

# CYBERNETIC HYPOTHESIS OF PERIODONTAL DISEASE IN MAMMALIAN CARNIVORES

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*Factors known to govern the pathogenesis of periodontal disease of carnivores are reinterpreted from an ecological perspective. A cybernetic hypothesis is generated which predicts and explains population control mechanisms. Sensitivity to prevailing conditions and the ability to exert a powerful influence upon those conditions is central to the hypothesis. Natural and domestic situations are contrasted with demonstration of a range of immune-mediated conditions arising from a permanent septic focus in the mouths of domestic cats and dogs. The hypothesis is expected to withstand critical scrutiny. In which case a new theory at the heart of a new paradigm will set the future course.*  
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## INTRODUCTION

Smoothly functioning systems frequently defy understanding. Exceptions to this rule occur and it is at these times that we gain quantum leaps in our understanding. Copernicus, Galileo and Darwin extracted inner secrets from grand systems enveloped in contemporary dogma. In the present day James Lovelock's 'Gaia hypothesis', that the earth possesses cybernetic systems akin to a self-regulating organism, could well come to be ranked alongside those towering earlier discoveries.<sup>1</sup>

Lesser discoveries frequently depend on the failure of a system. Mistakes and failings lead us to reappraisal and a deeper understanding. In veterinary medicine the prime mistake of the late twentieth century is brought to us through the widespread feeding of artificial foodstuffs. It is by virtue of the diabolical affront to natural systems that the Cybernetic Hypothesis of Periodontal Disease derives.

This lyrical passage from the Children's Encyclopedia published in the 1950's provides a background of untested fact. "Day and night the Carnivora are playing their appointed part in keeping down numbers. They themselves are without visible foes, yet have a mysterious check on over-multiplication. All the flesh-eaters are more numerous at birth than the herb-eaters. But an unseen agency takes off cubs from every nursery, or the flesh-eaters would be too numerous, and would destroy all herb-eaters. Check and countercheck are constantly at work to maintain the balance and for the terrors of it all - they hardly exist!"<sup>2</sup>

Other universally accepted 'truths' are:

- Plaque is constantly accumulating in the carnivore mouth.<sup>3</sup>
- Accumulation of plaque rapidly becomes mineralized to form calculus.<sup>3</sup>
- More than 85% of dogs and cats over the age of three years are suffering from periodontal disease to a degree that would benefit from treatment.<sup>3</sup>
- Conditions suitable for the growth of anaerobes exist in plaque after three to four days of maturation. The mature plaque flora is extraordinarily complex and may contain 325 different species.<sup>4</sup>
- Periodontal disease is the dependable consequence of plaque accumulation and mineralization.<sup>5</sup>
- What's more, research indicates that dogs with periodontal disease may develop further problems in the heart, liver, kidneys or bone marrow.<sup>6</sup>

- Chewing on raw bones is the most effective means of controlling periodontal disease in small carnivores. "It is imperative that in addition to this basic (commercial) diet, bones, preferably, or rawhide chews or super hard baked biscuits be added to it so that periodontal disease can be prevented."<sup>7</sup> "It is ironic that preventative dentistry towards the end of the 20th century is based on what dogs and cats found in nature thousands of years ago."<sup>7</sup>
- Diseases act to regulate animal populations, often in a random and unpredictable fashion.<sup>8</sup>

## THE HYPOTHESIS

As a theoretician impressed by the delicate cybernetic balance of nature there seems to be the workings of an invisible hand here. A small effort enables the formulation of the cybernetic hypothesis of periodontal disease.

Periodontal disease is the subtle dependable disease which modulates the effects of starvation in wild carnivore population dynamics.

- A 'feedback loop' ensures daily chewing of raw meaty bones that sanitizes the oral cavity of the successful carnivore.
- Failure of the 'feedback loop' facilitates multiplication of pathogenic bacteria within plaque and development of periodontal disease.
- Incremental losses of carnivores and herbivores are thereby facilitated.
- The populations of herbivores, carnivores and bacteria are maintained in dynamic equilibrium.

