communication from the Ministry of Food). This intake is much below the average for all towns in Britain, and therefore the figures for vitamin C nutrition elsewhere are presumably better. The percentage incidence of scurvy of all medical cases in Edinburgh is much lower than in the hospital in which the investigation was made. This hospital serves mainly the elderly poor, whose vitamin C nutrition is probably lower than that of other classes of the population.

The improvement noted must be credited to the activities and propaganda of the Ministry of Food. Nevertheless it is suggested that so long as the scarcity of fruit exists the concessions at present enjoyed by children and expectant mothers should be extended to the elderly. Scurvy, which is only one evidence of faulty nutrition among the aged poor, will need more than propaganda for its abolition, and it is suggested that the provision for them of clean cheap lodgings, with canteen facilities and very discreet supervision, is one which local authorities might consider as the most practical step.

Clinically the only unusual complaint was lumbago, which it is suggested was the result of small deep haemorrhages in the muscles of the back, and indicates an unusual cause for this complaint in poorly nourished individuals.

The anaemias in the cases investigated showed no new factors so far as the peripheral blood was concerned. Although in no patient was the blood picture completely normal, in some it was very nearly so, and agreement is reached with the opinions of others that (*a*) anaemia and scurvy need not coexist in man (Crandon *et al.*, 1940); (*b*) when they do coexist the anaemia often bears no relation to the extent of the haemorrhages or the plasma ascorbic acid content (Croft and Snorf, 1939); and (*c*) the anaemia is varied in morphological type, being mainly normocytic (Parsons and Smallwood, 1935). The marrow findings were also similar to those recorded by others. These earlier findings were: (*a*) a gelatinous mass with failure of erythropoiesis (1 case) (Harris, 1927–8); (*b*) moderate hyperplasia with scattered small groups of erythroblasts and no fibrosis (1 case) (Mettier *et al.*, 1930); (*c*) one normal marrow, and one megaloblastic marrow associated with macrocytosis and achylia gastrica (Jennings and Glazebrook, 1938); and (*d*) one normal marrow and two showing diminished erythropoiesis (Israëls, 1943). The change from a megaloblastic to a normoblastic type with only dietary replacements was interesting. This has been noted in non-scorbutics with nutritional anaemia with (Groen and Snapper, 1937) and without (Napier *et al.*, 1938) free HCl in their gastric juices. The inference is that the marrow changes in scurvy are not specific.

As regards the cause of the anaemia of scurvy many views have been expressed. In 1930 it was thought confidently that there was a specific anaemia due to vitamin C deficiency (Mettier *et al.*, 1930). Since then, however, many observations have been made. The following are noteworthy: (*a*) vitamin C lack will not affect blood formation (Crandon *et al.*, 1940); (*b*) Hb and red cell regeneration with reticulocytosis occurs in scorbutics on a vitamin-C-free diet (Lozner, 1941; Ungley, 1938); (*c*) ascorbic acid has failed to cure an anaemia in experimental scurvy which did react to germinated oats (Aron, 1939); (*d*) vitamin C was necessary in one deficient individual to prevent the progress of the anaemia (Vaughan, 1934); (*e*) vitamin C is necessary in some deficient individuals before the anaemia will respond to treatment (Kenney and Rapoport, 1939; Dyke *et al.*, 1942). Belief in the need for vitamin C has therefore dwindled, and it has been suggested that the anaemia of scurvy is due to lack of other factors (Croft and Snorf, 1939). The present experience confirms points *a*, *b*, and *e*.

Lastly, as the anaemia of scurvy is due to a complex deficiency, with vitamin C acting only as an adjuvant, and as it is usually moderate in degree, the often-observed absence of reticulocytosis is not surprising. To obtain it, even where the anaemia is severe enough for a good reticulocyte response to be expected, it would be necessary to supply all deficient factors at once—a form of treatment rarely given.

Summary

The social and economic backgrounds in 53 adults with scurvy are detailed, with clinical features including blood changes and biochemical findings.

The causes of scurvy of this type are assessed as ignorance, apathy, and poverty.

The incidence of scurvy in the series is compared with the percentage for the main hospitals in Edinburgh and Glasgow for each year from mid-1937 to mid-1943. The significance of the figures is discussed.

