On Dental Caries.

Various names have been given to this affection, according as different writers have taken different views with regard to its nature and cause. Amongst the most common of which are, Caries, Dental Gangrene, and Dental Decay. Caries, however, is the name generally used; although perhaps improperly, seeing this affection bears little
or no analogy to caries, as this disease is often affecting the human
skeleton, but is more probably
more decomposition the result
of chemical agents acting on
the dentine.

There are two principal
theories as to the cause of
dental caries. First, that it
is a vital process, the result
of inflammation affecting the
dentine. Second, that it is
a mere chemical process, the
result of the action of solvents
contained within the mouth.

Those who hold the first theory suppose, that when from cold, or some constitutional cause, a tooth becomes inflamed, the part which suffers most severely is unable to recover from the effects of the inflammation, being preceded if but a low degree of vital power—mortification of that part is the consequence.

Before considering this theory we must look at the
Structure of the human tooth.

The human teeth, according to the best observers, are composed of four tissues: the body which forms the principle part is composed of dentine, it is this which gives shape to the tooth, and immediately surrounds the pulp cavity; it is covered at the crown by enamel; at the root or root, by cirrus petroco, or cementum.

In structure the dentine is composed of an immense number of very fine tubules having distinct
paratus, and passing very near each other through an inter-
tubular tissue. These tubes open at their inner end into the pulp cavity, and from thence radiate through the dentine. No nerves have been detected in this tissue. Blood-vessels have sometimes been seen, but only as exceptions.

The pulp cavity in the interior of the tooth is occupied by cellular filaments and nuclei; and is well supplied with blood-vessels and nerves.
The enamel, forming the hard white covering of the crown of the tooth, is composed of microcopic hexagonal prisms, closely set side by side, with one extremity resting on the adjacent surface of the dentine.

The cementum or cæcata petrosa, almost identical in structure with bone, covers that portion of dentine not protected by enamel, and exists in greatest quantity at the apex of the root. More especially in old people, when it sometimes
blocks up the orifice leading to the pulp cavity.

We must also, before considering the inflammatory origin of caries, look at inflammation as it occurs in other parts, so that we may see what analogy there is between inflammation and caries.

Inflammation is usually considered under three grades. First, simple vascular excitement, which commences with determination of blood to the part. Capillaries, in some
Cases diminished in calibre at the commencement, and then flow of blood, probably retarded: but the capillaries soon become dilated; and the flow of blood increased in rapidity: there is a tendancy to unusual exudation, which, in this stage, is chiefly serous, but may be partly plastic.

Second, Active Congestion - The vascular excitement has extended to the surrounding blood-vessels which are secreting with renewed
energy; the capillaries and minute arteries becoming over distended in the part, and from whatever cause, and this constitutes the principal feature of inflammation. There is an increased increased evaporation of Liquor Sanguinis, with its fibrin increased in quantity.

Third. True inflammation. Capillaries over distended, and their coats becoming soft, spongy, and lacunary. Circulation has almost or altogether stopped in
the part. The capillaries being attached, blood is extravasated in mass; the surrounding circulation unusually active; copious exudation of fluid lympholiquor; suppuration in progress, from extravascular degeneration of exudation, breaking up of tissue.

We may safely affirm then, that inflammation is an affection of the blood-cells mainly, and that we cannot have inflammation unless we have blood-cells in a part. And the
Never can we certain that inflammation has attacked a part, until
we find its products, namely,
sicca, panniculus or pus. These
grades or stages being accompanied
by more or less pain, heat, redness
and swelling.

The results of inflammation
are- Restoration more or less
complete—Enlargement of lesion
Abscess—Ulcers and should action
have been initiated, or vitality of
part low, Gangrene or Mortification.

In inflammation, as it
occurs in bone, there are some slight peculiarities, the bone at first is softened from absorption of earthy matter, so that the bone becomes open, in texture, and porous. The cancellae of the bone are separated; the vascular canals widened; and bone infiltrated with fibrous exudation. Should true inflammation be reached, suppuration takes place, accompanied by intense pain. The results of this action, as it occurs in bone, are, abscess between surface of bone, and
periodic, or in the natural part of the bone, or increased more or less complete of the bone.

