Management of Caries Using Ozone

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Independent Seminars, 23 May 2003, RCP.

Professor of Restorative Dentistry and Gerodontology
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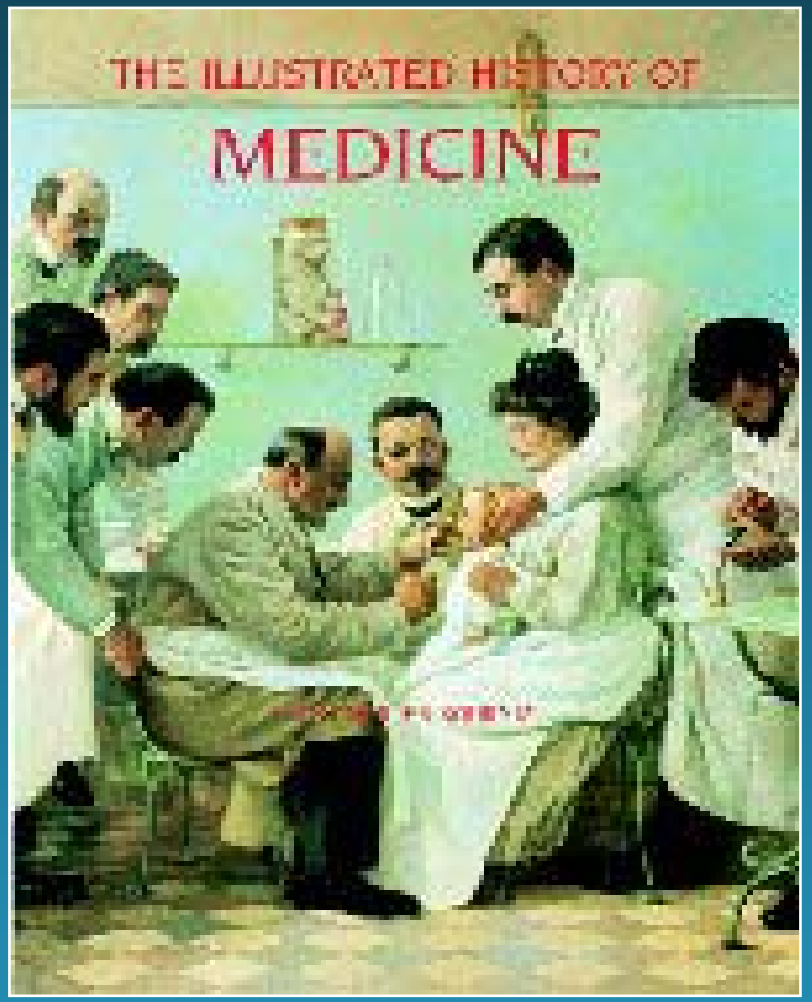
Queen's University Belfast

Frankfurt May 2003


THE ILLUSTRATED HISTORY OF
MEDICINE

Different Perspective

Tooth Friendly

Feel good factor

Easy to apply

The measurement of root caries for research purposes

Edward Lynch

J Dent Res 65, 510, 207, 1986.

Beighton D., Lynch E. and Heath M.R. (1993)

A microbiological study of primary root caries lesions with different treatment needs.

***Journal of Dental Research* 73: 623-629.**

This is the only validated severity index for root caries

Lynch E. and Beighton D. (1994)

A comparison of primary root caries lesions classified according to colour.

Caries Research 28: 233-239.

Lynch E. (1996)

Relationships between clinical criteria and microflora of primary root caries.

In: Early Detection of Dental Caries. Ed. Stookey G.K., 195-243.

Lynch E. (1996)

Antimicrobial management of primary root carious lesions.

***Gerodontology* 13: 118-129.**

A pharmaceutical approach to the management of root caries

E. Lynch and A. Baysan

Tissue Preservation and Caries Treatment
Quintessence Book 2001, Chapter 3,
p. 81-104.

Antimicrobial management

Lynch E. *et al.* (1997)

Multicomponent spectroscopic investigations of salivary antioxidant consumption by an oral rinse preparation containing the stable free radical species chlorine dioxide ($ClO_2^{\bullet}$).

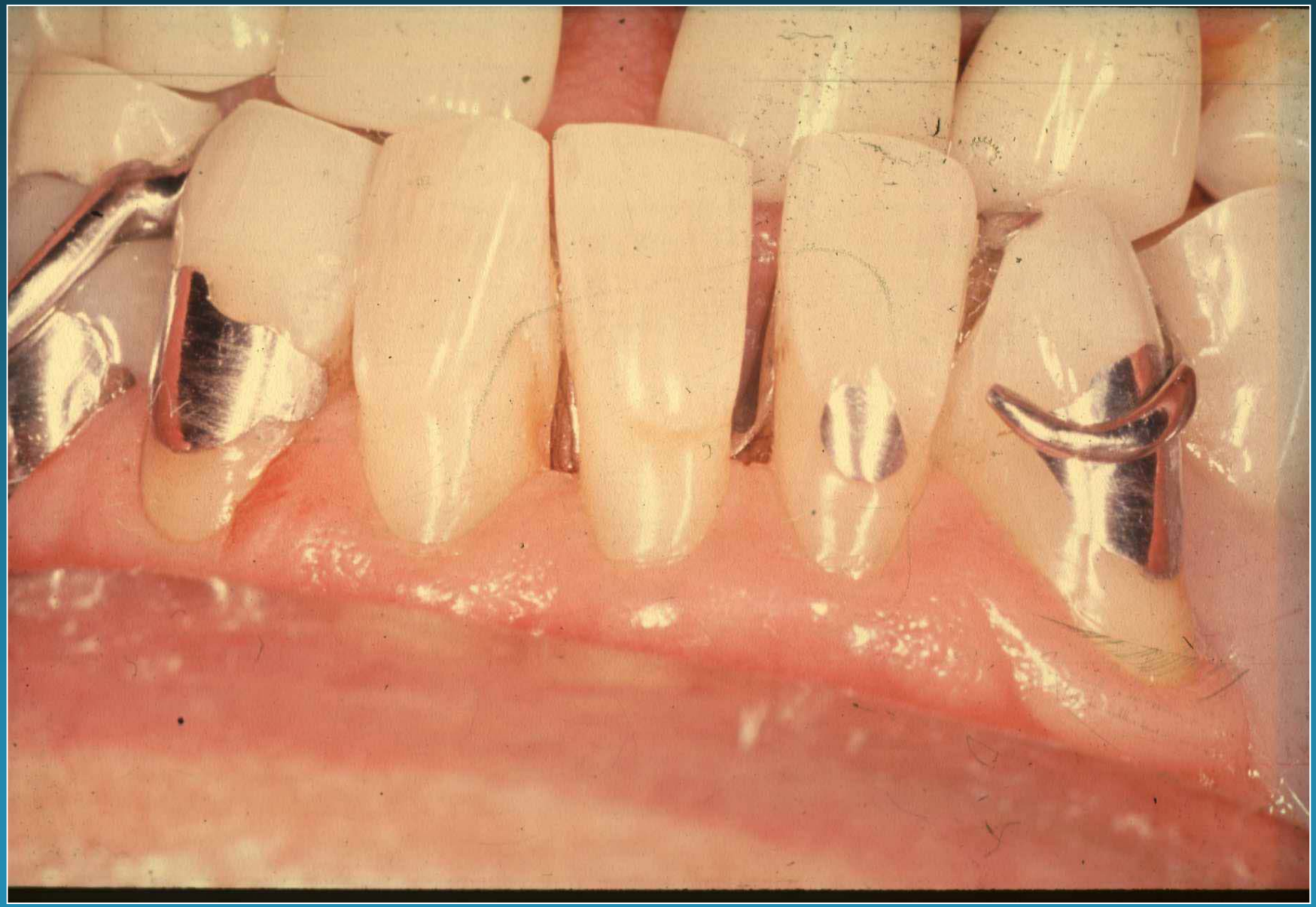
Free Radical Research 26:209-237.

Antimicrobial management

Lynch E . *et al.* (1999)

Multicomponent evaluations of the oxidising actions and status of a peroxoborate-containing tooth-whitening system in whole human saliva using high resolution proton NMR spectroscopy.

Journal of Inorganic Biochemistry 73: 65-84.



Ozone is currently used worldwide for sterilization of water, food storage, etc.

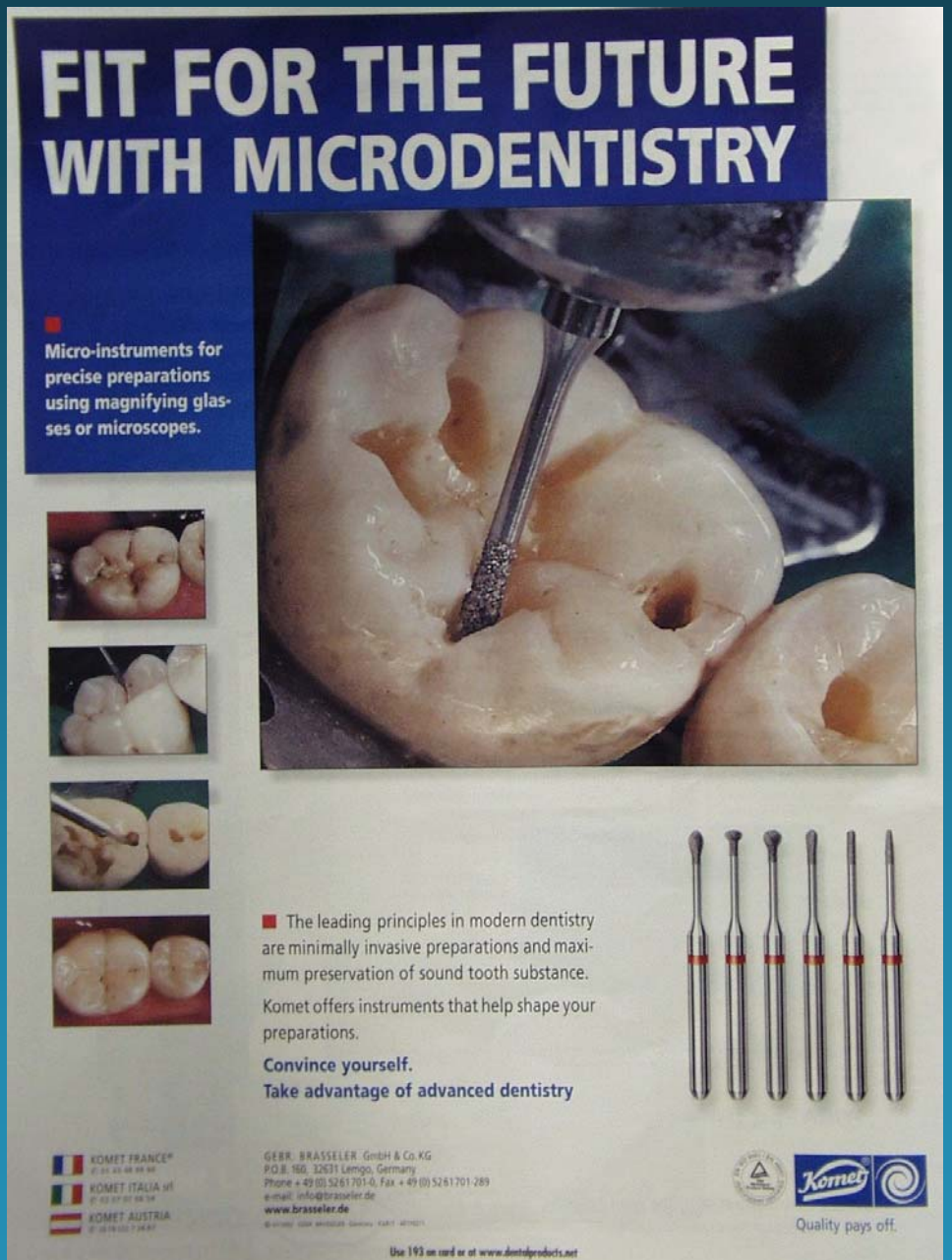
Ozone has been used extensively in medicine for decades.

Management of root caries using OZONE

Available from KaVo

- Indications

- Pit and fissure enamel caries
- Early occlusal caries just into Dentine
- Open accessable caries
- All accessable root caries



The Future of Dental Care?

- Contraindications

- Hidden carious lesions, ie deep dentinal caries with no visible cavitation
- Approximal lesions where a seal is not possible

Mechanism of Action

1 Antimicrobial
2 Eliminates “ecological niche”
3 Removes the Acidity
4 Removes Proteins

Saliva is naturally supersaturated with Calcium and Phosphate and wants to remineralise caries.

The regular acid production in Caries counteracts the above.

Anti-microbial effects of a novel ozone generating device on micro-organisms associated with primary root carious lesions

A. Baysan, R. Whiley and E. Lynch
Caries Research 2000;34:498-501.

99% killing achieved after the ozone treatment

Results

Mean ± SE $\log_{10}$ cfu + 1 before and after ozone application for a period of either 10 or 20 s

Groups	10 seconds	20 seconds
Control samples	7.00 ± 0.24	6.00 ± 0.20
Test samples	4.35 ± 0.49	0.46 ± 0.25

Ozone application either for a period of 10 (99%) or 20 s (99.9%) substantially killed micro-organisms in PRCLs

Eliminates “ecological niche” of acidogenic and aciduric microorganisms for at least 14 weeks.

Allows remineralisation to occur within lesions.

Antimicrobial management

Silwood C.J.L., Lynch E., Seddon S., Sheerin A., Claxson A.W.D. And Grootveld M. (1999)

^{1}H NMR Analysis of Microbial-Derived Organic Acids in Primary Root Carious Lesions and Saliva.

NMR in Biomedicine 12: 345-356.