A morphological classification of the anaemia of scurvy is made. The type of sternal marrow in six cases is indicated broadly. The anaemia is shown to be nutritional in origin and to be capable of alleviation in the absence of vitamin C, which is, however, thought to act as an adjuvant to the regenerating factors.

Suggestions are made for the elimination of scurvy.

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URTICARIAL REACTIONS AND DESENSITIZATION IN ALLERGIC RECIPIENTS AFTER SERUM TRANSFUSIONS*

BY

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While a great deal of research has been done on the haemolytic and the pyrogenic transfusion reactions, less attention has been paid to the so-called "allergic reactions." They are said to occur in about 1% of transfusions (Wiener *et al.*, 1941; Hoxworth and Skinner, 1941), and the incidence seems to be the same whether blood or plasma or serum is administered.

Immunologically the word "allergy" covers the changes in reaction towards increased and reduced sensitivity due to the presence of acquired antibodies. Clinically, however, the term "allergic transfusion reaction" is used, in a more restricted sense, for the occurrence of such phenomena as urticaria, angioneurotic oedema, bronchial asthma, and, in rarer instances, shock. It is commonly assumed that the cause of these syndromes lies in the transfusion of blood from the allergic donor to the normal recipient (*Lancet* editorial, 1941; Colonnel, 1943). Scarcely any attention has been paid to the role of the allergic recipient in the production of transfusion rashes, and only one case report of an allergic recipient developing a transfusion rash was found in the literature (Stewart and Bates, 1938). Neither is it yet established whether the first transfusion sensitizes or desensitizes the reacting recipient for subsequent transfusions with human material. Whereas Györgi and Witebsky (1929), Wiener *et al.* (1941), and Kilduffe and De Bakey (1942) believe in the development of an allergic supersensitivity in the interval between repeated transfusions, Young (1942) reported apparent desensitization.

* A report to the Medical Research Council from the S.W. London Blood Supply Depot.

The chief purpose of the present research was therefore to investigate the response of the allergic recipient to injection of human serum and to observe his behaviour to repeated transfusions. The investigations have been carried out in two sections. The first deals with skin tests by allergens and serum, the second with serum transfusions.

One type of human allergy, "atopy," has been investigated in regard to transfusion reactions. The term "atopy" has been introduced by Coca *et al.* (1931) to separate a certain group of allergic manifestations from the hypersensitiveness of infection and horse-serum disease. The term designates such forms of hypersensitiveness as urticaria, bronchial asthma, and vasomotor rhinitis, which have a hereditary basis and in which the hypersensitivity is characterized by special antibodies, the reagins. Reagins are present in the circulating blood, and are capable of sensitizing mucous membrane and skin in such a way that the minute vessels quickly produce an urticarial reaction on contact with the atopens. The best-known atopens are pollen, dust, milk, and egg. Reagins are transferable to normal individuals, sensitizing their skin and their mucous membranes.

Cases

The subjects were divided into three different groups.

Group I: Cases of Bronchial Asthma and Hay-fever (Atopic Types).—A family history of allergy was usually present. The patients, whose ages ranged from 11 to 43 years, gave positive skin reactions to one or more of the tested atopens. Reagins could be determined by passive transfer.

Group II: Cases of Bronchial Asthma (Non-atopic Types).—That this group is distinct from the first is shown by the usual lack of an allergic family history, the higher age group of the patient, negative tests with atopens, no determination of reagins, and the high incidence of chronic respiratory-tract infection.

Group III: Normal Controls.—These subjects gave no allergic family history and did not complain of any atopic symptoms. Atopic tests were negative.

Persons with latent allergy were excluded in this study—i.e., subjects with positive skin reactions but with no clinical history of allergic phenomena.

