best remedy. Although candidæmia has rarely been reported, failure to demonstrate Candida in blood or tissue of patients suspected to have systemic or endocardial candidal infection, is frequently followed by confirmation of the clinical diagnosis at autopsy (Hoeprich, 1983.) Systemic illness may also be due hypersensitivity or to immune response. From the capillary bed in the gingivæ, cellular components, Candidal metabolites or mycotoxins, may be absorbed. Cellular components which have been identified include proteins, polysaccharides and lipids. For example, glucan, chitin, mannan, ergosterol and triglycerides have been all identified. Although antibodies are produced against antigenic components of Candida species, anergy may result if the infection overpowers the host response (Hoeprich, 1983). Microbiological findings in relation to oral and systemic signs and symptoms should be carefully evaluated in view of what is now known about mycoses in general, and C.albicans in particular. One may well question whether Candida can be considered as commensal or any part of the normal flora.

SWITCHING

Candida albicans and some of the other pathogenic species of this Genus have been shown to be dimorphic in both culture and tissue. Dimorphism in tissue has been considered as one of the criteria of pathogenicity (Hoeprich, 1983.) As investigations progressed, it was observed that patients who attended the office with a history of vague illness, for which there was no apparent cause, sometimes had Oral Candidosis. It also became apparent that there was a correlation between symptomology and the observed stage in the life cycle of Candida.

When Candida is present in dental plaque, it may be observed in one of three basic forms. Long filaments, called hyphæ. These have been described as capable of inserting themselves between intact layers of epithelial cells, (i.e. an invasive stage). Candida converts from this mould stage (the hyphæ or tube cells) to the reproductive yeast stage (individual oval cells that "bud" daughter cells) at 37°C. The available data indicates that in the yeast form there is not only more rapid metabolism but also more rapid release of Candidal toxins which might enter the patient's circulation from the capillary bed in the gingivæ. The intermittent release of toxins into the tissue could alter the environment to permit the switching between buds and hyphæ as the tissue temperature cycled above and below 37°C. (In vitro, 37°C is critical in governing the change between buds and hyphæ. Above 37°C rapidly metabolising buds are formed, below this temperature, growth slows and buds elongate to form

hyphæ.) The invasive hyphæ penetrate to warmer tissue and the cycle repeats. The critical temperature in vitro is not necessarily followed in vivo, but no contradicting data is available.

In vivo it was observed that the bud stage only lasts two to three days and is followed by buds elongating to become short cells. These are joined end to end, the strands referred to as pseudohyphæ. The pseudohyphæ are found mixed with buds. Two or three days more sees the mix changed to pseudohyphæ, plus long branching septate filaments, the true hyphæ. Another two or three days sees the mix as pure hyphæ, with fat blunt ends. This is followed by the appearance of hyphæ which are very slender, tapering to a sharp point. These sharp hyphæ may sometimes be seen penetrating between individual epithelial cells. These may have dislodged in a clump when the plaque was taken. This stage is then followed by the appearance of many budding yeast cells. The entire cycle takes about ten days in an average individual.

SPORES

If the environment becomes unfavourable for Candida it produces chlamydospores. These are thick walled cells which look like a swelling at the end of a pseudohypha, or a swelling between two of the segments of the pseudohypha. Chlamydospores should not be mistaken for buds since they do not represent increased metabolism, but are a resistant stage. When fungi experience a hostile environment, they produce resistant forms, or "spores" in order to spread more easily to a distant (i.e. more fertile) habitat. Often spores are produced sexually. Recently it has been shown that yeasts do have a sexually reproductive stage. Chlamydospores are now held to be the result of the union of a positive with a negative filament (a sort of sexual union) to produce a new genetic variant more capable of survival. Chlamydospores should therefore be regarded as a disseminating form, i.e. an infective stage.

SYSTEMIC CORRELATION

Clinically significant features that have been observed:

When patients are most fatigued, morose, unenergetic or depressed, Candida in the plaque is observed to be in the bud form.

When patients are at their most energetic, Candida is observed to be in the hypha form, with or without chlamydospores.

Knowing the cyclical nature of Candida, it is then possible to observe it in plaque and relate the stage of the fungal cycle to the cyclical variation in mood, fatigue or energy of an individual. This is a valuable diagnostic test to determine if Candida has established to the point that the infection has started to seriously disturb the health and/or result in moderate to severe complications in treatment that might require the involvement of a physician.

It has been found that Candida is the most frequent organism which overgrows, following successful elimination of oral protozoa with antibiotic therapy. If this overgrowth is a biological embarrassment to the patient, the condition is called a superinfection. Typically, the aggressive, destructive phase of periodontal disease is arrested by the elimination of the protozoa but, if Candida remains, the tissue fails to heal properly. In the absence of Candida, appropriate therapy results in a good tissue response. These observations prompted the design a treatment regime for the elimination of Candida from the periodontal pocket.

TREATMENT

Treatment for the elimination of the oral protozoa was modelled on that for the elimination of any lumen dwelling, potentially tissue invasive, parasite. Namely, contact and systemic antiparasitic agents used concurrently until the target organism have been eliminated (Cuttings' 1979). What worked against an animal parasite could also work against a fungal parasite, providing that the appropriate antimicrobials were chosen. The concurrent use of systemic and topically applied Nystatin eventually resulted in elimination of the fungus which was accompanied by further healing. In clinical practice, discontinuance of medication after elimination of Candida was not followed by relapse provided that treatment was continued until three months after all signs, symptoms and tests were negative.

It was never found that only topical (or only systemic) anticandidal therapy was successful. When such single phase treatment was employed, although the fungus might be significantly suppressed, discontinuance of medication resulted in rapid relapse.

ORAL SIGNIFICANCE

Candida in the gingival crevice (or periodontal pocket) was often accompanied by a dull to bright red granular inflammation. Patients sometimes complained of prickling or burning sensation in the gums. The necks of the teeth were often hypersensitive. The gums were often tender and would bleed with little provocation, but the pockets were seldom deep, frequently only 1mm. Deeper pockets associated with Candida were frequently those which had been previously infected with the protozoa and which had failed to heal completely, leaving a "residual" pocket 1-2 mm shallower than previously measured. Sometimes the tissue adjacent to an area at the gingival margin, infected with Candida, would be slightly white, or have faint white patches. Candida was not found to be associated with "Black Hairy Tongue".

CANDIDA, pH and CARIES

Candida survives between pH 3 and 8, but thrives in an environment that is acid (pH 5 to 5.5) and has up to 35% fermentable sugars available. Although the ideal temperature for fungal growth is between 20°C and 40°C, our experience showed it survived refrigeration without adverse affect on viability when the colonies were returned to the ideal range. It survives well in the oral environment, especially if there is active caries. Decay is classically accepted as caused by bacteria producing acid and driving the pH below 5.4. It was repeatedly observed that when Candida was present the rate of decay was exceedingly high. The type of rampant caries, associated with Candida, started as small lesions in the dentine just at the gingival margin. These lesions tended to rapidly spread circumferentially at and below the gingival margin. This decay could encircle a tooth in as little as three months and cause so much destruction that the tooth would be all but unsaveable in six months. The progress of the lesion was typically not associated with pain until the cavity was quite large. Recovering Candida from the surface of carious lesions, as well as from the base of pockets, would indicate that the organism grows in either ærobic or anærobic conditions. However the metabolites under differing conditions would be expected to differ, a common finding with fermenting yeasts. Simply stated, under anærobic conditions (the base of the pocket) Candida produces toxic substances, including acetaldehyde, which inhibits cell membrane permeability. Aerobically the yeast ferments sugars to acid, adding to that already produced by bacterial metabolism.

ANOMALIES AND OTHER MATTERS

Subsequent to the nuclear attack at Hiroshima a strain of Candida capable of actually metabolising fermentable substances to produce ethyl alcohol has been reported. The alcohol can then enter the blood stream of the unsuspecting patient and produce unwanted intoxication, (Iwata, U of Tokyo; Zwerling, 1984; Baker, 1982). Aerobically, the yeast may simply ferment sugars directly to acid, adding to that already produced by bacteria thus further depressing the pH and increasing the rate of decay. In West Germany, in the early eighties, there was an outbreak of rampant caries in the primary teeth of some children. The condition progressed to pulpal necrosis and multiple jaw abscesses from which only Candida could be recovered.

The healthy human body is covered by an unbroken layer of "skin". This protects the inner parts of the body from invasion by micro-organisms. The skin changes from keratinized epithelium to mucous membrane as it enters body cavities. The covering remains unbroken, except in the mouth. Here the teeth are rooted in the jawbones and must pass from this inner part of the body to the surface.

FOCAL SEPSIS and INFECTIVE ENDOCARDITIS

The only part of the body where the epithelial covering is discontinuous is where the teeth are rooted and pass through the "gums". In health the gingivæ tightly attach to the tooth to prevent the ingress of micro-organisms. If Candida or the Protozoa are present at this site, and if the epithelium in the pocket has been destroyed by infection, then these parasites have direct access to the bone as well as to the soft tissues and the bloodstream. Instrumentation in such a site may drive these organisms deeply into the tissue or even the bloodstream. Moore-Gillon et al (1983) report thirty two episodes of infective endocarditis (between 1965 and 1982) in 30 patients with prosthetic heart valves. Of those that died from the infections, all were infected with organisms frequently found in the mouth. Two of these cases were candidal endocarditis (C.albicans). No cases of candidal endocarditis survived. Penetration of Candida to deeper structures, or dislodgement into the bloodstream, normally only occurs if the epithelial covering at the site of infection is not intact (ulceration), and/or if instrumentation is conducted at such a site, (Hoeprich and Rinaldi, 1983). If dislodged into the blood stream from such a site, Candida may not only settle on a prosthetic or a damaged heart valve, but also on a healthy heart valve in a nonimmuno-

compromised host. The prognosis for such an endocarditis is grim and further complicated by the risk of embolism. The frequency and size of emboli are greater in Candidal endocarditis than in bacterial endocarditis. Pockets infected with Candida frequently bleed upon the slightest provocation, indicating a break in the epithelium (micro-ulceration). Caution should be uppermost in the mind of the dentist before any instrumentation in such a site is contemplated.

Even the act of chewing can send showers of bacteria into the bloodstream. Normally our immune system copes with bacteria and viruses, but the parasite, E.gingivalis, feeds on the white cells which should destroy it. C.albicans and other fungi produce mannan, a soluble carbohydrate component that has been demonstrated to be immunosuppressive. Infections with such organisms, rather than being symptomatic of suppression of the immune system, more probably precede and contribute to suppression of cellular immunity. (Witkin, 1985). Thus animal parasites and parasitic fungi present a more insidious threat than mere bacteria.

For these reasons parasites should be treated with respect. Appropriate local and systemic agents should be prescribed to be used concurrently. Medication should be maintained until testing has shown that the infections have been eliminated, or controlled enough, before proceeding with routine dental care. The latter is always a necessary adjunct in treating these infections. Timing is all important to maximizing therapeutic response while minimizing complications.

No benefit accrues to the patient if the teeth are sitting in a bed of pus. Neither does the patient benefit if the end result of instrumentation in an infected site is the further spread of infection. Finally, for the physician attempting to treat a patient to eliminate Candida, treatment can be frustrating if a reservoir of Candida in the mouth receives no attention. Patients deserve a comprehensive team approach.

FOOTNOTE

Living with a parasite, animal or fungal, may be likened to living with a ticking time bomb. It is the role of the clinician to defuse this time bomb without exploding it. Carefully selected doses of appropriate antimicrobials, used to slowly kill off the parasite, reduce the Herxheimer's effect. (Showering of the host with antigenic material and virus resulting from the death of the parasite, animal or fungal.) Once the infection is controlled or eliminated, débridement and other physical treatment can be expected to be more successful, less painful and be accompanied by fewer complications.

The bottom line in the treatment of these types of infection is that patients must expect to get worse before they get better. Clinicians must strive to minimise the adverse effects of successful treatment.

CHAPTER VII

DIAGNOSIS

THE FOUNDATION OF SUCCESSFUL TREATMENT

PREAMBLE

For the purposes of this book, diagnosis of periodontal infections is divided into three broad categories:

1) Destructive periodontal lesions, with or without inflammation.
2) Inflammatory lesions of the gingivæ, unaccompanied by destruction.
3) Other lesions secondary to disturbances of systemic health.

The process of ecological succession is well recognized in the colonization of the digestive tract by micro-organisms. The microecosystem stabilizes after a series of changes in the microflora has occurred. Each dominant species maintains ascendancy as the environment is changed. Each alteration to the environment permits ascendancy of a different species, or group of species, each, in turn, better adapted to the altered environment (Wilson et al, 1988). Once stability of the oral microflora has been established, little further change with age occurs unless the ecosystem is disturbed by external factors (Marsh, 1988). Neither Candida spp (Marsh, 1988) nor the oral protozoa (Barrett 1914; Bass and Johns 1914; Chiavaro, 1914; Chandler, 1955; Lyons et al, 1982;) can be considered normal residents of the oral microflora, although any of these organisms are frequently present when there is pathology in process.

In order to obtain all the information relative to a patient's periodontal condition, it is necessary to have as much information as possible. Prior to a periodontal examination, patients are instructed to follow a few simple rules to stabilise the ecosystem of their plaque in order that target organisms, if present, may be found. This also allows stabilisation of tissue response. The typical state of disease will then be observed, rather than an artificially enhanced state produced by superlative oral hygiene.

The pretreatment instructions (see Chapter VIII and Chapter X for further details), allows for plaque stability and maturation while inhibiting the associated disease from running out of control.

To obtain an accurate diagnosis based on the microbiology of the plaque it is necessary to ensure that target organisms may be recovered for identification. Ideally, this would include viruses, bacteria, fungi and protozoa. There are technical problems associated with identification of all bacteria, since there may be more than four hundred species present. However, only a few species are considered potentially pathogenic. Viral identification also presents technical problems since most laboratories do not, at present, have facilities for viral cultures. Almost without exception, dental offices are not equipped for bacterial nor viral culturing. Even if such steps were considered practical, the biosafety aspect should not be ignored. There is an increased element of risk to the environment, as well as to the office personnel, when dealing with concentrations of potentially pathogenic micro-organisms. From the safety standpoint, therefore, such an approach to the diagnosis of periodontal disease might be ill advised.

For quick, safe and easy diagnosis, the phase contrast microscopic examination of plaque currently offers the most promise. Microscopy can be relied on to give consistently reliable results, especially with severe infections. Where there is light or recent infection, patients must observe a few simple rules to facilitate accuracy. It is best if the patient, as far as possible, adhere to the following instructions:

PATIENT INSTRUCTIONS FOR STABILISING PLAQUE IN VIVO

For five days prior to plaque examination:

1) Brush once daily in the evening using the Bass Brush Technique
1b) Use a Bass type of brush
1c) Do not use commercial toothpaste.
1d) Use floss, toothpicks, etc., only to remove food caught between the teeth, but do NOT floss or "pick" subgingivally.
2) Do not use mouth washes or water irrigation devices.
3) Use nonsweetened liquids to rinse away all food debris after eating.
4) If possible, take no medication for the five days,
4b) Particularly "cold remedies" or

4c) Acetylsalicylic acid and its derivatives.
5) DO NOT stop prescription medication unless authorised, by the prescribing physician, to discontinue.
6) Brush the night before the appointment.
7) Do not brush on the day of the appointment.
8) Do rinse away food debris using plain water
8b) Or any unsweetened beverage.
9) Do not drink tart fruit juices before the appointment.
10) On the day of the appointment, avoid eating food or snacks such as:

Salted nuts,
Sunflower seeds,
Fresh pineapple,
Citrus fruits, or
Other fresh fruit.

11) Do not use "breath mints" or other medicated lozenges.
12) Avoid fresh fruit juices and all carbonated beverages.
**) Do follow the oral hygiene instructions given by the office (See Chapter X - Patient Treatment Instructions for the Pretreatment Programme which includes Specific Oral Hygiene Instructions.)

If a negative plaque examination results when a positive is anticipated, carefully re-evaluate the diagnostic technique as well as the patient's food, medication and other habits; (chewing tobacco, brushing, use of breath fresheners, etc.)

MODIFIED PERIODONTAL EXAMINATION

Once the patient is positioned in the dental chair, a brief clinical examination should be performed. To avoid injuring fragile tissue, or promoting bleeding, lightness of touch is important in the probing technique used for measuring pocket depths. Bleeding will make microscopy that much more difficult. NO scaling, prophylaxis, use of antiseptics, cavitron, prophyjet, etc., should precede the plaque exam.

All parameters are graded into five levels, for example, Good (G), Fair to Good (F-G), Fair (F), Fair to Poor (F-P) and Poor (P). Quantities are recorded from minimum (<o+) to maximum (+++) with the grades listed

as: <o+, o+, +, ++, +++. The minimum clinical parameters that are recorded on the "K5" chart are:

Oral Hygiene, (OH) recorded from good (G) through poor (P).

Gingival Condition, (GC), recorded as above.

Plaque (P) (quantity), recorded from minimal <o+, normal o+, to maximum +++

Halitosis; from none -ve, then just detectable o+ through +++

Pockets (Poc - depths 3 mm or more);

Readings are taken mesial, buccal and distal for both the lingual and buccal surfaces of incisors, canines and premolars. For molars, the readings are taken mesial, mesiobuccal, furcation, distobuccal and distal, as appropriate, on both the lingual and buccal arches.

Bleeding, the location is marked with a red B.

Lingual and buccal bleeding points are charted separately.

Mobility, from minimum <o+, the limit of normal being o+, to maximum +++

Inflammation, recorded as a solid red line on the chart.

If the inflammation is sporadic in a quadrant, it is shown as a dotted red line. Additionally, the inflammation is described as:

"None"

"Minimum-sporadic"

"Only in Stagnation Areas"

i.e. the areas the patient finds hardest to clean, labial to the lower anteriors, lingual to the lower molars, buccal to the upper molars and palatal to the upper anteriors.

