Evolving perspectives

Robyn Metcalf reports on the recent British Society of Periodontology Spring Conference.

Understanding a disease is key to being able to manage and fight it, with this in mind the British Society of Periodontology took evolutionary science as the starting point for its spring conference. Phil Ower, president of the BSP, welcomed delegates to the Examination Rooms in Oxford, and opened by dedicating the event to the memory of Aubrey Sheiham, an epidemiologist of global repute in the field of oral health research.

The evolutionary theme addressed one of the major frustrations of periodontists everywhere: the species-wide predisposition toward developing periodontitis. In the 1851 Essays and Aphorisms, German philosopher Arthur Schopenhauer wrote, “If the immediate and direct purpose of our life is not suffering, then our existence is the most ill-adapted to its purpose in the world.” A quick look around the natural world would seem to confirm this and poses the question – why do we appear so maladapted in comparison?

Engineers needed

To understand why, Randolph Nesse, professor of life sciences at Arizona State University, advocates the need for a shift in perspective. Dental professionals are currently taught to be mechanics, providing routine maintenance and fixing faults when necessary; Randolph suggests that to solve the puzzle of periodontal disease they instead need to be taught to think like engineers – to question why things are the way they are.

Randolph proposed six factors that contribute to disease vulnerability:

- Mismatch with the environment – for example, modern day diets, sterile environments and lack of daylight.
- Co-evolution of pathogens – pathogens evolve considerably faster than we do.
- Constraints – we are subject to path dependence.
- Trade-offs – some evolutionary disadvantages could be the side effect of other evolutionary advantages, for example back pain as a result of bipedalism.
- Cost – some genes that give us an advantage at an early age can kill us in later life.
- Defences – we silence natural ‘alarms’ such as fever, coughs and panic attacks with medicine.

Looking specifically at periodontal disease, Randolph pointed out that with enamel entering bone through gingival soft tissue, leaving a pathway for bacteria to follow, it’s hardly surprising that periodontitis is so prevalent. Our understanding of bacteria – developing from its beginnings in the 1800s – is very much a work in progress. That we are mismatched with our environment, and particularly our diet, is especially discernible within the context of the current sugar debate.

So, why doesn’t everyone develop periodontal disease? Niklaus Lang, honorary member of the BSP, recounted a study that took place in Sri Lanka...
which 12 per cent of the subjects, none of whom had ever used a toothbrush, showed no progression of periodontal disease, appearing to suggest it was the relationship between host and bacteria that determines susceptibility or resistance. In his session, Niklaus asked which is the most important factor, the bacteria or the host. He concluded that whilst bacteria are the most important factors in periodontal disease, susceptibility is dependent on the host response, which is in itself influenced by genetic and lifestyle factors.

Old friends
The dramatic changes in environment, genetics and lifestyle were the subjects that Graham Rook, professor of medical microbiology at UCL, undertook; Graham aimed to explain why exposure to microbial biodiversity is essential for optimal function of the immune system.

In particular, Graham discussed chronic inflammatory disease and the ‘Old friends’ hypothesis, which states that:

- The immune system, like the brain, is a learning system.
- It learns mostly from data provided by microbial inputs.
- Without appropriate data the immune system malfunctions.

Defective immunoregulation can result in chronic inflammatory disorders, psychiatric disorders and metabolic disorders – all of which are undoubtedly on the rise as the more ‘traditional’ infectious diseases are in decline, particularly in the developed world. The ‘old infections’ or ‘old friends’, which could persist in hunter-gatherer societies, evolved to down-regulate the immune system; when these are absent, it is believed there is an epigenetically encoded susceptibility to ‘inflammatory overshoot’. As well as a decline in ‘old infections’ there are a number of reasons why we are beginning to lose some of our microbiota too, such as a reduction in breast feeding, antibiotic use, caesarean section, stress, diet and obesity. Sedentary, indoor lifestyles are also responsible for diminished exposure to organisms and animals from our natural environment.

Graham indicated that in an ideal world eating a Mediterranean-style diet and spending more time in the natural environment are two courses of action that could assist modulation of the immune system by leading to a greater diversity and balance of bacterial and microbial groups respectively. However, it is more likely that in the future lifestyles will only become more unnatural. Therefore, the focus must be on maintaining periodontal health and recognising and treating disease when it does occur.

