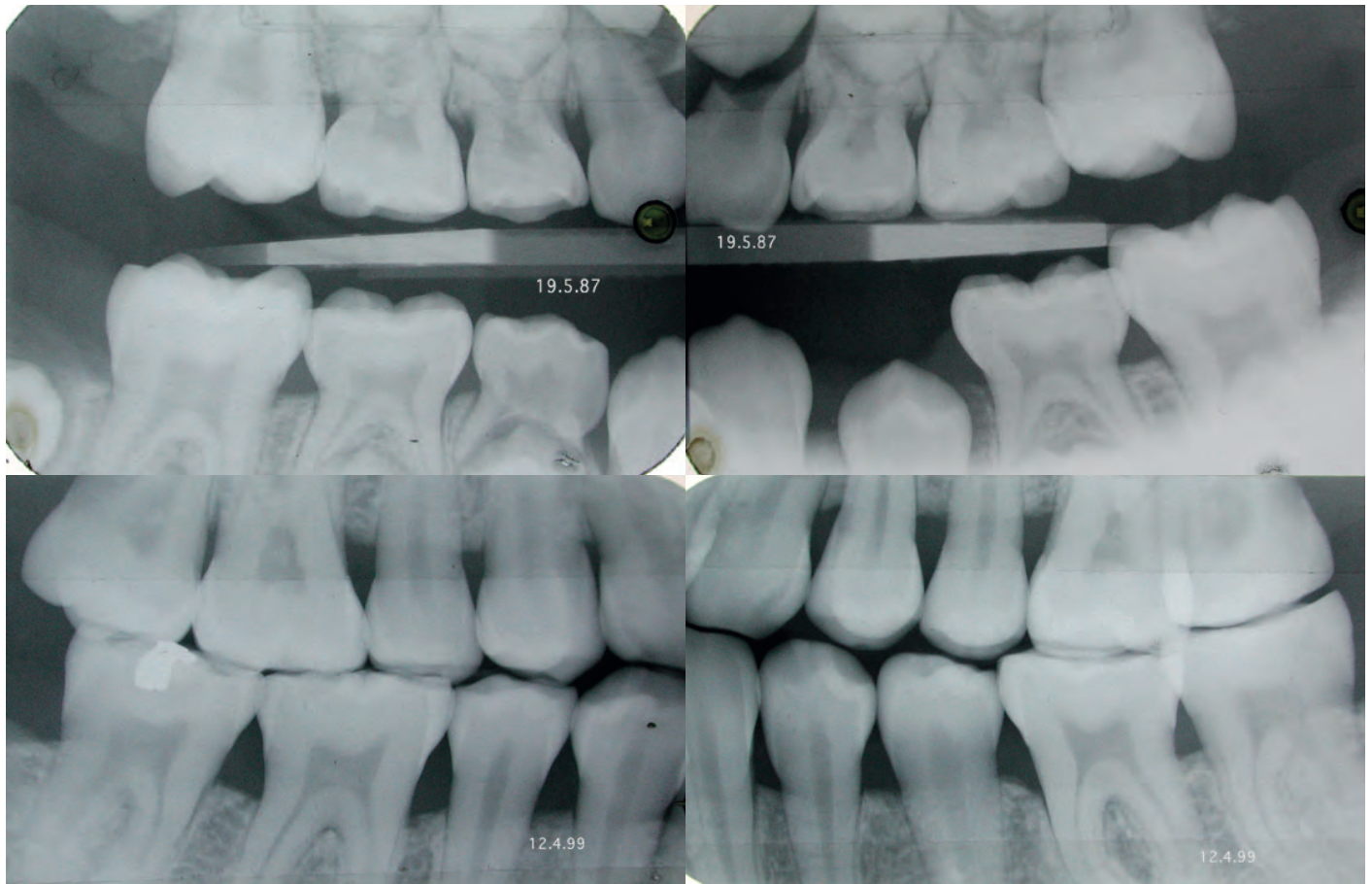


Fig. 10: Upper row: X-ray images of a 10-year-old (1987 with caries prevention campaign). Lower row: same person, 22 years old, with a single filling in April 1999. (Collection of U. P. Saxer)

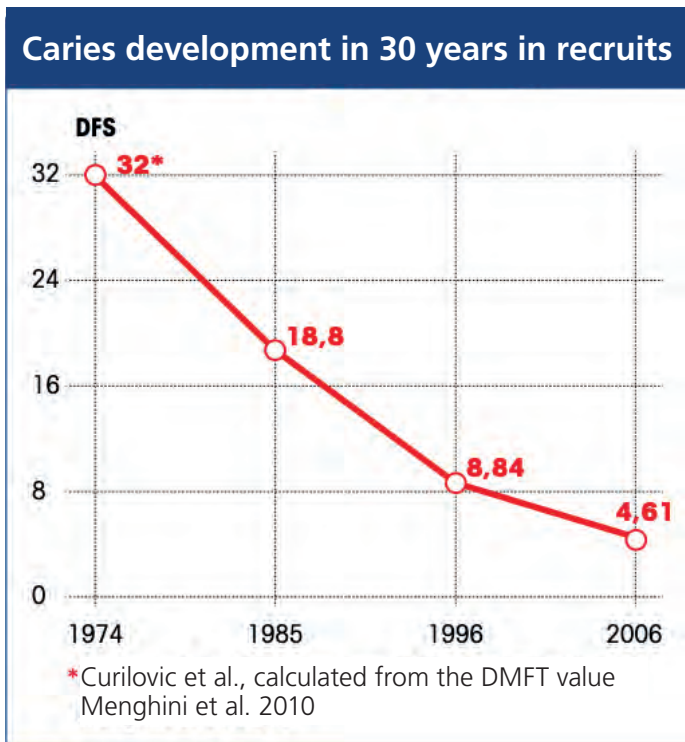


Fig. 11: Development of caries incidence in Swiss military recruits (20-year-olds) under the influence of caries prevention measures in the period from 1974 to 2006. (Collection of U. P. Saxer)

in the canton of Basel-Stadt, which introduced drinking water fluoridation, and the cantons of Vaud and Glarus, where special programmes were under way to study the possibility of collective salt fluoridation. By the end of the 1980s, prevention programmes had already been established throughout Switzerland. To date, this campaign has led to caries reductions of more than 95% in the canton of Zurich and also throughout Switzerland compared to the baseline in 1963 (Fig. 7). Children in Switzerland have an average of 1.6 carious lesions on their 28 teeth when they leave school today. This success has spread throughout Switzerland, as shown by the reduction in caries in military recruit examinations, which after 1972 were always carried out in Thun, where troops from all over Switzerland came to serve (Fig. 11).

The caries prevention programme also attracted a great deal of attention abroad. Professor Marthaler was required to travel to many countries on several continents to establish similar programmes, and received numerous awards for his efforts.

The successes today are there for all to see. The young people (aged below 40) we encounter today on the streets or here in this hall have radiantly healthy white teeth (Fig. 12).



Fig. 12: Healthy teeth: a typical image of a young twenty-year-old in Switzerland, 1996. (Collection of U. P. Saxer)

Marthaler predicted back in 1978 that, at the turn of the century, there would also be an impact on the preservation of teeth among pensioners. Tooth preservation can indeed be observed into old age today, and we now hardly ever see patients with complete dentures (Fig.13). Marthaler's predictions have all come true.

Thanks to progress and the latest scientific findings in medicine, we face similar challenges today, in that health could be controlled more effectively than is currently the case. Prevention of a large proportion of non-communicable diseases (NCDs) such as diabetes, obesity, arteriosclerosis, arthritis and even some cancers and dementia would be possible – but unfortunately, doctors are still overloaded with «sick care», in a similar way to the dentists of 60 years ago.

The question is how to address this challenge. How can behavioural change be brought about? Professor Marthaler showed us – he faced the same question 60 years ago, and he answered it with aplomb. Modestly and always with great restraint, he persistently followed his path. He wasn't much of a «talker» – but when he did say something, it was well-considered and coherent, and he had thought through all the possible consequences to the end!

**Our sincerest thanks to Marianne!**

Such people are rare today. But it is also clear that behind such a man there is usually a strong woman, and Marianne is a case in point. She completed a foundation course in medicine, and at the time was still one of the few women studying at all. Marianne subsequently decided to continue her education in the USA, and graduated from the University of California in Los Angeles (UCLA) with a bachelor's degree in bacteriology before returning to Zurich. She soon met her Tomi there, and once married decided to devote herself entirely to her husband and her family, but still served as a secretary to her husband's dentistry boss, Professor Hans R. Mühlemann, until the birth of their first daughter.

Who would do that today? I often saw Marianne at Tomi's over the last three years, and I know that she visited him every afternoon until dinner to spend time with him. Thank you, Marianne, for the support you always gave your Tomi, and I would also like to thank you on behalf of Tomi, who must have appreciated it very much.

*Thank you, Marianne!*

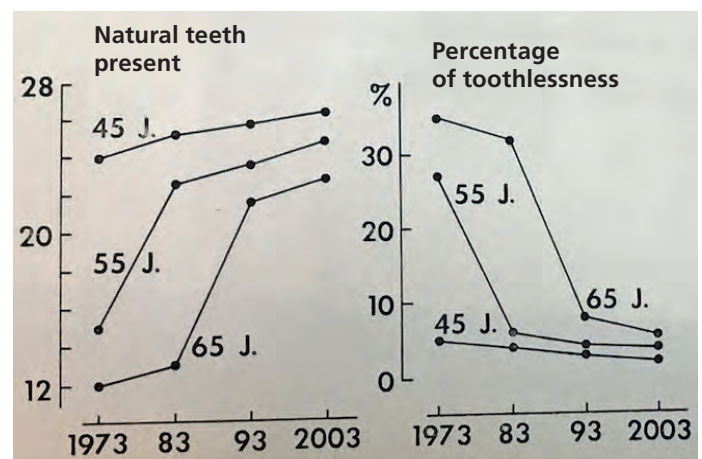


Fig. 13: Th. M. Marthaler's prediction in 1978. «Developments in the number of natural teeth present (on average per person, maximum number 28) and the percentage of completely edentulous individuals for the years 1983, 1993 and 2003.»

(Source: Marthaler TM, «Ist Zahnlosigkeit im Zurückgehen begriffen» (Is toothlessness on the decline?) in: *Schweizerische Monatsschrift für Zahnheilkunde, Aktuelle Fragen*, 88:1036, 1978).

**Notes**

- [1] Hans Rudolf Mühlemann – de.wikipedia.org  
Hans Rudolf Mühlemann – en.wikipedia.org and the three issues of SWISS DENT devoted to Hans R. Mühlemann: 1/2017, 1/2018 and 2/2018 (www.verlag-dr-felix-wuest.ch).
- [2] See König, K. G. Seen up close: Reminiscing on the life of Professor Th. Marthaler, Zurich, on his 60th birthday, in SWISS DENT 43 (2022) No. 1, p. 19–21. Also König, Klaus; Künzel, Walter;

Weatherell, John; Thomas Marthaler: Scientist, Musician, Friend, in: SWISS DENT 43 (2022) No. 1, p. 40.

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# ARTHROSKOPIE – GELENKCHIRURGIE

## SWISS MED 2/12

### Aufgelegt zum 29. Kongress der AGA Gesellschaft für Arthroskopie und Gelenkchirurgie

*Zürich, 13.–15. September 2012*

**Geleitwort von Prof. Dr. med. Roland Becker (Berlin), Präsident der AGA**

**SWISS MED 2/12 (64 Seiten)**

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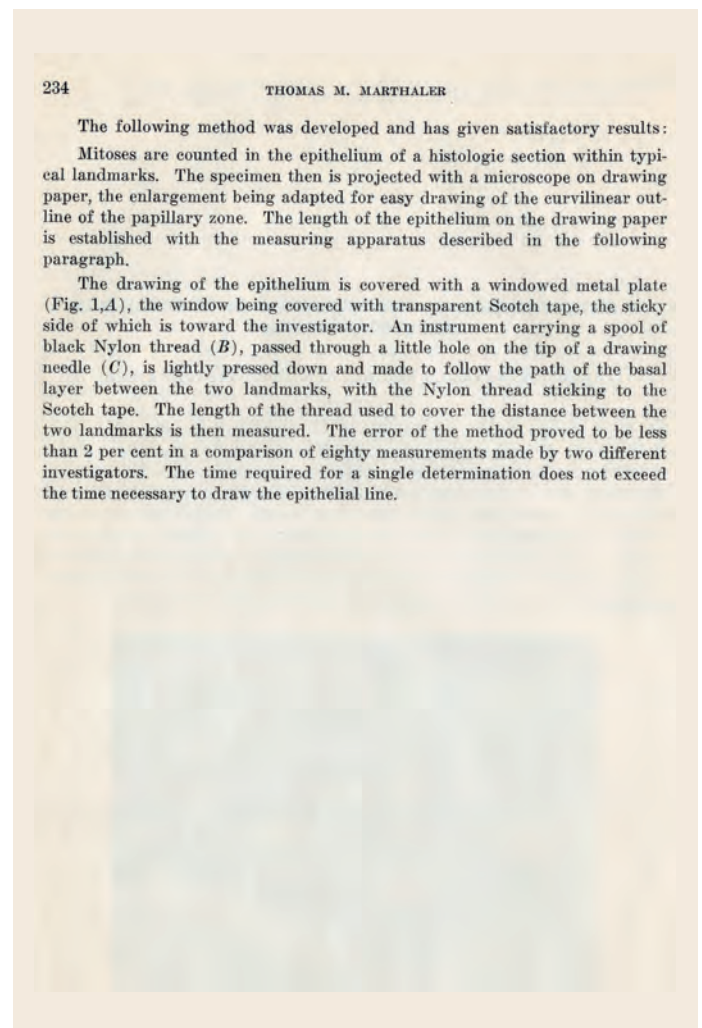
# Reminiscing on the life of Professor Th. M. Marthaler, Zurich, on his 60th birthday

Professor Thomas Martin Marthaler at 60 – for all those who know him well, an occasion to recall a lifetime of memories ...