"Four Quadrants (4Q) or GMD"

GMD is an acronym for Generalized Mauve Deterioration of the gingivæ, i.e. If venous stasis is present.

"Detachment" or "Loss of Interdental Papillæ"

are in the "most severe" category.

Submandibular lymphadenopathy (SMG)

relative to both palpability and tenderness, is recorded as "No" for not detected, L or R, meaning that the right or the left side is detectable but not tender, the next grade is L+R, meaning that

both are detectable. In addition, tenderness is recorded using the same format.

Microbiological Parameters are recorded from <o+ through +++, except for filaments (Leptothrices) and cocci which are either recorded as normal (++) or abnormal, with the abnormality noted. For example, if streptococci or filaments in adherent ropes or bundles are observed, this is recorded as an abnormality. Coccobacillary forms (CBs) are only recorded as "present" when observed. They are not graded.

The K5 chart has sufficient space to record this information in shorthand form. There is a simplified chart on which can be marked actual mobility, pocket depths and location of inflammation and bleeding. After patient identification, there is a prompt line and six charts so that a series of evaluations may be recorded on one sheet for ease of progress assessment.

Illustration Showing Layout Of K5 Chart

```
      NAME:                                        FOLIO NUMBER:

      Mob o+, +, ++, +++; Pockets 3 or 3>; Inflammation:red line

      DATE        OH    GC    P    Hal    Poc    Mob    I    SMG      ACs
      Lepto    Cocci    Mot     Bac     Spiro    Am    Trich    Can    CBs
      Buc                                  I
          8  7  6  5  4  3  2  1  I  1  2  3  4  5  6  7  8
      Pal                                  I                          MAX
Pdx=  ----------------------------------I--------------------------Left
      Ling                                 I                          MAND
          8  7  6  5  4  3  2  1  I  1  2  3  4  5  6  7  8
      Buc                                  I
      DATE        OH    GC    P    Hal    Poc    Mob    I    SMG
      Lepto    Cocci    Mot     Bac     Spiro    Am    Trich    Can
      Buc                                  I
          8  7  6  5  4  3  2  1  I  1  2  3  4  5  6  7  8
      Pal                                  I                          MAX
Pdx=  ----------------------------------I--------------------------Left
      Ling                                 I                          MAND
          8  7  6  5  4  3  2  1  I  1  2  3  4  5  6  7  8
      Buc                                  I
```

PLAQUE EXAMINATION: DIRECT

In order to achieve accurate and consistent results, it is important that the quality of the plaque is not altered by the sampling technique. The principles involved are:

A) The plaque should be mature.

B) The quality of the plaque should be undisturbed by medication.

C) The quality should be undisturbed by local factors, such as acidic or salty foods, astringents or antiseptics, brushing just before an appointment, other over exuberant oral hygiene or recent dental work.

D) The sampling technique should be consistent and not introduce variables which were not present in the patient's mouth.

Assuming that the first three parameters have been met, the following technique has been shown to be reliable:

> Having completed the clinical exam and identified the first pocket from which the plaque is to be taken, a drop of the patients own saliva is removed from the sublingual area and deposited in the middle of a clean microscope slide. Plaque from the suspect area is removed with a thin (and clean) instrument such as an explorer or fine perio-probe. DO NOT use a wire loop, a curette or similar instrument. The probe must be taken to the base of the pocket without causing hæmorrhage. The sample is then lifted clear and deposited in the saliva on the slide. Do not agitate or mix, but tease the plaque off gently, using a second instrument if necessary.
>
> Once the plaque is in the saliva on the slide, drop a cover slip in place and squeegee the cover slip to produce a thin film of plaque. (Half a pipe cleaner, doubled over, makes a good squeegee. It is unlikely to break the cover slip and yet is capable of exerting sufficient pressure to produce a thin even film). The saliva should reach the edge of the cover slip over its entire circumference and there should be no bubbles or grit under the cover slip. Supragingival plaque and detritus have little diagnostic value while reading the slide will be complicated by air bubbles, especially if they are numerous.
>
> It is difficult to recover plaque from teeth which have been restored by crowning (particularly if the crowns are metal) since

the plaque tends to stick to the crown margin instead of the dental instrument. Thus the plaque sample is very often lost onto the surface of the crown, to which the plaque adheres tenaciously.

For phase contrast microscopic examination of living amœbæ, the use of liquids, other than the patient's own saliva, as a mounting medium, causes temporary distortion of the amœbæ, which almost invariably makes them unrecognizable during the time that a slide would normally be examined.

The spotting and recognition of protozoan and fungal parasites is not within the scope of this chapter. It is assumed that the reader will seek additional assistance in the form of tutoring and training if needed. (See Chapter X for a guide to spotting and recognition of protozoa and other organisms commonly seen by phase contrast microscopy.) Once the slide has been read and a tentative diagnosis reached, it would be prudent for the neophyte to obtain confirmation of the diagnosis by submitting material to a reference laboratory.

PLAQUE EXAMINATION: INDIRECT

Confirmation of micro-organisms identified, for all practical purposes, may be divided into two classes:

PROTOZOA for which fixed plaque in sufficient quantity must be submitted to a parasitology laboratory.

FUNGI for which a swab may be taken in order to grow the material in culture. A dried slide from a suspect area may also be submitted to a mycology laboratory.

PARASITOLOGY: COLLECTING PLAQUE FOR THE LABORATORY

Introduction

Entamœba gingivalis was discovered in 1849 by Gros, but interest in this protozoan parasite has fluctuated as opinion about its pathogenicity has varied. The question of the degree of pathogenicity of this lumen dwelling parasite remains partially unanswered. The difficulty surrounding laboratory procedures for producing permanently stained slides, and for culturing this protozoan have compounded the enigma. Although wet mounts of plaque mounted in saliva may easily be used to demonstrate amœbæ in the deepest (most apical) portion of subgingival plaque, taken

from an infected site, certain practical problems arise for the dental practitioner and researcher alike.

When a patient, suspected of harbouring an amœbic infection, presents, several factors may interfere with proper diagnosis, for example:

1) the microscope may not be readily available,
2) the microscopist may not be available,
3) the first pockets searched may be negative,
4) there may not be time to conduct the microscope search at all,
5) there may not be time to conduct the microscope search immediately,
6) confirmation of the diagnosis may be required, or
7) the search may be interrupted by other more pressing matters and
8) the slide may dry out before the search is completed.

The routine laboratory procedures employed for the examination of fæcal smears for protozoa were modified in order to overcome the preceding barriers. The new method, (Palmer, 1981, see Chapter XI) produces permanently stained slides of Entamœba gingivalis in dental plaque which clearly demonstrates the nuclear structure.

Although the plaque samples are very tiny, difficulty in obtaining sufficient material for high quality slides will not be experienced, providing that all steps are meticulously followed. Sloppy technique in the dental office, clinic or laboratory only serves to jeopardise the results. In order to achieve consistent results, the steps described in this chapter for plaque collection should be carefully followed.

BULK FIXATION OF PLAQUE IN SAF

For each patient tested, plaque from a number of pockets can all be placed in one container of SAF fixative which was developed by Yang and Scholten (see Chapter XI). SAF is available from medical supply houses in bulk or in individual kits originally designed for stool sampling. The kits are used by many medical laboratories, including some Provincial Health Laboratories. In the United States, kits may be obtained from Meridian Diagnostics, 3471, River Hills Drive, Cincinnati, Ohio, 45244 (Phone 800.543.1980 or 513.271.3700). In Canada, Meridian products are distributed by BioMega Diagnostic, 10900, Rue Hamon, Montréal, PQ, H3M 3A2 (Phone 800.361.9615 or 514.331.7520).

The plastic bottle containing the SAF fixative fluid must be marked with the name of the patient and the name of the doctor submitting the sample. Only about 15cc of the fixative fluid should be in the container, therefore pour out any excess before starting to collect the plaque. Plaque from each pocket is taken (as for direct examination) and immediately deposited in the SAF fixative by gently agitating the instrument in the fluid to dislodge the probed material. The instrument is wiped dry before returning to the mouth for the next sample from the next pocket and the process repeated until sufficient material has been collected. The data sheet must also be completed and should be clearly marked DENTAL PLAQUE. Do not forget the name of the patient, the name and return address of the doctor. Inclusion of your own microbiological readings as they apply to Motility, Bacilli, Spirochætes, Yeasts, Amœba and Trichomonas may be of value since they may help the laboratory personnel.

Since plaque in SAF stores well (provided that the plastic container also has a plastic lid), there is no need to rush the material straight to the lab. However, do not stockpile specimens for more than a week or more than about two dozen kits. This will help the laboratory have an orderly flow of incoming work.

Unfortunately there is only one commercial laboratory in North America, at the time of writing, who has expertise in handling plaque preserved in SAF. Penpar Laboratory may be contacted at 3043a Hurontario Street, Mississauga, Ontario (Phone 416.361.3387). The protocol was developed by Palmer and Scholten, to whom enquiries should be directed: Ontario Ministry of Health, Central Laboratory, Parasitology, 81 Resources Road, Weston, Ontario, M9P 3T1 (Phone 416.235.5722). Plaque samples are no longer processed at the public health laboratory. The protocol, which is in Chapter XI, was released at the 11th Annual Education Conference of the International Academy of Preventive Medicine, 1981.

Trichomonas tenax is difficult to find by both direct and indirect examination. As yet, we do not have a reliable method for confirming T.tenax. A positive finding in either office or laboratory should be considered positive. The typical movement of Trichomonads make them unmistakable in a live wet mount, even if the numbers are sparse. In a stained slide they are very difficult to find unless the slide is "loaded".

SUMMARISED INSTRUCTIONS FOR COLLECTING PLAQUE IN SAF

The instructions for collection of stool samples do not, of course, apply to the collection of dental plaque. Here are the relevant directions for the collection of dental plaque:

1) Collect plaque at the beginning of the appointment.
2) The plastic bottle should contain 15 cc fluid.
3) Pour excess fixative into a spare container.
4) Locate affected areas: pockets 3 mm or more and/or inflamed areas.
5) Collect subgingival plaque ONLY with thin explorer.
6) Agitate instrument in fixative to deposit plaque.
7) Wipe instrument dry before returning to mouth.
8) Collect plaque from 6 to 10 pockets.

NB Patients should not floss for at least five days prior to the appointment.

On the day of the appointment:

A) Patients must not brush on the day plaque is to be collected.
B) Patients should avoid the use of tooth picks,
   (i) water irrigation devices,
   (ii) strong antiseptics and some
   (iii) drugs, even aspirin, which may depress the number of parasites in the plaque to the point where they cannot be easily found.

Disregard of any or all of the above instructions may result in a false negative result.

Follow the directions for plaque collection implicitly, starting with instructions to the patient. Please also remember that other organisms, such as Candida species, may also cause problems and should be tested for separately. C.albicans may be cultured by using BiGGY Agar (also called Nickerson's Medium.)

MYCOLOGY: COLLECTING PLAQUE FOR THE LABORATORY

Introduction

The most reliable test for Candida albicans is the use of Nickerson's Test Kit for the Selective Culture of C.albicans: BACTO BiGGY AGAR These kits are made by Difco in Detroit, Michigan. They are available in Canada through British Drug House, (B.D.H.) in Toronto, on special order. (Nickerson's Medium, Difco product #0635-42-3 for 20 tubes and #0635-80-6 for 100 tubes.) They should also be available from a medical supply house or a pharmacy. In Canada, B.D.H. may be contacted at 800.268.2129 or Toronto area 416.255.8521 and Montreal area 514.335.1621. The number for Difco in Detroit is 313.961.0800 or 800.521.0851 from anywhere in the USA except Michigan where the number is 800.344.8526. PML Microbiological (USA) also supply Nickerson's medium. Their number is 800.547.0659.

Kits show positive cultures in as little as two days, and as long as two weeks. Discard, only after sterilisation, after four of weeks incubation to rule out false negatives. If colonies are observed (they are usually chocolate brown, pale milk chocolate or even dark chocolate to black) the the entire kit, unopened, may be sent to a reference laboratory for confirmation. Mycology kits containing live cultures should be handled with appropriate precautions, preferably in a fume hood. Positive cultures should be confirmed as yeast because between 2% and 5% are false positives. Some positive cultures are not fungal at all, but are a species of oral bacteria observed as free floating cocci displaying Brownian movement. The species is yet to be identified.

Other kits that can be used for Mycology swabs are either Mycology kits, complete with the proper data sheet, or Bacteriology kits. The data sheet must be either amended to read MYCOLOGY or the proper data sheet substituted. Be sure to fill out the clerical details including the name of the patient and ANY MEDICATION the patient is taking, the name and return address of the doctor, the name of the doctor and the patient must BOTH be shown on the specimen bottle.

> Be sure to fill out data sheets and identify specimens properly. Send them to the appropriate reference laboratory, observing the proper protocol for transport of biologically hazardous material. NOTE that unmarked specimens arriving at the laboratory for either mycology or parasitology must be destroyed.

Once the paperwork is complete, including putting identification on the ground glass section of the slide, if applicable, take a sterile swab from the sealed packet. Try to make sure that the packet is opened at the "handle" end of the package (i.e. don't grab hold of the cotton swab and thus contaminate it). The cotton end of the swab is then run around the gingival margins of all of the maxillary and mandibular teeth on both the buccal and lingual surfaces as one continuous sweeping movement. (Or rubbed over a specific area to be swabbed.)

If using a Mycology kit (an empty sterile container):

The wooden part of the swab just above the cotton end is then grasped with a pair of orthodontic or similar pliers and the wooden "handle" broken off. The shortened swab is then placed in the sterile mycology tube and the top fastened.

If using a Bacteriology kit (a transport medium in a small bottle):

The swab should be placed in the container of transport medium, taking care not to sink the swab into the medium as this can make the material difficult to recover at the lab.

If submitting a dried slide:

A slide with a ground glass section, on which the names of both the doctor and the patient can be written, should be used. Probed material is spread out as a thin film on the slide with the instrument with which it was taken. Make sure the material is put on the same side of the slide that has the names on! Allow the slide to dry thoroughly before putting it in the cardboard protective sleeve. Secure it with the elastic band and place the slide, kit and form in the mailing tube.

Before submitting to the Lab:

For all specimens other than cultures already growing in Nickerson's medium, put the prepared specimen, (in its mailing tube) in the refrigerator for five to eight days. Then send the kit to the reference laboratory.

If using Nickerson's test kits:

After swabbing the suspect area, gently wipe the swab over the surface of the agar and dispose of the swab. Replace the lid on the test tube. Be careful to avoid breaking the surface of the medium when wiping it with the swab. Do not leave the swab in the tube. Allow the tube to incubate at room temperature. Keep tube under observation daily. If colonies grow, do not open but submit to a reference laboratory.

If you are well versed in handling pathogenic material a slide may be prepared for examination. To confirm the presence of yeast cells use tap water as a mounting medium for immediate phase contrast examination. Subculturing may be done to identify the species of yeast using appropriate media. Remember that this tube contains a concentration of potentially pathogenic organisms. Handle with care!

At the end of a month, if nothing has grown, release the cap, keep tube supported in a tray so that the medium will not run out when it is heated, place in the autoclave and sterilise before discarding. (e.g. Two thirty minute cycles at 15 psi in a steam autoclave.)

Whenever possible use the services of the Parasitology Laboratory and the Mycology Laboratory to confirm your chairside findings. Initially this will help you to establish your accuracy of diagnosis: proficiency testing is a common practice with public health laboratories and 70% correlation should be the minimum expected. The back-up of an accredited microbiology laboratory in the form of a written report can also have its own intrinsic value.

Once diagnosis is established treatment may be commenced. For treatment to be successful it has been found it necessary to impart a good understanding of the nature of the disease. Patients who experience problems associated with release of antigenic material from dying organisms (Herxheimer's Reaction) should phone the office for advice. Appropriate changes in medication can then be implemented before the situation gets out of hand. These concepts are dealt with in the next chapter and the rationale is explained in ensuing chapters.

CHAPTER VIII

CASE MANAGEMENT

PREAMBLE

The rationale for the antibiotics used has already been discussed. The recommended dosages, together with the special formulations will be found in Chapter IX. Outlines for treatment of lumen dwelling protozoa may be found in any good text on Parasitology (e.g. Beaver, Jung and Cupp), Pharmacology (e.g. Grollman and Grollman) or Infectious Diseases (e.g. Hoeprich). The principles of therapy used for the routine treatment of lumen dwelling parasites, such as those found in the alimentary canal (of which the mouth forms a part) and the reproductive tract have been modified to better suit the oral environment.

TREATMENT PRINCIPLES

The basic principle is the elimination of a lumen dwelling parasite using systemic and topical antiprotozoal drugs including antibiotics. This is co-ordinated with appropriate dental care (usually deep scaling) which is timed to coincide with the appropriate response to chemotherapy. Patients must, at all times, maintain adequate levels of oral hygiene. The exact treatment regime for any particular patient must be tailored to their individual need. Therefore there is no specific protocol. Each case must be judged on its merits and the treatment protocol adapted to meet the patient response rather than simply repeat a course of treatment which is not working. Emphasis is placed on biological interference with the metabolism of plaque by antiseptic and other antimicrobial agents rather than by intense mechanical interference.

COMPLICATIONS

Complications are often seen and should be expected. They fall into three main categories:

Group 1. Herxheimer's Reaction

The host (patient) reacts adversely to the toxins, antigens, virus and viroid particle which are released into the body of the host on the death and disintegration of the parasite. While the parasite lives, it controls the rate of release of toxic substances in order to maintain its environment. Disruption of the metabolism of the parasite results in the uncontrolled release of the cell contents of the parasite. The degree of the reaction will be dependent on numbers of parasites, nature and quantity of the released material and the tolerance of the host to these foreign substance.