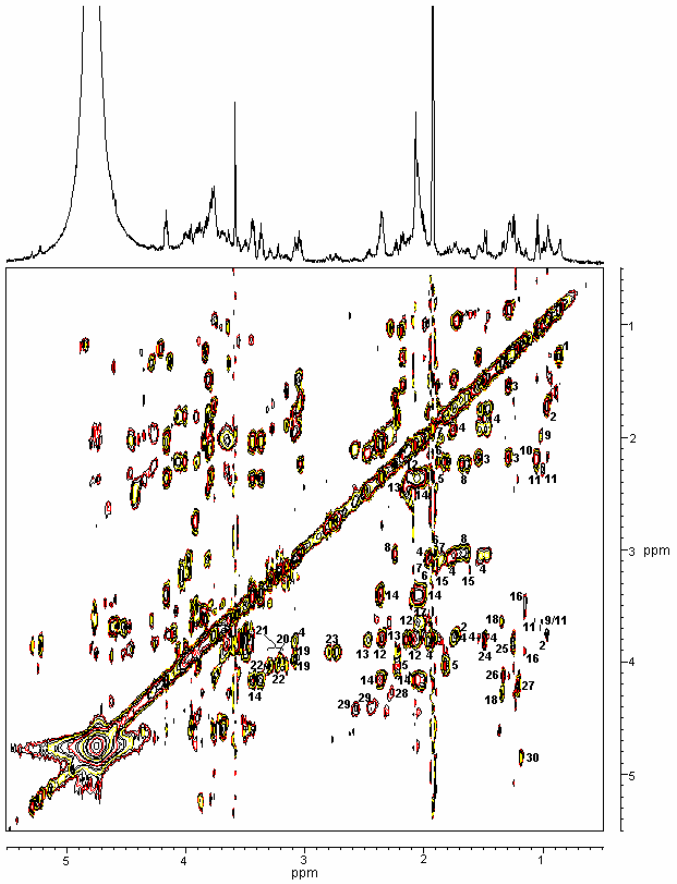
Silwood C, Lynch E and Grootveld M

Journal of Dental Research

Paper Published in June 2002

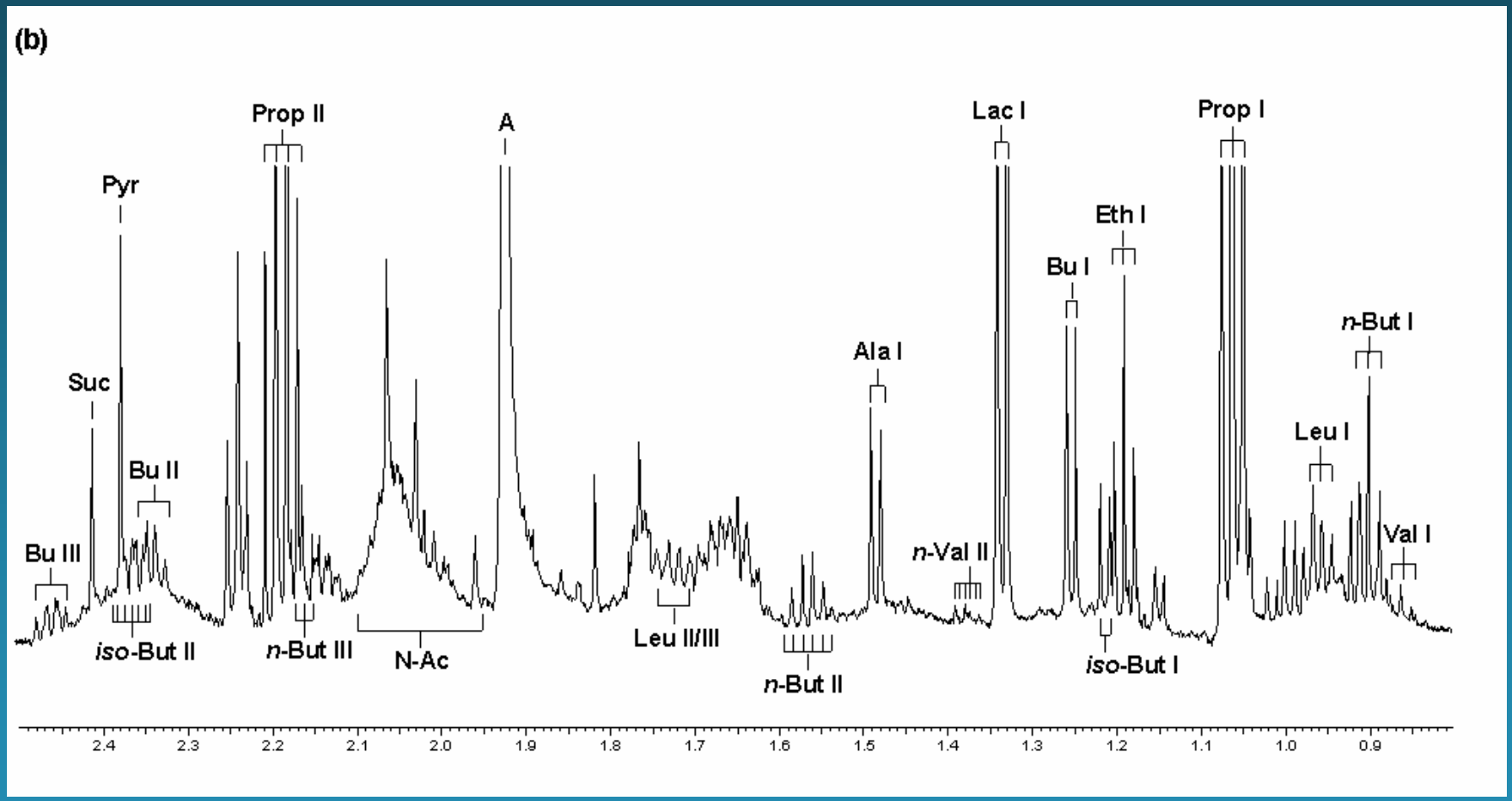
^{1}H NMR spectra

Partial ^{1}H-^{1}H 2D TOCSY spectrum of a human salivary supernatant specimen

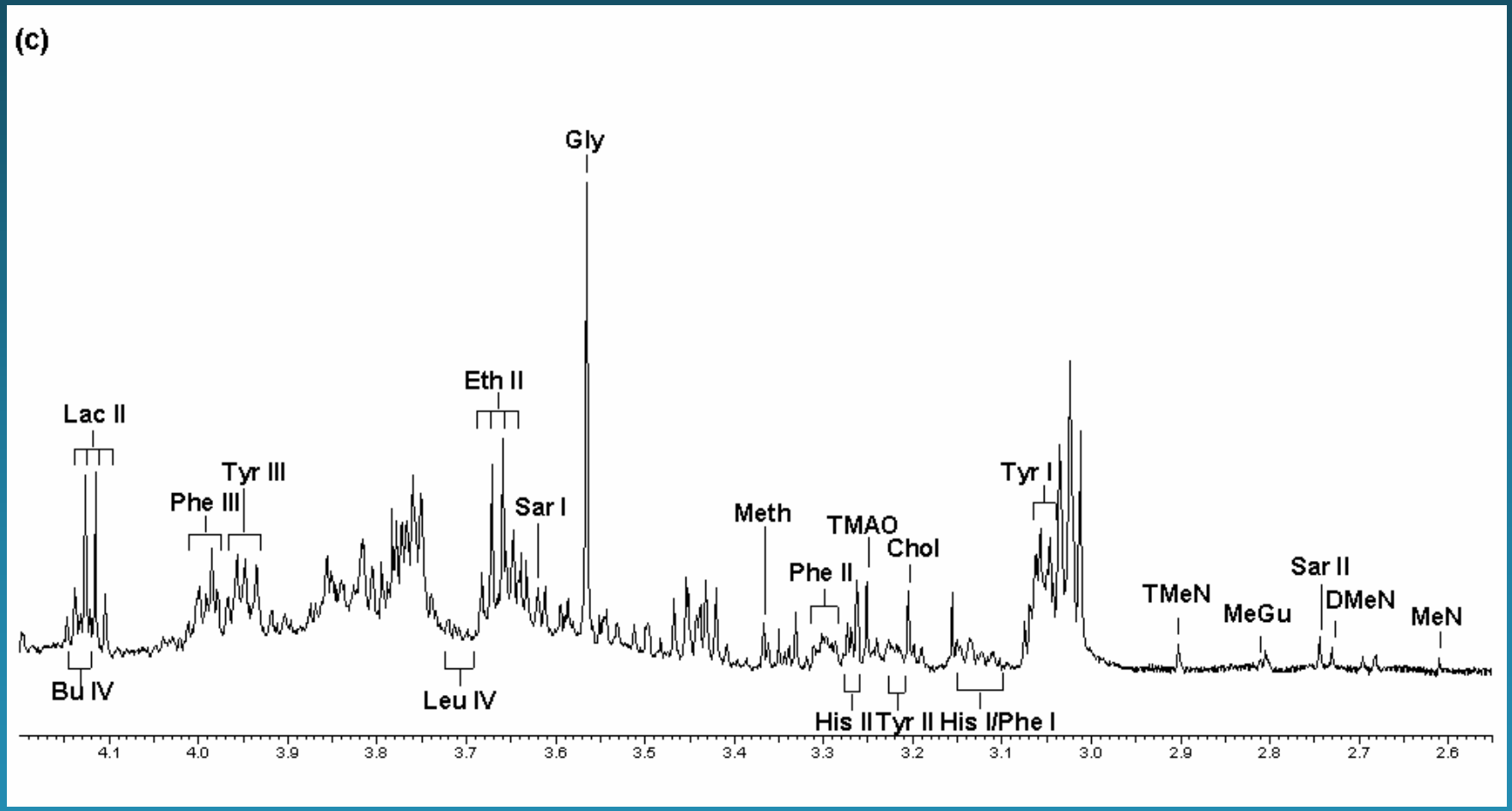


KEY: 1. saturated fatty acid (terminal end spin system) 2. leucine 3. saturated fatty acid (intermediate carbon spin system) 4. lysine 5. unassigned 6. γ-aminobutyric acid 7. ornithine 8. unassigned 9. isoleucine 10. propionate 11. valine 12. glutamate 13. glutamine 14. proline 15. unassigned 16. propane-1,2-diol 17. unassigned 18. threonine 19. unassigned 20. phosphorylethanolamine 21. tyrosine 22. phenylalanine 23. asparttic acid 24. alanine 25. ethanol 26. lactate 27, 28, 29 unassigned

^{1}H NMR spectra



^{1}H NMR spectra



Ozone treatment of caries

Pyruvic acid converted to acetate and carbon dioxide

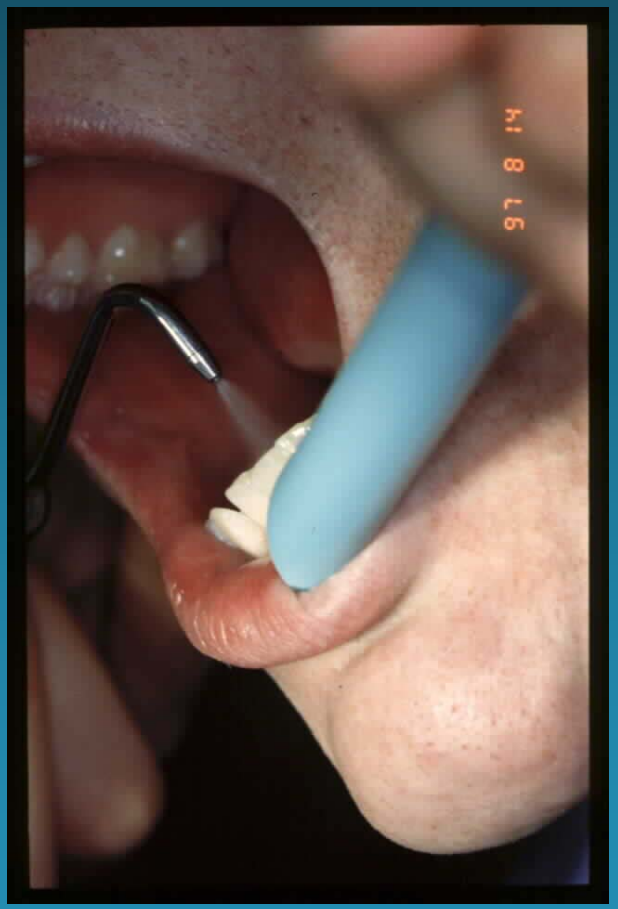
Ph becomes alkaline

Rapid remineralisation

Ozone Therapy

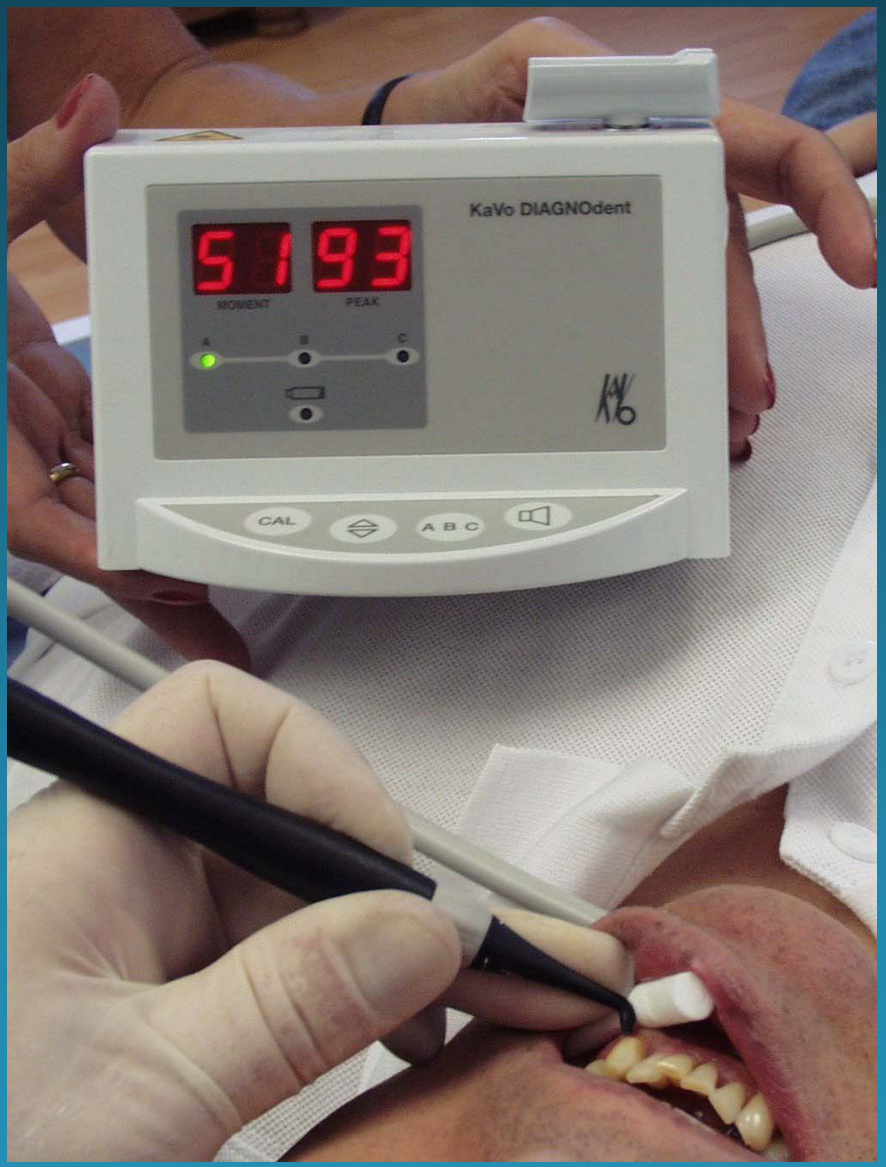
KaVo Prophyjet.

Ozone Therapy

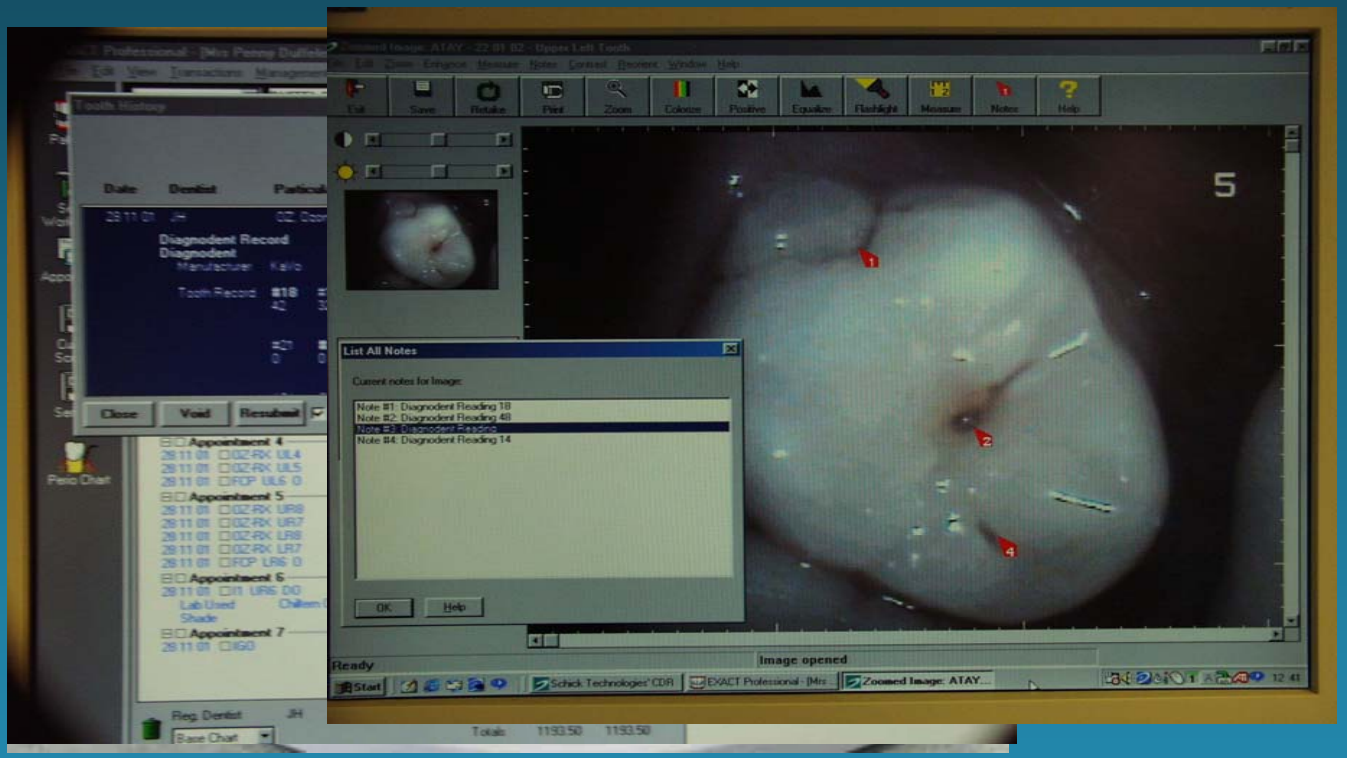


- Treatment method
  - 1. Clinical Detection and DIAGNOdent
  - 2. Ozone 10 to 40 seconds
    - Dispense Patient kit and instructions
  - 3. Recall in 2-3 months to reassess
    - Re-treat or seal