Part I: Skin Tests

Method.—Dried pooled human serum was reconstituted to normal strength with distilled water and filled into sterile test-tubes of approximately 2 c.cm. content. These test-tubes were kept frozen at 5° F. till required. On the day of use one or more of these tubes were thawed out and a sterile tuberculin syringe was charged with the fluid. To avoid any risk of contamination each tube was discarded after having been opened. Each syringe was used for one tube only, and after use was cleansed in chromic acid and resterilized. For the test, two intracutaneous injections, each of 0.05 c.cm. of the reconstituted serum, were made into the skin of the back in parallel with extracts of mixed inhalants and food in appropriate concentrations and 0.5 c.cm. of carbol saline. Whenever it seemed necessary, single atopic extracts were used.

Estimation of the Skin Reaction for Serum.—The intradermal injection of 0.05 c.cm. of serum produced a raised bleb of 0.8 cm. diameter in each person immediately. A bright flare of about 2 in. diameter occurred around this site of injection and faded after 10 to 15 minutes. A slight wheal formation was often noted as a semilunar swelling of the injected bleb. A reaction of this kind was recorded as negative. The reaction was regarded as positive when the erythema covered a larger area and was still present after twenty minutes, and when, simultaneously, the wheal developed in the whole circumference of the bleb. The size of the wheal was measured after 30 minutes by pressing a glass slide against the skin, and the outlines thus demarcated were arbitrarily recorded as:

Reaction +	Largest diameter of wheal:	1–1·5 cm.
,, ++	,, ,, ,,	1·5–2 cm.
,, +++	,, ,, ,,	more than 2 cm.

It should be made quite clear that a positive reaction was estimated by a quantitative difference and not by a qualitative variation. The method was not found reliable enough to estimate fine gradations, as even with careful work a different reaction was sometimes obtained from two equal injections. Two to three hours after the injection the wheal turned brownish. It usually disappeared within 24 hours. Late reactions in the form of distinct papules were observed rarely when working under strictly sterile conditions.

Results

Series 1: Sensitiveness to Reconstituted Dried Pooled Human Serum (Table I).—Group I: Of 52 atopic patients 40 (77%) gave positive serum tests, 3 of them being +++, 12 ++, and 25 +. Group II: Of 25 persons only 5 (20%) showed positive serum reactions; they were of the low grade. Group III: Of 50 persons 10 (20%) gave positive serum reactions, all of them being of the low grade.

TABLE I.—*Skin Reactions to Intradermal Tests with Reconstituted Dried Pooled Human Serum*

	Group I: Br. Asthma, etc.; Atopic Type	Group II: Br. Asthma; Non-atopic Type	Group III: Normal
No. tested	52	25	50
Negative reactions ..	12	20	40
Positive reactions:			
+	25	5	10
++	12 } 40	— } 5	— } 10
+++	3	—	—

It will be noted that there was a striking contrast between the atopic and non-atopic subjects in their susceptibility to serum tests.

Series 2: Sensitiveness to Fresh Unpooled Human Serum (Autoserum and Isoserum).—Blood was collected into sterile centrifuge tubes from 36 donors and kept at 4° C. for one day. The serum was then pipetted off after centrifugation. It was kept frozen solid until used for testing, which was usually done two days after bleeding. Thirty-six subjects of the atopic and non-atopic types were tested with their own fresh serum (autoserum), with three or four fresh sera from other individuals—also of atopic and non-atopic groups (isosera)—and with one pool of dried serum. Autosera did not cause a reaction in any of the 36 recipients. Isosera, on the other hand, did give reactions in some cases, which also reacted to pooled serum. These positive cases were, as before, in the main atopic subjects. In any one person the reactions to various individual sera were not all equally strong. Furthermore, a single serum which gave the strongest response in recipient X. did not necessarily do so in recipient Y., and vice versa. Positive reactions were not obtained more often with sera from atopic donors than with sera from non-atopic subjects.

Series 3: Sensitivity to Fresh Human Sera of the Four Main Blood Groups.—Three sets of sera were obtained in the same way as in Series 2. A set consisted of four sera—one each of the four main blood groups, AB, A, B, O. For testing each set 12 recipients (both atopic and non-atopic) were chosen, so that there were three individuals of each of the blood groups. Some of the recipients, especially of groups B and AB, were used for testing more than one set, but on different days. Positive reactions occurred in 11 recipients—1 out of 6 AB, 4 out of 12 A, and 6 out of 12 O. The sensitive individuals gave more or less strong positive reactions with all four sera of the main blood groups. The results therefore show no relation between the blood groups of donors and recipients. Of the 11 serum-sensitive recipients 9 suffered from bronchial asthma and hay-fever.

