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GLASS-BLOWERS' CATARACT

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It is well known that proteins coagulate when they are heated. The lens proteins are no exception to this rule. If an isolated lens is heated up to 65°C., cataract appears due to coagulation of its proteins. This fact assumed clinical importance when some writers at the close of the last century and the beginning of the present noticed that cataract was more frequent in workers whose vocation required prolonged exposure to intense heat, especially in those engaged in finishing heavy types of bottles. Robinson (1903) was led to the same conclusion after examining the records of cataract operations done in a glass bottle manufacturing district. He found that 25 per cent of the cases operated on for hard cataract were among the glass finishers. His further enquiry confirmed his suspicion that a peculiar type of cataract was very common in those who had to look at the fierce heat of a furnace (2,500°F.) for at least sixty-six minutes a day, or five and a half hours a week. Although Snell (1907), after an investigation carried on somewhat similar lines, could not confirm this conclusion, Robinson (1907), after examining 40 men engaged in making whisky bottles, published further evidence in support of his earlier view. He asserted that 10 per cent of those examined were found to be suffering from a peculiar type of cataract involving both eyes. The condition has since been recognized in tinplate workers (Healy, 1921) and in chain-makers (Roberts, 1921).

Although two-thirds of Robinson's (1907) cases were in those over 50 years of age, the consensus of opinion is, that the cataract comes on two to three decades before the senile variety.

The cataract produced is in the posterior cortical layers of the lens, and in its early stage is limited to the pupillary region. At the commencement it is like cob-web in structure, and saucer-shaped, with a definite 'brass' colour when seen with oblique illumination. Its outline is irregular. In some cases the superficial layers of the capsule are found to be separated and rolled upon themselves [Elsching (Clapp, 1934)] like a tissue paper singed with heat.

Its progress is variable. Sometimes it is slow (Robinson, 1907), sometimes fairly rapid, and within six months to two years the opacity is complete (Clapp, 1934). No effects on the lids and other parts of the eyes are noticed.

The underlying biochemical changes in this peculiar cataract are not clear, and the opinions on the subject differ widely. Lowenstein and co-workers (Duke-Elder, 1938) believed that, due to an increased permeability of the lens capsule, the essential substances such as glutathione diffused away. Friedenwald (Duke-Elder, 1938) on the other hand, has published experimental results proving the decreased permeability of the lens capsule so that nutrition cannot get in nor waste products get out.

The agent responsible for the production of glass-blowers' cataract has been the subject of much discussion. According to Robinson (1907) this is due to prolonged exposure to intense heat, which causes slight separation of the lens fibres from the capsule. As this separation occurs first near the posterior pole, the opacity is also posterior cortical to start with. The equatorial region, being sheltered from the heat for a long time by the iris, suffers last. Arlt believed the cataract to be due to bright light, but Leber to constant evaporation on the surface of the cornea, and intense sweating. In Peter's opinion the change in the aqueous consequent upon congestion in the vortex veins produced by the act of blowing had something to do with the development of this form of cataract. This view, however, was contested by Crammer (Duke-Elder, 1938) on the grounds that the cataract was usually unilateral, and those engaged in other professions involving blowing did not get it. Crammer (Clapp, 1934) put forth the view that the condition was due to constant exposure to ultra-violet rays—a view already expressed by Finsen. He based his view on the fact that the coarse constituents of common bottle glass, *viz* sand, sodium carbonate and emery (calcium carbonate and clay), produce limelight very rich in ultra-violet rays.

In more recent times, two factors are held mainly responsible for the causation of this particular variety of cataract: one, heat radiation and the other, infra-red rays. Goldmann stated that the cataract was due to absorption of heat radiations by the iris, and the heat was then conducted to the lens; the part of the lens not covered with the iris would remain clear. He showed that the iris of the rabbit absorbed about 98 per cent of the infra-red rays which thus became innocuous; and explained that the cataract in the glass-blowers was caused by continued exposure to heat waves. Goldmann published further experiments to conclude that the heat radiation from the furnace raised the temperature behind the iris, which was responsible for cataract formation. He excluded the infra-red rays from the heat radiations by passing them through iodine

filters. Vogt in 1933 reiterated his opinion first expressed in 1912, and confirmed by Meyer and others, that the cataract was not due to heat waves but to infra-red rays.