Group 2. Superinfection

With the elimination of the target organism, other co-infecting organisms that are not eliminated, expand into the ecological niche vacated by the offending parasite. This overgrowth of nonsusceptible organisms may require treatment (e.g. Candida). In some cases the overgrowth is self limiting and no additional treatment may be necessary (e.g. Black Hairy Tongue). The latter seems to be due to the overgrowth of pigment producing bacteria and may be exacerbated by ingested pigment or tobacco smoke.

Group 3. Suppression of Normal Flora

Suppression of normal bacteria in the digestive tract may result in gastro-intestinal disturbance. Since bacteria originally entered the digestive system with food, the imbalance is usually self limiting and only temporarily maintained while the patient is taking antibiotics. When antibiotic therapy ceases, the imbalance frequently redresses naturally.

MANAGEMENT OF COMPLICATIONS

With the treatment of a parasite infection, there will inevitably be a release of toxins resulting from the disintegration of the parasite. This is frequently greater than the release of toxin that normally occurs during that stage of the natural life cycle of the parasite. These toxins must be eliminated from the system because they may make the patient feel ill. Consequently, the patient should drink extra water or unsweetened tea or coffee to help "flush" the toxins out of their system. Alcoholic beverages, milk, soft drinks and fruit juices are not helpful. Treatment should be tailored to minimise the rate of toxin release. This would include selection of the appropriate antibiotic and timing of therapy. In order to

minimize the Herxheimer reaction, a less effective antibiotic regime should be used with more severe infections. This may necessitate increasing the duration of antimicrobial therapy. Such a regime will stress the patient less by minimizing peaks in the flood of antigenic material, to which the patient is exposed as a consequence of treatment. In general, a younger, more robust individual could tolerate a more severe stress from more massive or rapid release of toxic substance than could an older or more debilitated individual.

Reducing the antibiotic dosage to minimize the unwanted but unavoidable Herxheimer's Reaction is inadvisable, since the minimum inhibitory dosage may not be achieved and the end result may be the selective breeding of an antibiotic resistant organism.

The overall perceived severity of the infection, its duration, the age and general health of the patient should all be taken into account when choosing appropriate therapy. Moreover, the clinician must also be sensitive to the patient's social history and the likely impact that a moderate to severe reaction might have on the individual. Careful assessment of the risk factors and discussions with the patient about the likely complications and their impact are essential to effective case management. Should the patient exceed their individual tolerance and suffer undue malaise as an unwanted side effect of treatment, the therapy should be stopped for a short period (3-5 days) in order to eliminate toxins. Therapy should then be re-instituted at the previous level. Under most circumstances, the first reaction (Herxheimer's reaction) to death of the parasite, has been found to be more severe than subsequent reactions. This might indicate that initial therapy eliminates most of the organisms. Upon restarting therapy, the reservoir of infection is not great enough for there to be a release toxins that will exceed the threshold tolerance of the individual.

FREQUENT COMPLICATIONS

Complications often encountered in Group One are headache, nausea and malaise. With maxillary infections, the treatment may result in feelings of irritability and unreasonableness. Transiently increased arthritic symptoms are sometimes noted and there may also be transient increase in the mobility of those teeth affected by the infection. Loss of appetite and altered sense of taste may also fall into this category. One of the more frightening side effects is a sensation of the heart pounding, particularly at night. Underlying health disorders may temporarily exacerbate during an antigenic flood. Side effects in Group One usually disappear before the completion of antiamœbic therapy.

Complications in Group Two frequently include Black Hairy Tongue. This usually disappears during medication or shortly thereafter. Superinfections may also occur. These require diagnosis and appropriate attention. Alteration of therapy may be required. Superinfections with Candida species, especially C.albicans, fall into this category. C.albicans is a fungus which has both a yeast and a mould phase. If it is present in subgingival plaque, it may grow unmolested by the host immune response. C.albicans may pose a real threat due to the proximity of the gingival vascular bed, and the ability of the organism to invade through intact mucosa. Candida has been shown to produce a polysaccharide (MPPS) which stimulates suppressor cells of the immune system. Once thought of as an opportunistic organism that only infected persons with suppressed immunity, recent studies suggest that the converse is true and that the infection with C.albicans actually contributes to immunodepression (Piccolella, 1981; Rivas, 1983).

Group Three complications are usually related to disturbances of the gastro-intestinal (GI) tract and tend to be self-limiting. Not all disturbances of the GI tract fall into this category; some disturbances may be due to superinfection with Candida species or intestinal parasites. The latter two categories require diagnosis and treatment.

MEDICAL CONSIDERATIONS

For obvious reasons a good medical history is prerequisite to treatment. The information should contain the name of the patient's physician, who should be contacted as appropriate. This is of particular importance in the case of female patients who may develop vaginitis due to candidal overgrowth during antibiotic therapy. This would require treatment by the physician as well as temporary cessation of antibiotics. Female patients who are pregnant or nursing should not be on systemic medication unless prescribed by their attending physician. It is also wise to note that the elimination of infection, particularly with the use of antibiotics, has been known to enhance fertility. Patients should be so advised.

Clinical experience indicates that treatment is tolerated better and compliance improved if the patient is not subject to extremes of malaise resulting from parasite death and subsequent resultant shower of toxins, virus or viroid particle or other antigenic material. Placing patients who have not previously undergone therapy, or who have long standing infections, onto a "holding" programme for at least one month prior to starting systemic therapy greatly reduces adverse reactions.

STABILISING THE PLAQUE ECOSYSTEM

In order to stabilise the plaque and inhibit proliferation of protozoa, many patients are initially put onto a pretreatment programme. This involves the use of simple antiseptics and an oral hygiene routine that avoids the use of commercial products, most of which contain sweeteners. Some of the ingredients in commercial toothpastes and mouthwashes, while seeming to temporarily suppress protozoa in plaque do not seem to be effective in arresting pathologic change. The suppression of the protozoa may make them almost impossible to find and result in false negatives. If the use of these products is discontinued for a few days, the protozoa rapidly reappear in plaque. This suggests that the protozoa might be retreating into the tissue and would explain why attempts to eliminate lumen dwelling protozoa solely with contact amœbacides frequently fails. While the lumenal phase may be suppressed by contact amœbacides, the tissue phase is not. As soon as therapy stops, there follows a prompt relapse as protozoa once again recolonize the lumen.

The key to tolerable therapy is initial suppression of the protozoa. Once initial control has been established by following the pretreatment instructions, patients usually experience some improvement in oral health. This reassuring experience will bolster confidence for the next stage of treatment, where side effects of antimicrobial therapy are to be expected.

Effective treatment is dependant upon good liaison between the patient and the office. Therefore, at all stages of care, especially when side effects are experienced, or questions arise regarding their care, patients should be encouraged to phone the office for advice and clarification. Positive reinforcement and reassurance by telephone contact can be an effective way of ensuring compliance. One member of the dental office staff, an empathetic listener who can accurately relay messages between patient and doctor, should be trained for liaison.

Informative patient instruction sheets, given to each patient at the time that a prescription is made, or a change in home care is recommended, also help patients to understand the aims and scope of treatment at home and in the office. Prior to treatment by the author, patients are advised to alter home care in order to stabilize the plaque for microbiological diagnosis. Ideally the pretreatment programme will be followed for one month prior to the plaque microbiology appointment. Within a few days of starting the new oral hygiene routine most patients experience an

improvement in oral comfort. This pleasant experience bolsters confidence against future Herxheimer's Reaction. The pretreatment instruction sheet which patients receive in the author's practice is reproduced below.

PRETREATMENT PROGRAMME

Periodontal disease, gingivitis and "Pyorrhea" are three of the names commonly used to describe infections of the gum in the area where the tooth is rooted. A soft white film called plaque is found in this area. It is more abundant if there is infection. Plaque causes gum disease. There may be over 400 different types of "germ" in the plaque, but only a few actually cause disease. The purpose of a plaque examination is to identify target organisms: specifically two types of one-celled animals (protozoa) as well as certain kinds of fungi (yeasts and moulds). You will see living germs, including bacteria, on the TV monitor attached to the microscope. Once a diagnosis is made, antibiotics and antiseptics can be prescribed to eliminate the target organisms so that natural healing can occur. To speed this healing, your own dentist will have to do some dental treatment (scaling, stain removal, etc.,) at the appropriate time. Initial control or elimination of the infection usually minimizes dental treatment and also makes it less painful and more successful.

In order to get an accurate diagnosis some changes in your oral hygiene will be required to avoid false negatives and also to control the progress of any infection until your appointment for a plaque examination. These changes in outline are:-

Throw out your old tooth brush because it is infected.

Your toothpaste, which probably contains the sweetener mannitol should also be thrown out. Mannitol is used to culture the bacteria that cause decay.

Brush once daily, using 1% peroxide on the brush instead of toothpaste. Peroxide is an antiseptic which kills some mouth germs.

Use Modified Torren's Powder once daily. It also kills some germs but its main purpose is to stimulate the gums to better health.

Only use floss to remove food particles, such as meat or fibre, that you know is stuck between your teeth.

Do not use commercial mouthwashes because many of them contain chemicals which make plaque examinations more difficult and time consuming.

In the five days prior to your appointment for plaque examination it is ideal to have the plaque stable. That is, do not use anything for cleaning other than a toothbrush and water.

Try to avoid floss and any medication in the five days before your appointment. (HOWEVER YOU MUST CHECK WITH YOUR PHYSICIAN BEFORE ALTERING OR STOPPING PRESCRIPTION DRUGS.) You should not have been on any antibiotic for at least two and preferably six weeks prior to your appointment.

On the day of the appointment do not brush, floss, use any mouthwash, drink fruit juices, eat citrus or other fruit or fresh pineapple, salted nuts, sunflower seeds, suck "breath mints" or chew gum.

On the day of the appointment do rinse your mouth thoroughly with water, or any unsweetened beverage, after any meal or snack, so that there are no food particles in your mouth.

At the time of the appointment we want 12 to 18 hour old stable plaque, uncontaminated by residual food particles from your last meal. Some medications, particularly cold remedies and aspirin, etc, make our target organisms more difficult to find.

Recent dental treatment, especially within two, but up to six weeks, can also disturb the plaque and result in false negatives.

If difficulty is encountered in finding target organisms additional tests, or appointments may be necessary.

It will only take a few more moments to read the the next page which details your new oral hygiene routine. You will probably find it simpler and less time consuming than your present technique. You should find that it works as well, or better, than anything else you have tried.

MODIFIED TORREN'S POWDER (MTP): (For Tissue Conditioning)

The formula is one part salt plus six parts baking soda, (mix for 5 minutes in a blender to make a fine powder.) Put about a

teaspoonful of the powder into an egg cup, or similar. Pat the powder onto all the gum margins using a saliva-wetted finger. Spit out all the excess. Try not to eat, drink or rinse for the next hour. For those on a low sodium diet, use the preventive paste made with Epsom Salts instead of MTP. Use MTP in the morning.

For a sore or painful mouth or gums, a useful mouthwash is 3 teaspoons full of powder in 4 to 6 ounces of hot water. Rinse gently and keep it in your mouth while it is hot. When it cools, spit out and take another hot mouthful, etc. Do this as often as brings relief. An alternative is unsweetened tea or coffee. All act as a hot poultice, but the MTP rinse works best. Second best is hot, strong, clear tea.

PREVENTIVE MOUTH RINSE:
(Anti-plaque Anti-septic)

1% Hydrogen Peroxide is made by diluting 3% Peroxide: 1 part peroxide with 2 parts water makes a 1% solution when fresh. Use about three teaspoonsful to rinse for three minutes. *NOTE* Hydrogen peroxide "goes off" slowly after the bottle has been opened. Buy small bottles. Keep the main supply refrigerated. Keep a smaller bottle of 1% in the bathroom. The shelf life, once opened, is so short that when the bottle is half gone it may not need to be diluted as much as at first. It may even be down to 1% by the end of the month. Judge the strength by the fizz! Use at night after brushing.

PREVENTIVE PASTE:
(A taste alternative to MTP)

Mix a few drops of 3% hydrogen peroxide with about a teaspoonful of MTP to make a stiff paste. Apply the paste to the gum margins for tissue conditioning. Use your toothbrush, but don't "brush". Spit out the excess.

BRUSHING: Teeth and Gums
(I prefer the Bass Brush Technique)

Dip the toothbrush into 1% peroxide and brush the area covered by the brush, redip the brush and brush the next section and so on. After brushing, rinse thoroughly with water, then rinse with the peroxide. Brush last thing at night; Modified Torren's

Powder, alone or with hydrogen peroxide, should be used in the morning.

GENERAL NOTES:
(Including a quick summary of oral hygiene)

After the use of the peroxide or the powder, you should try not to eat, drink or rinse for the next hour. During the day rinse with water after all meals and snacks to remove food debris; use floss if necessary to remove food, but be careful not to hurt the gum. Don't saw with the floss. Remember that food debris encourages growth of bacteria which cause tooth decay and inflammation of the gums.

Change your toothbrush every week because it becomes infected with the germs from your plaque within two weeks. Continue this until the target germs have been eliminated by treatment. Use a Bass type of brush, for example, the Butler SUB-G (Dr. Bass Right Kind.) It is soft because the brush should wear out so that you don't! Do not use the rubber tip.

Use MTP in the morning and spit out the excess but do not rinse the residue away. However, after food or beverages always rinse (and swallow) with water to remove food residue. Brush once daily, with peroxide, before you go to bed. After brushing rinse out the foam with water then rinse with 1% peroxide. Spit out the excess but do not rinse the residue away.

By following the preceding regime, you will not only start yourself on the road to recovery but also minimize the time needed for your first appointment. Finally, if you have any questions, please phone.

(End-of-Patient-Instructions)

After diagnosis, those patients who should be on a holding programme are instructed relative to the appropriate medications and home care. The Holding Programme comprises the use of topical antiprotozoal agents together with the continued use of Modified Torren's Powder, plus brushing once daily with 1% hydrogen peroxide. The Torren's Powder soaks up exudate from the pocket. This fluid must then be replaced. The fluid re-entering the pocket will be drawn from the surrounding gingival tissue and contain a greater concentration of antibodies

with a lower concentration of the by-products of microbial life. Provided that the patient has not just brushed, the use of the powder also helps to reduce gingival œdema. Since brushing frequently causes microscopic scratches and abrasions on the tissue, brushing the tissues with the powder or the powder/peroxide mixture is inadvisable. Likewise the use of the powder right after brushing is discouraged since salt/soda getting into the wound can cause irritation and œdema.

In over ten years of clinical experience, the modification of the powder originally described by Torren in the British Dental Journal nearly half a century ago remains an excellent simple remedy, providing it is used as described. Brushing with this or similar mixtures can cause a lot of irritation and discredit an effective technique through sloppy mismanagement of Torren's original brilliant concept.

THE HOLDING PROGRAMME

(See Chapter IX for a full description of all pharmaceutical preparations and regimes referred to in this section)

In conjunction with these simple changes in oral hygiene and antisepsis, the patient uses MA paste, four to eight times daily, for up to two months or the tetracycline rinse, also four to eight times daily, for one month. The rinse is sometimes preferable when the pockets are deep, since a fluid should penetrate more effectively than a paste. A "waterpik" device could also be used for delivery of the rinse to the affected area, provided that the pressure is not excessive and that the rinse is further diluted 9:1. Both the rinse and the paste are very bitter. An advantage of the paste is that it is applied with a toothbrush and helps prevent the toothbrush from acting as a vector for infection. A disadvantage of the rinse is that staining of the teeth occurs, black hairy tongue is frequent and the use of 40% ethanol gives rise to a burning sensation of the oral soft tissues. However, unlike the paste, which is most concentrated on the gingivæ, the rinse will affect almost all tissue in the mouth.

ACTIVE TREATMENT

After successful completion of the holding programme, a re-evaluation of the patient allows the selection of the next phase of treatment. If the evidence now suggests a light or well controlled infection, a highly effective antiamœbic could be selected, provided that the patient is aware of the increased likelihood of more severe malaise experienced with these drugs. Minocin (which is expensive) or Metronidazole in Regime

#1, #3 or #4 might be selected depending on such factors as the the age and health of the patient, sociological considerations regarding alcohol consumption and the experience of the prescribing doctor.

A more severe periodontal infection generally requires more protracted treatment. Tetracycline, a weakly antiamœbic antibiotic might be selected, particularly if the patient has a history of any arthritic change, other systemic disturbance or metabolic disorder. These indicate that treatment is likely to be protracted due to potential drug interactions or antagonisms.

An alternative antibiotic of intermediate effectiveness between the last two groups is Penicillin V. However clinical experience has shown that it must be used for a minimum of 30 days to eliminate amœbæ. A course of therapy lasting 35 days is not unusual.

NOTE: The use of the Tetracycline mouth rinse, in the Holding Programme, for four weeks prior to starting systemic therapy reduces side effects and shortens treatment time. The rinse can also be used in conjunction with systemic tetracycline in recalcitrant cases.

Do not just prescribe:

First: Diagnose;

Second: Monitor;

Third: Adjust dosage and duration;

Fourth: Monitor, etc.

Finally... Expect complications and reinfections.

RESISTANT CASES

Do not prolong treatment with Metronidazole, (see your pharmacœpia) but rotate with a series of antibiotics, including Penicillin V, Tetracycline, Minocin and the Erythromycins or even antiprotozoals such as Atabrine. Metronidazole can be used in conjunction with some antibiotics in order to potentiate the therapeutic effect but side effects will be maximized. Increased dosage, above that usually recommended for deep seated infections is inadvisable. DON'T even contemplate Emetine hydrochloride.