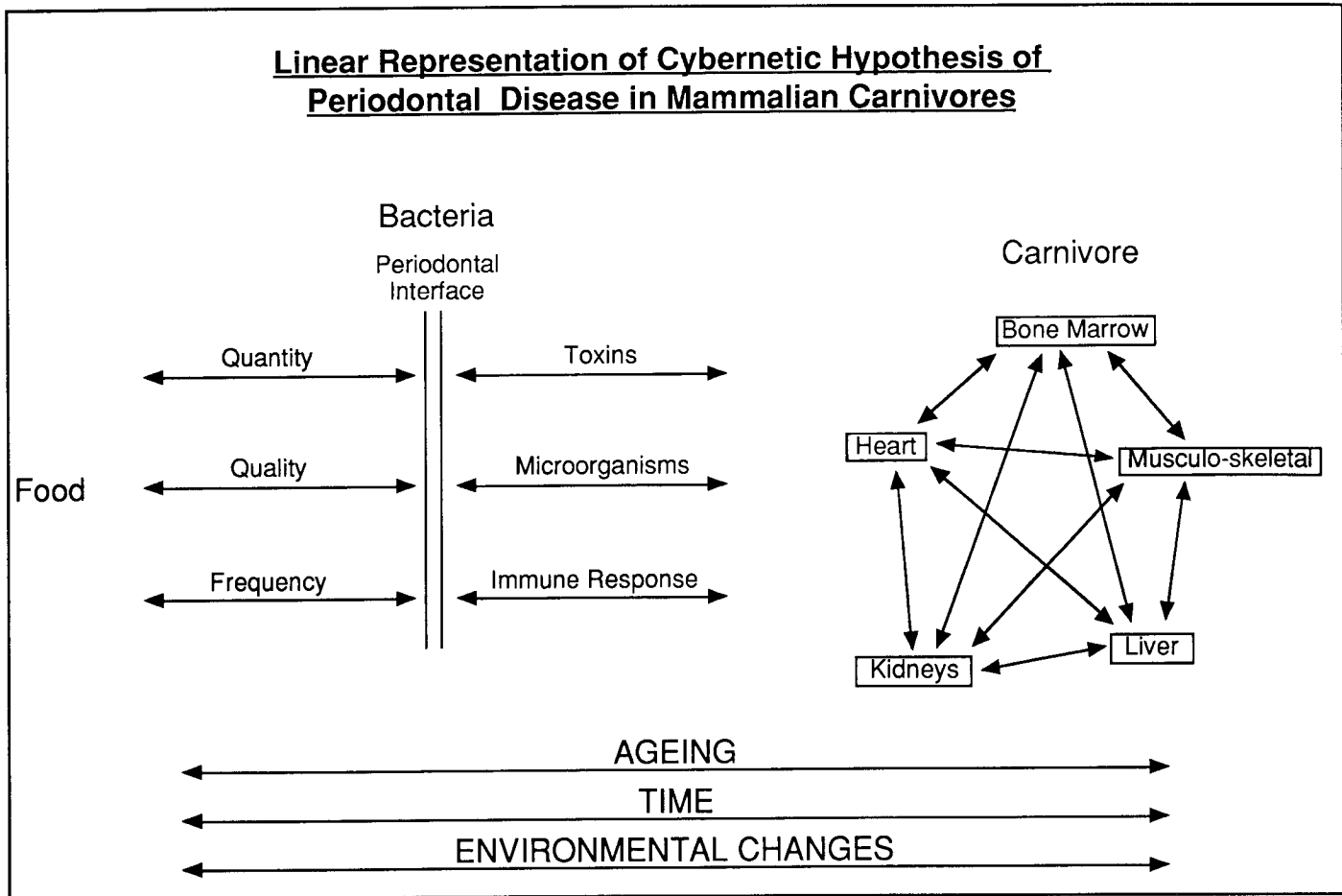


FIGURE 1 - A highly-stylized two-dimensional diagram used to illustrate the cybernetic hypothesis of periodontal disease.

#### AN HYPOTHETICAL EXAMPLE

Now let's consider the hypothetical case of a pack of wolves and a flock of sheep within a finite environment. The sole crude determinant of success of the wolves or the sheep is starvation. If sheep numbers increase they eat out the herbage and proceed to die. At the same time the wolf numbers increase at a great rate to achieve maximum concentration just as the sheep are dying of starvation. The wolves then die of starvation. The violent fluctuations suit neither the environment, the sheep nor the wolves. Now introduce periodontal disease and wolf sensitivity to starvation increases several fold. On day one, ten wolves dine on sheep. On day two, nine wolves dine on sheep and the tenth wolf goes hungry. On day three, our hungry wolf has to contend with three additional problems:

- Nine contented, well-fed wolves
- His own twenty-four hour starvation
- Increased plaque accumulation

The unequal struggle begins as his 'appointed part in keeping down numbers' is made redundant. The pathogens benefit. Their numbers sharply increase by day fourteen. The sheep gain since only nine wolves now give chase.

It is inconceivable that the stench would not communicate powerful signals to other wolves and prey alike. Wolf number ten, aware of his condition, would probably prefer to remove himself from contention and slink away to die. Each wolf in turn will occupy the number ten position and an abbreviated period of dying is highly desirable.

#### PERIODONTAL DISEASE ALLOWS IMMENSE FLEXIBILITY OF CONTROL

If the she-wolf finds hunting easy then she will return chewy food to the litter on a daily basis. Wolf cubs cutting their teeth are highly vulnerable to the periodontal disease organisms. However, if sheep numbers are high then more cubs

need to be reared in order to perform their regulatory role.

The next phase of increased sensitivity to periodontal disease is the four to six month age range. Periodontal disease organisms can surge in numbers in the inflamed mouth of the cub whose secondary dentition is erupting. If sheep numbers are extremely high, even the blundering efforts of the adolescent wolf will be rewarded with adequate food supplies. Consequently the gums will be massaged, the periodontal disease kept at bay, and the wolf will mature to become an effective killer of sheep.