Known as «Tomi» both in his private and professional lives, in the past 33 years since the start of his university career he has become to his colleagues (who are usually also his friends) the embodiment of profound expertise, relentless rigour towards himself (and others) in all important matters and, in his private life, kindness and goodness personified. For me, a less conspicuous but characteristic feature of his personality is that he never allows himself to be pre-occupied with anything that is unimportant. If something arouses his interest, perhaps even his great interest, once he has identified it as being non-essential, he systematically sets it aside.

In 1956, for example, after an extended study visit to the USA that also included playing with jazz greats such as Ella Fitzgerald, he gave up the genre and devoted his exceptional skills on the clarinet exclusively to folk music. If there were ever an in-depth cultural study of this subject in Switzerland, Tomi Marthaler would undoubtedly be recognised as the legitimate successor to Kasi Geisser, such an important figure in folk music culture. Tomi Marthaler once again set valid standards for the genuine and original in this field, running contrary to the spirit of the times, which tended to flatten the rustic pieces into *Schrammel* music for the sake of tourism.

But let us return to dental research, where Tomi Marthaler also started setting standards early on in his career. Tomi was forced



Reprint of the publication on the «Arcograph». On a handle, a thread was unrolled through the eye of a needle onto the adhesive side of Scotch Tape, following the drawing or photograph of a corrugated histological structure below. The thread could then be pulled off and measured to determine the exact length of the structure (for example, basal layer of the epithelium).



Professor Thomas M. Marthaler, Dr Angela Schait and Institute photographer Bisegger at the tap at a casual Institute party in October 1968.

to reach an important decision in the first months of 1956, after his return from the USA. His father Edi, whom he greatly admired, would have liked to gradually hand over the practice at Zurich's Tiefenhöfe to him. Tomi did not want to disappoint his father, but was determined to follow his scientific vocation. His understanding parents did not really resent his departure from the family tradition, however – despite their son's less than conventional views and principles, their relationship remained a positive one in essence.



Professor Klaus H. Rateitschak (left) presents a gift to Professor Th. M. Marthaler (right) in the canteen of the Dental Institute of the University of Zurich with colleagues in attendance (October 1968).



A meeting in the assistant's room of the new Dental Institute of the University of Zurich, 1961 (from left to right): Dr Heinz Lott, Microbiology, Dr Angela Schait, Chemist, Head Prof. Dr. H. R. Mühlemann, Prof. Dr. Th. M. Marthaler and Prof. Dr. K. G. König.

Tomi Marthaler had already found a great supporter in Hans R. Mühlemann in the mid-fifties, who offered him a promising area of activity in the newly established caries research station. Animal experiments and the study of biorhythms with the aid of the determination of mitotic activity, which was in full swing at the time, pushed Tomi Marthaler's mathematical-statistical talent to peak performance. In the early days of his work at the Zurich Institute, Tomi became indispensable as a planner, methodologist and statistician.

Late in the morning of 5 April 1956, when I met Tomi for the first time in the «assistant's room» on the first floor of the Semper building annex at Zürichbergstrasse 4, he had just unpacked the reprints of the publication in an American journal about his «arcograph»; this was a construction, almost ingenious in its simplicity, consisting of the basic components of a handle, reel, needle eye and window with plastic film, which could be used to accurately measure the length of the strongly undulating, irregular basal layer of the oral cavity epithelium. I was speechless with admiration, for I had never published anything in an international journal before, while he absently laid the reprints aside as if they were an everyday occurrence.

After a short period of time, Tomi was so well versed in statistics through lectures with Professor van der Waerden and Professor



At the 60th birthday celebrations of Prof. Dr. Klaus H. Rateitschak, Basel, 1988 (from left to right): Marianne Marthaler, Prof. Dr. Th. M. Marthaler, Prof. Dr. K. G. König, Christiane König (Nijmegen).



At the 60th birthday celebrations of Prof. Dr. Klaus H. Rateitschak, Basel, 1988. Old friends meet (from left to right): Prof. Dr. K. H. Rateitschak, Basel, Dr. Gerd («Johnny») Müller, Hamburg, Prof. Dr. Th. M. Marthaler, Prof. Dr. Klaus G. König, Nijmegen.

Linder that he was already able to publish a set of «Biostatistical Instructions» in *Zahnärztliche Rundschau* in 1957, which was in no way inferior to the «Richtlinien zur Durchführung wissenschaftlicher Arbeiten» (*Guidelines for the Conduct of Scientific Work*) by our guiding spirit Professor H. R. Mühlemann that had been published shortly before, in terms of its ability to set new standards.

Numerous prominent doctoral students – the first generation of «Mühli students» – such as Max Leu, Hans Graf, Herby Wolf, Richard Schneider and Frans Gressly (a very incomplete list) were advised by Tomi in a highly purposeful approach. Those who had already earned their doctorates, however, such as Klaus Rateitschak, Hubert Schroeder, Hans Herzog, Angela Schait, Christeli Schweizer, Helmi Hirt, Toni Engelberger and I myself also owed a great deal to Tomi Marthaler in their publications from the second half of the 1950s. Tomi also soon began advising researchers at the University Hospital Zurich on methodological and statistical issues, which the faculty eventually acknowledged by formally establishing a centre under Tomi's leadership.

Is this all worth reporting in detail? I believe so, because in the post-war lull in dental research that still prevailed in Europe at that time, a great deal of momentum was needed, and the statistical approach advocated by Tomi Marthaler could by no means be carelessly pushed aside as merely an «auxiliary science». Despite these great achievements in collaboration with others, Tomi Marthaler's greatest accomplishments are based on thoroughly independent creative thinking and years of his own experimental research. He excelled in two areas in particular: prevention and epidemiology.

Prevention was already a tradition in Switzerland when Tomi Marthaler took the stage in Zurich: Hans R. Held had already created a European forum for new approaches to prevention in 1953 with the foundation of the European Organisation for Caries Research (ORCA), which quickly gained worldwide recognition, and he had initiated important developments with his studies on tablet

fluoridation. Iodised salt was successfully promoted by Hans Wespi. Max Gutherz fought effectively for drinking water fluoridation in Basel, while Theo Hürny provided active support from the Academy in Bern. Last but not least, Marc Frey had already earned his spurs in both individual prevention and group supervision of schools in the canton of St. Gallen. The field of Swiss epidemiology was represented by the internationally recognised researcher Adolf Roos, even if he himself, with great modesty, saw his repeated and extensive studies in Goms more as a holiday activity than as high science.

Tomi Marthaler had the gift of learning from all these great role models in a highly effective manner: in long conversations, many of which I was fortunate enough to witness, he drew on the experience of his elders, was quick to grasp the essentials and at the same time determine the direction to be taken based on the situation at hand. Tomi's active contributions to the «Probesticker Club» alongside Otto Backer Dirks, Geoffrey Slack, Peter James and Douglas Jackson, for example, helped to develop the now internationally recognised method of standardised caries recording. Furthermore, the elaboration and introduction of the representative sample method for the partial caries recording (instead of the usual full recording), as a completely new approach, called for great courage and unshakable confidence in his own ability. And he had plenty of both.

Tomi already played a leading role back in the 1960s, which has since consolidated into scientific peer status, both in the field of prevention and epidemiology. The decades of work on salt fluoridation as an alternative to drinking water fluoridation, the constant commitment to cantonal school dental care (how many years has he been a cantonal chief dental officer!), the expansion of new systems such as Recall 3+, the national and international epidemiological studies and sample surveys, investigations into X-ray diagnostics – none of these activities need any further elaboration as they are still in full swing, and visible far and wide.

So it only remains for us to wish you the very best on your birthday, Tomi, and to say: «Keep up the good work!»

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### Note from the editor

This text by Prof. Dr. Klaus G. König, a close friend and colleague of Prof. Dr. Thomas M. Marthaler, was first published in German in SWISS DENT 10 (1989) No. 1–2, pages 16 to 18. It was subsequently published in SWISS DENT 42 (2021) No. 1, pages 54 to 56. The text published in this issue of SWISS DENT 43 (2022) No. 1 pages 19 to 21, is an English translation approved by the author.

# With a probe and a clarinet at 80

## Professor Thomas M. Marthaler celebrates his 80th birthday

Prof. Dr. med. dent. Thomas Imfeld, MBA

On 31 March 2009, Prof. Emeritus Thomas M. Marthaler, affectionately known as «Tomi» to his family, friends and colleagues, will turn 80. A welcome opportunity to pay tribute to his impressive life's work, but also to the man himself, who combines profound expertise, self-discipline, outstanding perseverance and endearing friendliness.

Tomi was born in Zurich in 1929, and also graduated from grammar school there. He studied dentistry in Geneva and Zurich, where he passed the Federal State Examination in 1953. Professor H. R. Mühlemann helped to arrange a one-year assistant position for him at the Forsyth Dental Infirmary in Boston, Massachusetts (USA). His dismay at the enormous caries damage suffered by the patients at this clinic, and the practice of mechanical tooth repair that he was less than enamoured with during his studies, aroused both Tomi's curiosity and his sociomedical vocation. The question of the causes and preventability of dental caries became his main interest. Back in Zurich in 1954, he decided with a heavy heart *not* to take on the dental practice of his father Edi Marthaler at Tiefenhöfe near Paradeplatz. While he continued to work part-time at the practice for two years, at the same time he followed his scientific calling as a research assistant at Professor Mühlemann's then Department of Conservative Dentistry, where he conducted animal experiments in the newly established caries research station. His mathematical talent and his dedication soon made him indispensable as a planner, methodologist and statistician. After expanding his knowledge of statistics through lectures by Professors Van der Waerden and Linder, Tomi wrote a set of «Biostatistical Instructions» for conducting scientific work in the *Zahnärztliche Rundschau* in 1957, and also provided methodological and statistical advice to researchers at University Hospital Zurich.

From 1958 to 1965, Tomi conducted the first longitudinal caries study on 500 schoolchildren, and in 1963 he began periodically recording the dental health of schoolchildren in the canton of Zurich and elsewhere in Switzerland. He entered the data collected – at the time the most extensive dataset available in terms of medical epidemiology – into the first large computer at the University of Zurich. His habilitation thesis in 1965 dealt with statistical issues in experimental medical research. By virtue of his high level of competence, the medical faculty additionally entrusted him with the management of the newly founded Biostatistical Centre in 1968. This was a function he continued to perform until 1991. Alongside this role, he independently pursued his own main interests of fluoride research, prophylaxis and epidemiology with creativity and endless energy. He developed the scientific basis for salt fluoridation, which he introduced to Switzerland and – as an advisor to the WHO – to other European countries and in particular to Central and South America. Today, around 300 million people benefit from salt fluoridation worldwide.

In epidemiological research, Tomi worked with Otto Backer-Dirks, Geoffrey Slack, Peter James and Douglas Jackson (known collec-

tively as the «Probesticker Club») to develop the now globally recognised standardised method of investigation for caries recording, and later independently devised a representative sample method for caries recording. In 1982 he was recognised by the International Association for Dental Research for «Outstanding Research in the Fields of Caries Aetiology and Prevention of Caries», and received the H. Trendley Dean Memorial Award for Research in Epidemiology and Dental Caries, while in 1994 he received the Borrow Memorial Award. In 1997, Tomi Marthaler received the prestigious Yngve Ericsson Prize in Preventive Dentistry. In 2001 he was awarded the Czech Dental Chamber's prize for «Merits in Public Health» and in 2006 the «Special Merit Award for Outstanding Achievement in Community Dentistry International» from the American Association of Public Health Dentistry.

With his consistent focus on the human aspect and his concern for the sustainability of caries prevention for public health in Switzerland, Tomi Marthaler made prevention a priority with the «Caries Prevention Campaign» (introduction of school dental care in the municipalities of the Canton of Zurich) and documented its success with caries epidemiological surveys in 16 sample municipalities at four-year intervals from 1963/64. To date, this has resulted in a reduction of around 90% in caries in schoolchildren of all ages, which, as military recruit and adult investigations show, continues into higher age groups. Tomi was responsible for introducing (and training) school dental care assistants (now school dental care instructors) in Zurich municipalities in 1966, and this practice was subsequently adopted by the majority of Swiss cantons. In 1988 he established a foundation for dental care assistants to support these efforts. At the same time, however, all of these sociomedical activities did not prevent him from publishing over 300 papers in scientific journals and becoming one of the most cited dental epidemiologists.