Cases that do not respond satisfactorily may be due to misapplication of the programme by the patient, selection of an inappropriate antibiotic

or the selection of an insufficient dosage. Other factors which may impede response include underlying medical disorders, multiple infections, foci of oral irritation or stagnation which may require remedial action such as the removal of calculus deposits or the elimination of overhanging margins. Ineffective therapeutic response may also be due to drug interaction or antagonism, for example, tetracycline may become bound to heavy metals in the digestive tract and thus not absorbed in therapeutic quantities. Constant re-infection from exogenous sources must be considered as must reinfection from close personal contact or even infection from close proximity to an infected person in a small enclosed space (e.g. an automobile). Poor air circulation which occurs with some "sealed" buildings may result in the air in the building becoming stale and an increasing load of environmental pollutants as well as pathogenic micro-organisms may produce an environment which is not conducive to successful therapy. Undue resistance in therapy may be due to multiple infections, in the mouth or elsewhere, particularly infections with both E.gingivalis and T.tenax or either parasite and C.albicans, or all three together. Refractory cases may also be due to antagonism with other medications, inadequate absorption or concurrent nonoral infections with Candida, intestinal parasites or other systemic condition which may have to be treated first. The aware clinician may often find it prudent to confer with medical colleagues.

SPECIAL CONSIDERATIONS FOR ROUTINE DENTAL CARE

Although the concept of Oral Amœbiasis is an alternative approach to the ætiology of some periodontal infections, the treatment of Oral Amœbiasis must be supplemented by traditional dental care. Oral Amœbiasis and "usual and customary" dental care are not alternatives to each other. It has been found that the best results are obtained if the clinician and the patient pay careful attention to detail and maintain open lines of communication for effective team work. Frequently one finds that most "in-office" treatment can be delayed until the infection is controlled or eliminated. The case can then be re-assessed and treated accordingly.

In some cases it may be found that deep pockets (greater than 5 mm) do not respond adequately because of inadequate penetration of the topical antiamœbic paste. Daily subgingival application of the treatment paste into such areas should be considered. Some patients can be taught to gently fill easily accessible pockets with paste, using a 10 cc syringe with a blunted one and a half inch 18 gauge needle. If the patient is

unable to perform this task, daily visits to the office may be required. In conjunction with systemic antibiotic therapy such an effort may be rewarded by such rapid progress that the needle can no longer be inserted in as little as three weeks. This technique should also be considered for unresponsive bifurcation and trifurcation involvements.

Dentures and Other Appliances

For those patients with dentures or orthodontic appliances, care must be taken to prevent the appliance from vectoring the disease. Once daily the appliance should be "sanitized". Betadene has been found to be an effective surface disinfectant for smooth surfaces, (Best et al, 1988) with the additional advantage that it is generally nonirritant to mucous membrane (CPS, 1988) and does not stain. Soaking in betadene solution at full strength for one hour should be followed by rinsing the solution from the appliance and use of a commercial denture cleaner. Before reinserting the appliance in the mouth a little of the prescription paste should be applied to the fit surface, thus utilizing the appliance to prolong the contact time of the paste with the tissues. The appliance should also be removed from the mouth and both should be cleaned of all debris after meals, then a little paste should be applied to the fit surface before reinserting it.

Reinfection

Patients should be made aware of possible sources of reinfection, that is, any object, cutlery, crockery or food that may have become infected from the mouth of another person. Shared food or beverages, chip dips and other communal sources of food into which licked food or fingers might have been placed and unhygienic practices engaged in by food servers or preparers all present potential for reinfection. Droplet infection from coughs and sneezes should not be dismissed as unrealistic, particularly if the potential "victim" has just eaten something sweet. The irritation from the by-products of bacterial metabolism or the microscopic scratches and abrasions from recent brushing may create a suitable environment for infection by protozoa should an amœba be introduced to such an environment. Auto reinfection from toothbrushes, bathroom cups, cosmetics, musical instruments, pens and anything else that goes in the mouth must also be considered as possible vectors. Household pets which may carry the infection, particularly older dogs (E.gingivalis) or cats (T.tenax) would also be suspect and may have to be treated by a veterinarian.

Timing of Dental Treatment

Patients often report that when the infection has been eliminated and the tissues have healed, periodontal procedures are less painful and rarely require anæsthesia. The most appropriate time to initiate periodontal therapy is when no further clinical improvement is observed after elimination of infection. Now the remaining calculus hinders progress and should be removed. Clinical observation suggests that once the infection has been eliminated and the tissue response stabilised, there seems to be less subgingival calculus, which is easier to remove than first anticipated. By eliminating the infection prior to scaling, both patient and operator are at lower risk to the spread of infection.

During active phases of treatment, the patient should use the appropriate paste, (MA, MK or MC). Peroxide and MTP remain as the cornerstones of the oral hygiene programme. Use of the paste, the powder and the peroxide should continue until three to six months after treatment is complete, in order to facilitate healing during the convalescent phase. After completion of treatment, the patient will change to the preventive programme, which basically means the continued use of effective non-prescription oral antiseptics. At the time of writing, the mainstay of the preventive programme is Modified Torren's Powder and 1% hydrogen peroxide. An alternative to the latter is a perborate-based dentifrice, the formulation for which has been modernized from an old dental compendium of pharmaceuticals (Dilling and Hallam, 1954). From an initial pilot survey, brushing with "Viadent" paste followed by a water rinse and then the "Viadent" rinse, twice a day, looks promising.

Special Oral Hygiene Considerations

Some patients will need to use a proxabrush. The best results are obtained with the #612 head, which is like a tiny bottle brush, rather than a Christmas tree. The patient who needs a proxabrush should be instructed to use it to loosen interdental plaque, so that it may be rinsed away, then to use the proxabrush to apply treatment paste to the interdental areas which have just been cleaned. Floss is not to be taken subgingivally rather it is used for the removal of impacted food particles, or for loosening plaque under a bridge pontic. Rinsing will then remove the dislodged debris. Treatment paste should be applied to all accessible areas of the mouth after plaque removal. The more intense use of treatment paste (MA or MK) by the patient, immediately before and after appointments where there may be some tissue injury, such as scaling, also

helps tissue response by reducing the chances of postoperative infection and soreness. Likewise, hand scalers may be dipped in the paste frequently and the areas from which calculus has been removed may be additionally dressed with a small quantity of the paste at the end of the scaling, curettage or root planing session.

The main principle is to interfere with the ecology and maturation of the plaque CHEMICALLY not mechanically. Each individual patient will ultimately develop their own successful variation on the theme under the guidance of each particular practitioner.

There are no hard and fast rules...

...just the application of general principles.

Anticipated Results

Following successful therapy to eliminate the protozoa, patients often report a series of improvements in both their oral and general health. These reports vary widely and seem to be related to the pretreatment status of the patient. Feeling of a cleaner mouth, loss of halitosis, absence of bad taste, especially on rising, absence of gingival bleeding, feeling that the teeth are firmer or stronger, absence of hot, cold and touch sensitivity, ability to eat comfortably and having a moister mouth are some of the oral improvements reported. General health improvements often reported are fewer headaches and reduced malaise and fatigue once the protozoa have been eliminated. Although there have been some reports of improved arthritic symptoms, the association is not clear at this time. However, the general feeling of "wellness" (which most patients report) is often first noted as a "wide awake" feeling immediately after elimination of E.gingivalis. Sometimes this feeling is so intense that patients have difficulty sleeping for the first night after elimination of the infection. Thereafter, normal sleep patterns return and patients report that they feel more energetic. Some patients find that they require less rest following the elimination of a long standing chronic infection. For patients with underlying metabolic disorders, such as diabetes, the disorder is often found to stabilise following elimination of the oral infection enabling them to enjoy a more active lifestyle.

Warning

As a footnote to this chapter it should be emphasised that the use of antimicrobial agents must be supplemented by effective oral hygiene as

well as thorough dental care. Failure of the patient to comply with the antibiotic or antiseptic regimes, failures in oral hygiene routine, failure to remove all sub- and supragingival calculus at the appropriate time, failure to treat adequately, or at all, open carious lesions, ignoring faulty restoration or crown margins, the presence of ill fitting or unhygienic dentures and the failure to correct dietary factors, or any other factors which promote rapid proliferation of plaque, will all lead to a less than satisfactory result.

Disclaimer

The purpose of this book is not to provide a universal panacea which makes other forms of dental care redundant. Rather, it is to provide information on organisms whose presence can jeopardise the success of regular dental care. Once infection has been eliminated, primary non-surgical periodontal care completed and sufficient time has elapsed to permit healing, each case can be re-evaluated. In the absence of aggressive osteolytic periodontal disease, the patient with a healthy mouth has more treatment options available. Such a patient may choose orthodontic repositioning of previously loose teeth, or may elect crown and bridge as a more viable alternative to extractions and full dentures. The clinician with a "maturing" practice will find that dental practice is no longer an uphill battle against ever widening odds.

CHAPTER IX

PHARMACEUTICALS AND ANTIPROTOZOAL REGIMES

PRINCIPLES OF THERAPY

The therapeutic principal employed, is the concurrent use of appropriate topical and systemic antimicrobials. For maximum therapeutic effect, this must be supplemented by the use of Modified Torren's Powder and 1% hydrogen peroxide in the oral hygiene programme. The timing of all phases of dental care is determined by clinical and microbiological assessments. Once the infection has been controlled, dental treatment can proceed. The aims of such an approach are the best possible therapeutic response, coupled with less pain for the patient, greater ease for the dentist and less risk of infection for both the patient and the dental team. The purpose of identifying and eliminating target organisms with antimicrobial therapy is to produce an ideal operative environment and increase the chances of operative success for those procedures which are hindered by the presence of blood.

Periodic testing ensures that antibiotic therapy may be precisely tailored to the presence of target micro-organisms. Once these have been eliminated antimicrobial therapy may be immediately discontinued. This avoids under- or over-utilization of antibiotics. Superinfection with non-susceptible micro-organisms can also be detected, allowing prompt changes in antibiotic regimes before major complications ensue. After successful completion of therapy, routine retesting can identify reinfection before significant tissue changes occur.

The following antibiotics and antiprotozoal medications have been of value in treating Oral Amœbiasis. The formulations for the special pharmaceutical pastes were developed in conjunction with local pharmacists to ensure appropriate strength, proper consistency, safety of active and adjuvant agents and quantity to be dispensed.

Pharmaceutical reference sources were consulted regarding possible drug interactions, antagonisms and synergisms. Specific brand names are sometimes mentioned, if clinical results were consistently good and/or if unwanted side effects were minimal. When side effects were consistent with a specific brand, the most likely explanation is a reaction to one of the adjuvants, fillers or flavours.

Within the context of obtaining a medical history for each patient, and updating it at the time that any prescription is made, it must be emphasized that certain antibiotics, including tetracyclines, metronidazole and ketoconazole, are inadvisable for pregnant or nursing women. It is also suggested that the MK paste not be used by pregnant or nursing mothers. Women of child bearing age should therefore be careful to use adequate contraception whilst taking these medications.

SUPPORTIVE DATA

My collaboration with researchers at the University of Münster, West Germany, who have been investigating the oral protozoa, suggests that the minimum period of antibiotic therapy needed to eliminate E.gingivalis in mixed infections is 35 days. At Münster, in vitro cultures of E.gingivalis were started from periodontally diseased sites. In order to obtain a pure culture, various antibiotics were used to suppress the bacteria. No matter which antibiotic was used, elimination of bacteria resulted in death of the protozoa in culture. Since the potentially pathogenic bacteria cultured with the amœbæ were eliminated before all the amœbæ died, the presence of amœbæ remains a useful guide-line relative to the destructive potential of periodontal lesions and indicates whether an environment conducive to pathosis still persists.

Clayton et al (1954) found that the minimum concentration (MIC) of Penicillin necessary to achieve bacteriostasis in mixed cultures of E.gingivalis and bacteria from dental plaque also prevented the amœbæ from multiplying. At lower concentrations the amœbæ flourished as did the controls which contained no penicillin. It took seven and a half times the MIC of penicillin in vitro to actually cause death of the amœbæ. These observations suggest that penicillin, or any antibiotic, should be effective in the treatment of Oral Amœbiasis providing that the dosage and duration of therapy are appropriate to maintain less than ideal in vivo conditions.

This theory has been borne out in daily clinical practice. Repeated microscopical examinations of plaque has shown that infection with

E.gingivalis is eliminated after 25 to 35 days of combined therapy with Penicillin V and topical amœbacides. This observation was also valid for other antibiotics, including some which are not generally considered effective in periodontal infections. Elimination of protozoa coincided with resolution of the disease. However, not all cases responded uniformly. Some cases resolved more rapidly, while others were more resistant and responded slowly. In those cases where the infection with amœbæ persisted, motile bacteria remained in the plaque in association with the amœbæ. Clayton (1954) also observed this phenomenon with E.gingivalis in vitro. He noted that in vitro conditions required by E.gingivalis were like those required by the pathogen E.histolytica; namely, the amœbæ required the presence of other living cells in order to survive.

The combination of in vitro experiments and clinical experience provides a rational explanation for the observations that:

As the amœbæ go,

.....So goes periodontal destruction.

The application of these principles helps explain why the current usage of antibiotics, such as Tetracycline, as an adjunct to conventional periodontal therapy, is so effective. The use of the microscope simply helps determine the choice and duration of antibiotic therapy for each patient. Microscopic examination of plaque helps prevent over- or under-use of antibiotics, helps prevent persevering with an inappropriate antibiotic and allows more advantageous timing of standard dental treatment. Elimination of infection prior to surgical periodontal procedures ensures success and also minimizes patient discomfort. The latter is a factor which should not be underestimated as being of practical importance.

SYSTEMIC AMŒBACIDAL ANTIBIOTICS

TETRACYCLINE: Weakly amœbacidal antibiotic.

Peak side effects normally between 8th to 15th days

Sample Prescription

Rx.Tetracin 250mg Caps
Mitte qs 35/7
Sig ii qid
Rpt x1 prn

General Comments

The usual dose employed until the protozoa have been eliminated is (Pfizer "Tetracin") 250 mg caps. Two caps twice daily. This is used in conjunction with MA Paste, Modified Torren's Powder and Hydrogen Peroxide.

WARNINGS

Usual warnings to the patient include increased skin sensitivity to direct sunlight and avoidance of "heavy metals" at the same time as the tetracycline is taken. In particular, polyvalent cations, such as aluminium, calcium, magnesium and iron, bind with tetracyclines in equal molecular ratio, thereby preventing absorption of the antibiotic. Tetracyclines should not be taken at the same time as products or foods which are likely to hinder absorption. Included in this list would be milk and dairy products, antacids and some vitamin/mineral preparations. Therefore, tetracyclines should be taken on an empty stomach, i.e. one hour before or two hours after food. As with all antibiotics used to eliminate an infection, there is a probability of increased fertility or decreased effectiveness of contraceptive measures. Prolonged antibiotic therapy increases the chance of superinfection, particularly with the yeast, Candida albicans. Female patients are especially at risk. Frequent side effects encountered with amœbacidal therapy include headache, nausea, irritability, altered sense of taste, (metallic taste), gastro-intestinal (GI) disturbance, malaise, exacerbation of arthritic symptoms and "general aches and pains", loss of spatial orientation including vertigo and difficulty with depth perception.

Follow up

After the infection has been eliminated, if the tissue is not yet fully recovered, particularly with reference to bone regeneration, continue the prescription at half dosage (i.e. one cap twice daily) until healing is complete. Frequently it is necessary for the duration of this second prescription to be double the duration of the first. The continued antibiotic coverage helps prevent reinfection during the healing (or convalescent) phase of therapy. This is modelled on one form of treatment for E.histolytica, the cause of amœbic dysentery. The patient should be periodically re-examined both clinically and microbiologically in order to determine the next phase of treatment.

MINOCIN: Potent amœbacidal antibiotic.

Side effects normally start about the second day and peak by the fourth or fifth day. After the tenth day the side effects may diminish slightly but then stay more or less constant for the duration of therapy.

Sample Prescription:
Rx.Minocin 200 mg Tabs
Sig. ii Stat
followed by i bid
Mitte qs 14/7
No Repeats

General Comments

This antibiotic in clinical practice is as effective, or more effective than Metronidazole. A good drug to keep in reserve when all else fails. Side effects encountered with Minocin may include nausea, vomiting and extreme malaise unless the infection has been well controlled prior to therapy with other less potent antibiotics.

Loading dose 100mg tabs x2, followed by one tablet twice daily for two weeks.

WARNINGS

No dairy products should be taken with the tablets which are preferably taken on an empty stomach, but can be taken with food. The side effects with this antibiotic (tetracycline family) are comparable to Metronidazole used at full dosage. It seems to be very effective against the protozoa, but is very expensive and makes patients feel really ill.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

ERYTHROMYCIN: Amœbacidal antibiotic.

Sample Prescription:
Rx. PCE
333 mg tabs
Sig i tid
Mitte qs 10/7
Repeat, number of times: x2 prn

General Comments

PCE is claimed to reduce the severity of GI disturbance, but with most erythromycins expect moderate to severe GI upset. Take with or without food.

Erythromycin tablets or capsules: for all erythromycins the daily dosage is 1000 mg, sometimes taken as one dose, but usually taken as three or four divided doses over at least ten days, or until infection has been eliminated.

Erythromycin base should be taken one hour before food, unless gastro-intestinal upset occurs, then take with food.

Both stearate and estolate are hepatoxic. The stearate is used primarily in dermatology. Neither in common usage.

Erythromycin (estolate): 250 (or even 500) mg qid 10/7. Expect moderate to severe GI upset. Take with or without food.

Erythromycin Ethyl Succinate (EES) 600 mg tid. Well tolerated. Take with food. Also hepatoxic.

ERYC: encapsulated, enteric coated pellets of erythromycin. 250mg take one hour before meals, qid. A version of the base. (Made by Parke Davis).

PCE 333 mg tabs. Polymer coated erythromycin base particles. Very expensive. (Abbott's reply to ERYC.)

Because of the severity of the GI disturbances encountered with this antibiotic, little experience has been gained. Some clinicians favour the drug, but patients do not appreciate it, because of the severity of the GI disturbances.

Erythromycins appear to be highly effective against the oral protozoa, particularly the soluble variant if used for thirty or more days. This form of the antibiotic is available in Germany, it comes as individual packets of powder, each containing 1000 mg. The contents are dissolved in water and swished around the mouth before swallowing. It is used twice daily. North American availability is unknown.