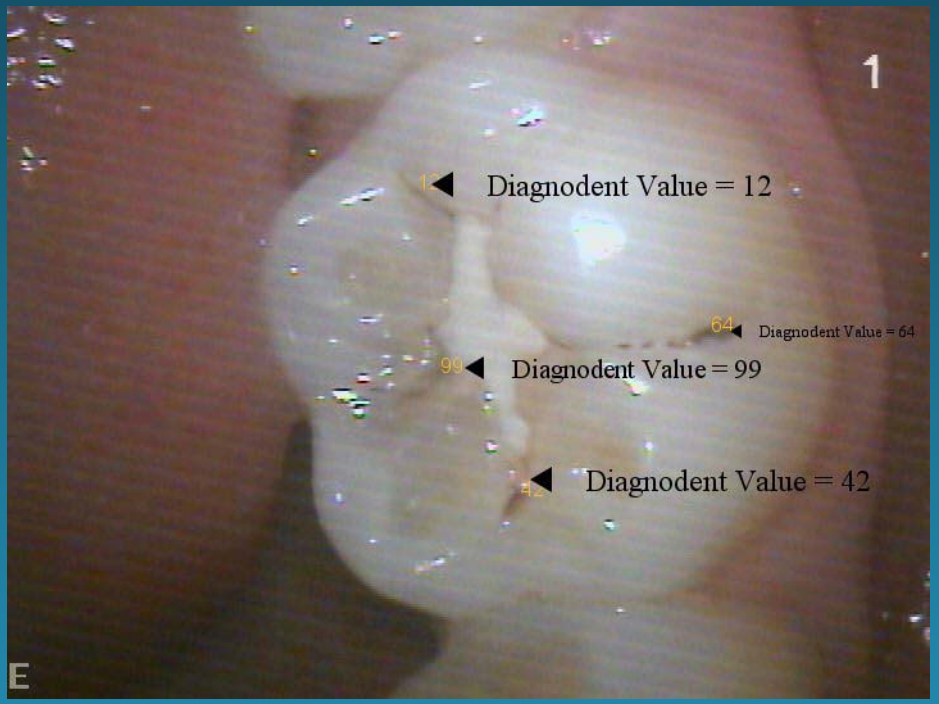
Ozone Therapy

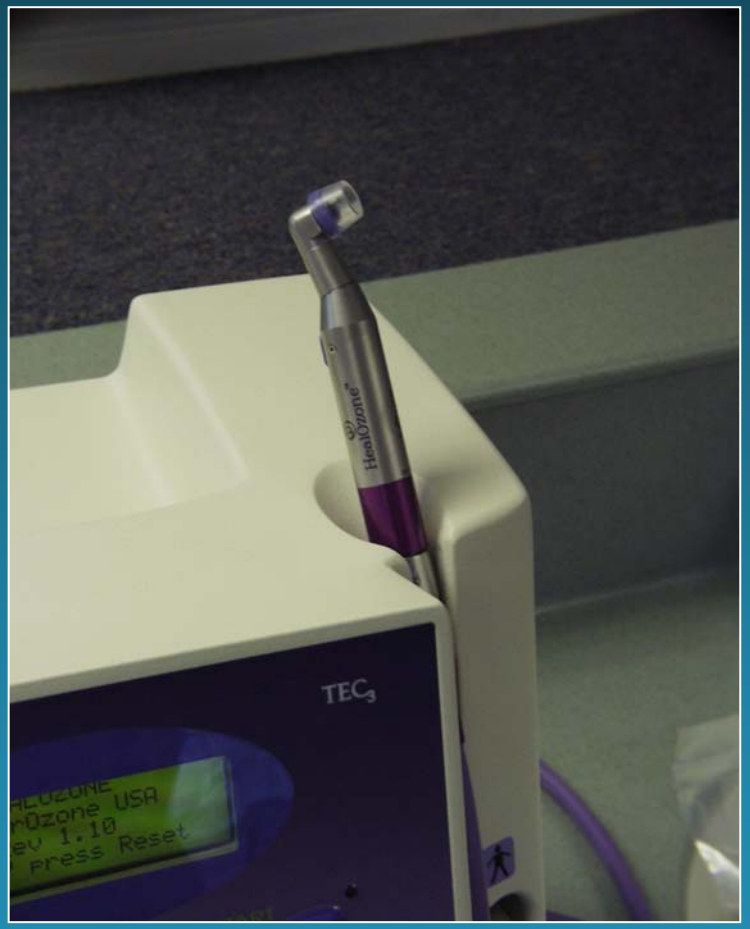


Ozone Therapy



Ozone Therapy





Hand piece and sealing cup

Ozone Therapies in Dental Care

Application cups 5 sizes to suit

5 cup sizes;

- 8mm
- 6mm
- 5mm
- 4mm
- 3mm

Ozone Therapy

- apply ozone to selected surface

Ozone Therapy

- Special Remineralising Formula

- toothpaste
  - mouthrinse
  - spray

The use of ozone for the management of primary root carious lesions

A. Baysan and E. Lynch

Tissue Preservation and Caries Treatment
Quintessence Book 2001, Chapter 3,
p. 49-67.

Ozone Therapies in Dental Care

QUEEN MARY
AND WESTFIELD COLLEGE
UNIVERSITY OF LONDON

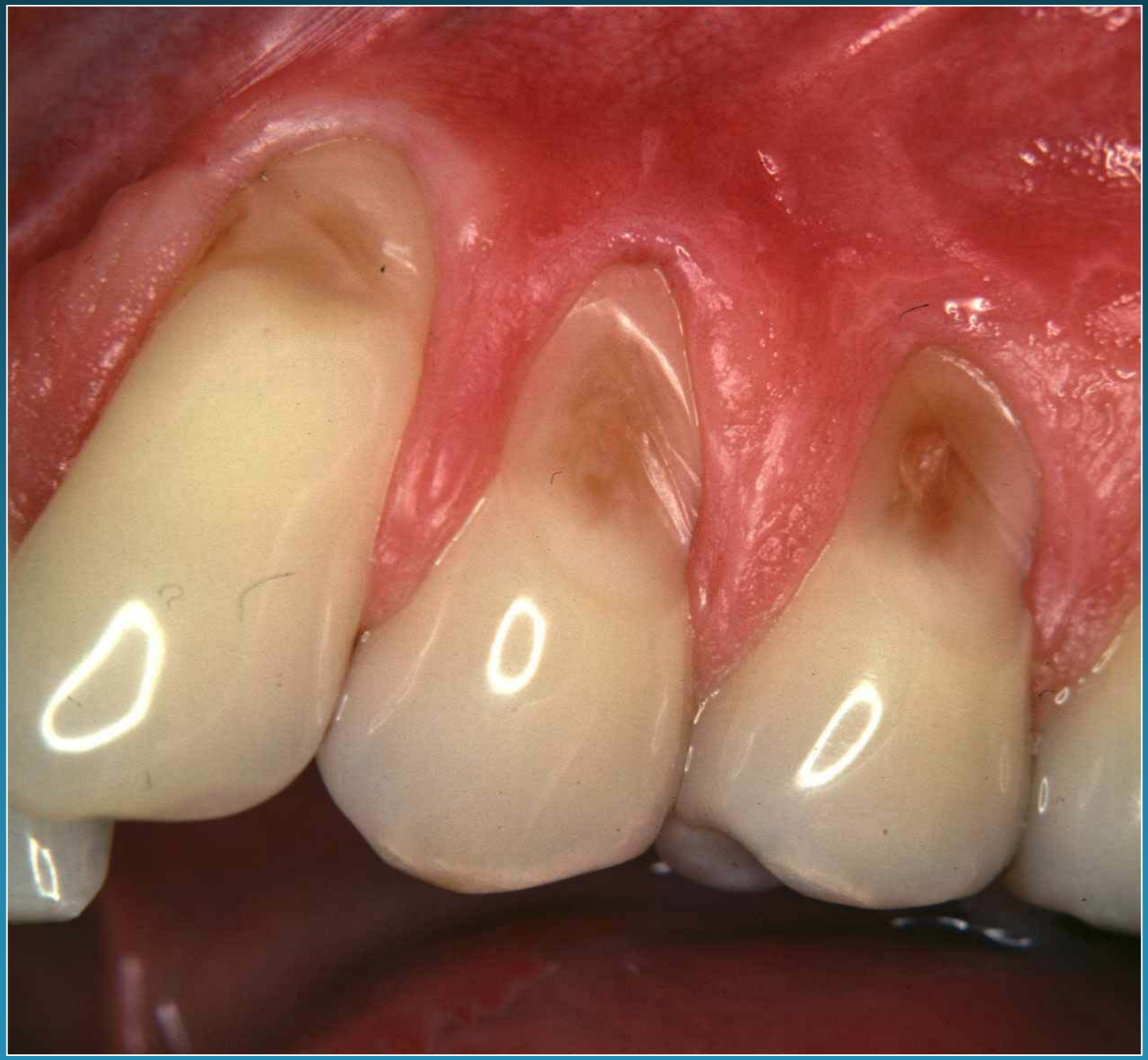
Management of root caries using ozone *in-vivo*

A. BAYSAN and E. LYNCH

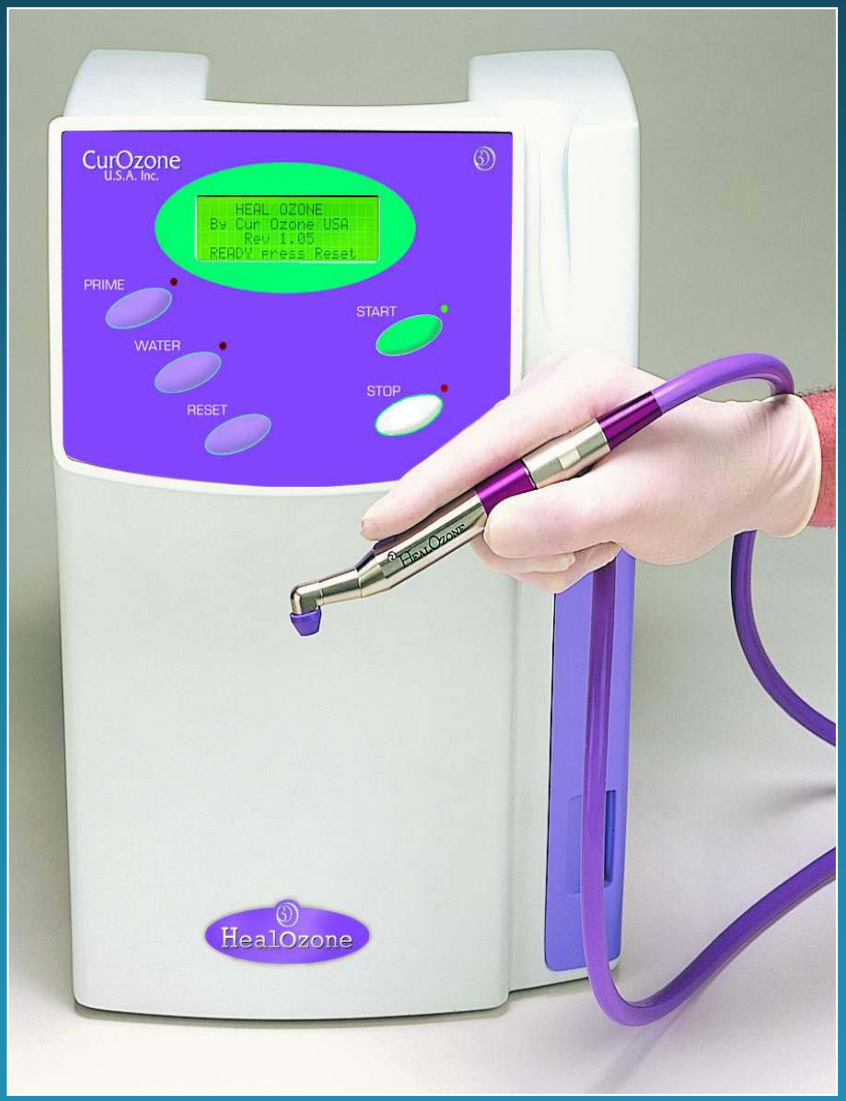
University of London, UK

Journal of Dental Research 2001;80:37

Awarded the 2001 GORG First Prize at the IADR.



The HealOzone Device -- KaVo



Ozone delivery system

HealOzone, KaVo

- apply ozone to selected surface

QUEEN MARY
AND WESTFIELD COLLEGE
UNIVERSITY OF LONDON

Treatment of root caries using ozone *in-vivo*

A. BAYSAN and E. LYNCH

University of London and QUB, UK

Caries Research 2001

Results

- No adverse events
- 99% killing achieved either after 10 or 20 s of ozone application
- 38 PRCLs out of 64 became HARD
- 17 PRCLs improved
- 9 PRCLs same
- NONE got worse

Conclusions

The use of ozone was associated with the reversal of Root Caries.

This novel treatment regime using ozone is also safe in patients.

QUEEN MARY
AND WESTFIELD COLLEGE
UNIVERSITY OF LONDON

Safety of an ozone delivery system during caries treatment *in-vivo*

A. BAYSAN and E. LYNCH

University of London and QUB, UK

Journal of Dental Research 2001

Study design

- ***Ozone delivery system***

  HealOzone, KaVo

- ***Ozone analyser***

  400A UV adsorption ozone analyser, API

Ozone Therapies in Dental Care

Conclusion

This method of using ozone for the treatment of root caries is therefore SAFE in clinical use.

Reversal of root caries using Ozone - A 12 month longitudinal study

A. Baysan and E. Lynch

Journal of Dental Research 2003

After randomisation one caries lesion was treated with Ozone and one left as Control in each Patient.

12 month recall

- No adverse events
- After ozone treatment
  97% of PRCLs reversed
- Control group
  8% of PRCLs reversed
  1% became worse

Management Of Root Caries Using Ozone and a Sealant.

A. Baysan and E. Lynch

61% intact sealants in the ozone and sealant group

42% of intact sealants in the sealant only group ($p < 0.05$).

Clinical Reversal of Occlusal Fissure Caries Using Ozone as well as HealOzone Toothpaste, Rinse and Spray

Dr J Holmes

www.uksmiles.com

IADR 2003

Results Study 1

After 4 months, 93 patients, (214 teeth) were recalled

99% of the ozone treated occlusal caries lesions had clinically reversed ($P<0.001$)

The control occlusal caries lesions did not significantly change.

Results Study 2

376 patients, 2364 lesions entered

315 patients, 1918 lesions 12 months recall

99% clinically reversed

Correlated with DIAGNOdent readings

No significant change in control group

Conclusion

Ozone is an effective alternative to conventional "drilling and filling" for carious lesions in general dental practice.

Ozone Efficacy in the Treatment of Pit and Fissure Caries

ABU-NABA'A L and AL SHORMAN H

Layla won the 2002 Basil Bibby IADR Cariology Award for this Research


7
E

Double Blind Controlled Clinical Trial

30 Seconds Ozone application

86% Clinical Reversal of Occlusal Pit and Fissure Caries at 3 Months ($P < 0.01$) and no significant reversal in the control Lesions

Ozone significantly remineralised Pit and Fissure Caries.