Anyone who assumes that Tomi's richly fulfilled professional life has left him no time for hobbies is very much mistaken. Music was and is his great passion. At the age of 14, he recalls, he received a clarinet from his best friend with the request that he learn to play it «so we can make folk music like on your father's records.» Tomi did just this, and his efforts at self-tuition soon bore fruit. He enjoyed the support of the folk clarinetists who frequently performed in the Kreis 3 district, whom he asked for guidance and advice. At the chance invitation of amateur musicians from the neighbourhood to play jazz with them, he found himself entering the active Zurich jazz scene. Tomi practised in the forest on the Zürichberg and, as a virtuoso jazz clarinetist, played with the legendary Zurich old-time jazz bands Trester Seven and Porridge Brass Band during his studies. With the latter formation Tomi, known as «Sabu», came third at the Zurich Amateur Jazz Festival in 1953. The greatest moments of his jazz career came in clubs during his year in America, when he accompanied Ella Fitzgerald and jammed with the legendary Charlie Parker. In fact, however, Tomi also had great success in America with the performance of Swiss folk music. Following his return





Tomi (left, with black clarinet) during his studies: clarinetist with the Zurich old-time jazz band «Trester Seven».

(Image: private archive of Marianne Marthaler, Zurich)



Tomi (below, right) was also part of the Zurich jazz band «Porridge Brass Band» as a student with his clarinet.

(Image: private archive of Marianne Marthaler, Zurich)



Tomi during his year in America: a jam session with the legendary Charlie Parker.

(Image: private archive of Marianne Marthaler, Zurich)

to Switzerland, he left jazz and dedicated his skills to folk music. With his characteristic persistence, he stubbornly resisted the tourist-motivated tendency to flatten folk music, and his compositions set new standards in their genuine and original approach. As a clarinetist, *Schwyzlerörgeli* (diatonic button accordion) and double bass player, he had a significant influence on the development of folk music. From 1955, Tomi performed with Josias Jenny under the name «Zoge-n-am Boge». In addition to this famous forma-

tion, Tomi played in countless other outstanding groups with folk music greats such as Rees Gwerder, Emil Widler, Luzi Bergamin, Sepp Huber Sr. and Johann Buchli. He played his own sophisticated compositions together with Heinz and Andreas Ambühl.

Dear Tomi, on behalf of all your friends and acquaintances, congratulations, and «ad multos annos»!

## Notes

On his 85th birthday, Swiss Radio DRS «Musikwelle» dedicated the programme «Fiirabigmusig» to the multifaceted personality of the «Professor» of the Swiss folk music scene<sup>[1]</sup>. After Thomas Marthaler's death, there was another programme «Fiirabigmusig» to remember the great musician<sup>[2]</sup>.

[1] «Fiirabigmusig – Thomas Marthaler – Play SRF», Sendung vom 15.04.2014

[2] «Fiirabigmusig – Thomas Marthaler – Play SRF», Sendung vom 17.11.2020

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# Changes in dental caries in Zurich school-children over a period of 45 years

Keywords: caries decline, causes, school-children

**Summary** In 16 rural communities of the Canton of Zurich, school-children of all age groups participated in dental examinations conducted at intervals of 4 years since 1963/64. The same standardised method was used throughout the entire period. This study documents the caries experience over a period of 45 years. From 1964 to 2009, the DM\*FT per 14-year-old child fell from 12.50 to 1.31, corresponding to a caries reduction of 90%. The caries experience in 8-, 10- and 12-year-olds decreased by 90% to 92%.

From 1964 to 2009, the “Significant Caries Index” (the mean DM\*FT in the third of 12-year-olds with the highest DM\*FT values) fell from 13.09 to 2.20, corresponding to a caries reduction of 83%. The observed caries decline was unexpectedly high. The effect of fluorides may explain a caries reduction of roughly 50%. A large part of the decline, however, remains unexplained. Possible causes are discussed in this paper.

## Introduction

Dental prophylaxis was introduced in schools in the Canton of Zurich, in 1963. To record the success of the measures introduced, children in 16 rural communities were dentally examined at intervals of 4 years, using a standardised method. The original plan for a comparison of test communities with preventive measures and control communities without preventive measures had to be abandoned, given the decision of school authorities in the control communities to join the prophylaxis programme. The investigations in the 16 communities have continued right up to the present day.

This study documents the changes in caries experience in the school-children of these communities over the course of 45 years.

## Materials and methods

### Selection of communities and school-children

At the beginning of the study, 16 communities of the Canton of Zurich with high demographic stability were selected

(MARTHALER 1972). These communities are distributed across the entire area of the Canton of Zurich (Fig. 1). Only in 2000 and 2009, one community (respectively) declined to participate in the survey.

In the smaller communities, all school-children were summoned for examination. In the larger communities, a randomised selection was carried out in each case. Children chosen to participate were again called upon for further examinations after 4 and 8 years, provided they were still of school age.

The present analysis is based on school-children in which both clinical and radiological examinations had been conducted. Absenteeism in the schools and objection to radiological examinations (particularly following the Chernobyl nuclear power plant accident in 1986) negatively impacted on the response rate. On average, it was possible to clinically examine approx. 90% of the children selected. Between 65% and 94% of the clinically examined participants were X-rayed between the years 1984 and 2009. The children excluded on the basis of unavailable X-ray images exhibited a slightly lower caries experience (DFS, pits and fissures) (STEINER ET AL. 1995).

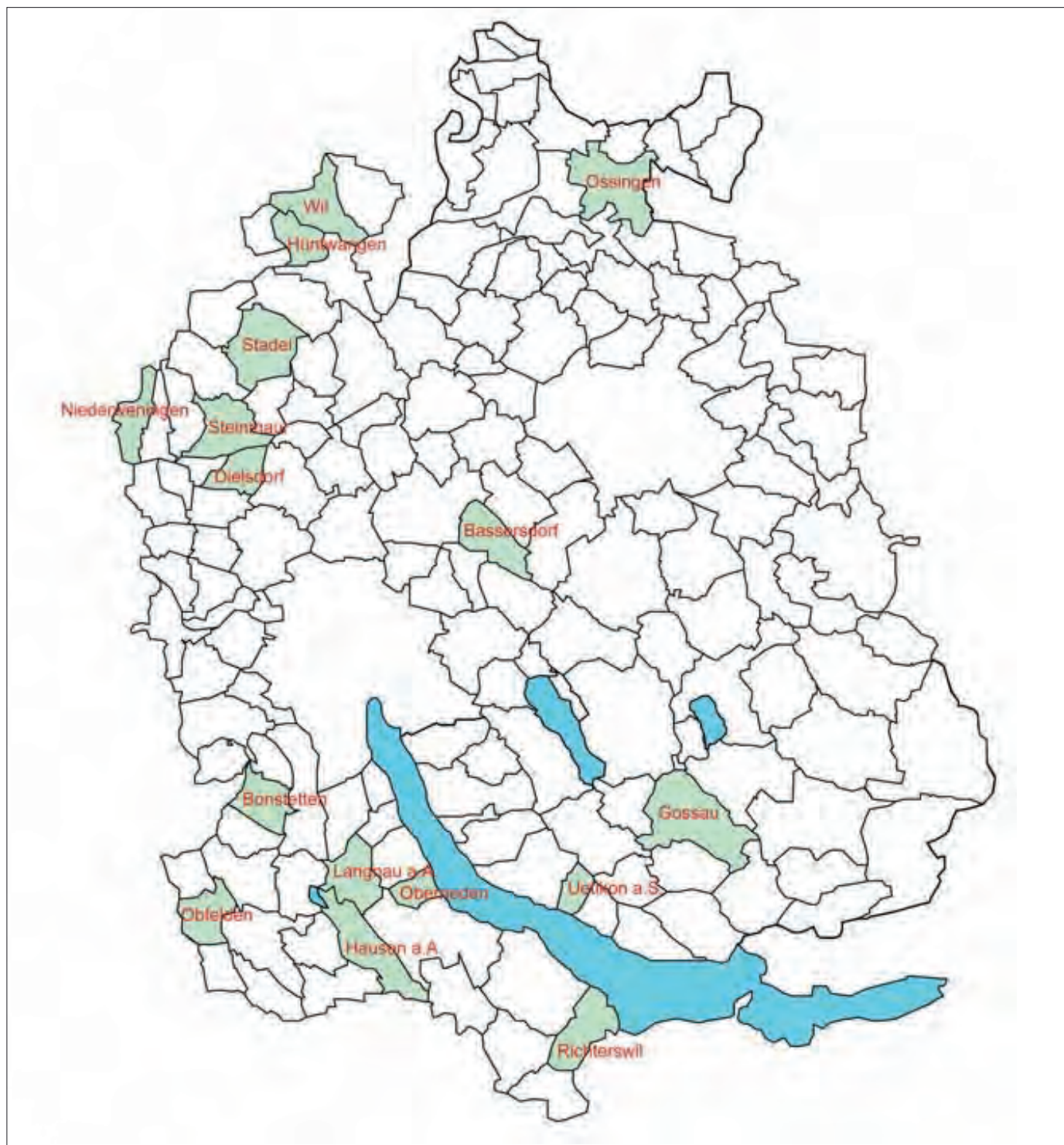


Fig.1 The 16 communities studied in the Canton of Zurich

The present analysis is based on Swiss and non-Swiss children resident in Switzerland from preschool age (5 years). The small number of children who had arrived as immigrants when they were over the age of 5 years were excluded from the analysis. Those excluded (2% to 4%) exhibited a substantially higher caries experience (MARTHALER ET AL. 1996a).

#### Examination dates

Dental examinations in the individual communities were generally conducted in autumn, at 4-year intervals, on one day. The scheduled examinations for all 16 communities were generally distributed over 2 years. The average examination date was in the second year: 1963/64 (=1964), 1967/68 (=1968),

1971/72 (=1972), 1975/76 (=1976), 1979/80 (=1980), 1983/84 (=1984), 1987/88 (=1988), 1991/92 (=1992), 1995/96 (=1996), 2000 (=2000), 2004/05 (=2005) and 2008/09 (=2009).

#### Standardised examination

The examination methodology has been described on several previous occasions (MARTHALER 1966, MENGHINI ET AL. 1998, MARTHALER ET AL. 2005). Several important points are reiterated here.

From 1964 to 1992, findings concerned one side of the dentition only, i.e. only the right side was examined. Children were examined at a rate of approximately 220 children per day, by two dentists working in parallel. From 1996, both sides of

the dentition were examined. From 1996, children were examined at a rate of approximately 140 children per day. Analyses indicated that one-sided assessments produce almost identical results to assessments of both sides (MARTHALER ET AL. 2005).

A total of 34 (one-sided) and 68 (both sides) caries predilection sites were clinically assessed in the permanent dentition. A further 12 or 24 approximal surfaces (7 mesial to 4 distal), respectively, were assessed radiologically using bitewing X-ray images.

In the deciduous dentition, 10 (one-sided) or 20 (both sides) deciduous teeth, respectively, were clinically assessed and 6 or 12 approximal surfaces on deciduous molars (V distal to IV distal), respectively, were assessed radiologically.

The examinations were conducted within the school buildings using portable chairs. The chairs were equipped with compressed air equipment and simple dental lamps (1964 and 1968), and later fibre optic lamps (from 1972). Clinical assessment was largely visual, with the aid of a dental flat mirror. Sickie probes were used only in cases of doubt to confirm cavitation or to remove plaque and food residues.

From 1964 to 1992, a conventional bitewing X-ray image (film) was taken of the right side of the dentition. From 1996, digital bitewing X-ray images (Digora) were taken of both sides of the dentition.

From 1996, the bitewing X-ray images were also used to correct obvious errors in clinical evaluation (overlooked tooth-coloured fillings, fillings assessed as sealings in the fissures of permanent molars and premolars, overlooked tooth-coloured fillings in deciduous molars).

Prior to the examination, children brushed their teeth in groups under the guidance of an oral health instructor.