The matter being still under more or less active discussion, and being likely to assume some importance in view of the rapid war industrialization, a series of experiments on rabbits were performed to find out, if possible, whether the cause of glass-blowers' cataract was the heat radiations. The scope of this investigation was limited to an enquiry into the following two points :—

1. Can cataract be produced by applications of moderate heat ?
2. If it can be produced, does it conform to the type met with in glass-blowers ?

For the purposes of applying heat, iodine filters were not used as it was felt that their use introduced an unnecessary source of error. Reliance was placed on the current conception that all bodies at certain temperatures emit infra-red rays (Beaumont, 1936), and that metallic bodies emit them in appreciable quantity only when heated to redness, or more especially when heated to dull red heat. For iron that temperature is 500° to 700°C. (Humphris, 1929).

Experiments were performed on six rabbits kept under similar conditions. The heat was applied to the open eye of a rabbit by means of a piece of iron 3/4 inch × 3/4 inch × 3/4 inch attached to a long rod with wooden handle and heated so that it was never dull red hot and the temperature considerably below 500°C. It is therefore assumed that in these experiments heat was imparted to the eye unassociated with infra-red rays. The fact that the cataracts produced were not at all axial also shows that no rays passed through, because otherwise they would have been refracted in their course through the lens and would have produced axial cataract. The time of application of heat was kept constant and the applications were repeated every 24 hours. The results obtained are given in the table.

It will be seen from the table that lenticular opacities developed in all the rabbits, but the time required for their production was variable. The shortest period was 80 minutes, *i.e.* 16 exposures each of 5 minutes' duration. The longest period was 530 minutes (106 exposures of 5 minutes each). In the majority the period was between 180 to 300 minutes.

The type of cataract produced was invariably in the cortex* near the periphery. The shape was variable. In two cases the cataract was sector-shaped, in three it took the form of rounded specks, while in the last it was feather-shaped. In all but one, the opacities produced were permanent. In the exceptional case it

disappeared entirely in about a month after cessation of heat.

TABLE

Serial number	Time required for cataract production	Type of cataract	Shape of cataract	Permanent or temporary
1	36 × 5 = 180 mts.	Peripheral cortical.	Feather-shaped.	Permanent
2	16 × 5 = 80 mts.	"	Rounded specks.	Temporary
3	40 × 5 = 200 mts.	"	"	Permanent
4	106 × 5 = 530 mts.	"	"	"
5	42 × 5 = 210 mts.	"	Sector-shaped.	"
6	92 × 5 = 460 mts.	"	Rounded specks.	"

No changes in the fundus or vitreous were noticed in any animal. All animals suffered from conjunctivitis after varying intervals ; if the heat was discontinued, this rapidly subsided in three or four days. In time the animals became accustomed to heat, and the attacks of conjunctivitis became increasingly rare.

It is clear from the above experiments that permanent lenticular opacities can be produced by heat waves of moderate intensity unassociated with infra-red rays, but that heat cataract so produced is a different entity altogether, and that glass-blowers' cataract cannot be produced experimentally at least by heat alone.

Summary

A brief survey of the subject of glass-blowers' cataract is given, and the various views regarding the agent responsible for its production discussed. An account is given of a series of experiments performed on rabbits in this connection. From the results of these experiments it is concluded that permanent cataractous changes in the lens can be produced by heat of moderate intensity when it is unassociated with infra-red rays, and that the cataract so produced is a separate entity altogether, not conforming to the type of glass-blowers' cataract.

I wish to express my thanks to Professor M. Bashir and Dr. R. A. Sayyed for much help and guidance, to Professor M. A. H. Siddiqui in whose laboratory the experimental work was done, and to Professor A. N. Goyal for permission to keep the experimental animals in his department.