Time	DIAGNOdent Base	
3 m Tt	20 - 40	P<0.000
3 m Cl	20 - 40	P<0.091

Occlusal Pit & Fissure Caries Reversal using Ozone. 12 month recall review

Abu-Naba'a L and Al Shorman H

Lesions fissure sealed after Ozone
No significant sealant loss compared to control
Conclude; ozone treat + fissure seal at 3 months

IADR 2003

Clinical Reversal Of Occlusal Caries Using Ozone

Professor Giovanni Megighian, Milan University

92% reversal of caries

IADR 2003

300 caries lesions in 80 patients

At 2 months 92% reversal
of Ozone treated lesions

Control lesions had no significant change

Clinical Reversal Of Occlusal Caries Using Ozone

Professor Newton Johnson
Wales

AADR 2003

Clinical Results

130 Test Lesions

109 Reversed
18 Remained The Same
3 Became Worse

60 Control Lesions

None Reversed
31 Remained The Same
29 Became Worse

Correlation Of DIAGNOdent Value Changes With Significant Clinical Changes

Conclusion

30 Seconds Of Ozone Application Can Clinically Reverse Primary Occlusal Pit And Fissure Caries

Comparison of time taken for conventional treatment v ozone

Professor Newton Johnson
Wales

AADR 2003

- Drilling and Filling one tooth took an average time of 35 minutes

- Ozone Therapy for an average treatment of 6 teeth took 8 minutes

Clinical Reversal of Occlusal Pit and Fissure Caries Using Ozone

Dr David Reaney
GKT, University of London

AADR 2003

Clinical Reversal Was Judged To Have Occurred If The Demineralisation Within The Pits And Fissures Decreased

A Perceived Treatment Need Index Was Also Used

Conclusion

30 Seconds Of Ozone reverses occlusal caries

Occlusal Pit & Fissure Caries Reversal using Ozone. Dr Pearse Stinson

32 patients, 69 lesion re-assessed

58 clinically reversed
11 remained the same
control group; no significant change

AADR 2003

Occlusal Pit & Fissure Caries Reversal using Ozone. Dr Richard Morrison

89 patients
123 clinically reversed
18 remained the same
control group; no significant change

AADR 2003

Occlusal Pit & Fissure Caries Reversal using Ozone. Dr Mark Cronshaw

31 teeth treated
25 clinically reversed (89%)
6 remained the same
control group got significantly worse

IADR 2003

Clinical Reversal Of Occlusal Caries using Ozone

Dr Paul Jackson
London, UK

AADR 2003

90% Reversal Of Occlusal carious lesions ($P < 0.01$) with no significant reversal of control lesions

Clinical Reversal Of Occlusal Caries using Ozone

Dr Tom Daly

89% reversal of caries

AADR 2003

Dr Chris Clifford,
Isle of Wight

Clinically proven to reverse open lesions combining air abrasion and Ozone.

IADR 2003

Occlusal Caries Reversal in Deciduous teeth using Ozone.
OT.Abu-Salem and MM.Marashdeh

42 non-cavitated occlusal lesions
at 6 month review
All treated lesions showed improvements in clinical severity, ECM & DIAGNOdent scores

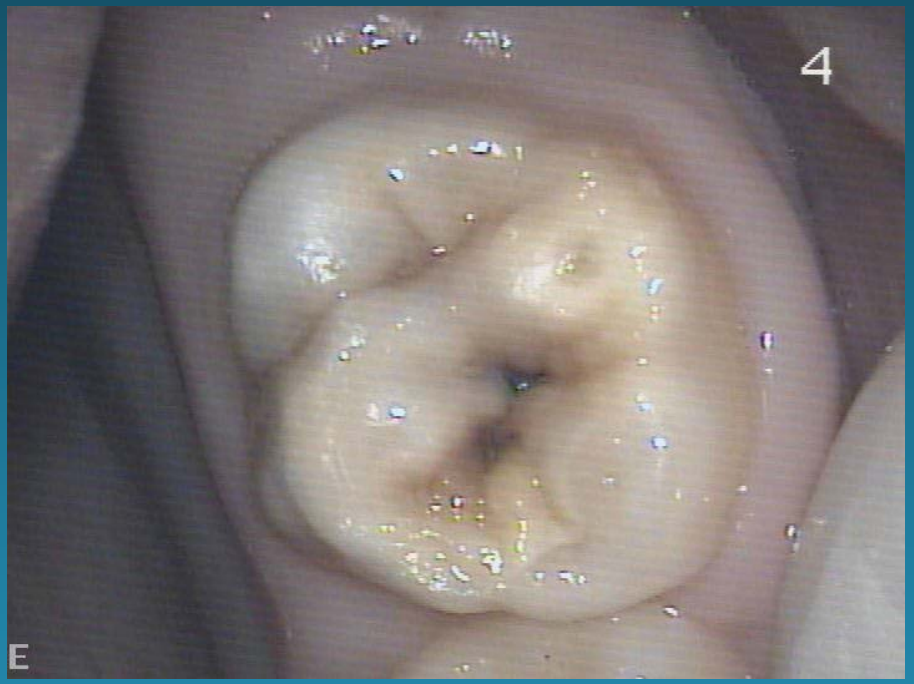
42 control lesions did not significantly change

IADR 2003

Ozone Therapies in Dental Care

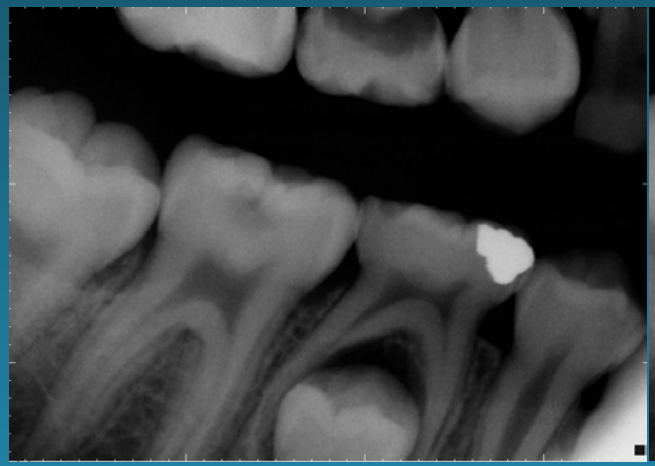
Jake; 4 yrs old, attention disorder syndrome

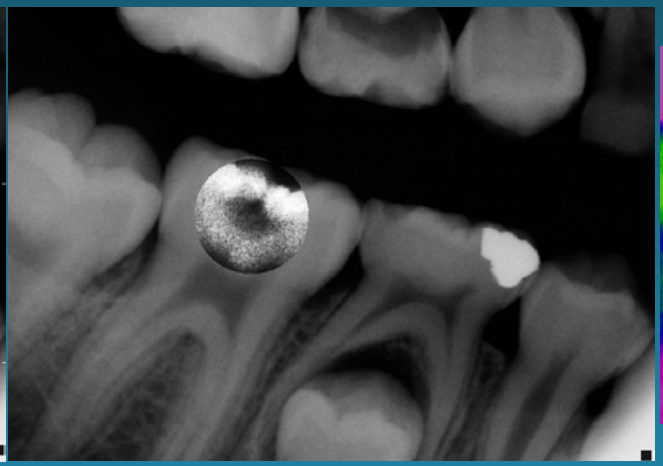
Ozone Therapies in Dental Care

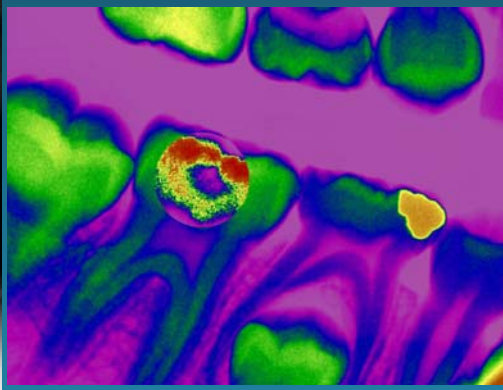


Charlotte; 12 yrs old, platelet count of 12

Lower Right







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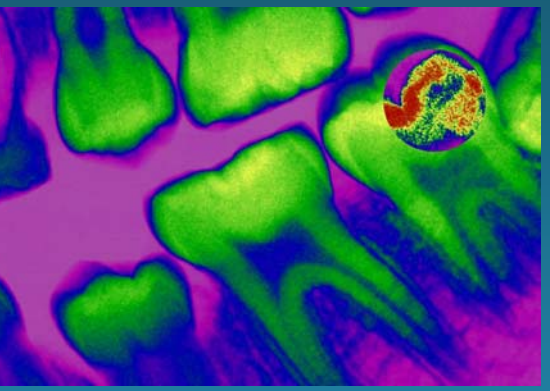
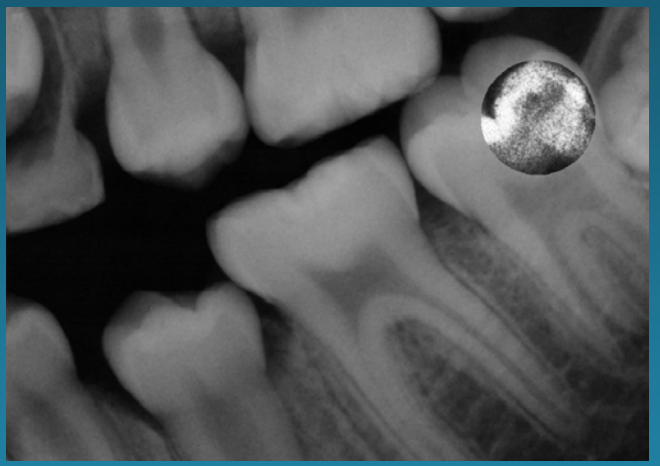
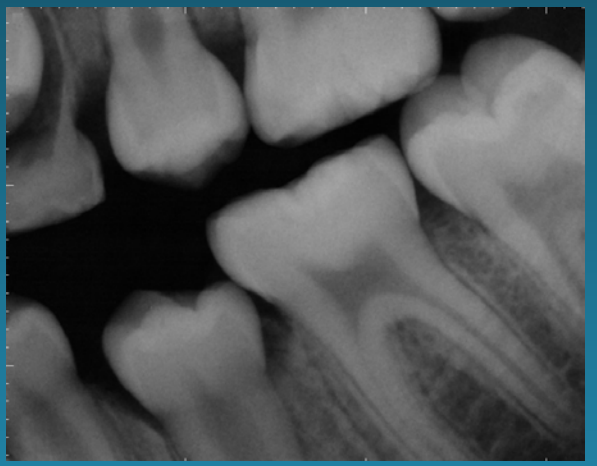
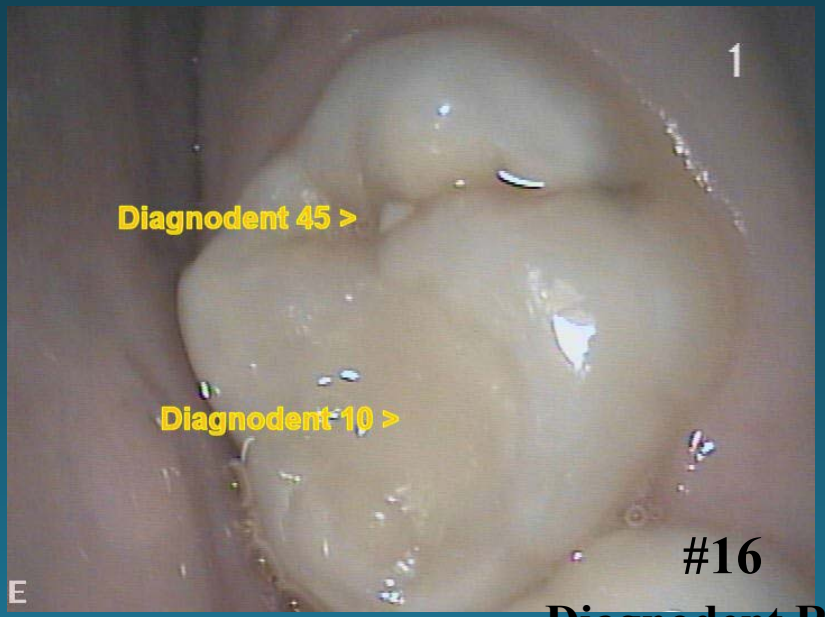
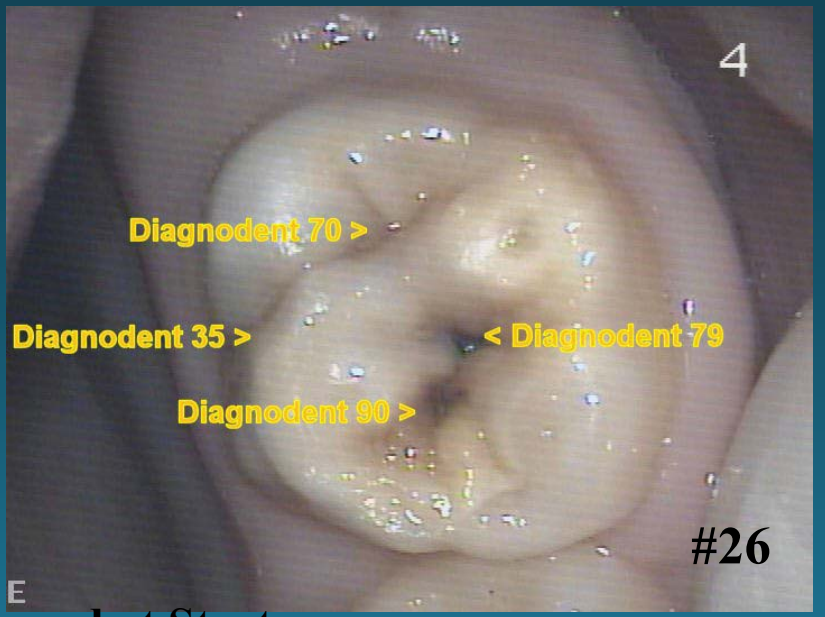


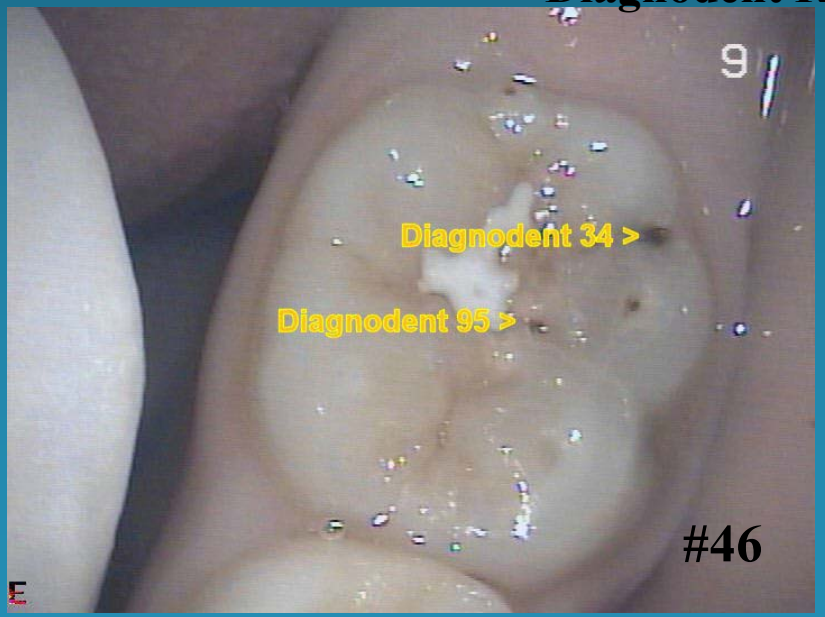


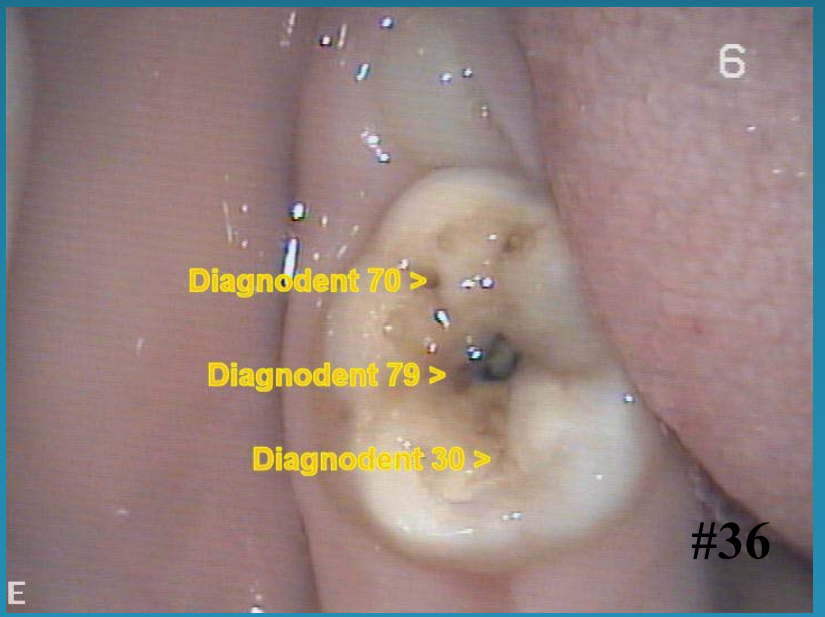






Diagnodent Record at Start





Patients Attitudes to Managing Caries with Ozone

H.Domingo, C.Smith and R. Freeman.