We now come to the consideration of the first theory, namely, that caries is the result of inflammation. We have seen what an important part the blood-vascular perform in the inflammation process. And we naturally conclude that inflammation cannot occur in a part, unless supplied with blood-vascular.

In other words, unless a part is vital, hence it has always been a
Matter of the first importance, to prove the vitality of the dentine, by those who hold the inflammatory origin of caries, and the arguments most commonly adduced are.

That matter passes from the blood into the dentine as far as when colouring matters are given along with food, such as madder, when an animal is fed on madder for some time, the dentine is found to be coloured by the madder, as can

from Mr. Hunter's experiments, but these experiments were performed when
the dentine was in course of formation; and as it is formed from the dental pulp, which is well supplied with blood-vessels, we can have no difficulty in seeing how it should be so; but from the same experiment, it appears, that those parts previously formed were not coloured by the madder.

It is also alleged, to prove the vitality of the dentine, that when pressure is made on that portion of a tooth affected with caries, pain is felt; but still from
the close proximity of the pulp cavity, it is not unlikely that the pressure was communicated to the pulp cavity, and perhaps the pulp cavity itself inflamed; the caries condition of the tooth allowing of the free access of acid matters from the mouth to a part now comparatively unprotected, and the inflammatory condition necessitating a return natural sensibility of the part. But, in many cases, no such pain is felt when pressure is made, the
perish from that destruction, which are not so easily acted on by acids, so that the parts near the pulp cavity remain hard and sound, when the external parts are slowly undergoing decomposition, pressure being cast to easily communicated through the texture when hard as when soft and baggy.

It is also frequently adduced, to prove the inflammatory origin of caries, that teeth, to all appearance quite sound, are
frequently the seat of abnormal sensations; and that such teeth when so affected do frequently become the seat of caries; but such abnormal sensations may have their seat in the pulp cavity, or in the alveoli, or in the gum themselves, and not at all in the dentine, which is much more likely, being these parts are all supplied with nerves.

But notwithstanding these objections brought against the arguments in favour of the vitality
of the dentine, since it may not be so entirely removed from the influence of the blood, as many have imagined. Being, it is permeated by such an infinite number of tubes which may very easily convey nutriment to its substance, and remove the waste or effete matter. It is not therefore perhaps impossible for inflammation to occur in the dentine, and it may, and probably does occur in the dentine, but still that is very different from saying that caries is the result of that.
inflammation; for all the changes, which take place in caries, may be explained in a simpler way. And in reality the affection bears little or no resemblance to it, for, in the analogous instance of necrosis in bone, the result of inflammation, the part so affected remains but little changed as asequentum, whereas, in dentine, there is a gradual removal of the dead portion, more especially of the calcareous portion of it: the animal part remaining also in bone there is an attempt
at separation of the dead portion, whereas, in Alveolar, the decay goes on gradually increasing without any such attempt at true separation; from this it appears that the processes are essentially different.

It is very evident then that Caries is not inflammatory in its origin and progress as ordinarily seen.

Next as to the theory which makes Caries to depend on mere chemical decomposition, the arguments in favour of its
being to, the, the peculiar process
and progress of Caries, in which,
the calcarious matter is removed,
and the animal matter left
behind; the continuous manner
in which it progresses; and the
peculiar mode of cure, which is the
removing the decayed portion by
sharp instruments, and completely
filling up the cavity, so enlarged,
by some material which will
resist the action of decaying
agents.

And the fact that human
Teeth, worn as artificial substitutes, are frequently attacked by caries at those points not protected by enamel, hence that caries can occur quite independently of inflammation; for inflammation cannot occur in those tissues after they have been removed from the body.

It is evident then that the condition of caries resembles that which could be produced by corroding agents, much more than the results of inflammation.
as it occurs in other parts of the body.