WARNINGS

The warnings for all antibiotics are basically the same since side effects seem to be more related to the nature of the infection than the nature of the treatment.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

ROVAMYCIN 500 mg: Amœbacidal antibiotic.

Sample Prescription	Rx. 500 mg caps
	Sig ii qid
	Mitte qs 5/7

General Comments

Can cause very severe diarrhœa. Two caps four times daily for three to five days or until two days after symptoms cease. This antibiotic is expensive and seems to be no more effective than tetracyclines. To eliminate protozoa it must be used for a comparable period. In spite of limited experience, it seems to hold promise as a useful short term drug when rotating from one antibiotic to another, in stubborn cases.

WARNINGS

The same general warning as applicable to all amœbacidal antibiotics.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

PENICILLIN V: Amœbacidal antibiotic.

Peak side effects normally 10th - 20th days.

Sample Prescription	Rx. Pen V 300 mg tabs
	Mitte qs 35/7
	Sig ii qid

General Comments

300 mg = 500,000 IU. Two tabs four times daily for thirty five days. For patients who are not allergic to penicillin this antibiotic is safe, inexpensive, effective and consumption of food and beverages is not critical at the dosage and duration employed. For Oral Amœbiasis, increase duration up to one month, or longer, if necessary.

Special Note

Low doses of Penicillin, for example, half the minimum inhibitory concentration required for Streptococcus mutans, can have unwanted effects. At this dosage the ability of S.mutans to bind to saliva-coated hydroxyapatite is enhanced, although the ability of the organism to bind to other tissue may be unimpaired or even reduced. (Crawford and Russell, 1988)

WARNINGS

As for other amœbacidal antibiotics, but the severity of side effects may be less since it would not appear to be a potent amœbacide.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

METRONIDAZOLE 250 mg tabs.

Amœbacidal and effective in anærobic infections. Not a true antibiotic but rather an antimetabolite.

Peak side effects normally 3rd - 8th days.

Sample Prescription	Rx. Metronidazole 250 mg tabs
	Mitte 30 tabs
	Sig i bid
	Do not repeat

WARNINGS

DO NOT consume alcohol while taking this medication, nor for 24 hours before nor 48 hours after.

General Comments: Regime #1.

Peak side effects normally 3rd to 5th days.

The original dosage was 30 tabs over 10 days with the first day's dosage split over two days: 1st day one tablet. 2nd day one tablet twice. 3rd and each subsequent day: one tablet three times a day. Should be taken with food but can be taken on an empty stomach.

General Comments: Regime #3.

Peak side effects normally 5th - 10th days.

30 tabs: one twice daily. Since this dosage does not encompass 30-35 days it should be followed by a second course of antiprotozoals as deemed appropriate, unless testing demonstrates that this minimum dosage has been successful. Regime #3 is sometimes all that is needed for very light and recent infections in young adults.

General Comments: Regime #4:

Two consecutive Regime #3. Side effects only occur once, timing as above.

General Comments: Regime #2

This was a gynæcological regime. It did not translate into an effective regime for oral infections. The dosage, one gram at bedtime for one, two or three successive nights, duration dependent on severity of infection, was not found to be effective in most cases.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

ANTIFUNGAL AGENTS

NYSTATIN Tablets: Relatively insoluble antifungal.

Peak side effects in first five days or after six weeks, depending on sites of infection.

Sample Prescription	Rx. Nilstat tabs
	Mitte qs 3/12
	Sig ii bid
	Repeat once

General Comments

Nystatin is almost insoluble, only about 2% being absorbed systemically. For this reason it has been advocated for treatment of candidal infections of the gastro-intestinal tract since it is NOT well absorbed.

Nilstat brand. Each pink tablet contains 500,000 IU active nystatin. Dosage is two tabs twice daily. For patients unable to tolerate this, a graded dosage based on the powder usage (see later section, this chapter) is as follows:

First month, one tablet daily. If this is well tolerated,

Second month, one tablet twice daily.

Third month, one tablet thrice daily.

Fourth month, one tablet four times daily.

Fifth month, and all succeeding months, two tablets twice daily.

For each month that the tablets are taken, the patient must have had no difficulty tolerating the treatment before the dosage is increased. When dosage is well tolerated dosage is increased by one tablet for the next month, until full dosage has been reached. Re-examination is then scheduled after the end of the month in which the dosage is changed to two tabs twice daily.

WARNINGS

Side effects are not normally encountered until about six weeks into medication at full dosage or at the 180 tablet level from onset of medication with the graded dosage.

Because of the complexities of signs and symptoms for patients with mycotic (fungal) infections, it may be frequently necessary to consult with the patient's physician in order to co-ordinate treatment and ensure that medical care and dental care are provided as appropriate.

Gastro-intestinal Disturbance

Nystatin may cause gastro-intestinal disturbance if there is significant gastro-intestinal infection. Since Nystatin causes increased permeability of the fungal cell wall, the leakage of cellular contents from Candida into the gastro-intestinal tract may cause irritation.

For other tissue use Ketoconazole, since it is well absorbed, but may be hepatotoxic. Blood testing is advisable if it is used for a protracted period, or in conjunction with Metronidazole, other hepatotoxic drug or if liver function is impaired. These parameters suggest consultation with the patient's physician.

Frequent Complications

The two most frequently encountered side effects in relation to the elimination of C.albicans with nystatin are thought to be due to the release of cellular contents. If Candida is in the gastro-intestinal tract, low abdominal pain may be encountered within an hour or two of taking the tablets. This indicates release of irritants comparable to the tissue response seen on first acute infections with this organism (Thrush). The pain may be accompanied by loose bowel movements which may be so severe as to cause urgent diarrhœa or even fresh blood in the stool. The best response is immediately stop the pills, allow the condition to settle, then restart therapy with the graded dosage. It may be advisable to consult a physician familiar with the latest concepts in the treatment of candidal infections. The patient should always be advised of possible complications at the outset.

Significant Complications

If marked GI disturbance occurs, it may be accompanied by fatigue and/or depression. The latter may be severe and quite frightening for the patient. If gastro-intestinal disturbance is not an initial complication then fatigue, lethargy and depression may appear at about the sixth week or 180 tablets into medication with the graded regime. This latter complication may be due to the release of cellular contents from dying candida colonies affecting brain cell metabolism. The mechanism could be an alteration in the balance between phenylalanine and serotonin. No matter what the explanation, in practice, the following typical history has been observed. Waves of fatigue and/or depression sweep over the individual which seem unrelated to social or factors other than the prescription for Nystatin. The first wave is the worst and may last about a day, followed by a return to normal then a second wave of slightly less severity a day or two later. These waves become less severe and further apart as treatment progresses.

Serious Complications

There have been reports of patients with severe infections with Candida becoming so depressed that suicide is attempted. Experience indicates that this could be a real risk. Patients should be warned that infection with Candida has been associated with suicidal tendencies. For many patients it comes as a relief to know that a fungal infection can have such devastating effects. A significant number of people with Candida, when apprised of this information, will admit to having contemplated

suicide. Knowing there may be a reason for feeling rotten will give many persons the strength to persevere. Over the last ten years two patients did attempt suicide. Both had oral infections with C.albicans that could only be diagnosed by culture. In neither case was the organism found on direct examination, although one patient had been diagnosed by direct examination about a year prior, the infection had "spontaneously resolved" and culturing was done to confirm the absence of infection. In both cases the attempt was made while awaiting the lab result. One of the two attempts was successful.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

NYSTATIN Lozenges: Antifungal.

General Comments

Nystatin powder in polyethylene glycol base with bitter orange flavour. 200,000 IU per lozenge. 24 per package. Each lozenge scored for half dose application. Sig: half a lozenge up to 8x daily to supplement MC paste. The pharmacist prepares the lozenges in trays. Clotrimazole or Miconazole can be substituted for Nystatin with slight cost increase.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

KETOCONAZOLE: highly soluble and well absorbed antifungal.

Sample Prescription	Rx. Ketoconazole 200 mg tabs
	Mitte qs 1/12
	Sig. i daily with evening meal.

General Comments

Dosage varies from one daily to two four times daily, although the latter dose would hardly be applicable in dental infections. The drug is hepatotoxic. If therapy is contemplated for more than a month, or if a repeat course of treatment is envisaged, the patient should be monitored serologically as well as microbiologically. The dentist should consider working with the physician in such cases. The main use for this drug is

in the final stages of treatment to clear the last vestiges of Candida in the final weeks of treatment. Preferred dosage is minimum and short duration (check a current pharmacœpia for more detail) unless the patient is being closely monitored by a physician. Nystatin tablets remain the treatment of choice as adjuncts to the MK paste.

WARNINGS

The most common side effect noted with the use of Ketoconazole is fluid retention. In addition, many patients experience a sense of woolly headedness, as if they had had a little too much to drink. (Ethyl alcohol, it must be remembered is produced by yeast fermentation and is a yeast toxin. Other fungi also produce hallucinogenic compounds, viz "magic mushrooms".) This latter side effect may also be noted with other anti-fungal drugs. With severe oral infections even the use of the paste may have unexpectedly severe repercussions. Treatment should always be tailored to the tolerance of the patient.

Because it is so effective, use Ketoconazole with discretion once the full extent of the infection has been determined. Extreme reactions to fungal toxins, from the indiscriminate use of this drug, could be life threatening.

Follow up

Re-examine patient clinically and microbiologically after completion of therapy to determine next stage of therapy.

NYSTATIN POWDER

made by Cyanamid: (1/8 tspn = 500,000 units):

General Comments

The dosage recommended by physicians who use this form of nystatin are:

a pinhead four times daily (qid) for one month (1/12),
then 1/8 tspn qid 1/12;
then 1/4 tspn qid 1/12;
then 3/8 tspn qid 1/12;
then 1/2 tspn qid 1/12;
then decrease at same rate.
(tspn = teaspoon)

Medical colleagues, who employ this form of therapy, prescribe the powder in bulk, to be measured out by the patient, suspended in water and drunk. Alternatively a pharmacist may make up capsules of predetermined strength for the patient to swallow if tablets are contra indicated. Patients who need this form of therapy will usually already be under the care of a physician. Treatment is often a medical dental team approach.

Summary and General Comments

Ultimately, with the elimination of the infection, there should be a slow return to normal oral health. Most, if not all, patients treated to eliminate oral Candida also report improvements in other areas of health which is one of the more pleasant side effects encountered.

The listing of the various remedies, together with the therapeutic results that have been reported herein, the warnings and etc. should not be construed as being an encyclopædic dissertation on the drugs mentioned. This chapter is not intended to be a pharmacœpia nor a substitute for one. Side effects listed in the pharmacœpia for any antibiotic that is effective against E.gingivalis may occur with any of the antibiotics used against this organism. For example, side effects listed as common with metronidazole may occur with penicillin, even though one would not expect the particular response in question.

A small group including the author, who reacted badly to the first course of Metronidazole taken to eliminate E.gingivalis, became curious. Were the side effects due to the drug or a Herxheimer Reaction? About three months after completing treatment and having retested negative, we again took the medication, each in varying doses. There were no reactions. Thus it could be concluded that we had either developed a tolerance to Metronidazole or the original side effects were a Herxheimer's Reaction. About three months after this experiment, it became necessary to be retreated. Side effects on this second course of Metronidazole to eliminate E.gingivalis were similar to the first course. From these observations it might be inferred that most of the side effects encountered were a true Herxheimer's Reaction rather than a drug reaction.

TOPICAL ANTIMICROBIALS

TETRACYCLINE MOUTH RINSE: Amœbacidal antibiotic.
For topical use only.

Sample Prescription

Rx.

Misce 250 mg caps Pfizer "Tetracin"; dissolve contents i cap per 5cc 40% Ethyl alcohol; filter out the filler before dispensing.
FLAVOUR: use bitter orange or bitter almond flavouring 2-3%; spirit compound or unsweetened commercial (i.e. supermarket) variety is compatible with the bitterness of the medication, a syrup or any sweetened flavouring is unsuitable and should not be used. All ingredients should be suitable for internal use.

Mitte. Bottles of 150 cc. DO NOT SUPPLY MORE THAN 150 cc PER WEEK. SHOW EXPIRY DATE AS 7-10 DAYS FOLLOWING Rx PREPARATION.

Sig. Rinse mouth four or eight times daily: see details of patient instructions in Chapter X.

Note: Tetracin is not available in all jurisdictions. A reasonable substitute brand of tetracycline is always available and should be selected for ease of preparation, minimising of side effects and patient tolerance re taste and texture.

The addition of nystatin powder to this rinse has not proved to be highly effective but may be of limited value:

General Comments

See Patient Instructions in Chapter X for further details relative to patient instructions and complications. Tetracycline Mouth Rinse gives maximum effect with minimum side effects if usage is limited to a ten-day period. Prescribe to control a severe infection before proceeding with a routine holding programme. In addition, it may be used in conjunction with tetracycline capsules during a ten-day period if warranted by the patient's clinical and microbiological parameters.

WARNING

Use of tetracycline mouth rinse for more than ten days frequently results in heavy staining of the teeth and other undesirable and avoidable side effects.

TETRACIN/NYSTATIN MOUTH RINSE: Antifungal and Amœbacidal
For topical use only

Sample Prescription

Rx: Tetracin/Nystatin Mouth Rinse:
To the following Tetracin Mouth Rinse is added Nystatin Powder or finely crushed Nystatin Tablets. One tablet (or 500,000 IU) per 250 mg Tetracycline (and 5cc alcohol). Sig as per Tetracin Rinse but add: SHAKE WELL BEFORE USING.

General Comments

See above and Patient Instructions in Chapter X for further details relative to patient instructions and complications. Use for more than ten days may be inadvisable.

The formulæ for the various pastes are as follows:

Rx: MA TREATMENT PASTE Amœbacidal treatment paste that also suppresses Candida.
Misce: 30 grams 10% Metronidazole cream with three finely crushed Nystatin tablets (Nilstat or an equivalent quantity Nystatin powder), plus 10 drops of bitter orange or 2 ml oil of Anise for flavour. Each Nystatin tablet contains 500,000 i.u. Nystatin. The paste should not be runny but have the consistency of margarine. DO NOT USE A SWEETENED FLAVOUR NOR A SWEETENER.
Mitte: 30 gms plus a 10 cc "PeeDee Dose" Syringe loaded with paste.
Sig: Use two to four times daily during treatment and thereafter once daily until the paste is all gone, normally about six months. Rinse away food debris after meals or snacks, after the evening meal rinse away food debris with water, then apply the paste.

Last thing before going to bed: rinse with water, brush with peroxide, rinse with water then apply the paste. (A strip of paste from the nozzle of the syringe (1 mm) across the width of the brush (6 mm) is sufficient for the gum margins of either the upper or lower jaw. Wipe onto the gum margin from left to right on the cheek side of the teeth, then back on the tongue side. Repeat for the other jaw.) Continue to use the paste sparingly until further tests have remained negative for about three months.)

Rx: MK TREATMENT PASTE: Antifungal treatment paste that suppresses protozoa.

Misce: 30 grams 10% Metronidazole cream with three finely crushed Ketoconazole tablets to produce, as nearly as possible a paste which is 10% metronidazole and 2% ketoconazole. Paste should be unflavoured but 10 drops of bitter orange could be added for flavour. The paste should not be runny but have the consistency of margarine. DO NOT USE A SWEETENED FLAVOUR NOR A SWEETENER.

Mitte: 30 gms plus a 10 cc "PeeDee" Dose syringe loaded with paste.

Sig: Use two to four times a day until further notice: rinse away food debris after meals or snacks, after the evening meal rinse away food debris with water, then apply the paste. Last thing before going to bed: rinse with water, brush with peroxide, rinse with water then apply the paste. (A strip of paste from the nozzle of the syringe (1 mm) across the width of the brush (6 mm) is sufficient for the gum margins of either the upper or lower jaw. Wipe onto the gum margin from left to right on the cheek side of the teeth, then back on the tongue side. Repeat for the other jaw.) Continue to use the paste until further tests have remained negative for about three months.)

Rx: MC TREATMENT PASTE: Antifungal treatment paste that suppresses protozoa.

Misce: 30 grams 10% Metronidazole cream with nine finely crushed Nystatin tablets (Nilstat or an equivalent quantity Nystatin powder), plus 10 drops bitter orange or 2 ml oil of Anise for flavour. Each Nystatin tablet contains 500,000 i.u. Nystatin. The paste should not be runny but have the consistency of margarine. DO NOT USE A SWEETENED FLAVOUR NOR A SWEETENER.

Mitte: 60 gms plus a 10 cc "PeeDee" Dose syringe loaded with paste.

Sig: Use four to eight times daily as per MK paste (above). The MC paste is useful if the ketoconazole contained in the MK paste is contra indicated.

SPECIAL NOTE: None of the above taste good, and the fluoride tastes even worse.

Home Application of Fluoride in Custom Trays.

An adjunct in the treatment of Oral Candidosis if the conditions warrant. Also effective in controlling caries.

Fluoride: use once daily; Germiphene 0.5% Neutral.

Fluoride: use once weekly; Germiphene 1.23% acidulated Sodium Fluoride, lemon flavour only.

Supply patient with trays and suitable supply of both fluoride gels.

In mild cases, use only .5%; in moderate cases, use both; and in severe cases, use 1.23%. In all cases a daily application is required.

Suggested regime: apply fluoride in trays for 10 minutes, remove trays, spit out excess but do not eat, drink or rinse for one hour.

Continue use until all tests are negative or clinical condition resolved and stabilised, or both.

This may be useful in the treatment of Candida (in conjunction with other measures, of course, including Nystatin tablets.) However, only the "Germiphene 1.23% acidulated" seems to be effective and it tends to remove the glaze from porcelain.