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* It is important to note whether the anterior or posterior cortex is involved. An illustration of the opacities would have been useful.—EDITOR, I.M.G.

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A Mirror of Hospital Practice

ALLERGIC REACTION DUE TO MALARIAL INFECTION

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ALLERGIC reaction in man due to malarial infection is of rare occurrence; in recent years, only 6 cases of malarial urticaria have been reported in India, by Chatterjee (1939), Sen Gupta (1942) and Bhowmick (1943).

The following case came under observation at Koraput in Orissa. The place is an inland plateau, 3,000 feet above sea level. It is a hyperendemic place, where *A. fluviatilis* is the main and *A. culicifacies* the secondary vector. All three common malarial parasites are met with, viz, *P. falciparum*, *P. vivax* and *P. malariae*, named in order of their density. The locality is also notorious for presence of blackwater fever.

Case report

Bengalee male, aged 30 years, native of Balasore District, which is another malaria endemic district of Orissa; staying here for the last three years; had had malaria several times in this locality previously but was free from fever for a year or more.

On 22nd November, 1944, at 1 p.m., he was suddenly seized with severe griping pain in the abdomen with nausea, vomiting, and evacuation of bowels twice in half an hour. Then he developed generalized urticaria all over the body accompanied by much itching.

On examination the following were noted:—

Temperature 99°F., pulse 92 and respiration 26 per minute; tongue moist and clean; spleen and liver not palpable; no abdominal tenderness; eyelids much swollen; conjunctivæ highly congested; arthralgia of the knee, elbow, wrist and ankle joints; stool showed no abnormality; no deviation from the usual diet on the previous day; no family or personal history of allergic diathesis was present.

He was given an adrenalin injection and a mixture containing calcium, bismuth, belladonna and mucilage, which helped him to attend his duties next day.

But on the day following, i.e. on 24th November, he had reappearance of the symptoms, with temperature 104.2°F.

Blood slides both thick and thin showed B.T. ring forms and schizonts, the former in large numbers. From 25th morning he was placed on quinine and alkaline mixtures. He had another bout of fever on the 26th with reappearance of all the allergic symptoms. From the next day he became afebrile with

disappearance of all other symptoms and his peripheral blood became free of malarial parasites at the end of the quinine course.

Discussion

The urticaria and other allergic symptoms were no doubt due to vivax malaria and they responded to quinine. Adrenalin and calcium gave immediate relief but did not effect a cure.

Allergic reactions appeared only during the sporulation of *P. vivax* with liberation of merozoites, waste products of the parasites, and remnants of the ruptured red cells, and that only when the number of parasites reached or exceeded the fever level in blood. Before the clinical manifestation of fever, in the incubation or prodromal stage, there was no symptom whatsoever.

The patient had had malaria in his childhood as well as in adult life, but he had never before such symptoms. No family or personal history of allergic diathesis is present.

Summary

A case is reported showing allergic reactions in the form of urticaria, arthralgia, congested eyes, nausea and griping due to *P. vivax* infection and coincident with the time of sporulation of the parasites.

Acknowledgment

I am thankful to Dr. J. N. Das, Civil Surgeon, Koraput, for permitting the publication of this report.

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ALLERGIC MANIFESTATIONS AFTER SULPHATHIAZOLE

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BERRY recently reported the occurrence of angioneurotic oedema after giving sulphathiazole to a patient. I have also come across such a case.

A Muslim lady, 60 years old, was given 'cibazol' for lupus erythematosus 2 tablets three times a day. In the same evening she developed itching all over the body, more marked on the scalp, face, forearms and hands. These parts became red and slightly swollen, and her eyes became congested with much watering and swelling of the eyelids. This condition subsided on adrenalin injection, but reappeared next evening with slight fever. Then she stopped taking cibazol. Six months later she again took cibazol, when similar symptoms appeared. This time, however, no adrenalin was injected and the urticaria disappeared only on discontinuing the drug.

She had never suffered during her lifetime from any allergic condition, nor is there any family history of allergy. No other sulphadiazole drug has been given to her.