IADR 2003

Results

- 99% of patients were happy with Ozone

- 97% were happy with the time required.

- 95% were satisfied to choose this treatment even if the Ozone treatment cost more than regular treatment

- 97% would recommend this treatment to a friend or close relative.
-100% wanted this treatment again.
- Patients reported a reduction in anxiety associated with the ozone treatment ($p < 0.05$).

Reduction of Dental Anxiety in General Practice associated with the use of Ozone

Professor R. Freeman and
Dr J Holmes

J Dent Res 2003

377 Patients

Significant reduction in Dental Anxiety ($P<0.001$) and excellent attitudes of the Patients to the Ozone treatment.

Reduction of Dental Anxiety in General Practice associated with the use of Ozone

Professor Giovanni Megighian,
Milan University,
IADR 2003

Reduction of Dental Anxiety 250 patients questioned

100% happy with ozone treatment,
100% would like to have it again,
100% would recommend ozone treatment to a friend

85% considered the review appointments to be necessary, but an irritation

55% would choose ozone treatment if it cost more than conventional ‘drill and fill’

Bond Strengths of Composite to Enamel/dentine Treated With Ozone

Hussey DL and Armstrong C

IADR 2003

Results

The mean loads (Newtons) to debond the composite were as follows:

- enamel without ozone 116.4 (sd 50.1)
- enamel with ozone 128.6 (sd 49.4)

Wilcoxon signed rank test revealed no statistically significant difference between the groups with and without the ozone treatment

Conclusion

It is concluded that the application of ozone for 10 seconds has no effect on subsequent bond strengths to enamel or dentine.

Safe use of Ozone on all filling materials

Hussey DL and Cunningham L

IADR 2003

Ozone Therapies

Changing the face of dentistry

The Future of Dental Care

Daily Mirror, 31st October 2002

Soft and dental

At last! A painless dental treatment that uses a whiff of ozone to beat tooth decay and banish fear of the dentist's chair

By VICTORIA KENNEDY and EMMA PRYER

THE sound of a dentist's drill sends a chill down the spine of the bravest of adults. But for a child, even the most basic dental treatment can be a terrifying ordeal.

Childhood fear of the dentist lasts a lifetime and many of us will find any excuse to avoid treatment until the serious damage has already set in.

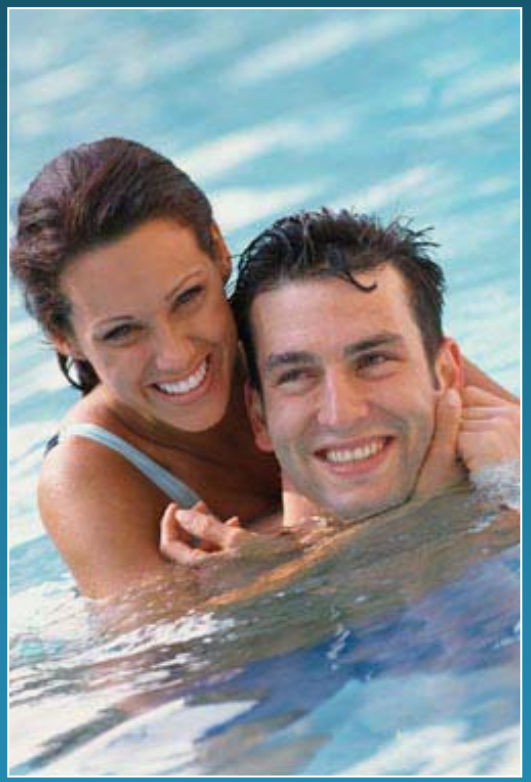
But the whirring drill and the anaesthetic needle could soon be just a bad memory for millions of patients, young and old.

Dentistry is set to be revolutionised by high-tech treatments that promise to make a trip to the dentist completely pain free.

The most exciting is a revolutionary new technique developed by British dentists, that uses ozone gas to wipe out the harmful bacteria that cause cavities once and for all.

By doing away with the drill altogether, the

It’s time to change the face of dentistry



Ozone Therapies in Dental Care

What About ? ~ costing this treatment

- no injections
- no drilling or filling required in most cases
- no tears, trauma
- no fear of dental treatment
- painless procedure
- quick, non-invasive, instant bacterial elimination
- allows natural remineralisation of decayed tooth tissue

Ozone Therapies in Dental Care

What About ? ~ costing ozone treatment

- Single Tooth Ozone treatment £ 20
  - Time 15 minutes for 8 teeth
  - Materials
    - materials £ 8 / patient
    - incidentals £ 2 (equipment w/tear)
    - wages £ 10
- Profit £ 140 approx
  - or £ 560 / hour profit


2

Cervical Sensitivity
Direct Pulp Caps
During RCT
Before Posterior Composites
After Crown Preparations
Cracked Tooth Syndrome


7
E


4
E


7
E


8
E

Dry Socket

Ulcer Treatments
Aphtous Ulcers
Herpes Labialis

The Next Generation of Whitening...

Ozone Therapies in Dental Care

tooth whitening PhD by Julian Holmes

Ozone Assisted Systems

in just 5 minutes

Not 18 months !

rowning product
oncentration

25 30 250 25 30 250

rowning strip;
efore O_3 T_x



browning strip;

2 minutes O_3 T_x, 2,200ppm



rowning strip;

0 Seconds O_3 T_x, ,200ppm



browning strip;