Part II: Transfusions

The fact that 80% of atopic individuals were positive to serum tests suggested that urticarial rashes after serum transfusions might occur more often in such subjects than in other persons.

Method.—Two pools of dried serum, each consisting of about 60 bottles, were used so that a number of atopic subjects and non-atopic controls could be transfused with the same serum. One bottle was reconstituted to normal strength with 400 c.cm. of distilled water. The serum was administered as soon as the dried powder had dissolved completely. Adjustment of the duration of the transfusion to 25 to 30 minutes was aimed at, but in patients who were known to have a high degree of atopic sensitiveness the first transfusion was given at a much slower rate. Whenever a rash appeared during the administration of serum the transfusion was stopped immediately. All persons transfused had been tested previously (Part I). If possible, the test injection of pollen, dust, etc., was avoided on the day of the transfusion, whereas serum tests were frequently applied simultaneously with the transfusion. The transfused persons were under constant observation during the transfusions, and were seen at least two to three times in the next three hours. The temperature and pulse were recorded half-hourly. No transfusions were administered during attacks of bronchial asthma.

Estimation of the Transfusion Reaction.—Up to half a dozen solitary small wheals occurred so often during or after transfusion that they were not considered to be a transfusion reaction. The features of what was regarded as a positive transfusion reaction were a large number of solitary white wheals surrounded by red flares, or many wheals occurring in large erythematous areas. Sometimes the wheals ran together and formed large white oedematous zones. The wheals tended to occur on the back, round the neck, and on the face. It was often noted that the first whealing appeared in areas in which the skin was subjected to pressure. The wheals were usually preceded by itching, which increased in intensity so long as fresh wheals were forming in the skin. In some patients running of the nose, streaming of the eyes, and tightness of the chest

occurred simultaneously. The general condition of the patient was in the majority of cases not affected by the transfusion reaction and no adrenaline was necessary to control the symptoms. Attacks of bronchial asthma were rare, but they were observed even in subjects who had previously suffered only from allergic rhinitis. Very occasionally the rash was accompanied by a marked fall of blood pressure and increase of pulse rate. This state of collapse was successfully treated with adrenaline. The transfusion reactions were recorded as:

Reaction	+	Erythematous patches and 6 to 20 isolated wheals
,,	++	Erythemata and more than 20 isolated wheals
,,	+++ ..	Erythemata and numerous confluent wheals
,,	++++ ..	Collapse in conjunction with rash

The time of onset of a transfusion reaction was in distinct relation to the severity of the attack, the strongest rashes occurring after the shortest incubation period. The majority appeared 10 to 30 minutes after the end of the transfusion, but in a few cases the outbreak was observed one to two hours later. The most severe reactions came on during the administration of the fluid. The duration of a weak reaction was not longer than half an hour, but stronger rashes lasted one to two hours. Rigor and rise of temperature occurred independently of the rashes.

TABLE II.—*Urticarial Reactions after Injection of Reconstituted Dried Serum*

Case No.	Age	Reaction to Skin Tests with				Reactions to Transfusions		
		Known Atopens			Serum	1st	2nd	3rd
		Inhalants		Ingestants				
		Pollen	Dust, Feathers, etc.					
Gp. I:								
1	26	−	++	++++	+	++++	+	±
2	43	−	++	−	+	++++	+	±
3	16	−	+++	+	+	+++	+++	−
4	20	−	++	++++	++	+++	+	−
5	11	++	+++	+	+	+++	+	++
6	22	−	++	+	+	++	−	−
7	23	−	++	++++	++	++	−	−
8	39	++	−	−	++	+	−	−
9	26	−	+	−	+	+++	−	
10	25	−	++	−	+	++	−	
11	35	−	++	−	+	+	−	
12	19	+++	++	++	++	+++		
13	18	++	++	+	+	++		
14	35	++	−	−	+	+		
15	22	++	−	−	+	−	−	
16	27	−	++	−	−	−	−	
17	30	−	++	−	++	−	−	
Gp. II:								
18		−	−	−	−	−	−	−
19–23		−	−	−	−	−	−	
24–26		−	−	−	−	−		
Gp. III:								
27–28		−	−	−	−	−	−	
29–38		−	−	−	−	−		