### Caries indices

To characterise caries experience, the following counts were made:

- MT, first molars = number of first molars missing/MT, other teeth = number of other teeth missing/DT = number of carious teeth/FT = number of filled teeth/DMFT = number of carious, missing and filled teeth/DM\*FT = number of carious, missing (first molars only) and filled teeth
- DS = number of carious predilection sites/FS = number of filled predilection sites/DFS = number of carious and filled predilection sites
- D<sub>1-2</sub>S on pits and fissures of molars and premolars = number of discoloured pits and fissures/D<sub>1-2</sub>S on approximal surfaces of molars and premolars = number of surfaces with radiolucencies in the enamel only/D<sub>1-2</sub>S on free smooth surfaces of molars = number of surfaces with white spots/D<sub>1-2</sub>S on anterior tooth surfaces = number of surfaces with white spots
- m\*t = number of missing deciduous molars/dft = number of carious and filled deciduous teeth/dm\*ft = number of carious, missing (deciduous molars only) and filled deciduous teeth
- ms = number of missing approximal surfaces on deciduous molars/ds = number of carious approximal surfaces on deciduous molars/fs = number of filled approximal surfaces on deciduous molars/dmfs = number of carious, missing and filled approximal surfaces on deciduous molars/d<sub>1-2</sub>s = number of carious approximal surfaces on deciduous molars (radiolucencies in the enamel only)
- The “D” and “d” components comprise lesions with cavitation (clinical evaluation) and radiolucencies in the dentin (radiological evaluation). The “D<sub>1-2</sub>” and “d<sub>1-2</sub>” components

comprise only initial lesions without cavitation and radiolucencies in the enamel.

### Examiners

The clinical examinations were performed by the authors TM, MS and GM, together with 23 other specially trained dentists. The radiological assessments were performed by three examiners.

### Reliability

The reliability (reproducibility) of the clinical measurements was determined since 1996 by means of the intraclass correlation coefficient (KINGMAN 1997), comparing the findings of several pairs of examiners. The mean intraclass correlation coefficient (ICC) for four pairs of examiners in 7-year-olds was 0.97 for dm\*ft. The mean ICC for eight pairs of examiners in 12-year-olds was 0.92 for DM\*FT and 0.93 for DFS.

It was also possible to determine the intraclass coefficient for the radiological assessment by repeating the assessment. The mean ICC (over several observation years) for dmfs on approximal surfaces of deciduous molars in 7-year-olds was 0.99. The mean ICC for DFS on approximal surfaces of molars and premolars in 12-year-olds was 0.95, and the ICC for D<sub>1-2</sub>S was 0.81.

### Statistical analysis

Mean values per child were calculated for the caries indices specified above. The mean values for the findings from one side of the dentition (1964 to 1992) were duplicated to make the values directly comparable with the findings from both sides of the dentition (1996 to 2009).

The mean caries experience in the permanent dentition was calculated as for 8-year-olds (7.50 to 9.49), 10-year-olds (9.50 to 11.49), 12-year-olds (11.50 to 13.49) and 14-year-olds (13.50 to 15.49). The caries experience in the deciduous dentition was calculated for 7-year-olds (7.00 to 7.99).

The “Significant Caries Index” (SiC) was calculated for 12-year-olds (11.50 to 13.49) (BRATTHALL 2000). For this purpose the sample was ordered according to DM\*FT values. The mean DM\*FT was then calculated in the third of participants with the highest values.

## Results

### Changes in dental caries in the permanent dentition

Changes in caries experience in the permanent dentition are shown in Tables I, II, III and IV for 8-, 10-, 12- and 14-year-olds. The means are based on 241 to 988 children, depending on age and examination year. The mean ages were close to 8.5, 10.5, 12.5 and 14.5 respectively in all examination years.

Changes in caries experience (DM\*FT) are depicted in Figure 2. A steady caries decline was observed in all age groups up to about 1996. Thereafter, the caries experience stabilised at a low level.

From 1964 to 2009, the DM\*FT index per 14-year-old child fell from 12.50 to 1.31 (Tab. IV), corresponding to a caries reduction of 90%. The caries reduction in 8-, 10- and 12-year-olds was 90% to 92% (Tab. I, II and III).

The number of missing first molars in 14-year-olds fell from 0.86 to 0.01 (Tab. IV).

From 1964 to 2009, the DFS (all predilection sites) per 14-year-old child fell from 22.69 to 1.63. This corresponds to a caries reduction of 93%. The caries reduction in 8-, 10- and 12-year-olds was 93% to 94%.

Tab. I Caries experience (mean values) in the permanent dentition of 8-year-old Zurich school-children (1964 to 2009)

Year N	1964 486	1968 768	1972 974	1976 988	1980 734	1984 562	1988 502	1992 522	1996 437	2000 430	2005 422	2009 428	Caries Decline
Teeth (28)													
MT, first molars	0.09	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	
MT, other teeth	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	
DT	1.22	0.73	0.60	0.78	0.47	0.25	0.15	0.12	0.07	0.07	0.04	0.05	
FT	1.28	1.27	0.96	0.61	0.52	0.36	0.33	0.26	0.20	0.21	0.16	0.16	
DMFT	2.59	2.03	1.57	1.39	0.99	0.61	0.48	0.39	0.28	0.28	0.21	0.21	
DM*FT	2.59	2.03	1.57	1.39	0.99	0.61	0.48	0.39	0.28	0.28	0.20	0.21	92%
Predilection sites (92)													
DS	1.79	0.90	0.73	0.89	0.53	0.27	0.17	0.15	0.09	0.08	0.05	0.06	
FS	2.25	1.99	1.54	1.03	0.79	0.51	0.41	0.35	0.26	0.25	0.22	0.21	
DFS	4.04	2.88	2.28	1.93	1.32	0.78	0.58	0.50	0.36	0.33	0.26	0.27	93%
FS/DFS	56%	69%	68%	53%	60%	65%	71%	70%	72%	76%	85%	78%	
Pits and fissures of molars and premolars (22)													
DS	1.05	0.57	0.39	0.38	0.25	0.18	0.14	0.13	0.07	0.07	0.03	0.05	
FS	1.88	1.82	1.45	0.96	0.75	0.49	0.40	0.32	0.24	0.24	0.20	0.20	
DFS	2.93	2.39	1.84	1.34	1.00	0.67	0.54	0.46	0.31	0.30	0.23	0.25	91%
D <sub>1-2</sub> S	2.92	3.09	2.37	2.40	1.95	1.41	1.35	1.19	1.16	1.10	0.93	0.93	68%
Sealed	0.00	0.00	0.01	0.01	0.20	0.15	0.32	0.62	0.96	0.73	0.68	0.59	
Approximal surfaces of molars and premolars (24)													
DS	0.27	0.24	0.30	0.49	0.26	0.08	0.02	0.01	0.02	0.02	0.01	0.00	
FS	0.18	0.11	0.06	0.05	0.02	0.01	0.00	0.01	0.02	0.01	0.00	0.00	
DFS	0.45	0.36	0.37	0.54	0.28	0.09	0.02	0.02	0.04	0.02	0.02	0.01	98%
D <sub>1-2</sub> S	2.18	1.92	1.44	1.21	0.94	0.63	0.47	0.22	0.20	0.29	0.15	0.15	93%
Free smooth surfaces of molars (16)													
DS	0.27	0.05	0.02	0.01	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	
FS	0.13	0.04	0.03	0.03	0.02	0.01	0.01	0.01	0.00	0.00	0.01	0.01	
DFS	0.40	0.09	0.06	0.04	0.04	0.01	0.01	0.02	0.01	0.00	0.02	0.01	98%
D <sub>1-2</sub> S	2.49	2.19	1.02	0.97	0.57	0.37	0.25	0.25	0.12	0.10	0.07	0.04	98%
Anterior tooth surfaces (30)													
DS	0.19	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
FS	0.07	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	
DFS	0.26	0.05	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	100%
D <sub>1-2</sub> S	0.72	0.41	0.14	0.14	0.07	0.02	0.03	0.03	0.01	0.02	0.01	0.02	97%

FS/DFS expresses the level of dental care.

From 1964 to 2009, the DFS in pits and fissures fell by 87% to 91%, depending on the age group.

The DFS on other predilection sites (approximal surfaces of molars and premolars, free smooth surfaces of molars, anterior tooth surfaces) fell by 96% to 100%, depending on predilection site and age group.

From 1964 to 2009, the D<sub>1-2</sub>S in pits and fissures fell by 40% to 68%, depending on age group.

The D<sub>1-2</sub>S on other predilection sites fell by 81% to 99%, depending on predilection site and age group.

**Changes of the "Significant Caries Index"**

The changes of the SiC are shown in Table V. From 1964 to 2009, the SiC fell from 13.09 to 2.20, corresponding to a caries reduction of 83%.

**Changes in dental caries in the deciduous dentition**

Changes in caries experience (dm\*ft) in the deciduous dentition are depicted in Figure 3 for 7-year-olds. A steady caries

decline was observed up until 1988. A slight increase was then observed between 1988 and 2000, followed by a subsequent decrease to the level of 1988 once again.

From 1964 to 2009, the dm\*ft per 7-year-old child fell from 7.60 to 1.57 (Tab. VI), corresponding to a caries reduction of 79%.

The number of missing deciduous molars fell from 0.75 to 0.07.

From 1964 to 2009, the dmfs on approximal surfaces of deciduous molars fell from 8.37 to 1.71, corresponding to a caries reduction of 80%.

**Sealings in the permanent dentition**

From 1996 on, 1 to 2 pits/fissures (of 22) were sealed (Tab. I, II, III and IV).

**Level of care in the permanent dentition**

More than two thirds of the carious lesions had been filled in practically all examination years and age groups. (See level of dental care, FS/DFS in Tab. I, II, III, IV.)

Tab. II Caries experience (mean values) in the permanent dentition of 10-year-old Zurich school-children (1964 to 2009)

Year N	1964 487	1968 712	1972 823	1976 950	1980 742	1984 508	1988 476	1992 501	1996 395	2000 399	2005 372	2009 390	Caries Decline
Teeth (28)													
MT, first molars	0.18	0.12	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.01	
MT, other teeth	0.04	0.04	0.09	0.03	0.05	0.07	0.03	0.02	0.03	0.01	0.00	0.02	
DT	1.76	1.02	0.94	0.97	0.73	0.42	0.17	0.10	0.13	0.08	0.06	0.07	
FT	2.86	2.31	1.93	1.34	1.04	0.76	0.67	0.53	0.46	0.45	0.39	0.38	
DMFT	4.84	3.49	3.02	2.36	1.82	1.26	0.87	0.65	0.61	0.54	0.45	0.49	
DM*FT	4.80	3.45	2.93	2.33	1.77	1.19	0.84	0.63	0.58	0.53	0.45	0.47	90%
Predilection sites (92)													
DS	2.49	1.23	1.15	1.12	0.82	0.45	0.17	0.12	0.16	0.09	0.07	0.08	
FS	5.88	4.10	3.48	2.30	1.73	1.09	0.96	0.69	0.56	0.56	0.48	0.46	
DFS	8.37	5.33	4.64	3.42	2.56	1.54	1.13	0.82	0.72	0.65	0.55	0.55	93%
FS/DFS	70%	77%	75%	67%	68%	71%	85%	84%	78%	86%	87%	84%	
Pits and fissures of molars and premolars (22)													
DS	1.07	0.54	0.39	0.36	0.33	0.19	0.07	0.09	0.10	0.05	0.05	0.05	
FS	3.64	3.31	3.07	2.12	1.59	1.01	0.88	0.62	0.51	0.53	0.45	0.42	
DFS	4.71	3.86	3.46	2.48	1.93	1.20	0.95	0.71	0.61	0.57	0.50	0.47	90%
D <sub>1-2</sub> S	2.99	3.37	2.68	2.99	2.61	2.52	2.05	1.58	1.75	1.55	1.32	1.19	60%
Sealed	0.00	0.01	0.01	0.05	0.13	0.30	0.42	0.94	1.18	1.20	1.15	1.01	
Approximal surfaces of molars and premolars (24)													
DS	0.63	0.47	0.67	0.71	0.46	0.23	0.09	0.02	0.05	0.03	0.02	0.03	
FS	1.13	0.54	0.28	0.12	0.09	0.06	0.06	0.05	0.03	0.03	0.01	0.03	
DFS	1.76	1.02	0.95	0.82	0.54	0.28	0.16	0.08	0.08	0.06	0.03	0.05	97%
D <sub>1-2</sub> S	3.22	3.06	2.66	2.60	2.26	1.20	0.72	0.55	0.61	0.55	0.45	0.29	91%
Free smooth surfaces of molars (16)													
DS	0.28	0.07	0.03	0.02	0.03	0.01	0.00	0.00	0.01	0.01	0.00	0.00	
FS	0.39	0.12	0.07	0.03	0.04	0.01	0.01	0.02	0.02	0.01	0.01	0.01	
DFS	0.67	0.18	0.10	0.05	0.07	0.02	0.01	0.02	0.03	0.01	0.01	0.01	99%
D <sub>1-2</sub> S	3.19	2.94	1.55	1.26	0.74	0.59	0.37	0.35	0.29	0.19	0.09	0.04	99%
Anterior tooth surfaces (30)													
DS	0.52	0.14	0.06	0.04	0.01	0.02	0.01	0.01	0.00	0.01	0.01	0.00	
FS	0.71	0.13	0.06	0.03	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	
DFS	1.23	0.27	0.13	0.07	0.02	0.03	0.01	0.02	0.01	0.01	0.01	0.02	98%
D <sub>1-2</sub> S	1.54	0.84	0.43	0.39	0.20	0.20	0.07	0.05	0.06	0.06	0.02	0.01	99%

FS/DFS expresses the level of dental care.