There must then be some external agent which is capable of producing the caries when it has once gained access to the dentine. And there are many imperfections in the enamel by which these corroding agents may gain admission to the dentine.

The enamel is frequently imperfect in formation, as is very often seen in those of a stream or habit, in whom the enamel...
assumes a honeycomb appearance, being full of small holes.

Cavities are very frequently found in the substance of the enamel.

The fissures naturally existing on the masticating surface of the larger teeth are most unfrequently prolonged into the dentine.

The E teeth are frequently so crowded together, that the enamel becomes completely broken up by the pressure of the contiguous teeth.
The enamel fibres are sometimes but imperfectly united, giving an opaque appearance to the teeth.

It is evident how these imperfections must allow, or facilitate, the entrance to, or action of, matters on the dentine.

This corroding agent, once having gained access to the dentine, decay proceeds with different degrees of rapidity, according to the composition of the tooth.

Those teeth, in which the earthy matter, as Phosphate of Lime
exist in great abundance, are remarkably durable; the teeth present a dull heavy white appearance, are of a medium size, and, as age advances, become a faint yellowish appearance. The enamel of such teeth is seldom deficient, but when it is so, and corroding agents find access to the dentine, decay proceeds very slowly, and the decayed part presents a black appearance.

Other teeth again are of a chalky appearance, or faintly
tinged with blue, and have frequently a rough surface. Such teeth are not durable; decay proceeds with considerable rapidity; there is but a small quantity of earthy liquid, consequently a much smaller quantity of the solvent agent is required; on the solvent agent exerting in considerable quantity, decay proceeds rapidly; the lime being soon abstracted.

Other teeth again are almost of an almost bluish appearance, are long, and thin and very apt to
decay, such teeth are frequently
seen in those who have a tendency
to consumption, and the enamel
also on the teeth of such individ-
uals is very frequently defective,
and the lime is in small quantity.
It would be expected that the
teeth of such individuals should
frequently be affected with caries,
and it is frequently the case that
they are so.

The dentine is composed
of Phosphate of Lime and Animal
Matter, a small quantity of
Carbomate of lime and phosphate of magnesia.

When this composition is considered, it will be evident, that acids will act powerfully on the dentine, removing the latter, and leaving the animal matter which is usually found occupying the caries portion.

In the various parts of the body, which are undoubtedly proceed of considerable vitality, the force of chemical affinity is very much modified, or completely overcome, by the
vital force.

But in a structure, like the dentine, of undoubtedly low vitality, the vital force cannot be regarded with propriety as exerting any influence over the chemical affinities, which, Various matters, brought into contact with the dentine, may exert on its composition.

Therefore any agent, brought into contact with the dentine, which has a greater affinity for the lime existing in the dentine, than the acid, with which the lime is united,
will combine with and remove it from the dentine.

The saliva, as secreted by the various glands, seems to be alkaline; at least during a meal. During the interval between meals, however, it has been supposed to be secreted of an acid reaction; but there must be a great difficulty in determining the latter, since it must indeed be rendered so by the acid mucous of the mouth, as soon as the saliva enters the mouth.

The acids which have been
frequently observed in the mouth and the sources of these acids are very various.

From particles of food becoming lodged about the teeth, and these undergoing fermentation, acetic acid may be formed. Acetic acid or vinegar is also very frequently used as a condiment. Citric acid or lemon juice is also very frequently brought into contact with the teeth. Malic acid also which is contained in the juice of apples, citric, sulphuric, and nitric also as medicines. But besides these acids which are admitted
from without, in cases of hydrocephalus a fluid, of a strong acid reaction is frequently boiled
from the stomach, so very powerful sometimes,
as to cause expiration of the mouth and
nasal.

Now all these acids will, more or less, strongly act on the dentine, and the
wonder is, not that there is so much
disease from so few causes, as those who
hold the inflammatory origin of caries
are in the habit of saying, but that the
disease is not more common, seeing
that the Causes of it are so very Numerous.

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