10 minutes O_3 T_x, 2,200ppm



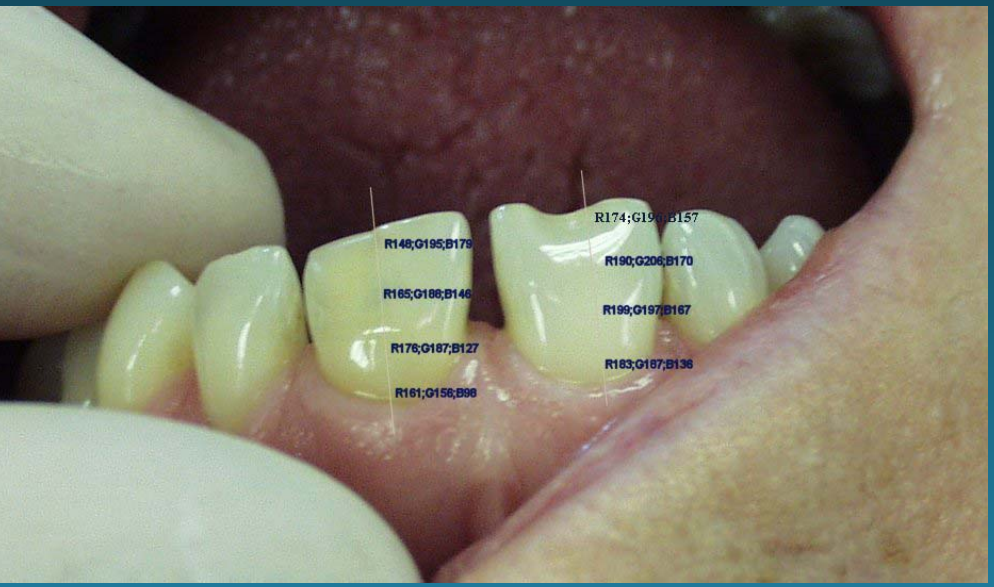
Ozone Therapies in Dental Care

Ozone Whitening Julian Holmes

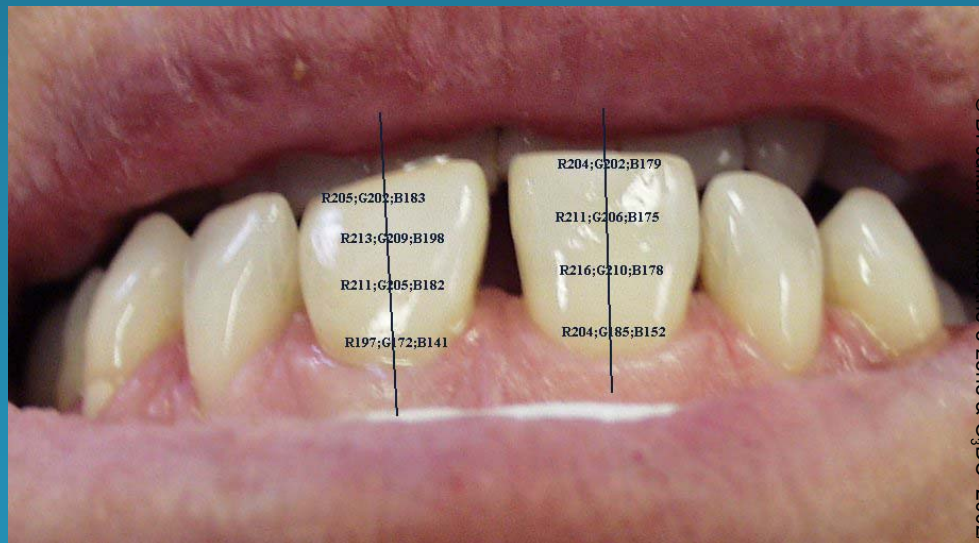
Ozone Therapies in Dental Care

Ozone

Ozone Therapies in Dental Care



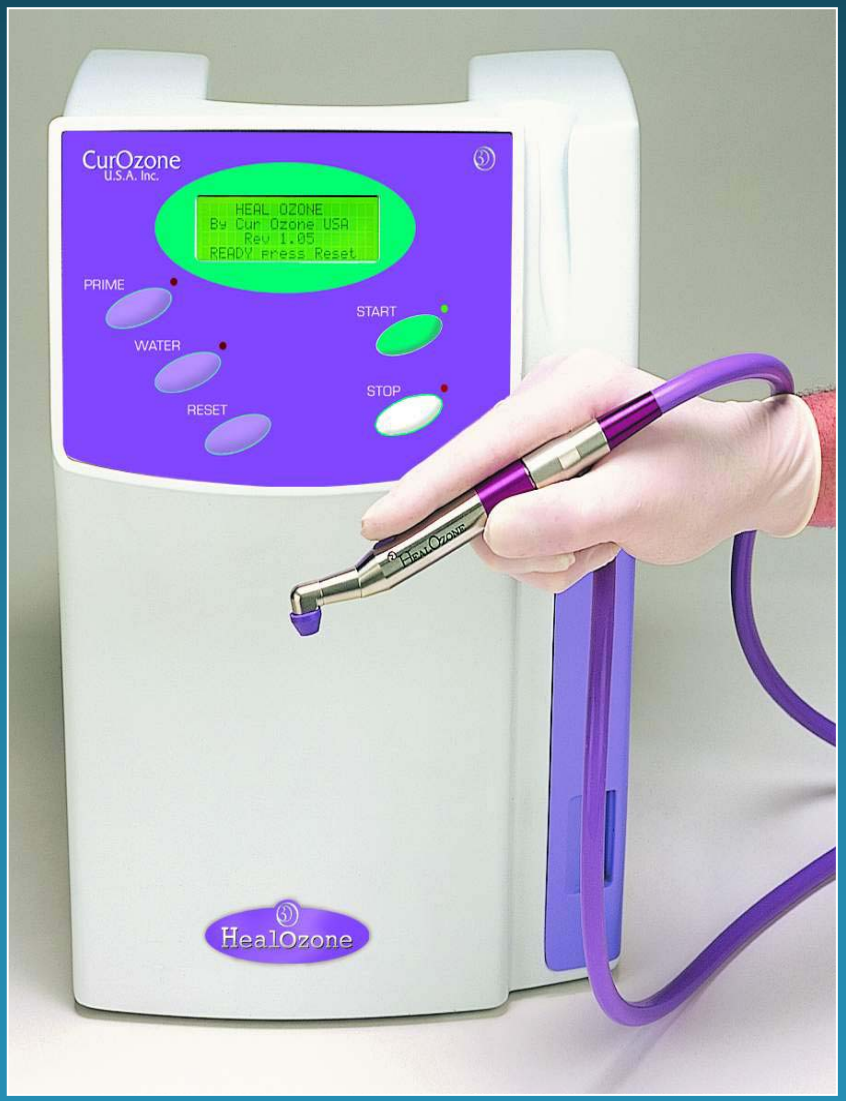
2 x 5 minute Tx time



Ozone Therapies in Dental Care

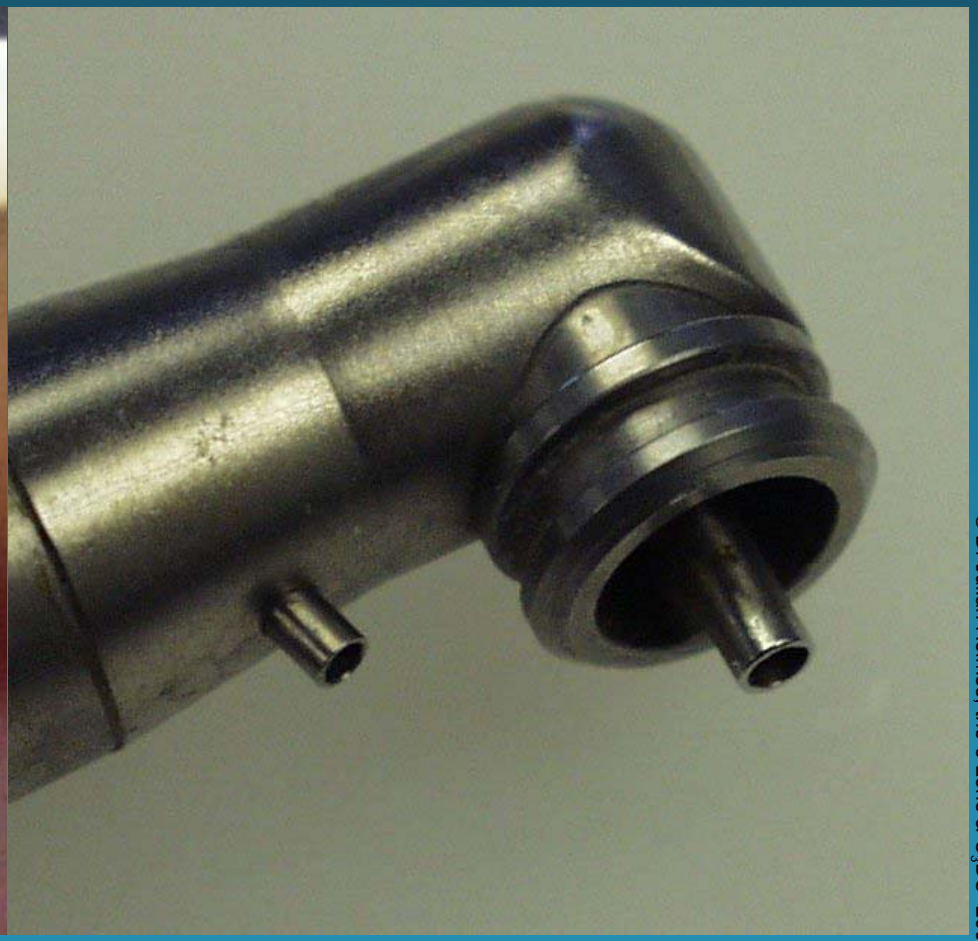
Ozone Assisted

The HealOzone Device

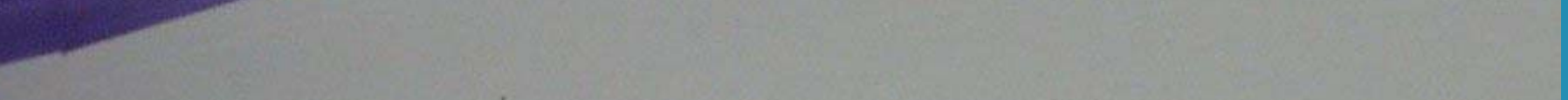


Ozone Therapies in Dental Care

Ozone in RCT Julian Holmes



Ozone Therapies in Dental Care



Ozone Therapies in Dental Care

Ozone in RCT

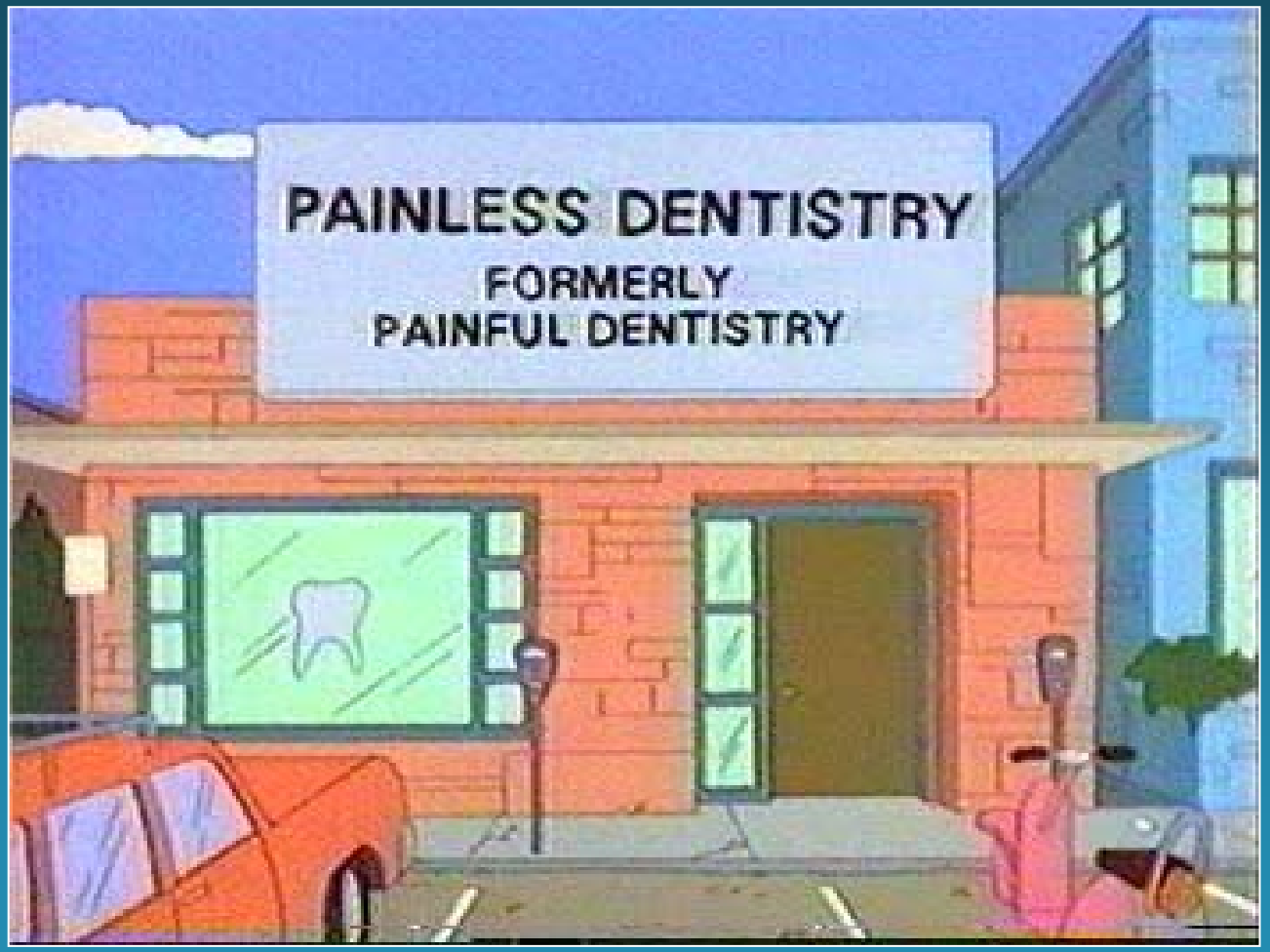
Ozone Therapies in Dental Care

Ozone in RCT

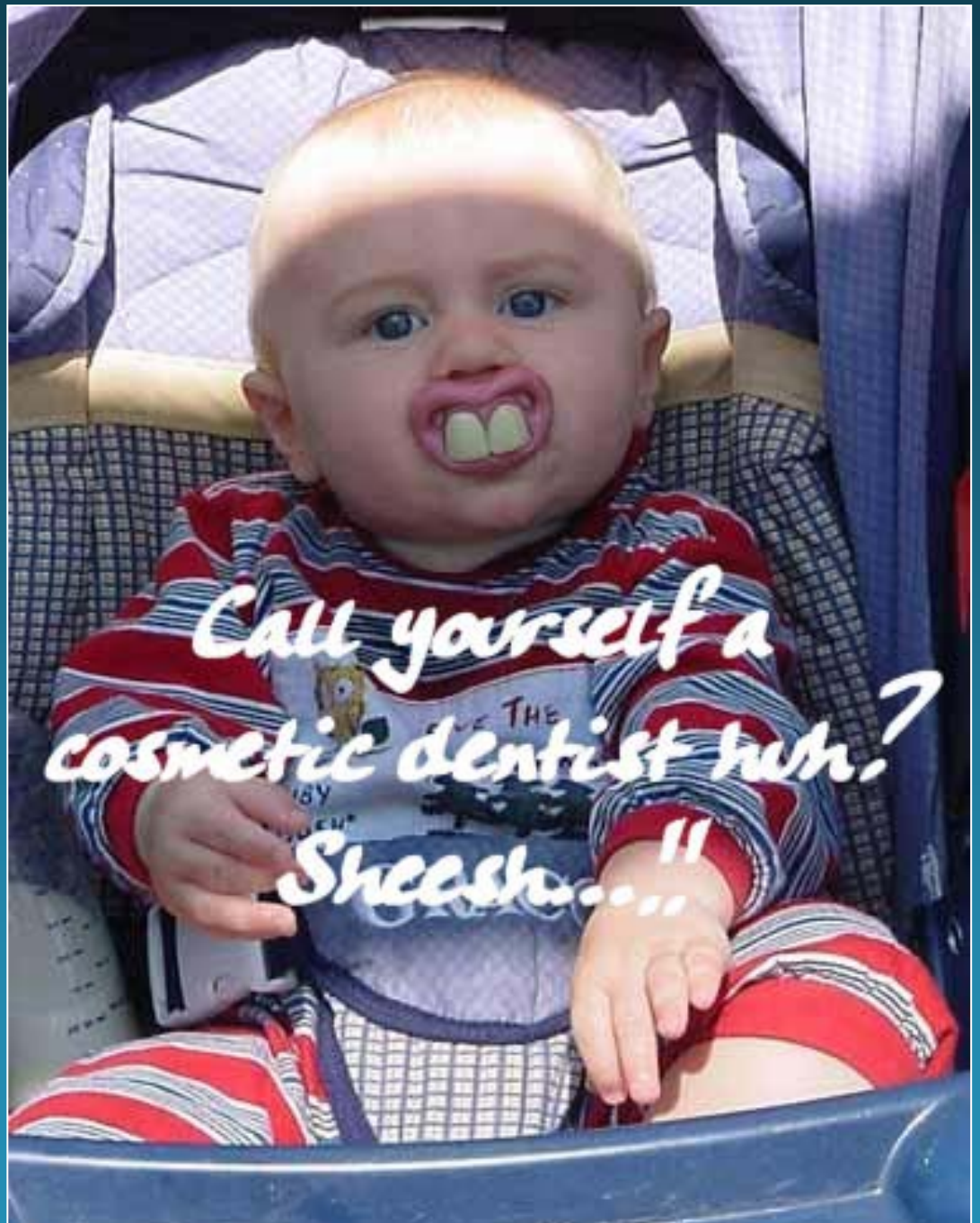
Ozone sterilises 10^6 cfu Enterococcus Faecalis

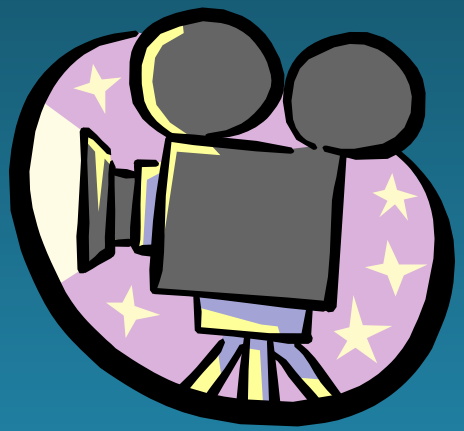
Chang H

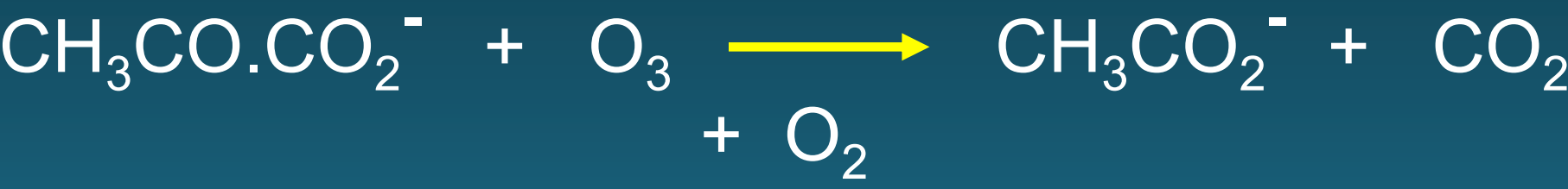
IADR 2003


PAINLESS DENTISTRY
FORMERLY
PAINFUL DENTISTRY

e.lynch@qub.ac.uk


Call yourself a
cosmetic dentist huh?
Sheesh...!!





Pyruvate **Acetate**

Ozone effects the oxidative decarboxylation of pyruvate, generating acetate and CO_2 as products

Painless Profitable Dentistry. A Pharmaceutical Approach to the Management of Caries

Edward Lynch

Professor of Restorative Dentistry and Gerodontology
School of Clinical Dentistry
Queen's University Belfast

Ozone Therapies in Dental Care

Frequently asked Questions;

What do I need to start?

Ozone Therapies in Dental Care

Frequently asked Questions;

Where do I learn how to use the technology?
Who will help me when there is a problem?
Is there a user group?

Courses and practice training

- KaVo
- Users group;

groups.yahoo.com/group/healozone

- e-mail based support group

Ozone Therapies in Dental Care

Frequently asked Questions;

What resources & research are available?

Current reported research is available on the Internet

- see www.curozone.com
- see **www.the-o-zone.cc**

Papers are published in the dental journals

Ozone Therapies in Dental Care

Frequently asked Questions;

What resources & research are available?

What Research is happening at the moment?
What other projects are being set up?

Historical Dentistry

Ozone Therapies in Dental Care

Frequently asked Questions;

How much does it cost?

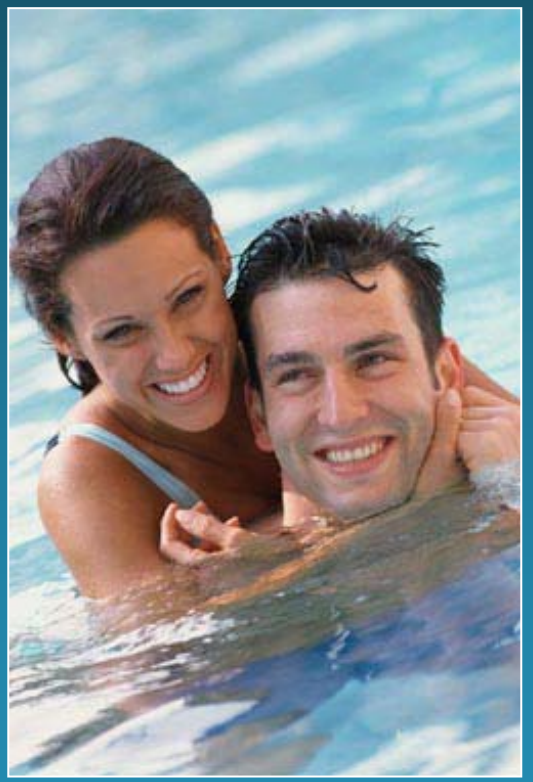
The HealOzone unit is £240/month approx on lease or £5 per day after tax relief

Educating our patients & community

educate to stimulate to motivate

Time for a different view

We can change the face of dentistry



Queen's University Belfast

Oxidising actions of an Anti-Bacterial Ozone-Generating Device towards Root Caries Biomolecules

E. LYNCH*, C. SILWOOD, C. SMITH and M. GROOTVELD

Professor of Restorative Dentistry and Gerodontology
School of Clinical Dentistry
Queen's University Belfast

Introduction

Unfortunately, many studies concerning the clinical evaluation of ozone have been based on assessments of its harmful effects rather that demonstrating the therapeutic benefits it may offer.

Ozone is one of Nature’s most powerful oxidants which accounts for its ability to kill bacteria, spores and viruses.

Chemistry of ozone (O_3)

O_2 (1) —solar energy / uv→ $2O$

$O_2 + O$ (2) → O_3

O_3 (3) → $3/2\ O_2$ $\quad \Delta H = -142\ kJ\ mol^{-1}$

In this investigation, a multicomponent evaluation of the oxidative consumption of primary root caries biomolecules by ozone (O_3) has been performed using high resolution proton (^1H) nuclear magnetic resonance (NMR) spectroscopy.

Therefore, a multicomponent evaluation of the oxidative consumption of primary root caries biomolecules by O_3 has been conducted using high-field proton (^1H) nuclear magnetic resonance (NMR) spectroscopy. The ozone-generating equipment employed in this study was the HealOzone Unit [1].

[1] HealOzone Unit, CurOzone, U.S.A.

Materials and Methods

- *Ozone delivery system*

The ozone delivery system is a portable apparatus (HealOzone, CurOzone USA).

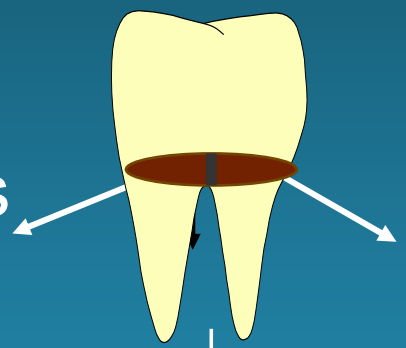
This system includes a source of oxidizing gas and a dental hand piece with a cup for delivering the gas to a lesion.