### Level of care in the deciduous dentition

From 1964 to 2009, the level of care in deciduous dentition increased continuously (Tab. VI). In 1964, only 11% of the carious approximal surfaces had been filled; in 2009, this figure had increased to 44%.

## Discussion

### Changes in caries experience

The changes in caries experience are strictly speaking only representative for the 16 Zurich communities. However, the changes in other regions of Switzerland are similar (MENGHINI & STEINER 2006).

In the permanent dentition, a steady caries decline was observed from 1964 to 1996. The caries experience stabilised at a low level thereafter (Fig. 2). In the deciduous dentition, a steady caries decline was observed only up until 1988 (Fig. 3). No plausible explanation could be found for the slight increase up until 2000 and the subsequent relapse to the level of 1988.

The caries decline in school-children has reached an unexpectedly high level, as shown by the example of the caries experience on the approximal surfaces of permanent molars and premolars of 14-year-olds (Tab. IV). In 1964, 7.2 lesions per child were present, while in 2009, this figure had fallen to only 0.3 lesions. This represents an enormous benefit, since approximal fillings in the posterior teeth in particular have a limited lifespan (SJÖGREN & HALLING 2002) and may promote loss of attachment (BROADBENT ET AL. 2006).

It is noteworthy that the caries experience also declined by 83% (Tab. V) in the group most susceptible to caries (SiC in 12-year-olds). Additional preventive measures for school-children at high caries risk have consequently no priority.

### To what extent can the observed caries decline be explained?

To discuss this question, we will examine the decline of DFS in 14-year-olds (Tab. VII). In 1964, 14-year-olds had 22.7 lesions, while in 2009, this had decreased to just 1.6 lesions.

Tab. III Caries experience (mean values) in the permanent dentition of 12-year-old Zurich school-children (1964 to 2009)													
Year	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2005	2009	Caries Decline
N	474	677	736	775	758	542	452	399	292	328	276	295	
Teeth (28)													
MT, first molars	0.52	0.31	0.11	0.04	0.01	0.02	0.01	0.01	0.01	0.02	0.01	0.00	
MT, other teeth	0.16	0.25	0.35	0.26	0.23	0.16	0.21	0.11	0.10	0.06	0.05	0.05	
DT	2.97	1.64	1.65	1.42	1.23	0.65	0.31	0.18	0.14	0.15	0.14	0.10	
FT	4.46	3.68	3.20	2.18	1.75	1.56	1.27	0.95	0.69	0.72	0.71	0.66	
DMFT	8.10	5.88	5.30	3.90	3.22	2.39	1.80	1.24	0.93	0.96	0.91	0.82	
DM*FT	7.94	5.64	4.96	3.64	2.99	2.23	1.58	1.13	0.84	0.90	0.86	0.77	90%
Predilection sites (92)													
DS	3.79	1.96	1.87	1.59	1.38	0.74	0.35	0.20	0.16	0.16	0.16	0.12	
FS	9.88	7.10	6.06	4.06	3.05	2.42	1.78	1.30	0.89	0.96	0.93	0.75	
DFS	13.67	9.07	7.93	5.66	4.43	3.16	2.12	1.50	1.05	1.12	1.09	0.87	94%
FS/DFS	72%	78%	76%	72%	69%	77%	84%	87%	85%	86%	85%	86%	
Pits and fissures of molars and premolars (22)													
DS	1.30	0.62	0.60	0.46	0.44	0.35	0.14	0.08	0.07	0.08	0.08	0.05	
FS	5.34	4.97	4.89	3.48	2.72	2.07	1.57	1.15	0.81	0.86	0.83	0.72	
DFS	6.65	5.59	5.49	3.93	3.16	2.42	1.70	1.23	0.87	0.94	0.91	0.77	88%
D <sub>1-2</sub> S	5.05	5.24	4.30	4.81	4.17	4.11	3.26	2.57	2.82	2.95	2.54	2.26	55%
Sealed	0.00	0.01	0.02	0.04	0.12	0.37	0.40	0.87	1.06	1.59	1.12	1.66	
Approximal surfaces of molars and premolars (24)													
DS	1.16	0.94	1.06	1.04	0.89	0.34	0.17	0.09	0.08	0.07	0.06	0.06	
FS	2.21	1.36	0.85	0.45	0.24	0.25	0.17	0.10	0.07	0.08	0.09	0.03	
DFS	3.37	2.30	1.91	1.49	1.13	0.59	0.34	0.19	0.14	0.16	0.15	0.09	97%
D <sub>1-2</sub> S	5.89	5.88	5.30	6.20	5.51	2.63	1.77	0.98	0.68	0.66	0.72	0.58	90%
Free smooth surfaces of molars (16)													
DS	0.48	0.15	0.06	0.05	0.02	0.02	0.02	0.02	0.02	0.00	0.01	0.01	
FS	0.63	0.25	0.13	0.06	0.04	0.06	0.02	0.04	0.02	0.02	0.01	0.00	
DFS	1.11	0.40	0.18	0.11	0.07	0.08	0.04	0.06	0.04	0.02	0.02	0.01	99%
D <sub>1-2</sub> S	4.16	3.63	2.46	1.69	1.23	1.03	0.64	0.42	0.33	0.39	0.13	0.14	97%
Anterior tooth surfaces (30)													
DS	0.85	0.25	0.15	0.05	0.03	0.03	0.02	0.01	0.00	0.01	0.01	0.00	
FS	1.70	0.53	0.20	0.08	0.04	0.05	0.03	0.01	0.00	0.00	0.00	0.00	
DFS	2.54	0.78	0.35	0.13	0.07	0.08	0.04	0.03	0.00	0.01	0.01	0.00	100%
D <sub>1-2</sub> S	2.21	1.07	0.62	0.58	0.34	0.35	0.21	0.11	0.12	0.11	0.06	0.12	95%

FS/DFS expresses the level of dental care.

### Fluorides as a reason for the caries decline

The children examined in 1964 had scarcely come into contact with fluoride as a prophylactic measure compared with children examined in 2009. The use of fluoride as a caries prophylaxis began only in the early 1960s.

In the years 1960–63, three fluoride toothpastes whose effectiveness had been verified were launched on the market (MARTHALER 1975). From 1963, fluoride salt with a low fluoride content (90 ppm F) was used by the majority of the population in the 16 communities (MARTHALER 1972). Around 13% of the families used fluoride tablets in 1963/64 (MARTHALER & SCHRÖDER 1966). Since 1962–1964, toothbrushing exercises using fluoride preparations have been carried out four to six times a year in the schools of the 16 communities (MARTHALER 1972).

Today (2009), according to information provided by the parents, 96% of the children use fluoride toothpastes and 81% consume fluoridated salt with a high fluoride content (250 ppm F) at home. Around half of the children additionally use a fluoride gel and/or a fluoride mouthwash at home. Ac-

ording to the parents, 13% of the children took fluoride tablets in the first five years of their lives. Some of the children would have received a fluoride varnish application from their dentist. In the schools of the 16 communities, toothbrushing exercises using fluoride preparations continue to be held four to six times a year, as they have been since 1962–1964. From 1980–1984 to 1990–1994, the annual per-head consumption of toothpaste in Switzerland increased from 370 grams to 420 grams (MARTHALER ET AL. 1996b).

In a systematic review (MARINHO ET AL. 2003), the caries-preventive effect of fluoride toothpastes has been estimated at 21% to 28% (Tab. VII). The effect of locally applied fluoride preparations in addition to fluoride toothpastes has been estimated at 2% to 17% (MARINHO ET AL. 2004). MARTHALER (2005) estimates the preventive effect of fluoride salt with 250 ppm fluoride to be 21% to 24%. The cumulated effect of all these fluoridation measures has been calculated using a formula given by MARTHALER (1983), whereby it has been assumed that the applied measures act independently of one another. With



Tab. IV Caries experience (mean values) in the permanent dentition of 14-year-old Zurich school-children (1964 to 2009)

Year N	1964 451	1968 501	1972 685	1976 640	1980 715	1984 569	1988 488	1992 357	1996 241	2000 299	2005 285	2009 271	Caries Decline
Teeth (28)													
MT, first molars	0.86	0.48	0.24	0.10	0.05	0.03	0.02	0.03	0.01	0.01	0.01	0.01	
MT, other teeth	0.34	0.44	0.59	0.47	0.35	0.32	0.31	0.39	0.28	0.25	0.12	0.21	
DT	4.96	2.40	2.46	2.17	1.77	1.21	0.64	0.26	0.27	0.30	0.25	0.23	
FT	6.67	6.82	4.82	3.74	2.94	2.53	2.00	1.61	1.25	0.95	1.26	1.06	
DMFT	12.84	10.14	8.11	6.48	5.11	4.09	2.98	2.29	1.80	1.52	1.64	1.52	
DM*FT	12.50	9.70	7.52	6.01	4.76	3.77	2.67	1.90	1.53	1.27	1.52	1.31	90%
Predilection sites (92)													
DS	6.44	2.92	2.83	2.47	2.03	1.38	0.72	0.28	0.29	0.38	0.28	0.26	
FS	16.25	14.12	9.67	7.27	5.20	4.20	3.01	2.21	1.67	1.28	1.71	1.37	
DFS	22.69	17.04	12.49	9.74	7.23	5.58	3.73	2.49	1.95	1.66	1.99	1.63	93%
FS/DFS	72%	83%	77%	75%	72%	75%	81%	89%	86%	77%	86%	84%	
Pits and fissures of molars and premolars (22)													
DS	1.68	0.61	0.66	0.58	0.62	0.40	0.19	0.15	0.14	0.14	0.08	0.07	
FS	7.77	8.20	6.93	5.83	4.31	3.49	2.52	1.86	1.43	1.14	1.39	1.19	
DFS	9.45	8.81	7.58	6.41	4.93	3.89	2.71	2.01	1.57	1.28	1.47	1.25	87%
D <sub>1-2</sub> S	5.63	5.73	5.27	5.42	5.67	5.93	5.64	4.21	4.41	4.18	3.40	3.40	40%
Sealed	0.00	0.00	0.01	0.01	0.09	0.22	0.42	0.76	1.18	2.01	1.46	1.75	
Approximal surfaces of molars and premolars (24)													
DS	2.76	1.82	1.85	1.71	1.33	0.88	0.49	0.11	0.14	0.19	0.16	0.15	
FS	4.47	3.63	1.92	1.17	0.66	0.54	0.36	0.24	0.19	0.13	0.29	0.16	
DFS	7.23	5.45	3.77	2.88	1.99	1.42	0.85	0.35	0.33	0.32	0.45	0.32	96%
D <sub>1-2</sub> S	7.66	7.76	8.26	9.22	8.30	5.10	4.09	2.15	1.37	1.44	1.52	1.44	81%
Free smooth surfaces of molars (16)													
DS	0.71	0.21	0.10	0.06	0.03	0.03	0.02	0.01	0.00	0.03	0.01	0.01	
FS	1.04	0.55	0.20	0.12	0.09	0.09	0.07	0.05	0.03	0.00	0.02	0.01	
DFS	1.75	0.77	0.30	0.18	0.12	0.12	0.09	0.06	0.03	0.03	0.03	0.02	99%
D <sub>1-2</sub> S	5.56	5.52	3.69	2.52	2.01	1.89	1.28	0.90	0.75	0.59	0.26	0.27	95%
Anterior tooth surfaces (30)													
DS	1.29	0.27	0.23	0.12	0.06	0.08	0.03	0.01	0.01	0.01	0.03	0.03	
FS	2.97	1.74	0.62	0.15	0.14	0.07	0.05	0.06	0.02	0.01	0.01	0.01	
DFS	4.25	2.01	0.85	0.26	0.20	0.15	0.08	0.07	0.02	0.02	0.05	0.04	99%
D <sub>1-2</sub> S	3.19	2.14	0.84	0.89	0.68	0.53	0.43	0.45	0.12	0.36	0.15	0.33	90%

FS/DFS expresses the level of dental care.

a calculated overall (rounded) preventive effect of 39% to 55%, there is a reduction of carious lesions from 22.7 down to 10.3 to 13.9 (Tab. VII).

**Other possible reasons for the caries decline**

What are the possible reasons for the observed further decline from 10.3 to 13.9 down to 1.6 lesions, i.e. a (rounded) reduction of 84% to 88%? Other factors must be responsible for this – accordingly, other possible factors are listed in Table VII. The reasons listed have partly already been discussed in connection with the observed caries reduction in industrialised countries (BRATTHALL ET AL. 1996).

A reduction in plaque levels through improved oral hygiene (Factor 1) in the observation period (1964 to 2009) can be derived from the gingivitis data (results not shown). A reduction of plaque levels per se (without the contribution of fluoride) as a result of normal oral hygiene on the part of the patient would appear to have only a minor influence on caries prevalence. According to BELLINI ET AL. (1981), the effect is

mainly limited to the free smooth surfaces and the anterior teeth.