#### Bacteria

Bacteria, particularly anaerobes, were the earliest inhabitants of the planet. Their evolving interest is on a par with the interests of wolves. The vigorous chewing on raw bones render the mouth of the carnivore an inhospitable place, except for the enamel sulcus of the upper fourth premolar. It is usual to find a bead of

calculus immune from the abrasive forces and containing a full complement of plaque bacteria lodged in this sulcus. It is easy to understand that once the feeding function of the host declines the complete colony of plaque organisms can readily colonise the gingival sulcus.

### Sheep

The sheep in our example benefit from a balance of wolf and bacteria numbers.

- All bacteria and no wolves leads to over multiplication of sheep, mass starvation and population destruction.
- All wolves and no bacteria leads to intense predation pressure and population destruction.

### FURTHER IMPLICATIONS

We can see the supreme efficacy of the negative/positive feedback loop. Nature has struck the perfect balance ensuring that the wolf's very strength carries with it its inherent weakness.

Paradoxically it is the susceptibility to periodontal disease of the individual carnivore which confers a survival advantage on the species. The carnivore susceptibility to periodontal disease as opposed to the omnivore and herbivore can be explained thus: In the extreme, herbivores, e.g. sheep, can all be at the brink of death by starvation and then, with the next shower of rain, their feeding fortunes recover. No particular advantages would accrue to the flock which reduced its numbers dramatically at the onset of a drought.

Human omnivores appear to withstand a level of periodontal disease more readily than carnivores. As a cooperative species even periodontal disease affected individuals could be of benefit to the survivability of the group.

Conventional wisdom has it that the immune system is necessary to protect the host. This is a simple, linear 'cause and effect' concept that takes little account of degree or time within the holistic framework. The 'Cybernetic Hypothesis of Periodontal Disease' allows a range of options depending on degree and time. This can be summarized as two functions thus:

- a. In a short time, and with minor challenge, the immune system will provide a minor degree of protection sufficient to protect the host genes and therefore the gene pool.
- b. As either the time frame or the degree of challenge increases, the immune system will provide a major response. This major response will serve to expedite the demise of the host genes. The concomitant of this being that the host gene pool (a critical issue) will be protected.

It is important to note that this graduated response facilitates the shaping of populations. For example, the animal which employs the immune system least will be the best adapted to its environmental niche and therefore have the greatest breeding potential.

### EFFECTS OF PERIODONTAL DISEASE ON DOMESTIC CARNIVORES

There is nothing hypothetical about the effects of periodontal disease on domestic small carnivores shielded from the absolute calorie deficit of starvation. Any periodontal disease should be considered as serious and it should be remembered that more than 85% are affected to a degree requiring treatment.<sup>3</sup> The disease itself is debilitating, beyond that it is the cascade of immune consequences that are so devastating. There is good evidence for the following five sombre categories.

#### Bacteremias, Viremias and Toxemias

In the first instance the inflamed gingival sulcus presents a widened portal of entry for pathogens.<sup>3</sup> Pyrexias of unknown origin are commonplace and the veterinary literature abounds with 'baffling' cases of bacterial arthritis, endocarditis, osteomyelitis, etc. These cases follow on from teething and continue throughout adulthood. The immune system is obliged to respond in the 'normal' way.

#### Hyperimmune Conditions

The immune system did not evolve to cleanse a filthy mouth. When faced with the task it frequently overreacts. Plasma cell pododermatitis of cats,<sup>9</sup>

eosinophilic granuloma complex,<sup>10</sup> exfoliation of teeth, amyloidosis, and others are commonplace examples of immune system overactivity.

#### Autoimmune Conditions

Autoimmune conditions present as a variety of clinical and subclinical entities. One can speculate that the immune response against invading bacteria and toxins becomes vigorous and ultimately misdirected. Examples are the cardiopathy and hepatitis mentioned in the Upjohn poster.<sup>6</sup> Ruptured cruciate ligaments are thought to be due to chronic degenerative joint disease. In turn this could be explained as collagen disease brought about through vigorous destruction of the periodontal ligament.

#### Hypoimmune Conditions

There could be no evolutionary adaptation for immune defense against periodontal disease. As we have seen in the preceding paragraphs, it is a question of the 'efficient and the dead'. Now our domestic carnivores are protected from starvation but their immune systems are required to work constantly in a vain attempt to sanitize the mouth and detoxify the circulating poisons. We have a series of cases documenting middle-aged cats and dogs which had a range of non-specific disease entities and raging periodontal disease. Their white blood cell counts were low or at the low end of 'normal'. The figures are indicative of acquired immune deficiency and due to either toxic suppression or immune exhaustion. Once the problems were corrected follow-up blood tests revealed fifty to one hundred and fifty percent increase in the white blood cell count and a corresponding increase in vitality and general health. So called 'normal' values for white blood cell counts (and maybe other parameters) are likely to be invalid if they were obtained from populations of processed-food fed animals.

#### Multicomponent Immune Disease

In our population of aging pets nothing is ever tightly defined as a single problem. It is common to see flaccid elderly animals with foul mouths and heart, kidney, joint and skin conditions attributable to the preceding four immunological disasters. We use to depend on antibiotics to kill bacteria and corticosteroids to suppress the immune response. Now we correct the periodontal disease and change the diet. These flaccid