Results

Series 4: Reactions to First Transfusions (38 Cases, Table II).—17 atopic subjects of Group I, 9 patients of Group II, and 12 persons of Group III were transfused each with 400 c.cm. of reconstituted dried pooled serum. *Group I:* Of the 17 patients 14 developed an urticarial rash (2 ++++, 5 +++, 4 ++, 3 +). Only two of the recipients had reactions of the violent type. One occurred in a boy aged 10, with bronchial asthma, who was sensitive to dust and related inhalants. The urticarial rash developed during the transfusion, after 300 c.cm. had been administered. The boy shortly afterwards complained not only of an attack of asthma but also of severe abdominal cramps. These were accompanied by a sudden fall of blood pressure. The reaction was controlled by adrenaline. The other alarming incident occurred in a young woman aged 26. She suffered from bronchial asthma and was extremely sensitive to egg. After 100 c.cm. of serum had been given her eyelids started to itch and swell. The transfusion was stopped, but the patient became deeply cyanosed. The pulse was 140 and the blood pressure 80/50. She recovered from the atopic shock after treatment with adrenaline and cardophyllin, but suffered from an asthmatic attack for the next three hours. Both these cases had only moderately strong positive serum skin reactions, whereas other persons with much more pronounced skin reactions produced general manifestations of a weaker degree. *Groups II and III:*—Twenty-one subjects were transfused, and no rash was observed in any of the cases.

Series 5: Reactions to Subsequent Transfusions (22 Cases, Table II).—The same pool which had been used for the first transfusion was administered on a second and a third occasion. The interval between the transfusions was usually a fortnight. *Group I:*—A second transfusion was given to 14 patients, 11 of whom had developed a rash on the first occasion. After the second treatment 10 out of these 11 showed definite signs of desensitization: 6 subjects had no reaction at all, 4 got a slight rash, and only 1 reacted in the same way as on the first occasion. A third transfusion was given to 8 subjects, all of whom had produced urticaria when transfused for the first time. Of these cases 7 demonstrated the decrease of sensitivity—5 did not react at all, and 2 showed some erythematous areas but no wheals. Only one boy, aged 11, again developed a rash. Three patients who had been desensitized by repeated transfusions of serum from the same pool were re-transfused with serum of other pools. No reaction occurred. Thus desensitization had been established not only for the pool which had been given during the course of transfusions but also for others. Three patients who did not respond to the first transfusion were equally negative on re-transfusions. *Groups II and III:*—Eight cases were re-transfused and were negative as on the first occasion.

The marked decrease of urticarial rashes in sensitive individuals on repeated transfusions demonstrated the desensitizing power of serum transfusions.

Skin Tests Before and After Transfusion.—Two tests were made with pooled serum. The first was carried out in the recipient 20 minutes before starting the transfusion, and the second was performed towards the end. There was hardly any difference in the reaction in those cases which failed to produce a rash. In those individuals, however, who subsequently developed a rash, the second reaction was about five times as large as the first. It was formed not only by increase of the original bleb but also by coalescence of small wheals which developed in the area of the erythema. This phenomenon, when observed, preceded a general reaction by 10 to 30 minutes.

Discussion

The occurrence of urticaria after transfusion is accepted mostly, without further comment, as an allergic reaction, but the validity of such an assumption seemed doubtful. The literature on this subject is extremely vague. First, skin tests with human serum, which have been carried out occasionally in cases of transfusion rashes to support the allergic theory, usually lack the necessary controls. Secondly, only single cases of transfusion rashes have been reported, and no experiments on a larger scale are found in the literature. Thirdly, hardly any evidence has been published regarding the changes of reaction towards increased or reduced sensitivity after serum transfusions. The results of the present investigations throw some light on the following points.