Changes in the plaque quality (Factor 2) are conceivable: a high level of mutans streptococci (>1 million bacteria per ml of saliva) was found significantly less frequently in Swiss school-children (14%) than in foreign school-children (26%), as indicated by the unpublished results of a caries epidemiological study (MENGHINI ET AL. 1998). In a Swedish study, a significant reduction of mutans counts in saliva was observed in school-children (KLOCK & KRASSE 1987).

In addition to toothbrushing exercises with fluoride preparations four to six times a year, the children of the 16 communities of the Canton of Zurich were also given dietary counseling. It is conceivable that the quantity or frequency of sugar consumption (Factor 3) was reduced, although there is no firm evidence of this. Since 1950, the amount of sugar (sucrose) consumed in Switzerland has remained at a constantly high level (40 to 44 kilograms per head per year [MARTHALER ET AL. 1994, Swiss Federal Statistical Office 2009]).

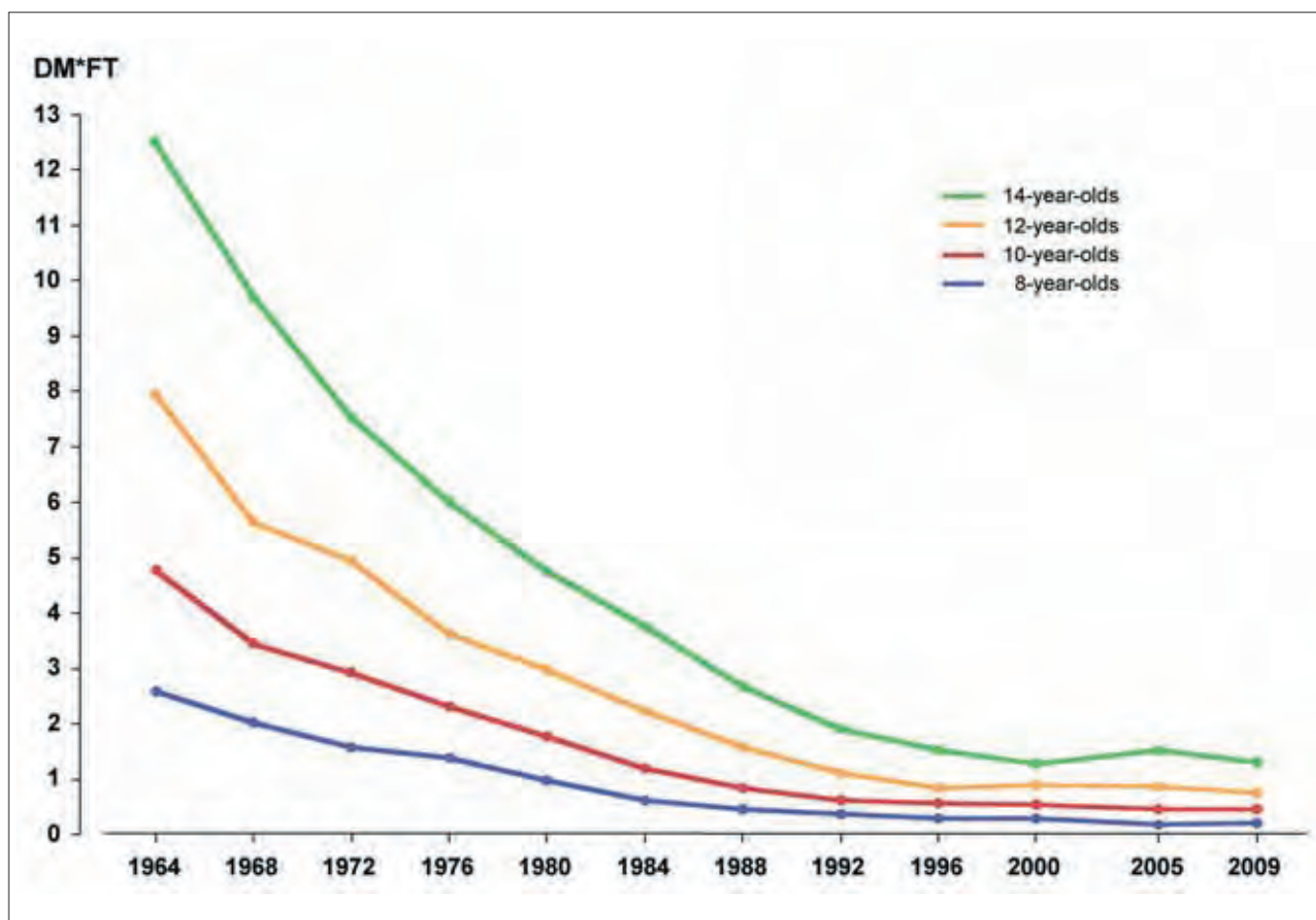


Fig.2 Mean DM\*FT values per school-child

**Tab.V "Significant Caries Index" (SiC) in the permanent dentition of 12-year-old Zurich school-children (1964 to 2009)**

Year	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2005	2009	Caries Decline
N	158	226	246	259	253	181	151	133	98	110	92	99	
Teeth (28)													
SiC	13.09	9.31	8.30	6.36	5.79	5.06	3.93	3.20	2.38	2.46	2.34	2.20	83%

**Tab.VI Caries experience (mean values) in the deciduous dentition of 7-year-old Zurich school-children (1964 to 2009)**

Year	1964	1968	1972	1976	1980	1984	1988	1992	1996	2000	2005	2009	Caries Decline
N	155	351	529	500	338	261	275	281	216	194	205	173	
Deciduous teeth (20)													
m*t	0.75	0.65	0.40	0.17	0.11	0.04	0.03	0.01	0.13	0.18	0.10	0.07	
dft	6.85	5.77	4.74	3.39	2.18	1.72	1.57	1.54	1.73	2.27	1.50	1.50	
dm*ft	7.60	6.42	5.14	3.56	2.28	1.75	1.60	1.55	1.87	2.45	1.60	1.57	79%
Approximal surfaces of deciduous molars (12)													
ms	1.15	0.96	0.58	0.24	0.15	0.07	0.03	0.01	0.19	0.22	0.15	0.09	
ds	6.32	5.29	4.13	3.44	2.86	1.88	1.20	1.35	1.31	1.27	0.73	0.86	
fs	0.90	1.26	1.22	0.96	0.62	0.65	0.61	0.55	0.55	0.79	0.59	0.76	
dmfs	8.37	7.52	5.93	4.64	3.64	2.60	1.84	1.91	2.04	2.27	1.47	1.71	80%
d <sub>1-2</sub> s	1.72	2.42	2.26	2.83	2.86	1.52	1.30	1.12	0.81	1.00	0.72	0.80	
fs/dmfs	11%	17%	21%	21%	17%	25%	33%	29%	27%	35%	40%	44%	
fs/dmfs expresses the level of dental care.													

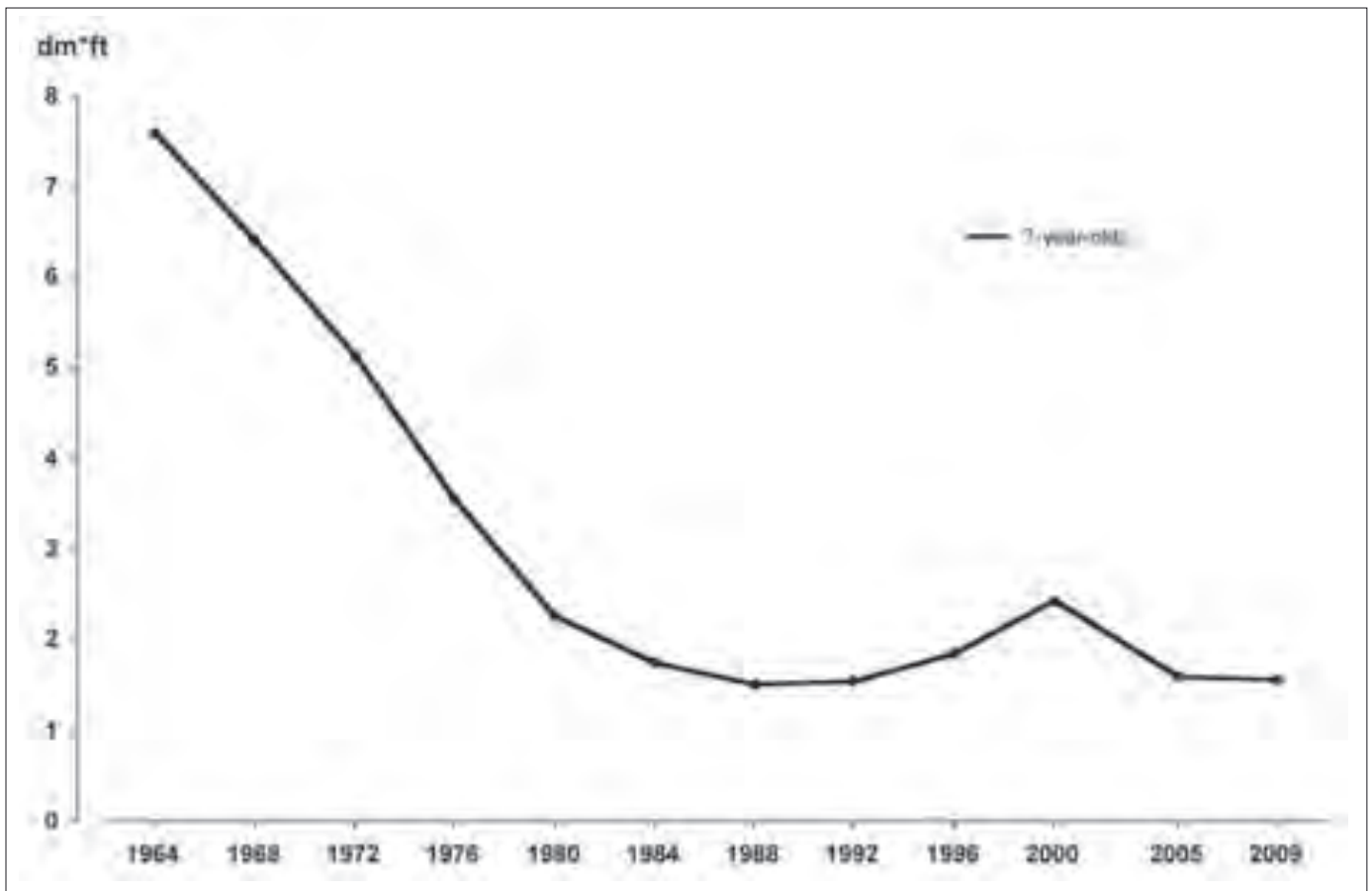


Fig. 3 Mean dm\*ft values per school-child

Tab. VII To what extent can the observed caries decline be explained?			
Factors	Reduction	DFS	References
F-toothpastes	21%–28% <sup>b</sup>	22.7 <sup>a</sup>	MARINHO ET AL. 2003
F-gel/F-mouthwash/F-varnish in addition to F-toothpaste	2%–17% <sup>b</sup>		MARINHO ET AL. 2004
F-salt	21%–24% <sup>c</sup>		MARTHALER 2005
F-factors cumulated	39%–55%	10.3–13.9	
Other factors:			
1 Mechanical reduction of plaque quantity	Small		
2 Changes in plaque quality (number and virulence of cariogenic bacteria)	?		
3 Reduction in quantity or frequency of sugar consumption	?		
4 Sugar-free confectionary products	?		
5 Sugar-free chewing gum	Small		
6 Fissure sealants	Small		
7 Antibiotics	?		
8 Preservatives	?		
9 Polyphenols	?		
10 Unidentified factors	?		
11 Synergistic effects	?		
Other factors cumulated	84%–88%	1.6 <sup>a</sup>	

<sup>a</sup> The mean DFS in 14-year-old school-children in the Canton of Zurich decreased from 22.7 in 1964 to 1.6 in 2009.  
<sup>b</sup> 95% confidence interval  
<sup>c</sup> Estimation based on different assumptions

The proportion of sugar-free confectionary products (Factor 4) on the market in Switzerland is around 20% (BISCOSUISSE 2010). This can have contributed to a decline in caries only if the consumption of sugar-containing confectionary products has sunk as result; however, there is no firm evidence of the latter.

In Switzerland, the consumption of sugar-free chewing gum (Factor 5) is widespread. In a survey of recruits in 2006, 39% of respondents stated that they chewed two or more pieces of gum daily. Today, over 90% of chewing gums are sweetened with sugar substitutes and/or artificial sweeteners. School chil-

dren who chewed gum sweetened with Sorbitol developed 20% fewer carious lesions than children who chewed no gum at all (DESHPANDE & JADAD 2008). Chewing sugar-free gum may therefore have led to a small caries reduction.

The influence of the sealing of pits and fissures (Factor 6) on caries experience was probably low; only few pits and fissures were sealed (Tab. IV).