Changing behaviour
Managing periodontitis relies heavily on the clinician’s ability to influence and change behaviour, which was the subject with which the first day of the conference was closed. Everyone knows that they should brush their teeth and yet, to the annoyance of dental professionals around the world, many don’t do it or don’t do it effectively.

The theory proposed was that the way to change behaviour is to formulate habit. Health messages don’t appear to motivate particularly well but narratives do; telling a story can engage the patient and add value to the target behaviour. Habit is a reactive response which takes a while to develop but once it has taken root it is robust. So, health messages need to link to the receiver’s individual identity rather than being generic. A great example of this is the BSPs ‘The Sound of Periodontitis’ film which tells the story of periodontitis from the personal perspectives of three patients with whom it is hoped the viewers can relate.

Clinical protocol
Saturday began with an introduction by Iain Chapple, professor of periodontology and chair of the morning session, who described the aim of the day to be “putting Friday’s philosophy and theory into...”
practice”. To begin, Professor Cristiano Tomasi, associate professor at the department of periodontology for the University of Gothenburg, shared his clinical protocol for the treatment of periodontal disease:

- Diagnose
- Establish supra-gingival infection control
- Disrupt sub-gingival biofilm – debridement, scaling and root planing
- Prevent sub-gingival recolonisation

For Cristiano, it is vital to treat each patient as an individual, sometimes debridement and scaling will be effective enough and there will be no need to remove cementum. Reassessment can take place between each step to avoid over instrumentation. This clinical approach harked back to Friday’s messages about host and bacteria reacting together. In this process each individual case is unique and therefore, so must be the treatment.

The antibiotic question

Neil Paterson, of Denmark Street Practice in Gateshead, continued this theme of treating cases as individual in his talk: ‘Antibiotic use – a clinician’s view’. He said: “I liken the microbiota to a pick and mix counter, different patients and even different pockets in the same patient will be different.” Neil’s practice sees mainly referral patients who have usually already had some kind of failed non-surgical treatment and he often uses a combination of antibiotics in their treatment. In his opinion, using dual antibiotics such as amoxicillin and metronidazole alongside chlosite gel can significantly reduce the amount of time involved in getting periodontal disease under control.

Neil advocated the use of antibiotics when necessary but cautioned that periodontists must be “super aware” of antibiotic resistance. Interestingly, Neil also made a strong statement about the antibiotic debate raging within dentistry. He pointed out that globally 90 per cent of antibiotics administered are given to animals, and that of those, only 14 per cent are unwell and in need of medicine. He asked what difference a handful of periodontists prescribing antibiotics make within that bigger picture – “If we really want to make a difference, we as a society... have to start putting pressure on the food industry."

Mike Curtis, professor of microbiology at the University of London, took to the stage next to offer a microbiologist’s view on the antibiotic question. He explained that there are 23,000 deaths annually that can be linked to antibiotic resistance and few laboratories looking into developing new antimicrobials because it is not cost effective research. Mike commended Neil’s comments about the field of periodontology playing a relatively small part in the global problem but also pointed out that a metronidazole resistant form of P.gingivalis has now been isolated in Holland, so seemingly, regardless of who is responsible, the ramifications of resistant strands will be widespread. In Mike’s words, “genetic modification was invented by bacteria”. Most likely, we are fighting a losing battle and Mike concluded that in the case of periodontitis, we need to understand the principles underlying the stability of symbiotic and dysbiotic bacterial communities in order to develop novel approaches to rebiosis.

One such novel approach was presented by Wim Teughels, associate professor within the faculty of medicine at KU Leuven, who promised the delegates he intended to introduce some controversy. He proposed that in the treatment of periodontal disease it is important to stop fighting bacteria and start working with them, to stop focusing on the increase in pathogenic bacteria and instead, consider treatments based on promoting beneficial bacteria, which could be more viable. A couple of suggestions being researched include probiotics, prebiotics, predatory bacteria and faecal/oral microbiome transplantation. These are just some of the potential future solutions to the problem.

Finding a solution

This year’s BSP Spring Conference was unusual in that teeth were discussed very little compared with the average dental meeting, however, what was offered instead was a fresh perspective on a persisting problem. The take away impression was that any element within dentistry or the wider medical and scientific communities that can garner greater understanding or inspire new research and treatment pathways should be welcomed into the discussion if progress is to be made.

Periodontal disease is unlikely to be beaten by eliminating one single causal factor, the conference in its entirety served to illustrate that the work of a periodontist is more a balancing act than a vanishing trick.