Study design

10 soft PRCLs samples

↓

Control samples (10 s)



Ozone samples

↓

Each sample weighed

↓

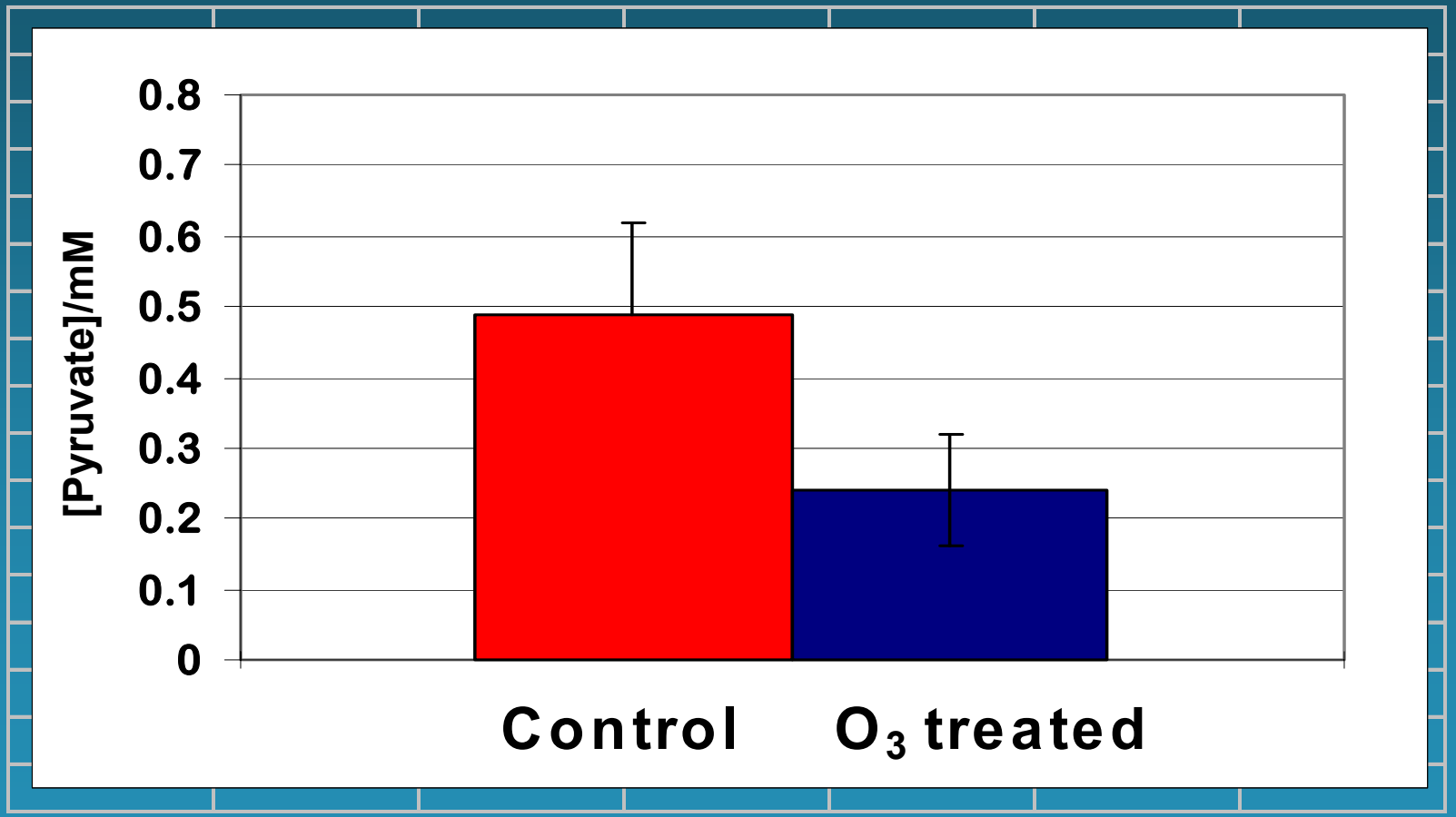
^{1}H NMR analysis at an operating frequency of 600 MHz

Results

^{1}H NMR-determined electron donor pyruvate levels before and after ozone treatment (Pyruvate) mmol.kg^{-1}

Sample	Control	Ozone
1	0.68	0.47
2	0.33	0.32
3	1.23	0
4	0	0
5	0.36	0.32
6	0.49	0.49
7	0	0
8	0.18	0.12
9	0.59	0
10	1.07	0.66

Mean and SE of ^{1}H NMR-determined electron donor pyruvate levels before and after ozone treatment (Pyruvate) $mmol.kg^{-1}$

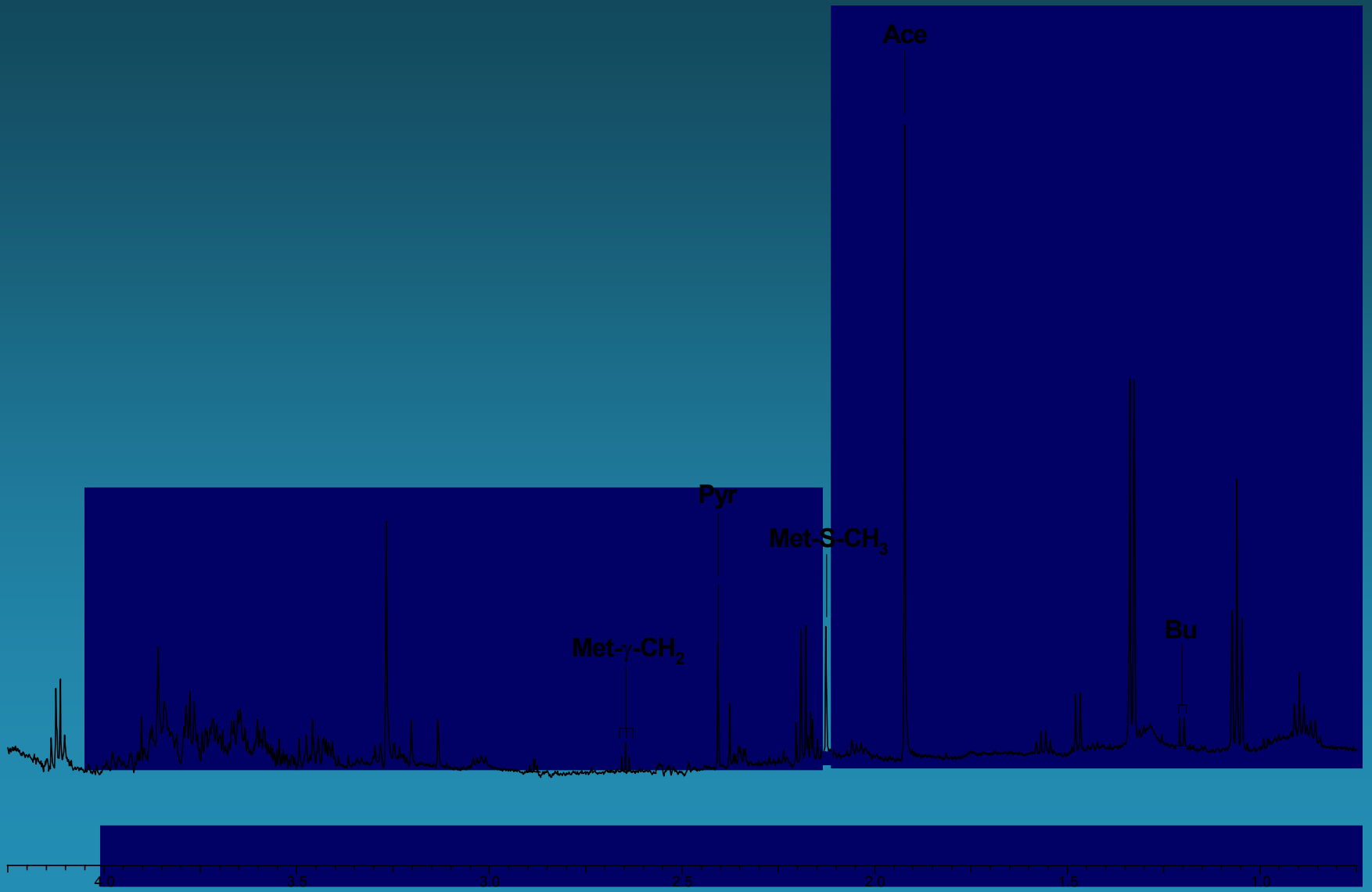


Mean and SE of ^{1}H NMR-determined electron donor pyruvate levels pyruvate levels before and after ozone treatment (Pyruvate) $mmol.kg^{-1}$

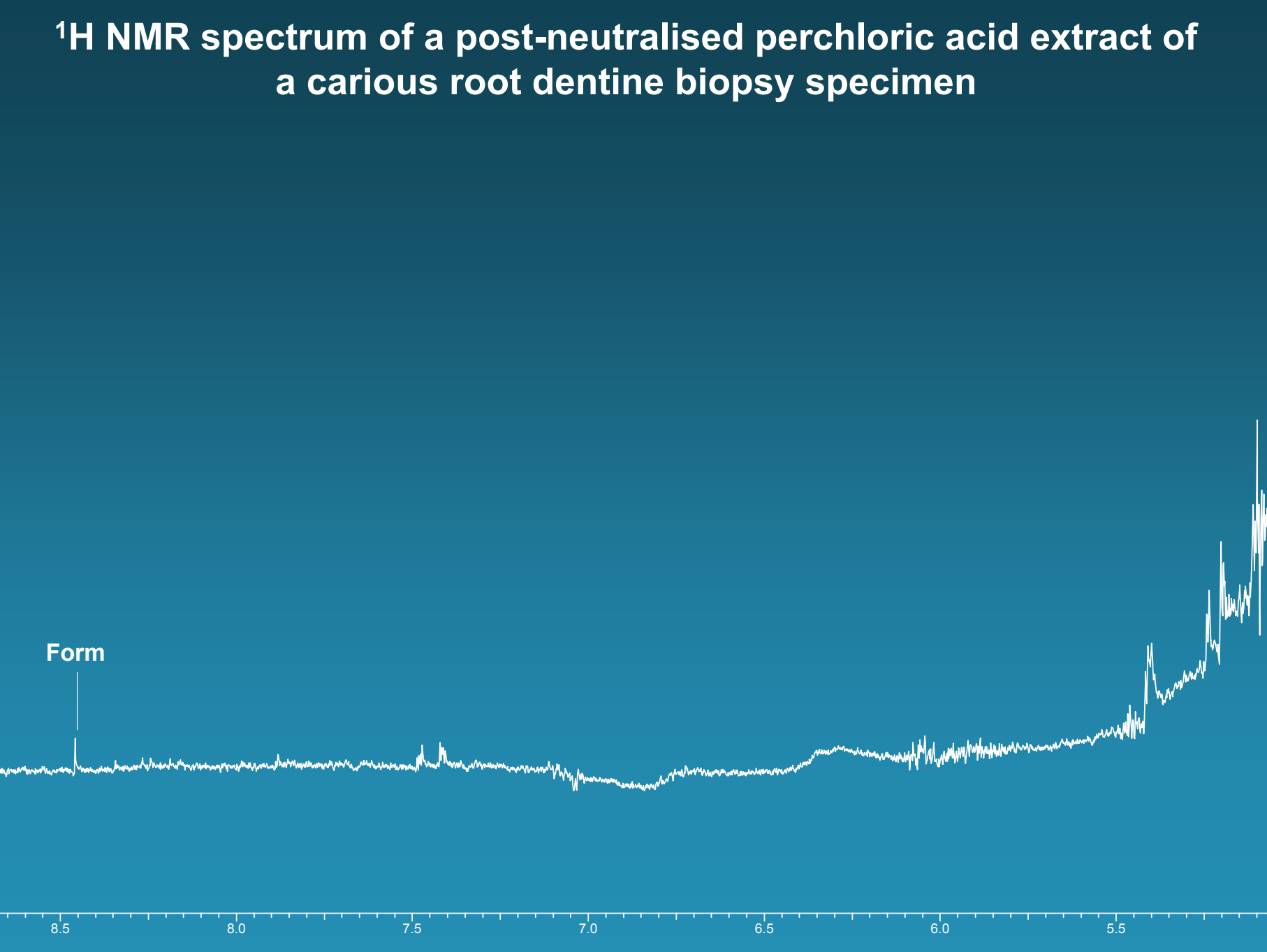
Groups	Mean	± SE
Control	0.49	0.13
O_3 treated	0.24	0.08

$p<0.05$ (paired t-test performed on untransformed data)

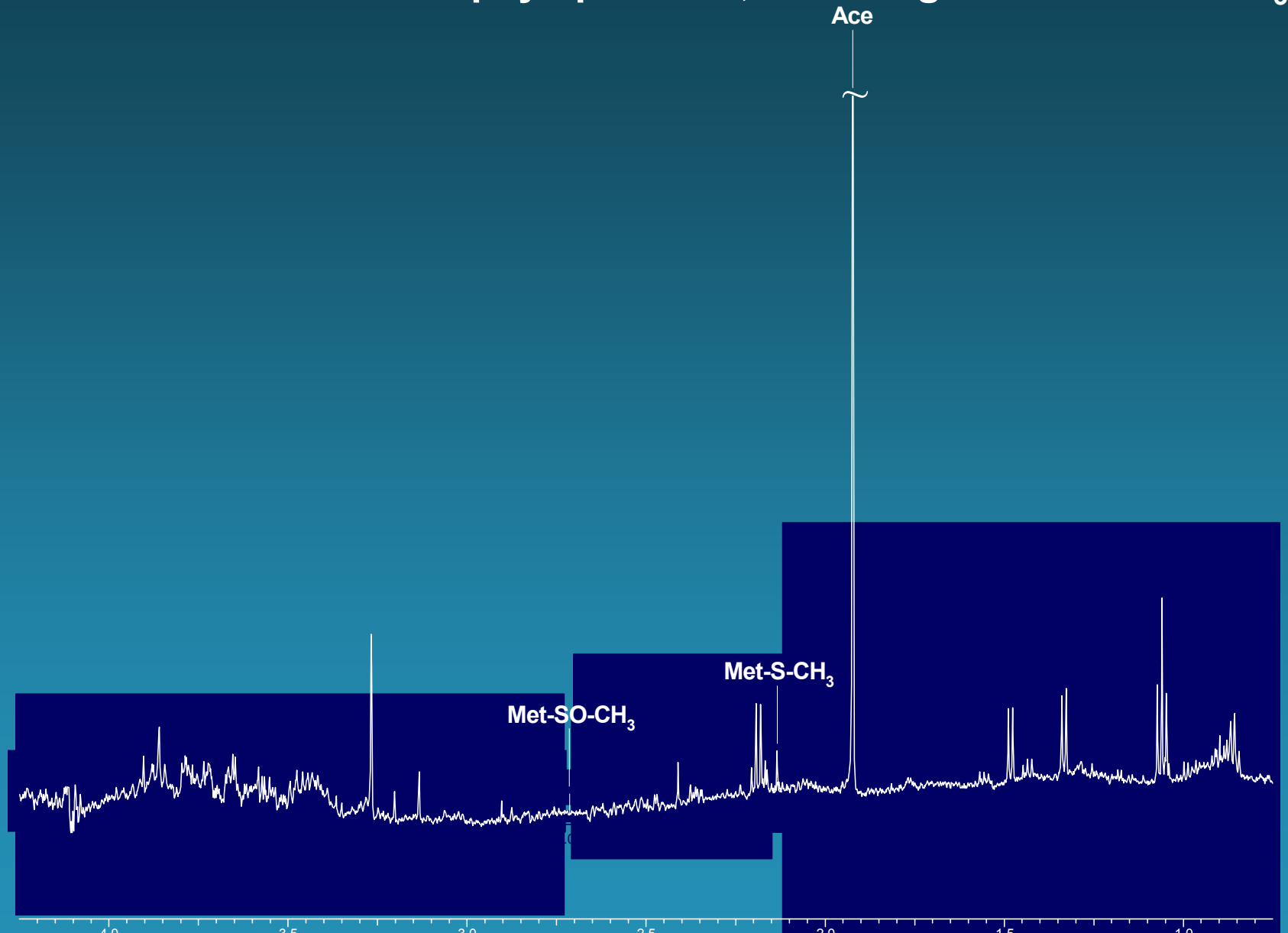
^{1}H NMR spectrum of a post-neutralised perchloric acid extract of a carious root dentine biopsy specimen.



^{1}H NMR spectrum of a post-neutralised perchloric acid extract of a carious root dentine biopsy specimen



^{1}H NMR spectrum of a post-neutralised perchloric acid extract of a carious root dentine biopsy specimen, following treatment with O_3.



Conclusion

Multicomponent analysis of root caries by high field ^{1}H NMR spectroscopy provides useful information regarding the oxidation of PRCL biomolecules by O_3.