The prescription of antibiotics (Factor 7) by paediatricians probably increased during the observation period (1964 to 2009) (FILIPPINI ET AL. 2006). A number of authors referred to a possible influence of antibiotic usage on caries prevalence (LOESCHE ET AL. 1989, KÜNZEL 1997, GIBBONS 1996).

The use of preservative-containing foodstuffs (Factor 8) probably also increased during the observation period, since the use of industrially processed foodstuffs increased. A caries-preventive effect of preservatives was demonstrated in an experimental animal study (DAVIES ET AL. 2001). Antibacterial and plaque-inhibiting properties were shown in an in-situ study (ARWEILER ET AL. 2008).

In-vitro studies showed, that polyphenols (Factor 9) reduce the virulence of mutans streptococci. Clinical studies demonstrated, that polyphenols inhibit the growth of mutans streptococci and dental plaque. In animal studies a caries inhibition was demonstrated (PETTI & SCULLY 2009). Important sources for polyphenols in the human diet are fruit, tea, coffee and chocolate (SCALBERT & WILLIAMSON 2000). It is conceivable that changes in consumption of these foodstuffs could influence caries experience.

It is also possible that unknown factors (10) contributed to the reduction in caries.

Synergistic effects were little studied (11). The effect of two factors in combination can be greater than the sum of the effects of the two factors taken individually. There are indications that good oral hygiene in combination with fluorides may have an increased caries-preventive effect (RÖLLA ET AL. 1991, MATHIESEN ET AL. 1996).

KLEEMOLA-KUJALA & RÄSÄNEN (1982) observed that poor oral hygiene and high sugar consumption in combination have an

increased caries-promoting effect. This means that good oral hygiene has an increased caries-preventive effect in the case of high sugar consumption.

## Conclusion

In summary, it must be said that only the effect of fluorides is at all quantifiable, which means that a caries reduction of around 50% can be explained (Tab. VII); the further reduction of more than 80% remains unexplained.

## Uncertain future development

The caries experience in the permanent dentition appears to have stabilised at a low level. Since the caries decline can be explained only to a (small) degree, a long-term and reliable prognosis of future trends is not possible. The future development should therefore be followed by means of caries-epidemiological surveys.

## Résumé

Dans 16 communes zurichoises, des écoliers de toutes classes d'âge ont été soumis à un examen bucco-dentaire, à intervalles de quatre ans depuis 1963/64. Pendant cette période, la même méthode standardisée a été utilisée. Cette étude documente l'évolution de la carie sur 45 ans.

L'indice CA\*OD moyen des écoliers âgés de 14 ans a diminué, entre 1964 et 2009, de 12,50 à 1,31. Cela correspond à une réduction de la carie de 90%. Chez les élèves âgés de 8, 10 et 12 ans, cette réduction était de 90% à 92%.

Le «Significant Caries Index» (le CA\*OD moyen du tiers des élèves de 12 ans avec les valeurs du CA\*OD les plus élevées) a diminué, entre 1964 et 2009, de 13,09 à 2,20. Cela correspond à une diminution de la carie de 83%.

La forte réduction de la carie observée était inattendue. L'effet des fluorures peut expliquer une réduction de la carie environ 50%. Une grande partie de la réduction reste inexpiquée. De possibles causes sont discutées.

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# Thomas M. Marthaler and salt fluoridation

## Literature references concerning his activities in the service of WHO

SWISS DENT editorial team

Professor Thomas M. Marthaler «was passionate about fluoride research with a view to caries prevention. He developed the scientific basis for salt fluoridation, which he introduced to Switzerland in 1955, and subsequently – as an advisor to the WHO – to other European countries, as well as in Central and South America. The 50% decline in caries was far exceeded and is now around 95%. More than 300 million people worldwide benefit from salt fluoridation.»<sup>[1]</sup>

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### Note

[1] Imfeld, Thomas: Prof. em. Dr. med. dent. Thomas M. Marthaler died on 13 November 2020 at the age of 91 after a long illness. He leaves behind an impressive life's work as a successful preventive dentist, epidemiologist and statistician. The good dental health enjoyed by the Swiss population today is thanks to his tireless work. In: *SWISS DENT* 43 (2022) No. 1, p. ....

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<sup>[1]</sup> Clinic of Preventive Dentistry, University of Zurich

<sup>[2]</sup> WHO Collaborating Center, UTHSCSA

# Prof. em. Dr. med. dent. Thomas M. Marthaler died on 13 November 2020 at the age of 91 after a long illness.

He leaves behind an impressive life's work as a successful preventive dentist, epidemiologist and statistician. The good dental health enjoyed by the Swiss population today is thanks to his tireless work.

## A passionate commitment to dental health

Professor Marthaler, affectionately known as «Tomi» by friends and colleagues, was born in Zurich in 1929. After completing his studies in dentistry in Zurich in 1953, he spent a one-year residency at the Forsyth Dental Infirmary in Boston, Massachusetts (USA). Dismayed by the extensive caries damage suffered by patients there and the equally poor dental conditions in Switzerland in the 1950s, Tomi was inspired to pursue a career in preventive dentistry. Back in Zurich, he became an assistant at the caries research station led by Professor Hans R. Mühlemann and soon distinguished himself as a creative study planner and statistician. From 1958 to 1965, Tomi conducted one of the world's first longitudinal clinical caries studies in 500 schoolchildren. In 1963 he began his epidemiological survey of the dental health of Zurich schoolchildren, which was carried out every four years. From 1968 to 1991 he was head of the Biostatistical Centre at the Faculty of Medicine of the University of Zurich.

Tomi was passionate about fluoride research with a view to caries prevention. He developed the scientific basis for salt fluoridation, which he introduced to Switzerland in 1955, and subsequently – as an advisor to the WHO – to other European countries, as well as to Central and South America. The anticipated 50% decline in caries was far exceeded and is now around 95%. More than 300 million people worldwide benefit from salt fluoridation.

Tomi established school dental care in the municipalities of the canton of Zurich with a view to providing all young people with access to caries prevention, regardless of their social background. He recruited and trained the school dental care instructors himself. The provision of school dental care was subsequently adopted by many other cantons.

## International recognition

Professor Marthaler's scientific oeuvre comprises over 300 publications, and he is one of the most cited dental epidemiologists.

In 1982 he was recognised by the International Association for Dental Research for his «Outstanding Research in the Fields of Caries Aetiology and Prevention of Caries», and received the H. Trendley Dean Memorial Award for Research in Epidemiology and Dental Caries, while in 1994 he received the Borrow Memorial Award. In 1997 he was awarded the Yngve Ericsson Prize in Preventive Dentistry, in 2001 the Czech Dental Chamber's prize for «Merits in Public Health» and in 2006 the «Special Merit Award for Outstanding Achievement in Community Dentistry International» from the American Association of Public Health Dentistry. In 2010 he was named «Dentist of the Year» by the Academy of Dentistry International.

Tomi's scientific work, and his creative and pragmatic ideas for making new findings accessible to all, allowed for great progress to be made in oral health, both on a national and international scale.

## Love of music

Tomi was already playing the clarinet at the age of fourteen. Following his initial focus on folk music, he soon found his way onto the Zurich jazz scene and came in third place at the 1953 Zurich Amateur Jazz Festival with the «Porridge Brass Band». The highlights of Tomi's jazz career came during his time in Boston, however, when he accompanied Ella Fitzgerald and jammed with Charlie Parker. He later returned to Swiss folk music, making a name for himself as a virtuoso clarinetist, player of the *Schwyzzerörgeli* (diatonic button



Marianne and Thomas M. Marthaler; taken in 2002

(image: Carola Imfeld, Stäfa, Canton Zurich)

accordion) and composer, as well as for simply being extremely enjoyable company.<sup>[1]</sup>

### Colleague and human being

Professor Marthaler was a loving husband and a caring father to his three daughters. Tomi and his wife Marianne were a wonderful, harmonious couple. Marianne Marthaler was lovingly supportive of Tomi throughout his professional life and during the years of his illness, for which he was immensely grateful.

Tomi was a friendly, serene and helpful person. With his structured and analytical approach, he was great at giving advice. His enthusiasm and dry humour were refreshing, and he was by no means an aloof academic. His modest, collegial and pleasant demeanour helped to make his work credible and ensure its lasting effect.

Tomi will be missed and fondly remembered by friends, colleagues, staff and students alike.

Prof. em. Dr. med. dent. Thomas Imfeld, MBA

### Notes

[1] Various sound recordings by Thomas M. Marthaler are available online. The programme «Öisi Musig» hosted by Wysel Gyr on 10 March 1984 provided a perfect portrait of Thomas Marthaler both as an individual and a musician («Öisi Musig – Thomas Marthaler – Play SRF»). From 1961 to 1979, Wysel Gyr (1927–1999) was responsible for various cultural programmes including «Öisi Musig» on Swiss Television (SF).

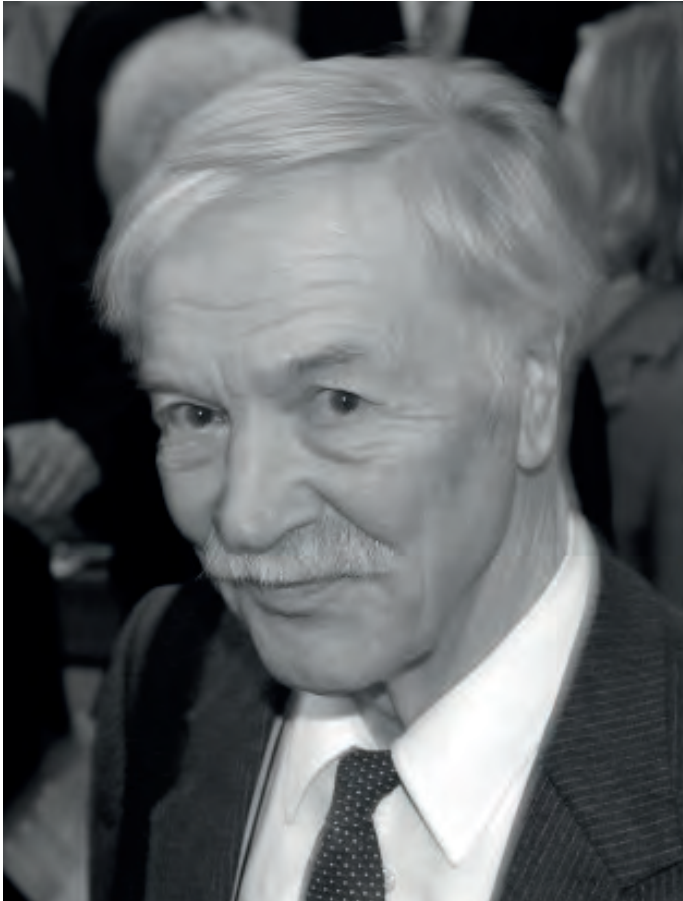
### Note from the editor

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BRANCHENMELDUNGEN 21.12.2020

# DGPZM mourns the loss of Prof. Dr. Thomas M. Marthaler



Teaser image: German Society for Preventive Dentistry DGPZM/  
Prof. Dr. Stefan. Zimmer

The German Society for Preventive Dentistry (DGPZM) announces with great sadness that Prof. Dr. Thomas M. Marthaler passed away on 13 November 2020 at the age of 91 from Covid-19 following a long illness.

Professor Thomas Marthaler was one of the most important preventive dentists of his time. With his focus on group and collective prevention, he was the driving force behind salt fluoridation in Switzerland for decades, and also introduced the practice to Germany together with Dr. med. dent. Hanns -Werner Hey in 1991. Without these two individuals, salt fluoridation and its benefits for almost 60% of all Germans would probably not exist today.

The prevention programmes initiated by Professor Marthaler, first in the canton of Zurich, contributed significantly to the fact that oral health throughout Switzerland – which was very poor in the 1970s – improved so rapidly that the country has become a model for prevention, and a role model for Germany.

Professor Marthaler was also a great role model as a human being. Despite being an internationally recognised scientist of high standing, he remained modest and unpretentious, and was an excellent listener and advisor. It is impossible to overstate Professor Marthaler's contribution to preventive dentistry. He embarked on a path in collective and group prevention that we will continue to follow for a long time to come. For this we are greatly indebted to him.

Our thoughts are with his family.

Source: German Society for Preventive Dentistry DGPZM

## Note from the editor

This text was reprinted with the kind permission of the DGPZM in German in SWISS DENT 42 (2021), page 85. The text published in this issue of SWISS DENT 43 (2022) No. 1, page 39, is an English translation approved by Prof. Dr. Stefan Zimmer, DGPZM.

## Thomas Marthaler: Scientist, Musician, Friend

It is a privilege to be able to say a word about our dear friend and colleague “Tomi” Marthaler, who died on the 13th of November 2020, aged 91.

Tomi was a giant in the world of caries prevention and there were several stages to his long career. He served as a dentist at his father’s practice and, while working part-time at Zurich’s Dental Institute, he studied the effect of fluoride on dental caries in rodents. He was awarded a Doctorate by the University of Zurich and carried out longitudinal studies on schoolchildren and clinical trials in caries prevention. These interests led to his serious involvement with mathematics and statistics. He became Head of Zurich University’s Biostatistical Centre and served as an adviser to the WHO. Through his support for the fluoridation of salt, some of the benefits of his life-long endeavours in caries prevention have been passed on to his fellow citizens in Switzerland.