Some general comments and notes gleaned from various sources

Emetine Hydrochloride, an alkaloid derived from ipecacuanha, is a powerful amœbacide, but hazardous in use since it irreversibly inhibits protein synthesis in mammalian and yeast cells. Used topically it exerts an irritant effect, if swallowed this irritation (emetic action) can cause salivation, nausea, vomiting, muscular weakness, depression, perspiration and tachycardia. It is considered as a dangerous drug which should only be administered in a hospital where the emergency cardiac support services are readily available. It is worth noting that it has no effect on bacterial metabolism and was at one time extensively used for the successful treatment of periodontal infections. Successful, that is, if the occasional fatality is discounted. It may cause a complete cardiovascular collapse with topical use.

To the discerning reader, it should be obvious by now that in some cases the complications likely to be encountered can be quite complex. From the text it may not be apparent that many of the complex cases which come to my office do so by referral from physicians or dentists. It is frequently necessary to work as part of a team to rehabilitate patients to a better state of health. Findings are reported to the referring doctors. Consultations among health care professionals provide the patient with comprehensive co-ordinated care. The dentist should not take responsibility for treating medical conditions, but co-operate with the attending physician when there is a mixed medical-dental problem. Patients must be kept fully informed and aware that there may be an interplay between oral infection and systemic disease. If there is, then there will be a combination of care given by dental and medical practitioners, each according to their field of expertise.

A FEW INTERESTING FACTS

MILK upsets body chemistry and is not a good source of calcium; Ca++ is better obtained from vegetable products.

Fungi:

Nickerson's Tests: About 5% of cultures are false positives. Bacteria, seen as CBs have not yet been identified.

Fruit juices are often contaminated with Torulopsis (glabrata) and Candida (tropicalis and albicans).

90% vaginal infections are now Candida as against 25% in the pre antibiotic era.

Candida tends to concentrate at either end of the gastro-intestinal tract. All species of Genus Candida are susceptible to Nystatin, a polyene antimicrobial.

Sweet cravings have been treated with Nystatin by some physicians. Does this mean that some sweet cravings are due to an upset in body chemistry caused by Candida?

There are many dermatalogic symptoms of Candidal infections, some of them allergic in origin.

Protozoa:

Didinium nausatum. A free living protozoan, it is a predator on paramecium. D.nausatum is between 80 and 200 microns. Proboscis penetrates prey, sucks out contents, involutes membrane and then consumes remains.

CHAPTER X

PATIENT TREATMENT INSTRUCTIONS

TREATMENT OF ORAL AMŒBIASIS

Reproduced in this chapter are the actual information sheets which are given to the patients attending the author's practice. The general format has been developed over the years to the point where the material seems to be understood by the average patient. These instruction sheets are presented "as is" and without further editing.

TETRACYCLINE MOUTH RINSE

The patient is initially prescribed a bottle of 150 cc which will remain stable for not more than ten days following the preparation of the Rx. It should be used within this time period at a rate of 15cc per day. Used four to eight times per day, it is then a matter of simple arithmetic to arrive at the individual amount to be used at each rinse.

Patient Instructions

Sig. Rinse mouth four times daily for ten minutes or more frequently for shorter durations as outlined:

"If you have used MTP, eaten or drunk anything one hour prior to using the rinse: rinse mouth thoroughly with water before use. Take one half to one teaspoonful (3-5cc) and swish around teeth and gums for ten minutes, then spit. (This gives you 100 points). 60% of the benefit comes in the first 60 seconds of rinsing, 20% in the next three minutes and 20% in the last six, so, if the lesser volume is used, or if the duration is reduced, increase the frequency to achieve 400 points daily plus or minus 10%. Do not rinse away with water, drinks, food, etc, if possible, for one hour after use. If you do consume anything within an hour after using the rinse, simply do an extra rinse. The bottle is to be finished in not

more than ten days. If the rinse makes you feel nauseated you probably took too big a mouthful.

If there are infected areas of "skin" in your mouth, they may turn yellow and eventually peel off. If the underlying skin is not pink and healthy, i.e. if it is raw, sore or bleeding, phone at once.

Because you have an infection, because the rinse contains 40% alcohol as well as an antibiotic, you may find it feels like your mouth is on fire, especially if the infection is severe.

Beware: extremely bitter. Expect Black Hairy Tongue. If treatment is working also expect yellow/brown stains on teeth which may feel "gritty".

To be used for at least two and preferably four weeks. Do not discontinue without checking with doctor. Maintain your personal oral hygiene regime; i.e. continue to use Modified Torren's Powder and Hydrogen Peroxide, etc., as instructed, but discontinue the bitter paste (MA or MC) for the time being."

ALTERNATE METHOD: Dilute to 4% and use in a WaterPik: put one teaspoonful (5cc) of the rinse in the WaterPik tank and add nine teaspoonsful (45cc) water to dilute the rinse. Use all of the resultant mix at the lowest possible pressure setting (= 100 points). Repeat this four times daily or use any combination of rinse at full strength or use of diluted rinse in WaterPik that you find convenient in order to obtain 400 points. Clean tank thoroughly after each use. (WaterPik is Manufactured by Teledyne)

Repeat, on request(*), NO times.

PREAMBLE TO SYSTEMIC MEDICATION

The following instructions are given to patients, in conjunction with other material on the general nature of parasite diseases, the specific nature of their infection, and the details of their individual prescription. The information package is rounded off with a copy of their "PERIODEX" which also contains a summary of instructions relative to medication, antisepsis, oral hygiene and the timing of dental treatment.

PATIENT TREATMENT INSTRUCTIONS FOR ORAL AMŒBIASIS

Pretreatment Rinse for Soreness in the Mouth

A saturated solution of Modified Torren's Powder is made by dissolving 3 teaspoons of the powder in four ounces of hot water. Rinse and hold in mouth until the solution cools then spit out. Repeat. If the solution in the glass cools off, add two more ounces of hot water. (Don't burn yourself!) Continue until you have used all the rinse. Repeat as often as brings relief. An alternative rinse is hot, strong, unsweetened, clear tea; use as above but you can swallow instead of spitting. To be used only if absolutely necessary.

Preventive Mouth Rinse: (Antiplaque Antiseptic)

This is 1% hydrogen peroxide. Dilute the 3% Peroxide, which you buy: Add one part peroxide to two parts of water. Use this, instead of toothpaste, to brush your teeth. (Peroxide slowly goes flat with time. Judge the strength by the "fizz". Make sure it is reasonably fresh so that it will work properly.)

Preventive Paste: A taste alternative to Modified Torren's Powder

Mix a few drops of 3% hydrogen peroxide with about a teaspoonful of Modified Torren's Powder to make a stiff paste. Apply the paste to the gum margins, (in the morning) using your toothbrush, don't scrub! Spit out the excess but don't rinse. (This mixture may also be used occasionally to brush teeth, but not gums, to remove stain.) The use of this mixture during treatment is discouraged.

BRUSHING: Teeth and Gums

Brush last thing at night: dip the toothbrush into the dilute peroxide; brush the area covered by the brush, rinse the brush, redip in the peroxide and brush the next area and so on. After brushing rinse thoroughly with water, then apply MA paste. Do NOT brush with MTP - pat it on the gums in the morning to improve tissue healing.

HOLDING PROGRAMME

Brush at night (wet your brush with 1% peroxide!); use Modified Torren's Powder (MTP), for tissue conditioning, in the morning; the pre-

treatment rinse, if needed, and MA Treatment Paste or Tetracycline Rinse (TR) as prescribed, at least four times daily.

STERILISATION: Preventing Re-infection

Dishes may be "sterilised" (to kill amœbæ and trichomonas) by filling the sink with only hot water, adding a cap full of bleach, double the usual amount of detergent, a kettle full of boiling water then leaving the dishes to soak until you can comfortably put your hands in the water: i.e. 30 to 45 minutes. Wash the dishes, rinse, then stack to dry. Alternatively, if you have a dishwasher, use it on the heating cycles: i.e. Heated Wash and Hot Air Dry.

MEDICATIONS: Complications and Side Effects

With prescriptions for Metronidazole, no alcoholic beverages should be consumed for 24 hours before starting the medication, for the duration of the prescription plus an additional 48 hours after finishing the pills.

With prescriptions for tetracycline, "Tetracyn" is normally prescribed because it has been found to work reliably with minimal effect on the digestive tract. The normal dosage is two capsules twice a day until the infection has been eliminated. This is often two to four weeks. Some patients require longer and the need (and dosage) is assessed according to the microbiology and also the patient response. Extended periods of antibiotic coverage to minimize re-infection while healing is occurring can be accomplished at half dosage (i tab x2 daily) until parameters warrant discontinuation of medication.

The absorption of tetracycline is hindered and in some cases prevented, if it is taken at the same time as "heavy metals", (for example, calcium contained in dairy products. "Heavy metals" are also contained in saccharin, Modified Torren's Powder, antacids, MSG, most vitamin preparations and mineral supplements.) Ideally you should take tetracycline one hour before or two hours after meals or "heavy metals".

Side effects must be expected in the treatment of any parasite infection. Most side effects (e.g. a flare up of arthritic symptoms,) are due to the release of toxins from the dying amœba. This is called the Herxheimer's Reaction. Some side effects are due to the overgrowth of nonsusceptible organisms, (e.g. Black Hairy Tongue, an overgrowth of pigment producing bacteria.) Other side effects are due to temporary

suppression of normal bacteria. Elimination of any infection may increase fertility and thus increase the chances of pregnancy.

Apparent allergy, especially rash and itch, two to three weeks after starting medication, may be due to overgrowth of other animal or fungal parasites. Such symptoms require investigation so that the cause may be eliminated. Gas and bloating may also fall into this category.

MA PASTE: Metronidazole paste for treating Amœbæ.

Because the MA paste is concentrated, you only need a tiny amount. Squeeze out 6 mm of paste across the width of the toothbrush, (the brush is about 6 mm wide.) This is enough paste to treat the gums in only one jaw. Wipe the paste around the gum margin of the upper teeth: start on the cheek side at the back and wipe to the opposite side. Immediately place the brush on the palate side and wipe back to the starting tooth. Repeat this procedure for the lower jaw. The paste should be used so sparingly that there is no excess to spit out. If you eat or drink within the hour of using the paste, simply apply the paste again after your food or beverage. The paste is meant to be swallowed. It helps your treatment to swallow the residue. The paste should be used four to eight times daily during the holding programme and two to four times daily during treatment. One month after the infection is cured, the paste should still be used, sparingly, each evening, until it is all gone, (normally four to six months.)

A SUMMARY and SOME HINTS

Rinse all food debris away thoroughly, after meals and snacks. After the evening meal, rinse and then apply the MA paste. Brush last thing at night with peroxide, rinse with water then apply MA paste. In the morning use Modified Torren's Powder. After the use of any of the special antiseptics (the paste, rinse or powder,) you should try not to eat, drink or rinse for the next hour. Remember that any food debris in your mouth will cause bacteria to grow and increase the chance that you will catch the infection. It is caught by direct and indirect mouth to mouth contact so be careful about what goes in your mouth.

Take the capsules or tablets as prescribed. For the first month, renew your tooth brush each week. For the second month, renew it every two weeks and thereafter start each month with a new tooth brush. A Bass type of brush is best; for example, Butler's "Dr Bass Sub G Right Kind". Many tooth brushes are too stiff and can abrade the teeth or gums.

The pills and paste are ordered for a minimum time so make sure you take them as prescribed, each day, until they are all gone. IF YOU RUN INTO PROBLEMS, PHONE AT ONCE. Continuity of treatment is important. The MA paste should be used at least twice a day while you are taking medication. The applications should be one to four hours apart, the second application near bedtime. Use the paste more often, but sparingly, rather than a large amount just once. Large portions of paste may make you feel ill, especially if used close to consuming alcohol. If you use too much paste, the treatment may not work. The syringe makes it easier to measure the paste accurately. When the syringe is empty, disassemble and clean it by squirting water through. Dry the barrel before reloading. If the paste has been supplied in a tube, squirt new paste into the syringe from the tube. If the paste was supplied in a jar, then use a wooden stir stick, a butter knife, or similar to quarter fill the barrel. Refit the plunger, expel the air, then refit the cap.

GLOSSARY: Entamœba gingivalis, the amœba that is the target of treatment, lives in the absence of oxygen, together with bacteria. Moving bacterial rods (bacilli) break sugars into acid which causes inflammation and decay. Tiny moving snake like bacteria, spirochætes, cause odour and inhibit healing. ACs, bacterial filaments with cocci attached, cause inflammation.

(End of Patient Instructions)

PREAMBLE TO PREVENTING REINFECTION

Once patients are found to be free of infection and all prescription items have been discontinued, they will change to the preventive programme, which is designed to minimize the chances of reinfection. If patients do become reinfected despite application of the preventive programme, it has been found that the programme, which bears similarity to the pretreatment regime helps to control the infection until rediagnosis and retreatment can be instituted. Where patient instructions are identical to previous instructions, reference is made to procedures and techniques, but without elaboration.

PATIENT INSTRUCTIONS FOR THE PREVENTIVE PROGRAMME

Continue to use MODIFIED TORREN'S POWDER (MTP). (For Tissue Conditioning) once daily, as before.

Oral hygiene routine will also be as before with the use of:

1% hydrogen peroxide to wet the brush as previously described, or

MTP/peroxide paste (so called preventive paste) which is wiped onto the gingival margins with the toothbrush. This paste is not intended for brushing the gingivæ, although it does make an effective dentifrice, or

"Viadent" toothpaste and mouth rinse each used twice daily. Before brushing all loose debris should be rinsed from the mouth with water. The teeth are then brushed with "Viadent" which is then rinsed away with water. About 2cc of "Viadent" rinse is then used for about one minute. Or

The following home made toothpaste (TLT PASTE) can be used for brushing in place of peroxide. Because it contains salt, unless it is thoroughly rinsed away after use, it is inadvisable to use this just before going to bed since it may engender thirst in the night. At all other times, if used as directed by persons who have no restrictions about salt intake, this paste is an effective dentifrice. Monitoring has shown this inexpensive dentifrice exerts good control over dental plaque. Any other (commercial) toothpastes and/or mouthwashes are not a part of this programme.

TLT PASTE (PERBORATE DENTIFRICE: Antiplaque, Antiseptic)

This nonabrasive stable toothpaste combines the benefits of hydrogen peroxide with the convenience of commercial toothpaste: Mix two parts of MTP with one part of "Amosan" in a blender to form a fine (dust like) powder. (Mix about 30 gms or 1 oz.) Add Mineral Oil USP to make a creamy paste. Store in a dry closed jar. Half fill a Peedee Dose syringe and squeeze a blob about the size of a match head onto the brush. Alternatively, use a dry spatula to put a blob onto the toothbrush. Wipe the paste onto the teeth and gums, then brush them. Spit out excess. Repeat for the upper jaw. Rinse with water. Then wipe some more paste onto the gum margins, spit out the excess but DO NOT RINSE. Use once daily instead of peroxide for brushing.

GENERAL NOTES

If you get stains on your teeth you can also clean them by brushing with either "TLT" or "PREVENTIVE" pastes. Do not brush the gums while doing this. Immediately after brushing, rinse out thoroughly with water. This technique is for cleaning teeth, not conditioning tissue. During the day rinse (swish and swallow) with any liquid to remove food particles after eating. Water is preferable, but any unsweetened beverage is OK. Any rinse is better than no rinse at all. Use floss, if necessary, to remove food. Be careful not to hurt the gum. Don't saw with the floss. Food debris encourages growth of bacteria, this can lead to tooth decay, inflamed gums, even reinfection with protozoa or yeasts. Start each month with a new tooth brush, preferably a Bass type of brush: The brush is supposed to wear out. A stiff brush is hard on the gums and may hasten recession. If instructed to, use a proxabrush with #612 refills. #1612 is the "Traveller".

(End of Patient Instructions)

TREATMENT OF ORAL CANDIDOSIS

For patients with oral candidosis, the treatment and the information had to be modified to suit the condition, but the principles of treatment remain the same. Modified Torren's Powder, hydrogen peroxide and a treatment paste are prescribed in conjunction with appropriate antifungal tablets. The oral hygiene instructions remain the same as previously described in this chapter, the different nature of the infection results in variations in medication and the different instructions are outlined below:

PATIENT TREATMENT INSTRUCTIONS FOR ORAL CANDIDOSIS

Candida, (previously called "Monilia") is a fungus which has two forms. The mould phase: long strands (hyphæ) grow slowly and can penetrate skin. The yeast phase: single cells (yeast cells) grow rapidly, release poisons (mycotoxins) at a higher rate. It switches back and forth between the (invasive) mould and the (reproductive) yeast over about a ten day cycle. In plaque it lives on sugar from food, fermenting sugar directly to acid. I find Candida in gum line cavities when the rate of decay is extremely high: usually, the rate of decay slows after Candida is eliminated. I find Candida in deep pockets that have not healed after successful treatment for Oral Parasites. Candida may cause white areas in the mouth; ulcerations; painful cracks at the corners of the mouth and

associated raw areas on the adjacent skin. My other observations, associated with Oral Candidosis, include "stinging" in the gums, and sensitive or painful teeth for which no other cause can be found. Usually, relief of symptoms coincides with elimination of Candida.

The Dallas Environmental Unit, other similar diagnostic centres and many physicians now report Candida as the only abnormal finding for some patients with environmental illness, undue fatigue and even some types of depression. Improvement is observed when Candida is eliminated. Recently, the latter has been shown to be due to Candida toxins interfering with normal brain cell chemistry. Up to March of 1984 there had been seventy nine Candida mycotoxins discovered. Nine out of fifty-eight species of Candida are associated with disease.