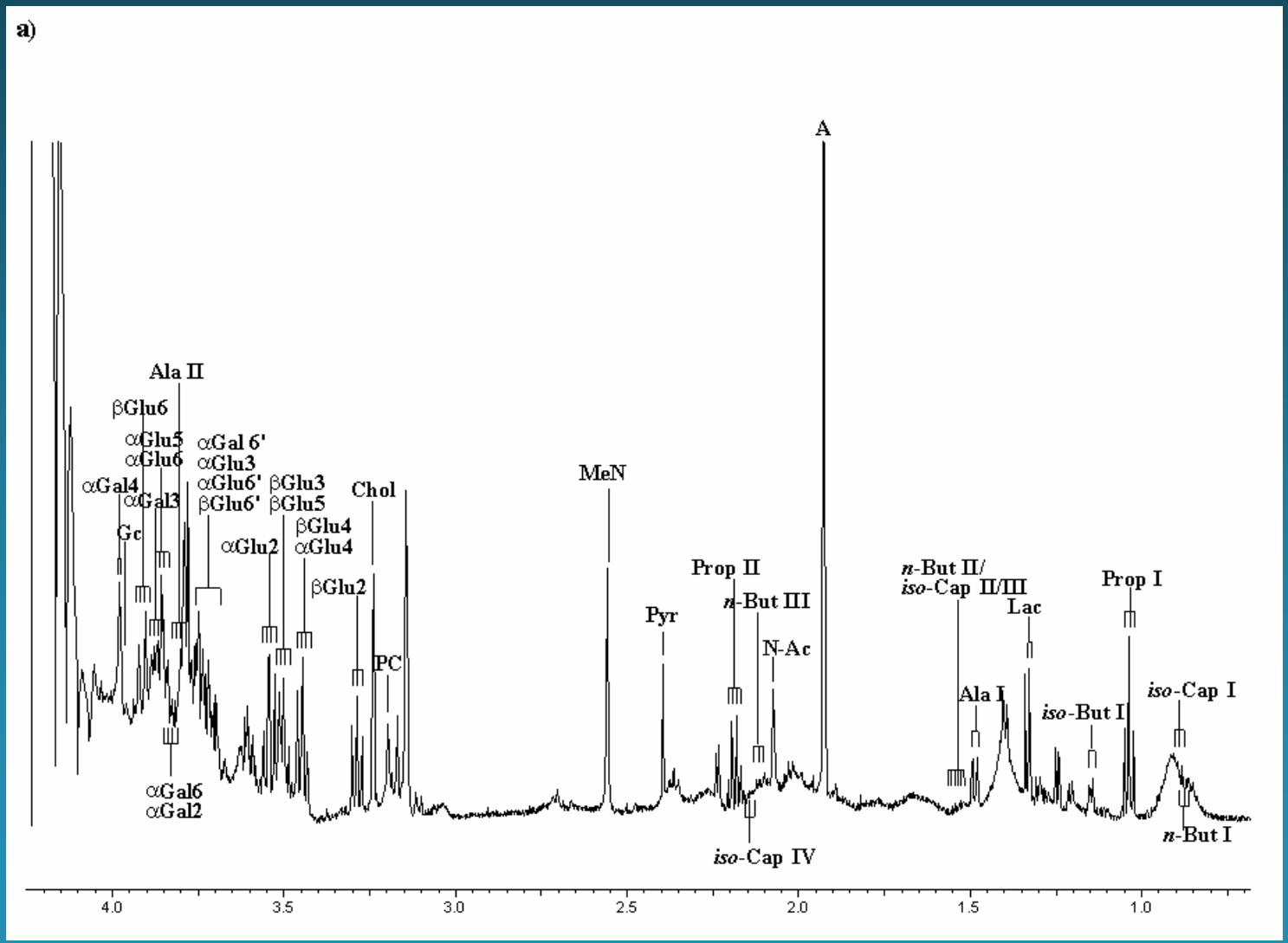
Restorative treatment of primary root carious lesions (PRCLs) presents a challenge to the dental profession. The aim of this study was to assess a unique method of non-restorative management of PRCLs using ozone gas (O_3).

Results obtained revealed that in addition to giving rise to the oxidative decarboxylation of pyruvate (generating acetate and CO_2 as products), and the attack of carbohydrates to produce formate, O_3 also oxidised PRCL lactate, urate, glycosaminoglycans and methionine to yield acetate and CO_2 (via pyruvate), allantoin, low-molecular-mass saccharide fragments and methionine sulphoxide, respectively.

12 soft PRCLs requiring restoration from teeth were used as these are the most severe type of lesions found in humans. Plaque was removed using a hand-held standard fine nylon fibre sterile toothbrush with sterile water. After drying, a sample of PRCL was taken using a sterile excavator from half of the most active part of lesion.

Subsequently, ozone was applied to the lesion for 5 s (equivalent to a delivery of 2.24 mmol. of this oxidant) and another sample was taken from the other half of the most active part of the lesion. Each sample was weighed and perchloric acid extracts derived therefrom were subjected to ^{1}H NMR analysis at an operating frequency of 600 MHz.

^{1}H NMR spectra of root caries



Anti-microbial effects of a novel ozone generating device on micro-organisms associated with primary root carious lesions

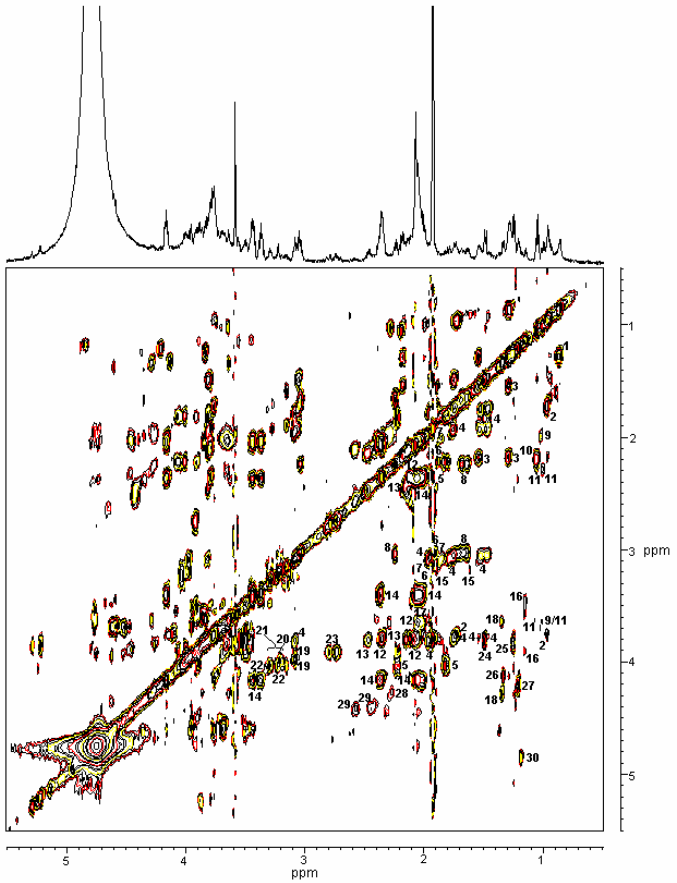
A. Baysan, R. Whiley and E. Lynch

Caries Research 2000;34:498-501.

99% killing achieved after the ozone treatment

^{1}H NMR spectra

Partial ^{1}H-^{1}H 2D TOCSY spectrum of a human salivary supernatant specimen



KEY: 1. saturated fatty acid (terminal end spin system) 2. leucine 3. saturated fatty acid (intermediate carbon spin system) 4. lysine 5. unassigned 6. γ-aminobutyric acid 7. ornithine 8. unassigned 9. isoleucine 10. propionate 11. valine 12. glutamate 13. glutamine 14. proline 15. unassigned 16. propane-1,2-diol 17. unassigned 18. threonine 19. unassigned 20. phosphorylethanolamine 21. tyrosine 22. phenylalanine 23. asparttic acid 24. alanine 25. ethanol 26. lactate 27, 28, 29 unassigned

Results

Mean ± SE $\log_{10}$ cfu + 1 before and after ozone application for a period of either 10 or 20 s

Groups	10 seconds	20 seconds
Control samples	7.00 ± 0.24	6.00 ± 0.20
Test samples	4.35 ± 0.49	0.46 ± 0.25

Ozone application either for a period of 10 (99%) or 20 s (99.9%) substantially killed micro-organisms in PRCLs

The use of ozone for the management of primary root carious lesions

A. Baysan and E. Lynch

Tissue Preservation and Caries Treatment

Quintessence Book 2001, Chapter 3,

p. 49-67.

Beighton D., Lynch E. and Heath M.R. (1993)

A microbiological study of primary root caries lesions with different treatment needs.

Journal of Dental Research 73: 623-629.

This is a validated severity index for root caries

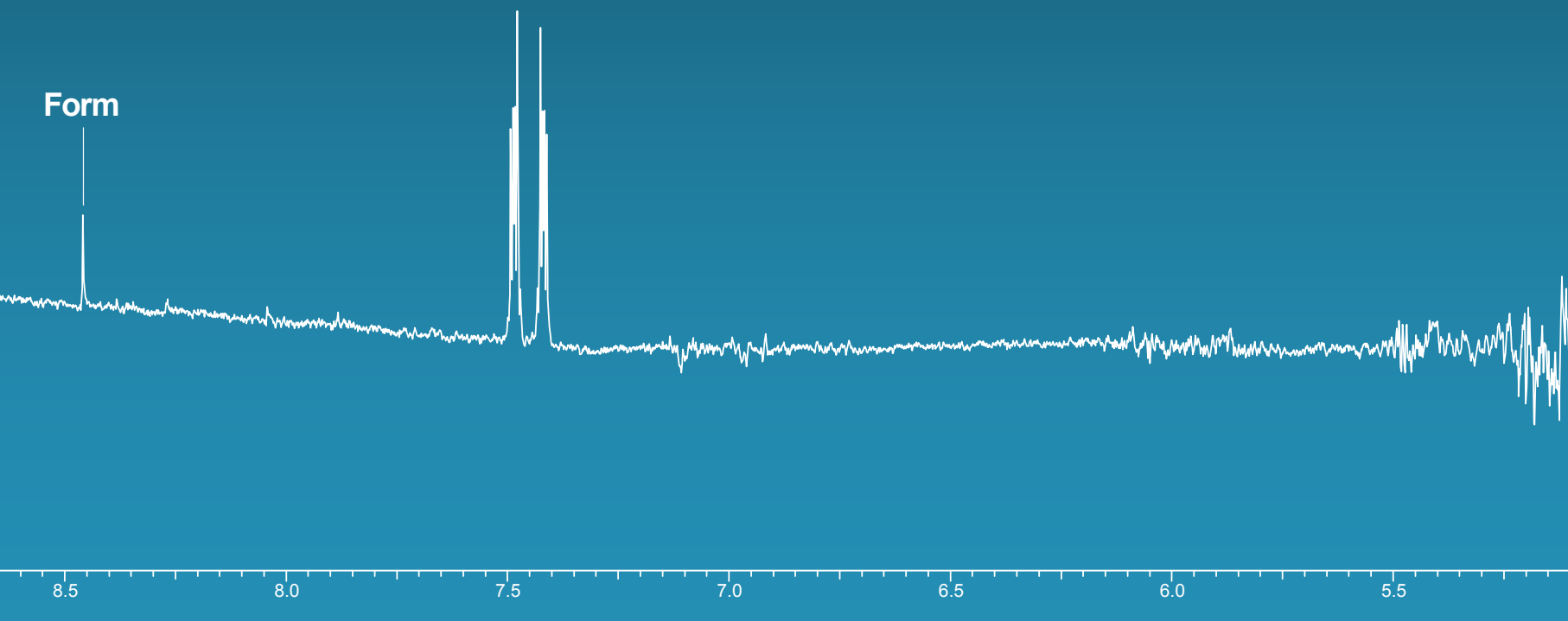
Ozone delivery system

^{1}H NMR-determined electron donor formate levels before and after ozone treatment (Formate) mmol.kg^{-1}

Groups	Mean	± SE
Control	2.71	± 0.71
O_3 treated	5.47	± 1.82

$p<0.05$ (paired t-test performed on untransformed data)

^{1}H NMR spectrum of a post-neutralised perchloric acid extract of a carious root dentine biopsy specimen, following treatment with O_3.



- ^{1}H NMR spectroscopy

Nuclear magnetic resonance (NMR) spectroscopy uses energy from the radio frequency region of the electromagnetic spectrum to detect changes in the alignment of nuclear magnets during exposure to a powerful external magnetic field.

The absorption frequency is dependent on the magnetic (and, therefore, chemical) environment of nuclei.

Moreover, evidence for the O_3-mediated oxidation of 3-D-hydroxybutyrate was also obtained.

What About ? ~ Questions your patients will ask;

What is ozone & is it safe?

Ozone is a special gas that our HealOzone unit makes to kill the bacteria that are causing decay in your teeth.

The equipment cannot produce ozone unless there is a seal around your tooth, and any excess is sucked away from you.

What About ? ~ Questions your patients will ask;

What can ozone do for me?

Ozone will stop the decay process in a simple, quick and painless process

What About ? ~ Questions your patients will ask;

How can it help my teeth?

Ozone will stop the decay process, without the need for anaesthetics, injections, drilling and filling

What About ? ~ Questions your patients will ask;

How do I know it has worked?

In 3 months time, we will ask you to return to evaluate your teeth with our laser. There is a small fee to cover this surgery time

In most cases, the decay will have halted or reversed.

What About ? ~ Questions your patients will ask;

Do I feel anything?

No! The process is quick, simple, and you will not feel anything.

What About ? ~ Questions your patients will ask;

What are the alternatives?

We can place a traditional filling. This may involve an injection, drilling away part of your tooth, and placing a filling. You may have some sensitivity in the first few days. It is important that you realise that this filling may need replacing in 5 – 8 years time.

What About ? ~ Questions your patients will ask;

How much is the treatment going to cost?

The ozone treatment is less costly than a traditional filling in place. We will let you know in advance what our fees are.

What About ? ~ Questions your patients will ask;

What is included in the cost to me?

Our ozone fees include a special kit for you to use at home.
It is very important that you use this as directed;
the success of this HealOzone treatment requires you to take
responsibility for your own dental health.

What About ? ~ treatment results

- At UKSmiles
  - Treated 247 surfaces
  - Reviewed 195 surfaces
  - significant changes at the 99.99% level
    - showing reversed decay
    - no surfaces have decayed further

Ozone Therapies in Dental Care

What About ? ~ treatment for patients

- At UKSmiles
  - review at 2 months after 1st ozone application
  - for deciduous teeth
    - we now ozonate decayed surfaces
    - leave for 6 weeks to remineralise
    - prep cavity margins if required & place glass ionomer
    - usually no anaesthetics required
    - less tissue destruction

Ozone Therapies in Dental Care

What About ? ~ treatment uses

- At UKSmiles
- we now ozone all decayed surfaces & leave for 6 weeks to remineralise where possible
- ozone cavity preps prior to filling
- ozone crown and veneer preps
- ozone prep cores to change the colour if dark
  - intention to ozone surgical areas, eg. extraction & apicectomy sites immediate implant sites surgical instruments

Ozone Therapies in Dental Care

What About ? ~ costing this treatment

- At UKSmiles

- no injections
- no drilling or filling required in most cases
- no tears, trauma
- no fear of dental treatment
- painless procedure
- quick, non-invasive, instant bacterial elimination
- allows natural remineralisation of decayed tooth tissue

Ozone Therapies in Dental Care

What About ? ~ costing amputation therapy

- Single surface composite filling £ 98.00
  - Time 30 minutes average
  - Materials
    - needle £ 00.02
    - r/dam £ 00.10
    - local anaesthetic £ 00.15
    - acid etch, resin, brushes £ 01.00
    - composite £ 04.50
    - incidentals £ 07.00 (equipment w/tear)
    - wages £ 30.00
  - Profit £ 54.00 approx
    - or £ 108.00 / hour profit

Ozone Therapies in Dental Care

What About ? ~ costing ozone treatment

- At UKSmiles
  - Single Tooth Ozone treatment £ 30.00
    - Time Average 6 teeth treated in 15 minutes
    - Materials
      - materials £ 08.00 / patient
      - incidentals £ 02.00 (equipment w/tear)
      - wages £ 20.00
  - Profit £ 150.00 approx
    - or £ 600 / hour profit

Ozone Therapies in Dental Care

What About ? ~ costing ozone treatment

- At UKSmiles
  - Full Mouth Ozone treatment £ 290.00
    - Time 15 minutes
    - Materials
      - materials £ 08.00 / patient
      - incidentals £ 02.00 (equipment w/tear)
      - wages £ 20.00
  - Profit approx £ 260.00
    - or £ 1040 / hour profit

Ozone Therapies in Dental Care

What About ? ~ costing comparison

- At UKSmiles

- Treatment profits
  - Single surface composite filling — £ 108.00 / hour profit
  - Single Tooth Ozone treatment — £ 600.00 / hour profit
  - Full Mouth Ozone treatment — £ 1040.00 / hour profit

- Resale profits
  - Patient kit sales — £ 22.50 each

Ozone Therapies in Dental Care

What About ? ~ costing amputation therapy

- Composite filling £ 100
  - Time 30 minutes average
  - Materials
    - needle £ 00.02
    - r/dam £ 00.10
    - local anaesthetic £ 00.15
    - acid etch, resin, brushes £ 01.00
    - composite £ 04.50
    - incidentals £ 07.00 (equipment w/tear)
    - wages £ 30.00
  - Profit £ 56.00 approx
    - or £ 112.00 / hour profit

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Baysan A, Lynch E, Ellwood R, Davies R, Petersson L, Borsboom P. Reversal f Primary root caries using dentifrices containing 5000 and 1100 ppm fluoride. Caries Res 2001; 33; 261-266.

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Silwood CL, Grootveld M, Lynch E. 1H NMR investigations of the molecular nature f low-molecular-mass calcium ions in biofluids. J Biol Inorg Chem. 2002,7:46-57.

Yeganeh S, Lynch E, Jovanovski V, Zou L. Quantification of root surface plaque using a new 3-D laser scanning method. J Clin Periodontol. 1999;26:692-7.

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