His enormous contributions to the field of epidemiology and dental caries have been recognised and variously honoured in Europe, Scandinavia, and elsewhere. Much of Tomi’s work has been described in over 300 scientific papers. In 2010 he was acclaimed as “Dentist of the Year” by the Academy of Dentistry International in the USA.

Tomi had another life. In celebration of his 80th birthday, Prof. Imfeld referred to Tomi’s “dental probe and clarinet.” Many of us on the periphery of Tomi’s statisti-



*Thomas Marthaler*

cal kingdom found the clarinet much more musical than the probe. Tomi had another name in Switzerland, where, under the alias “Sabu,” he wrote music. At Zurich’s Amateur Jazz Festival, his group once shared the honour of third place with the Porridge Brass Band.

Several of us, who are approaching or share with Tomi the title of “nonagenarian,” have lost a warm and valued friend. Our love and heartfelt condolences go to all of Tomi’s family and our dear friend, Tomi’s wife, Marianne.

*Prof. em. Klaus König, University of Nijmegen*

*Prof. em. Walter Künzel, University of Erfurt*

*Prof. em. John Weatherell, University of Leeds*

### Note from the editor

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Thomas Marthaler: Scientist, Musician, Friend. Caries Res 2021;55:73–73. doi: 10.1159/000513507.  
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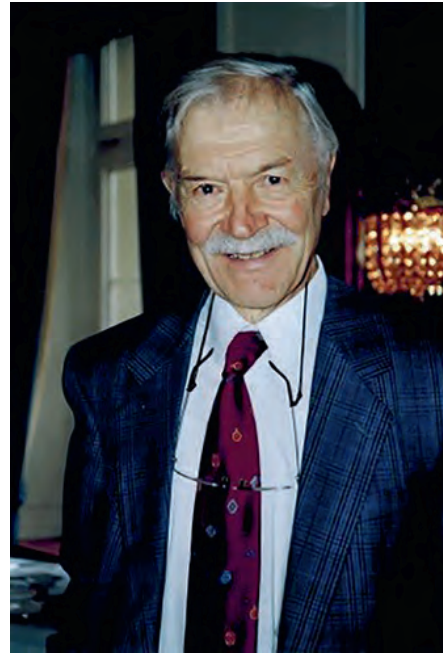
## ORCA Has Lost One of Its Pioneers

On the 13th of November 2020, our long-standing Swiss member Prof. Dr. Thomas Marthaler passed away at the age of 91 years. From very early on, Tomi Marthaler, as many friends called him, took an international and scientific approach to dentistry. He spent the year after his graduation in the USA. Back in Switzerland, he combined working in the family practice with scientific work at the University of Zurich. Like many other pioneers in cariology, he was driven by the question of how to prevent the enormous burden of dental caries in many highly developed countries, instead of treating the damage caries caused. Switzerland was definitely a prime place for this in the 1950s, when ORCA was also founded.

Very systematically, Prof. Marthaler found partners in the Swiss School Dental Services, developed a sound epidemiological base, and analyzed the influence of dietary factors in the process of caries which was not fully understood at that time. The big breakthrough occurred when many researchers concentrated on the caries-preventive effect of fluorides, which was one of the founding topics of ORCA. Thomas Marthaler examined the properties of amine fluorides and played an important role in establishing their regular application in Swiss schools. This very simple but systematic approach led to an incredible decline in caries of over 90% and was an outstanding success for caries research with its epidemiologic, basic science, and community dentistry branches. Thomas Marthaler thus set an example for young researchers and caries prevention in many other countries. Modern caries preven-

In Switzerland, his outstanding achievements were rewarded with an “Außerordentliche Professur”, an “extraordinary” Professorship for Oral Epidemiology and Preventive Dentistry at the University of Zurich. He formed a network with colleagues such as Hans Mühlemann, Klaus König (who was actually called his preventive twin brother), and Klaus Rateitschak, and Zurich became one of the leading centers for preventive and biologically based dentistry, both in cariology and periodontology. They developed the idea and regulations for labeling sweets as “tooth-friendly,” a logo used in many countries.

Prof. Marthaler was also involved in spreading the idea of fluoridated salt as a population-wide preventive ap-



Prof. Dr. Thomas Marthaler

proach improved the quality of life of whole populations and countries and Thomas Marthaler helped to make this possible. ORCA acknowledged these achievements by awarding him the Junior Rolex Prize in 1966. He was part of the international ORCA family, presenting their current research at annual conferences and enriching the evening event with a group of very vocal entertainers.

Very quickly, his endeavors became a benchmark for other activities for caries prevention, he initiated an international comparison of the caries decline published in *Caries Research*, and he also served as adviser to the WHO and US CDC. In appreciation of his contributions, he became an Honorary Member of ORCA after his retirement.

ORCA has lost a true member and a role model for scientific and humanitarian engagement in cariology. Our hearts are with his family and friends.

*Christian Splieth*, on behalf of the ORCA board and the whole ORCA family

### Source note

Reprinted from: *Caries Research* (S. Karger AG, Basel). Published online: January 11, 2021. ORCA Has Lost One of its Pioneers. *Caries Res* 2021;55:74-75. doi: 10.1159/000513508. With the kind permission of S. Karger AG, Basel.

# Hans R. Mühlemann

Pionier der Erforschung der Mundkrankheiten  
Karies und Parodontitis

Publikationen in der Zeitschrift SWISS DENT  
in den Jahren 1980 bis 1985

SWISS DENT 1/17



Zum 100. Geburtstag  
\* 26. August 1917 in St. Moritz GR  
† 1. Juni 1997 in Zürich

(Bildnachweis: Archiv Dr. med. dent.  
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## EDITORIAL

Professor H. R. Mühlemann:  
«Mehr Mundgesundheit  
für mehr Menschen!»  
– Prof. em. Dr. med. dent.  
Werner H. Mörmann,  
Abteilung für Computergestützte  
Restaurative Zahnmedizin, Zentrum  
für Zahnmedizin der Universität Zürich,  
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## BEITRÄGE

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– Gespräch mit H. R. Mühlemann

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ein kalorienarmer Zuckerersatzstoff:  
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Dentalhygiene – Zwanzig Jahre später  
– Barbara J. Benson, RDH, MS

Kariesprophylaxe und Zahnarztgehilfin  
– H. R. Mühlemann

Die zahnmedizinische Versorgung der  
Schweiz: Istzustand, Probleme, Ausblick  
– H. R. Mühlemann

### 1981

Auf dem Weg zum sauberen Zahn?  
– H. R. Mühlemann

Papillenblutungsindex (PBI):  
Ein Motivationsmittel zur Mundhygiene  
– Beschreibung des Inhalts einer  
von H. R. Mühlemann verfassten und  
von Elida Cosmetic AG veröffentlichten  
Broschüre

### 1982

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– H. R. Mühlemann

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dents» – A quand des sirops médicaux?  
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Drei neue «zahnschonende» Präparate –  
Wann wird es medizinische Sirupe geben?  
– H. R. Mühlemann, A. Firestone

Die erste zahnschonende  
Schweizer Milkschokolade  
– H. R. Mühlemann, Th. Imfeld,  
A. Firestone

### 1983

A propos des appellations  
«ménage les dents» et «sans sucre»  
– H. R. Mühlemann

Sucre et Zurich –  
Télémetrie du pH de la plaque  
– H. R. Mühlemann

Cariology, Zurich 1953–1983  
Some Aspects of One Man's Stand  
– T. Imfeld, R. Schmid, F. Lutz, U. P. Saxer,  
F. Barbakow

Quintessenz von «30 Jahre Zähne»  
(Abschiedsrede von H. R. Mühlemann  
vom 18. November 1983)  
– H. R. Mühlemann

### 1984

Anlässlich der Abschiedsrede von H. R.  
Mühlemann, Zürich, 18. November 1983:  
– Foto mit F. Lutz und H. R. Mühlemann

«Some Conclusions after 30 Years  
of Dentistry»  
– H. R. Mühlemann

Anlässlich des St. Moritzer Zahnärzte-  
Fortbildungskurses, Flims Waldhaus,  
2. bis 8. September 1984  
– Foto mit F. Lutz und H. R. Mühlemann  
– Foto mit H. E. Schroeder  
und H. R. Mühlemann

### 1985

Anlässlich des St. Moritzer Zahnärzte-  
Fortbildungskurses, Flims Waldhaus,  
2. bis 8. September 1984:  
– Foto mit B. Maeglin, H. R. Mühlemann  
und H. E. Schroeder

Standespolitik statt Ethik – oder mögliche  
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# «We've got a little book!»

## On the death of the Swiss oral epidemiologist Prof. Dr. Thomas Marthaler

In the 1980s, the caries rate among children and adolescents in Germany was alarmingly high. Measures aimed at rectifying this were limited to calls to avoid sugar, and the construction of elaborate toothbrushing fountains in some schools. Thirty years earlier, and in the face of an even higher rate of caries, Switzerland had identified collective prevention as the most effective countermeasure. Thomas Marthaler, at the time still an assistant to the great Hans R. Mühlemann at the Dental Institute of the University of Zurich, was the initiator who resolutely promoted systematic school-based dental care and, from 1955, the use of fluoridated table salt by all households. As a «tireless worker», as one speaker called Marthaler on his 80th birthday, he spent time not only out and about in the cantons of Switzerland, but all over the world – of course frequently in the USA, where he received his first inspiration in Boston at the Forsyth Children's Dental Clinic, and later – as a motivator and fluoride expert *par excellence* worldwide, in countries such as Hungary, the Czech Republic and Colombia to name but a few.

In Germany, various attempts to approve table salt fluoridation had failed. The dental establishment feared economic losses, and the university kept a low profile. An expert report by Professor Marthaler seemed to me to be the only chance of convincing our government of the efficacy and safety of salt fluoridation based on the success achieved in Switzerland, where the reduction in tooth decay was already over 50% by 1985. On the plane to Zurich, Mr Rächle, the managing director of the Reichenhall salt works and my partner in this mission, asked me how much a report by such an expert would cost, and I told him he should expect around DM 20,000 – I remember how he gulped. And then there we were, sitting in the Dental Institute on Plattenstrasse in front of the professor, who slightly unsettled me, and Mr Rächle even more so, with his somewhat ponderous manner. But he agreed to produce the report. Mr Rächle then asked how much it would cost, and Marthaler again paused for far too long and said: «We've got a little book.» Beg your pardon? «We've got a little book.» Neither Mr Rächle nor I understood at the time that this 'little book' referred to the department's savings account, for which the professor expected only a donation – Rächle later told me it was DM 2,000 that had been destined for the little book. Personally, Marthaler told me later that he saw his report as a gift to our German Dentistry Working Group (DAZ), whose efforts towards systemic caries prevention he had been following for a few years.

After overcoming a few more obstacles, *provisional* approval was then obtained – and is still in place after almost 30 years – and Marthaler not only gave one of the speeches at the introduction of fluoridated salt in Munich but also, for 15 years afterwards, sat on the expert panel of the IfK, the DAZ's information centre for caries prevention. He was of course a godsend for us with his decades of experience, including identifying the scientific basis of the mode of action of fluoridated table salt. Added to this was the amine fluoride for elmex® toothpaste and elmex® gel, the latter together with his colleague Professor Klaus König. Also a godsend was his treasure trove of around 300 publications, and his involvement in many international professional organisations.

The many years of professional contact also brought us closer together privately over time. Especially memorable was a tour in the Karwendel mountains with our wives, when he told us at the hut about his second life as a musician, recounting tales of his role as a clarinetist and accompanist for Ella Fitzgerald and Charlie Parker, the jam sessions in Zurich and what was for him the 'real thing', folk music with clarinet and *Schwyzörgeli* (diatonic button accordion).



Professor Marthaler on his 80th birthday  
(Image: private archive of Marianne Marthaler, Zurich)

Our last visit to the apartment on Bellerivestrasse in Zurich was particularly unforgettable. By then Tomi's condition was already deteriorating, and not long afterwards came the inevitable move to a nursing home where he was well looked after, but unfortunately, at the age of 91, he contracted the Covid virus and passed away on 13 November 2020. I recall his look, the fascinating conversations, the attention of the kind and patient listener, the friend I will never forget.

Dr. med. dent. Hanns-Werner Hey

### Note from the editor

[1] On 18 January 2022, the editor of *SWISS DENT* asked Dr. Hanns-Werner Hey about the current situation of salt fluorida-

tion in Germany. In his e-mail of the same date, Dr. Hey replied that the German administration was still too anxious to grant final approval. He referred in his reply to his article «15 Jahre Speisesalz-Fluoridierung in Deutschland – Nutzen und Akzeptanz» («15 years of table salt fluoridation in Germany – benefits and acceptance»), published in: *DAZ-Forum*, 88, 25th year, 11/2006, page 22.

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