The following partial list of conditions, sometimes associated with Candida, is useful in helping to determine if your Candida might be affecting you. However, Candida is NOT the sole cause of these, or any condition. Finding Candida should not exclude other tests or diagnoses:

> allergy symptoms; some cases of infectious endocarditis. Disease of collagen which may include mitral valve prolapse and some types of joint or ligament disorder; digestive system disorders including gas, bloating and diarrhœa; blood poisoning; hair loss; infected nail beds; urinary and reproductive system infections; hormone imbalance, cystic acne; "thrush" (e.g. diaper rash.) Candida infections, zinc deficiency and loss of sense of smell are interrelated as are Candida and deficiencies in Iron, Vitamin A, B3, B6, folate and pyridoxine: this could lead to blood disorders, such as a reduction in the white cells that belong to the immune system. In fact, recent research has shown that some of the toxins produced by Candida reduce circulating T-cells from 35% to 5%. Candida can dramatically suppress the immune system, rather than being symptomatic of suppression of immunity. It has also been reported as one of the co-infection factors that, if left untreated in HIV infected individuals, may weaken their immune system to the point where they may develop AIDS. However, infections with Candida do not mean a person will, or even might develop AIDS. To get AIDS a person must be infected with the virus. Without the virus persons with Candida do NOT develop AIDS. Candida is treatable, thus the risk factor can be reduced. Other symptoms associated with Candida infections include loss of short term memory,

headaches, hyperactivity in children, sweet cravings, abnormalities in blood sugar, multiple jaw abscesses, suicidal tendencies and the "Drunken Charlie Syndrome." Elimination of Candida often brings improvement in associated signs and symptoms of disease.

Although this list is incomplete and may sound frightening, remember that you don't necessarily have to have any of the above. It is only if the infection has affected your general health that you might have a problem. Your particular problem would depend on the severity of the infection and its location, your genetic susceptibility, the genetically determined pathogenesis (ability to cause disease) of the strain of Candida, etc.

Candida interferes primarily with cell function, rather than cell structure. Most Candida related disease, while apparently bizarre and unrelated, have disturbance of cell metabolism as a common denominator so they are usually largely reversible.

Although Candida is all around us, not everyone becomes infected. A positive finding of Candida must be related to signs or symptoms of disease. If the suppression or elimination of Candida brings an improvement in health it can reasonably be assumed that the Candida was, at least in part, responsible. A positive finding of Candida with no symptoms may indicate an incubation stage.

Taking an antibiotic will not give you Candida. But if you are taking an antibiotic and already have Candida, then the suppression of the other "germs" (which compete with Candida for space and nutrients in your ecosystem). upsets the balance and allows Candida to overgrow and cause a problem.

Taking everything into consideration, relative to the importance of this yeast, if it is associated with ill health I advise treatment to eliminate the Candida. Systemic and topical antifungal agents are used until further testing is negative for Candida and the health has stabilized. Retesting is normally done about every three months. Treatment is continued for three months after all tests, signs and symptoms are negative.

NYSTATIN TABLETS:
brand "Nilstat" (pink tablets) is preferred

Take two tablets in the morning and two at night, unless your Rx instructions are different. Nystatin is only slightly absorbed from the digestive system. It must be taken for a long time in order to achieve

concentration in tissue enough to kill Candida. When this happens (toxic) cell contents are released into the body. This is called the Herxheimer's Reaction and can cause side effects which may include an initial upset of the digestion, followed by fatigue and/or depression. These may occur after a few days or at about six weeks. This seems to depend on the location of Candida colonies. The latter two complications may recur on a cyclical basis until succeeding generations of the fungus have all been killed. When taking the tablets no longer causes any side effects (release of toxins) this indicates that the yeast is nearly eliminated.

MK PASTE: Ketoconazole paste for treating Candida

Apply the paste two to four times per day, in the same manner as MA paste. The same routine as outlined for MTP and brushing is also followed. The paste is more effective if use is concentrated over several hours to produce one peak concentration each day. (Applying the paste twice/day is minimum, four times/day is maximum.) Candida is a hardy bug that can be difficult to eliminate. Research has shown that Candida can grow on toothbrushes. Try to prevent this by rinsing it after cleaning your mouth, then massaging a little fresh MK paste into the bristles and let it dry. For the first month, use a new brush each week; use a new brush each two weeks for the second month and then start each month with a new tooth brush.

The pills and paste are ordered for six months, so when you run out of either go back to the pharmacy for your repeat prescription.

GLOSSARY: Candida albicans, the yeast which is the target of treatment, lives in the absence of oxygen, together with bacteria, in the pocket producing toxins which may enter the circulation. Above the gum line there is oxygen so the fermentation of sugars, by Candida, can proceed to acid formation. Moving bacterial rods (bacilli) also break sugars into acid. The acid can cause inflammation or decay. Tiny moving snake like bacteria, spirochætes, cause odour and inhibit healing. ACs, bacterial filaments with cocci attached, also cause inflammation.

(End of Patient Instructions)

The preceding patient instruction bulletins are the 1988 versions. From time to time, the instruction sheets are updated to reflect changing patterns of disease and treatment. If patients consistently misunderstand part of the instructions, theses areas are edited to improve comprehension. Newer remedies and changes in protocol can also be immediately included since the files are stored on computer disk and printed out as

needed. Variations in patient instructions can be included in the printout so that patients can receive a personal instruction sheet, not just a printed copy.

The instructions for the Bass Brush Technique, as taught in the author's practice, are as follows.

> Rinse the brush with water and dip it in 1% hydrogen peroxide. Place (the side of) the brush against the sides of the teeth and gums. Twist, so that the bristles tuck between the teeth. Push, so that the handle of the brush begins to bend. Keeping the bristles locked in position, "shimmy" to dislodge the plaque. To avoid scratching, do not let the bristles move across the teeth or gums. Remove the brush, rinse it, redip in peroxide, replace the brush in the mouth, placing the bristles on the next area to be covered, but use a slightly overlapping stroke to avoid missing an area. Twist, push, shimmy. Continue this technique until all areas have been brushed. Rinse out loosened plaque, foam and debris with plain water, as often as needed. Don't forget to brush the biting surfaces. Brush forward and backwards to dislodge anything on the tooth.
>
> In order to avoid missing hard to reach areas, turn your head left or right as needed. For example, as you approach the midline, turn your head away from the hand holding the brush. When you reach the midline, turn the brush (from left to right, or vice-versa) and turn your head at the same time to ensure even attention to all quadrants on both the cheek and tongue surfaces of the upper and the lower teeth. Work by feel and do not watch yourself in the mirror as this may hinder access.
>
> After brushing, use the antiseptic advised. Substitute TLT paste for hydrogen peroxide if advised and modify technique accordingly.

CHAPTER XI

LABORATORY PROCEDURES
PARASITOLOGY

INTRODUCTION

The steps outlined have been shown to be a reliable method to demonstrate the oral presence of Entamœba gingivalis. When compared to the results of direct phase contrast examination of plaque there was a better than 95% correlation between the two methods. This study involved a total of 1074 samples in a six year period (* previously unpublished data.)

Plaque samples were examined by direct phase contrast microscopy and plaque for bulk fixing in SAF was collected as previously described in Chapter VII. If confirmation of diagnosis was required, or if primary diagnosis was uncertain, plaque from all "suspect" pockets in the same mouth was taken and deposited in 15cc of SAF contained in a plastic bottle (bulk fixed). This was submitted to the reference laboratory for the preparation of a permanently stained slide which was examined for oral protozoa.

The results of direct and indirect methods of plaque examination were:

> 484 positive direct plaque examinations were confirmed positive by the laboratory. The laboratory reported a further 10 cases in which the direct examination had not been 100% conclusive (97.98% confirmed positive diagnoses). Where diagnosis was negative by direct examination but positive by laboratory examination, the number of amœbæ was very low. Therefore they were difficult to find by direct microscopy or there were very few amœbæ in the sample submitted to the laboratory.

541 negative direct plaque examinations were confirmed negative by the laboratory. A further 39 cases were found positive by direct examination but were negative by laboratory examination (93.28% confirmed negative). In all cases, the amount of plaque was sparse and/or the numbers of amœbæ were very low (1 or 2 on a slide.)

There were 7 samples which were submitted relative to only Trichomonas tenax. Six were positive by direct microscopy and confirmed by the laboratory. One was positive by direct microscopy but insufficient plaque was submitted to the laboratory to permit preparation of a slide. Some of the samples which were positive for E.gingivalis were also positive for T.tenax. Because of the very low number of infections where T.tenax was the only protozoan present, statistical analysis relative to this organism could be misleading since there were insufficient cases for a reliable data base. These cases were all negative for E.gingivalis by direct and indirect examining methods, so they have been included in the number of confirmed negative E.gingivalis samples. The microbiology laboratory at Münster achieved reliable and accurate results by culturing for T.tenax. This method would seem to hold the most hope for accurate laboratory testing for the organism.

Of the 1074 slides examined by the laboratory, there was agreement between the direct and indirect method with 484 positives and 541 negatives. The overall confirmation rate was 95.44%. Those cases where there was a discrepancy (4.56%) could be explained because there was very little plaque, or the amœbæ were very small, or they were very few in number. In all cases they would be hard to find. This indicated that if either the direct or the indirect method showed positive, it was probable that the numbers of "free" protozoa in the plaque had been "captured" by only one of the methods. Therefore it appeared that either method is equally accurate. However, direct microscopy allows better monitoring of the patient since there is no delay. The clinician receives the microbiological data at the time of the patient's appointment and is better able to direct continuity in medication.

Examination of Dental Plaque for Entamœba gingivalis. Nov 1978-Feb 1984

Laboratory Findings		
E.g +ve Slide	=	494.00
E.g -ve Slide	=	580.00
T.t +ve Slide	=	6.00
TOTAL		1074

Chairside Findings		
E.g +ve confirmed	=	484.00
E.g +ve unconfirmed	=	39.00
E.g -ve confirmed	=	541.00
E.g -ve unconfirmed	=	10.00
T.t +ve confirmed	=	6.00
T.t -ve unconfirmed	=	1.00
TOTAL		1074

Total number of chairside E.g positives	=	523
Percentage of unconfirmed chairside -ve	=	1.72%
Percentage of unconfirmed chairside E.g	=	7.89%
Discrepancy Rate (i.e. % not confirmed)	=	4.56%
Correlation Rate (Percentage)- Both +ve	=	97.98%
Correlation Rate (Percentage)- Both -ve	=	93.28%
Percentage of chairside E.g confirmed	=	94.46%
Percentage of chairside -ve confirmed	=	93.28%
Correlation Rate (Percentage) +ve and -ve	=	95.44%

A LABORATORY TECHNIQUE TO DEMONSTRATE ENTAMŒBA GINGIVALIS IN STAINED SMEARS

Developed by J. C. Palmer, A.R.T.

Preparation of Reagents

A. SAF Fixative:

Sodium Acetate, anhydrous or with three molecules	0.9 gm
water	1.5 gm
Acetic Acid	2.0 ml
Formaldehyde, 40% Commercial	4.0 ml
Water	92.5 ml
Final pH	4.15

B. Physiological Saline

Prepare a stock solution of 8.5 gm NaCl in 100 ml water. For use, dilute one part of the stock solution with nine parts of water.

C. Mayer's Albumin

Thoroughly but gently mix the white of a fresh egg with an equal amount of glycerine. (To avoid trapping air bubbles, use a magnetic stirrer on slow speed.) Strain through a gauze; store in the refrigerator in a brown bottle with a crystal of thymol added to reduce fungal growth.

D. Picric Acid

Prepare a saturated solution by dissolving picric acid in lukewarm water until some crystals remain undissolved in the bottom of the container. Cool to room temperature overnight. Dilute by adding 25 ml of the supernatant with 25 ml of distilled water to produce 50 ml of half-saturated working solution.

IMPORTANT NOTE:
Solid picric acid should be stored **under water** and NOT dry because it is EXPLOSIVE when completely DRY.

E. Ethyl Alcohols

To prepare an x% alcohol solution, dilute x parts of 95% ethyl alcohol with (95-x) parts of water.

F. Carbol-xylol Solution

Phenol, (liquefied by warming)	250 ml
Xylol	750 ml

Mix by adding the phenol to the xylol.
Store in a closed brown glass bottle.

Modified Iron Hæmatoxylin Stain (for SAF preserved plaque)

Hæmatoxylin-mordant solution:

a)	Hæmatoxylin	10 gms
	Alcohol (absolute or 95%)	1000 ml

Allow to "ripen" in light for one week (or longer).

b)	Ferrous Ammonium Sulphate	10 gms
	Ferric Ammonium Sulphate	10 gms
	Concentrated Hydrochloric Acid	10 ml
	Distilled water	1000 ml

WORKING SOLUTION

Solution a)	25 ml
Solution b)	25 ml

Mix and place in a coplin jar

To Test Solution:

Add a few drops of the working solution to some alkaline tap water. The drops of working solution should rapidly change to BLUE. This indicates that the solution is still fresh and may be used. If the brown colour persists, the solution has deteriorated and should be discarded and fresh working solution made as above.

Method for preparing SAF fixed E.gingivalis for staining

1. Resuspend SAF fixed specimen by shaking.
2. Pour into 2 conical centrifuge tubes.
3. Centrifuge at 2000 rpm for 5 minutes.
4. Pour supernatant back into original container (to prevent any loss of specimen.)
5. Add 1 to 2 ml isotonic saline. (to both tubes.)
6. Resuspend the sediments.
7. Combine both specimens in one tube.
8. Fill the tube with saline.
9. Centrifuge at 2000 rpm for 5 minutes.
10. Decant supernatant very carefully.(Drain tube well.)

10a. Repeat steps 5 to 10. This second wash is to ensure the removal of excess SAF as it interferes: with adherence of specimen to the slide and with the quality of staining. After the second wash the tube is drained well and

11. An equal quantity of Mayers Albumin (usually one or two drops) is added to the sediment in the centrifuge tube.
12. Mix well in a vortex mixer.
13. Remove some of the suspension with a capillary pipette and place 1 or 2 drops on a microscope slide.
14. Place slides horizontally in a 37°C incubator.

14a. Leave overnight.

15. Spread the material out slightly on the slide, (by squashing with an applicator stick,) to give areas of varying thickness.

Method for staining amœbæ with modified iron hæmatoxylin

16. Place slide in 70% ethyl alcohol (to coagulate the albumin.)	10 mins
17. Place in alkaline tap water	10 mins
18. Place in Hæmatoxylin-mordant working solution	10 mins
19. Place in distilled water	1 min

20. Place in picric acid for (as determined by experimentation)	5 to 10 mins
21. Place in running tap water	20 mins
22. Place in 50% alcohol (to which a few drops of ammonia have been added*)	10 mins
23. Place in 70% alcohol (to which a few drops of ammonia have been added*)	10 mins
24. Place in 85% alcohol	10 mins
25. Place in 95% alcohol	10 mins
26. Place in 100% alcohol or carbol-xylol	10 mins
27. Place in xylol	10 mins
28. Place in fresh xylol	10 mins
29. Mount in a neutral mounting medium & dry (preferably at 37°C) overnight	

Notes

* 3 to 4 drops of ammonia in 50 ml alcohol

1. Gomori's trichrome could be used instead of modified iron hæmatoxylin.

2. Do not agitate slides during processing or specimen may be dislodged and lost.

3. Stained slides should be scanned systematically at 10x & 40x to spot amœbæ and identification confirmed with the 100x oil immersion lens.

4. Except for the staining and destaining (steps 18 & 20 above), the times given are not critical for modified iron hæmatoxylin, but should be followed as closely as possible. Staining time should be adjusted to produce good colour contrast (see below:)

5. The background debris should stain pale blue while the trophozoite (body of the amœba) should stain medium blue. The nuclear chromatin should stain dark blue or even blue-black. By contrast, the cytoplasm of the leucocyte should be almost colourless but the nucleus should be dark blue.

Description of Typical E.gingivalis and Nucleus

6. The typical Entamœba gingivalis trophozoite has an entamœba nucleus, consisting of fine peripheral chromatin applied to the nuclear membrane. There is a slightly diffused central karyosome. The cytoplasm is divided into ectoplasm and endoplasm. Within the endoplasm are food vacuoles which usually contain the partly digested remains of leucocyte nuclei, leucocyte cytoplasm or even hæmoglobin removed from erythrocytes. Bacteria are sometimes seen within the food vacuoles while some amœbæ even have no ingested food. This does not hinder identification, however, because the nucleus is quite typical.

The laboratory and clinical protocols were developed by collaboration between the authors of this chapter starting in 1979 and have been previously published at professional meetings. These methods have been used by dentists in general practice, medical laboratories and the Dental Faculty of the Universität Münster.

CHAPTER XII

THE PERIODEX EVALUATION

Following the integration of computer technology with the practice of dentistry, the author developed "The Periodex" to assist in evaluating the clinical and microbiological data for each patient. "The Periodex" is a copyrighted, computer generated report together with a numerical read-out ("score") and a bar graph. The clinical and microbiological parameters, recorded on the patient chart during the examination, are entered in the computer and the patient receives a report at the end of the appointment. The "PERIODEX EVALUATION", a copy of which is kept by the patient, is useful for motivation and to help patients understand their progress. "The Periodex" can be tailored to reflect the clinician's judgement, with extra emphasis being placed on those criteria deemed most important. A copy of the report can also be sent to a referring dentist, or to the patient's physician. Only the "score" is recorded on the patient chart, since the information used to generate the report is already a part of the patient record. The simplicity of the final score has been found beneficial in assessing progress.

The computer software, which is the basis for "The Periodex" is simply a spreadsheet, such as "VisiCalc", (registered programme of Tandy/Radio Shack) or Lotus 1-2-3. Each block to be used as a "label" is filled in, as illustrated in the "Periodex Evaluation" sample file contained in this chapter. The areas to be used to generate the score are initially filled with prompt words (labels) which will ultimately be replaced by a numerical entry. The advantage of "VisiCalc" is that the numerical entry is not shown on the screen (or printout) as a number but rather as an asterisk. The usual numerical entry for any block is one, which is shown as a single asterisk. The programme is instructed to multiply the numerical entry for any position by a pre-selected number. For example, entries in column two are multiplied by two in the first eight rows. The system can be weighted to give extra emphasis in the final score to those factors deemed most important by the clinician. For example, gingival condition might be rated as fair (enter 1 in the appropriate box) but

bleeding may occur with gentle probing. A second entry could be made on this line to record this fact by entering 1 in the appropriate box. For clarity, the adjacent box to the right of this entry would be now be filled with the explanatory note "Bleeding". The programme adds the value of each entry made to make the final score. A bar graph is simultaneously generated. The starting score when the programme is loaded is always zero. The previous score is shown as ?. The "ideal" score is 14 with a five point spread being acceptable. Most patients experience no difficulty maintaining a score in the ideal range in the absence of infection. On subsequent appointments the score from the previous appointment is entered against "Previous Score".

At the beginning of the appointment, "The Periodex" master file is loaded from disk into the memory of the computer. Each clinical and microbiological parameter recorded for the patient is also entered on the computer display. The computer programme "VisiCalc" changes numbers to asterisks, makes the calculations, produces the bar graph and displays the entries, score and graph as seen in the examples. At the end of the examination the reports are printed, including one for the patient. To the bottom of each report is added the specific instructions which are selected from the information contained in the master file. By using a simple spread sheet to record information, produce calculations and issue a summary of instructions, the clinician can have a flexible programme which can be quickly tailored to individual requirements without the necessity to understand computer programming or hire a computer consultant.

After initial diagnosis, appropriate therapy is instituted. The patient is then seen at appropriate intervals to assess progress, make any necessary alterations in therapy and co-ordinate the most advantageous timing of routine office care. Each subsequent appointment follows the pattern of the first with the clinical and microbiological assessments necessary to produce the "Periodex Evaluation". Integral to successful treatment are patient consultations in order that each person adequately understand their problems, their specific instructions relative to medication and home care. In addition to the summary of instructions printed on "The Periodex", details of the prescription, home care and other pertinent instructions are given to the patient on pre printed instructions at the end of the appointment. (For examples of these, see Chapter X.)

SAMPLE OF "THE PERIODEX" MASTER FILE

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-* "PERIODEX-EVALUATION" (c) 1989 Dr Trevor Lyons & Eleanor Stanfield.*-
Documentation for this programme is contained in Chapter XII of the book
"INTRODUCTION TO PROTOZOA & FUNGI IN PERIODONTAL INFECTIONS"(a Manual of
Microbiological Diagnosis & Nonsurgical Treatment) by Trevor Lyons. Send
for more information: 45 Rosebery Avenue, Ottawa, Ont., K1S 1W1, CANADA.
Before using this nonscientific programme, replace lines 1+2 with your
own heading & delete rows three through ten. Customize the programme for
your own requirements. The author & copyright owners are not responsible
for use or misuse of this programme. No warranty is implied or intended.
---------<"PERIODEX-EVALUATION">---( developed 1983; (c) 1989.)---------
Patient  Name:-                                   DATE:
Report sent to Dr
-*-*-*-*-*-*-*-*-*-*-*-*-*-PERIODEX EVALUATION-*-(c)-*-(1989)-*-*-*-*-*-
A computer generated professional opinion report on periodontal status.
A (*) for each category replaces the appropriate prompt word and has a
value automatically assigned. The total is also shown as a bar graph and
the totals per column show the pattern of clinical & microbial findings.
On Examination:      "A"      "B" <+>  "C"      "D"      "E"  (A = Best)
ORAL HYGIENE:       Good     F to G   Fair     F to P   Poor
GINGIVAL CONDITION  Good     F to G   Fair     F to P   Bleeding
PLAQUE :           <o+       o+       +        ++       +++
HALITOSIS :        <o+       o+       +        ++       +++
POCKETS :          <1        1-3      3+       4-5      6+
INFLAMMATION :     None      Min/Spor Stagn    4Q/GMD   Detached
MOBILITY:          <o+       o+       +        ++       +++
SUBMANDIBULARS:    None      One      Two      1 Tender 2 Tender
Leptothrices:      ++        Any variation
Cocci :            ++        Any variation
5 Stages Infection-First---Second---Third----Fourth---Fifth-------------
MOTILITY :         <o+       o+       +        ++       +++
BACILLI  :         <o+       o+       +        ++       +++
SPIROCHAETES :     <o+       o+       +        ++       +++
ENT. GINGIVALIS :  <o+       o+       +        ++       +++
TRICHOMONAS TENAX:<o+        o+       +        ++       +++
CANDIDA :          <o+       o+       +        ++       +++
CB FORMS :         PRESENT
A/C :              <o+       o+       +        ++       +++
================================================================================
Total per Column
PERIODEX SCORE =          0          (Ideal Range = 12 to 17)
PERIODEX GRAPH
YOUR LAST SCORE = ?
YOUR LAST GRAPH =
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
Notes to the referring dentist or physician. Thankyou for the referral.
If you have questions, please phone the office for clarification.
DDS only, please delay all but emergency treatment until the infection
is under control or cured. I will advise you of your patient's progress.
I have prescribed medication & issued appropriate patient instructions.
The infection is controlled enough for you to do the scaling & etc. now.
I advise polishing restorations to reduce irritation. Please arrange it.
I advise adjusting the bite to reduce traumatism. Please proceed with it
There is need to restore teeth; xrays may be necessary, especially:
```

I recommend a new upper/lower denture/bridge to assist with the therapy.
The patient now seems to be free of serious infection. Now is the time
to proceed with all routine treatment, especially the scaling & etc.
I will continue to monitor the patient on a regular basis & report.
I shall only see the patient again if there is a perceived need
Improved relative to gum condition, inflammation, swelling, etc
Review instructions re timing, method & dosage. If you brush near a meal
Brush before eating & rinse afterwards. Watch for hidden sugars!
Prescription depends on result of swab for Candida: phone in 3 & 30 days
Use a "Proxabrush" with #612 refills for cleaning & applying the paste.
DENTURES: After food: wash clean. Daily soak in "Betadine" for one hour,
then in a denture cleaner. Wipe paste onto fitting surfaces, 2-4x daily.
See your dentist for construction of custom trays for home application
of Fluoride Gel. Germiphene 1.23% in close fitting trays works best. Use
once daily for ten minutes. Do not swallow. Too much may be nauseating.
Change Rx to:
Holding programme:Tetracycline Rinse or MA Paste four to eight times/day
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Metronidazole Regime #3: 30 tabs. Take one twice daily preferably with
food. No alcohol for the duration of Rx plus one day before & two after.
plus MA paste twice daily until further notice-approximately 6pm & 10pm.
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Metronidazole Regime #4: 60 tabs. Take one twice daily preferably with
food. No alcohol for the duration of Rx plus one day before & two after.
plus MA paste twice daily until further notice-approximately 6pm & 10pm.
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Continue with Rx
Tetracycline Capsules: two caps twice a day until the infection has gone
This is usually for four weeks, followed by 1 cap x2 daily for 8 weeks.
plus MA paste twice daily until further notice-approximately 6pm & 10pm.
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Minocin 100 mg tabs: Loading dose of two tablets, then 1x2 daily for two
weeks. Can be taken with food, but not with milk or milk products.
plus MA paste twice daily until further notice-approximately 6pm & 10pm.
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Penicillin V (300 mg tabs) Two tabs four times daily for 30 or more days
plus MA paste twice daily until further notice-approximately 6pm & 10pm.
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Change Rx to:
Nystatin Tablets: 2x2 daily for at least 6 months with testing at three
month intervals to check progress & for 3 months after negative tests.
plus MK paste, two to four times daily, ideally x3, until further notice
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Nystatin Tablets: one daily for a month, then 1x2 daily for a month then
1x3 daily for a month, then 1x4 daily for a month, then 2x2 daily til K5
plus MK paste, two to four times daily, ideally x3, until further notice
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Ketoconazole: one tablet x1 daily: Report any side effects immediately.
plus MK paste, two to four times daily, ideally x3, until further notice
pat MTP on the gums in the am & brush with 1% hydrogen peroxide at night
Nystatin lozenges: dissolve slowly x4 daily, plus use MC paste x4 daily.
WARNING: Use of antibiotics to treat infection may enhance fertility.
WARNING: This medication may make your skin more sensitive to sunlight.
Change to Preventive Programme
Use MTP in the AM, brush with hydrogen peroxide or TLT PASTE in the PM.
Brush daily with "VIADENT", rinse with water then with "VIADENT" rinse.
(Use a teaspoonful to rinse then hold in mouth for at least one minute.)

Software Availability

This file is available for uploading from some computer bulletin boards, such as GEnie. The file was uploaded to this board in ASCII format and should be downloaded in the same manner. "The Periodex" should run, without major modification, using VisiCalc. With other spread sheets, such as Lotus 1-2-3, some modifications will be necessary in order for "The Periodex" to operate.

(If you do not have access to GEnie, you can order a copy on diskette by mail. Please see the order form at the back of the book for details.)

"THE PERIODEX" & VISICALC

Using your communications software, download "The Periodex" and save to disk as PERIODEX with the extension /VC. After logging off from the bulletin board, exit the communication programme, load VisiCalc and then PERIODEX. Edit the first ten lines as indicated, save the edited file to disk and "The Periodex" is ready to run.

"THE PERIODEX" & LOTUS 1-2-3

Proceed, as with the instructions for VisiCalc, to download and save the file to disk as PERIODEX/VC. Exit the communications programme and load Lotus. Use the self-prompting "translate" feature, to convert the file to be readable by Lotus and save it to disk with a .WKS extension. It may now need considerable editing to make "The Periodex" workable. The text portion should be self explanatory, but error messages indicate that formatting or formulæ may need editing.

PROGRAMMING NOTES

Global format is left aligned, 9 characters per column, all numbers are shown by the computer as * except for the "Periodex Score" and the "Previous Score" which show the actual value. Calculation is automatic and the order of recalculation is across the rows first. Columns I through M in the rows adjacent to the prompt words contain the multiplication formulæ used to generate the score.

Example: Oral Hygiene good (position C11) is referenced by position I11 which multiplies a numerical entry at C11 by one. J11 multiplies the entry at D11 by two, K11 multiplies E11 by three, etc.

Each of the five positions in each row is scored one through five and the totals are calculated by adding the column totals, then adding each total with the formula in position C32.

At position C33 the total at position C32 is multiplied by .4 and the answer shown as a single asterisk. Asterisks are used in VisiCalc for the generation of graphs.

At each of the positions C through H in row 33 the total score from position C32 is multiplied by a successively smaller number: .4; .2; .1; .05; .025; and the answer is shown as asterisks thereby producing a bar graph.

The same formula is used in row 35 relative to position C34.

At position A101 the spread sheet shows "Brush daily" the word is completed in box B101 and further text is added. The quotation marks at the start of each label block tell the computer programme that this is a "label", i.e. text, and neither a numerical entry nor a formula. The comment "Print -> H102" does not appear on the worksheet at this position but is shown at the top left of the screen. It is the prompt to tell the computer operator to print from the first position (A101) to the second position (H102) if the instructions on these two lines are applicable for this patient.

Positions A36 to H36 create a line of colons across the worksheet. The slash (/) is a computer command meaning Special Instruction? The dash (-) means repeat the next symbol across the position. The symbol is a colon (:). The same command is given in the adjacent position and the result is a line across the worksheet appearing as:: : : : : : : : : : : : : : : : :

From position G35 to I11 will be found the formulæ which calculate the score and generate the bar graphs.

The last six entries are formatting instructions. /W1 means one window. /GOR means that the global order of calculation is across the rows. /GRA means that the global calculation is done automatically each time a value is entered on the worksheet. /GF* means that all values displayed on the worksheet will be disguised as asterisks. /GC9 means that each column is nine characters wide. Words longer than nine characters must be completed in the next position on the worksheet. The final entry is a code used within VisiCalc to identify the file.

APPENDIX

SOME FINAL COMMENTS BY THE AUTHOR

An "appendix" may be thought of as a useless blind extension to the intestine. Derived from the same root, an "appendage", such as a thumb, forms a useful extension of a limb. The reader will have to assess into which category this addition to the book belongs.

CONCEPTS REVISED

Two parallel concepts previously referred to have been left with no apparent connection. Chapter II detailed stages of infection with Entamœba gingivalis, starting with an incubation stage. This was followed by a severe or repetitive 'flu' like illness during which a periodontal deterioration was observed to commence. Following the apparent recovery of the patient, it was frequently noted that rather than a return to normal health, the patient had seemingly acclimatised to a diminished state of health. This was characterized by fatigue and often by more frequent headaches. Patients experienced greater problems with maintaining oral health. Excessive plaque production (often an accompaniment to a cough, a cold or a 'flu' like illness), gingival bleeding and a bad taste on arising were often matched by the observation that this individual had unpleasant halitosis, vaguely reminiscent of garlic. It should be noted that many providers of dental care develop an unpleasant halitosis within a few years of commencing their training. This phenomenon does not go unnoticed by the general public and is regularly the subject of newspaper columns. (Viz: "Dear Abby, my dentist is a nice fellow and very good at his job, but he has overpoweringly bad breath. How can I tell him not to eat garlic?/Should I tell him he has halitosis?", etc.)

Chapter II details the stages of infection with E.gingivalis and also indicates that, despite good oral hygiene, ærosol spray created by dental instrumentation could put the dental team at risk of infection. For both patient and dental staff, the risk of pulmonary infection from such a source also exists. Although pulmonary amœbiasis is usually reported as due to E.histolytica, (Blyth and Pirie, 1978), E.gingivalis has been recov-

ered in cases of pulmonary suppuration, (Sutliffe, Green and Suter, 1951). Blyth and Pirie stated the reason for identifying the organism as E.histolytica rather than E.gingivalis was because of the presence of ingested red cells. They were almost certainly unaware that E.gingivalis ingests red cells, since this fact was not reported until 1984 (Lyons). Blyth and Pirie found no evidence of hepatic or intestinal amœbiasis, which they stated was unusual in cases of pulmonary amœbiasis, but they stated that bronchial embolism leading to pulmonary infection was associated with E.gingivalis. My colleagues in public health laboratories have also reported the presence of E.gingivalis in sputum samples submitted by patients with chronic lung infection, but this fact has only infrequently been reported in the literature. The situation is further compounded because dentists are not normally exposed to medical or public health literature and so would remain largely unaware.

In Chapter VII it was stated that, for the purposes of this book, diagnosis would be divided into three broad categories. It now remains to tie these categories to to those classes of periodontal diseases which have been traditionally described. Pyorrhea alveolaris, literally pus in the gums, was the early term used to describe destructive periodontal disease.

Destructive periodontal lesions came to be subdivided into three main classes:

Periodontitis Simplex was described as destructive lesion, where the bone loss was horizontal; it was accompanied by inflammation.

Periodontitis Complex was described as a destructive lesion with vertical bone loss, i.e. intra-bony lesions. It too was accompanied by inflammation.

Periodontosis on the other hand was described as a noninflammatory destructive lesion.

— —

Gingivitis, a nondestructive inflammatory lesion of the gingivæ became recognised as a separate entity. Even today it is recognized that gingivitis does not necessarily proceed to destructive lesions.

Applying the concepts of Oral Amœbiasis, as outlined in this book, to these four main classes of periodontal diseases it has been observed that

periodontal diseases may be reclassified according to the clinical and microbiological parameters.

BACTERIAL GINGIVITIS

Gingivitis, with pocket depths ranging up to 3mm, is associated with motile bacilli or ACs, (Actinomyces filaments with cocci attached) or CBs (coccobacillary forms). The latter may be Actinobacillus actinomycetemcomitans (AAC), but other species have a similar appearance.

CANDIDAL GINGIVITIS

Gingivitis, characterized by a red granular appearance, shallow pockets, which are frequently only about 1mm deep and fragile gingivæ which bleed with slight provocation, is frequently found in association with Candida spp or other fungi. This type of gingivitis is not associated with infection with protozoa. It should not be confused with a superinfection with Candida spp which is sometimes a sequel to infection with protozoa. Pockets which fail to heal and which are infected with Candida spp do not fall into this category of gingivitis.

INFLAMMATORY DESTRUCTIVE PERIODONTAL LESIONS.

These lesions are typically infected with one or both species of the oral protozoa together with large numbers of motile bacilli, ACs and ropes of bacterial filaments. Spirochætes are frequently also present in abundance.

NONINFLAMMATORY DESTRUCTIVE PERIODONTAL LESIONS.

These lesions are found to be infected with one or both species of the oral protozoa but without accompanying bacterial activity.

OTHER DESTRUCTIVE LESIONS.

Applying the diagnostic criteria outlined in this book, these lesions form a small minority of the cases of periodontal disease seen in a mixed general dental practice in Ottawa, Canada. Only about 2% of cases seen over the period in which data for this book was compiled fall into this category. Most of the patients had no specific target organism in their plaque. Rather there was an underlying disorder of the general health which had escaped medical diagnosis at the time of dental diagnosis. The two most frequent disorders associated with generalized and unexplained

periodontal destruction were either diabetes mellitus or infection of the intestinal tract with protozoa.

Some apparently destructive lesions (perhaps .1%, that is one tenth of one percent of the total number of persons for whom a plaque examination was made) appeared to be of bacterial ætiology. This total includes one case of juvenile periodontitis seen in the practice of a colleague.

In conclusion, then, it appears that the vast majority of patients with destructive periodontal lesions are infected with oral protozoa. Elimination of protozoa is followed by arrest of the disease and resolution, including regeneration of alveolar bone.

Protozoal infection calls for long term systemic and topical treatment to eradicate the infection.

Bacterial infection calls for topical treatment alone. Systemic therapy is seldom required.

Mycotic infection calls for extended long term therapy with antifungal agents.

In all cases the aim is to eliminate the offending target organisms.

All cases of periodontal infection require correction of local factors by changes in home care and effective dental treatment. The timing of the latter should be dictated by the microbiological status of the patient.

In the absence of target organisms which might be implicated in periodontal disease, consider a systemic ætiology.

Always consider that there may be a systemic component to periodontal infection.

Simple Simon, simple soul,
Bought a book on plaque control.
Judging from his gum condition
He got the unrevised edition.

Trevor Lyons.
1989

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