1. *Local reactions* caused by intradermal injections of serum are indistinguishable in their features of wheal and erythema from those occurring after tests with the known atopens. It seemed plausible, therefore, that this reaction could be looked upon as evidence of allergic sensitiveness, but it had to be kept in mind that not all urticarial reactions are manifestations of allergy. The visible reactions to many substances like histamine, peptone, atopens, and serum are extraordinarily similar. Their relation lies in the common point of attack—the capillary wall. In their mechanism they differ profoundly. Histamine and peptone, as representatives of one group, act directly on the capillary wall. They act in any person. The atopens, on the other hand, produce vasodilatation indirectly as a sequel to their union with their reagins. Thus they react only in sensitized tissues. The present investigations produced evidence in favour of the assumption that local serum reactions are an atopic manifestation. It was shown that positive serum reactions were seldom obtained in normal subjects, but frequently in those individuals who gave positive reactions to the known atopens.

2. The *general urticarial reactions* following serum transfusion are related, in the similarity of the clinical features, to the condition caused by intravenous injections of atopens—e.g., pollen. The onset of the rash is sudden and the duration short. It may be accompanied by rhinitis, bronchial asthma, severe headaches, intestinal spasms, and fall of blood pressure. The same considerations, however, as discussed for the local reaction hold true for the general eruption. Not all attacks of urticaria, asthma, etc., are manifestations of atopy, and the clinical features alone are therefore not sufficient evidence for the atopic aetiology of the transfusion rashes. It was shown by this study that the serum rashes after transfusions most probably constitute atopic phenomena, as they were not observed in the normal controls, but only in the known atopic subjects.

Thus it seems likely that the atopic sensitiveness of the recipient is the cause of these serum reactions, and it is

surprising that the majority of case reports in the literature refer only to the allergic donor (*Lancet* editorial, 1941). Although the role of the allergic recipient is mentioned sometimes in discussions on allergic transfusion reactions (Polayes and Lederer, 1932 ; Kilduffe and De Bakey, 1942) only one case report of an allergic recipient developing a transfusion rash was found in the literature (Stewart and Bates, 1938). Böttner (1924), Brem *et al.* (1928), and Price (1934), considering the sensitiveness of the recipient as the cause of transfusion reactions, do not refer to urticaria and related syndromes, but to febrile reactions. Duke and Stofer (1924), who are also frequently quoted as having observed an allergic reaction in a sensitive subject after transfusion, do not describe a typical allergic syndrome, but a coma.

Nothing is known of the character or source of the atopic substances in human serum. The fact is notable that fresh autosera failed to react even in highly serum-sensitive subjects, and positive skin reactions were observed only with isosera or with serum from pools. The same observation was made by Chant and Gay (1927) in a fairly large series of cases. This may indicate that the reacting substances are foreign to the human body. Furthermore, it is interesting that a serum-sensitive person does not respond equally strongly to different human sera.

Levine and State (1942) claim that the soluble A and B substances produce the positive serum reaction and the serum rashes. No confirmation of their observations has yet been published. Nor was it obtained by the results of the present skin tests with A and B sera.

There is some reason to believe that the presence of extraneous atopens—e.g., food or inhalants—in the transfused serum may be the cause of the serum reactions in sensitive subjects. In this respect Walzer's and Freeman's researches are noteworthy. Walzer (1927) sensitized small areas of normal skin passively with serum from persons who were highly food-sensitive. When the normal recipients, on the following day, ate the corresponding food, the sensitized site responded promptly by producing a wheal and an erythema. This proved the absorption of food atopens from the non-allergic digestive tract. The absorption of pollen atopen from the non-allergic mucous membrane of the nose was shown by Freeman (1925) in a similar way.

3. *Desensitization.*—In the present series 10 out of 11 serum-sensitive subjects, after recovery from a transfusion rash, showed a condition of desensitization on re-transfusion. Thus, on repetition, the administration of serum caused no urticaria or only the slightest rashes in subjects who had reacted previously. The reaction to the first serum transfusion cannot be due to nervous excitement, as several cases had preliminary saline transfusions without reaction. The refractoriness may only be temporary. It was, however, still present in several cases transfused three months after desensitization had been established. The refractory state of transfused atopic subjects resembles the desensitization in anaphylaxis, since sensitive animals surviving a sufficiently strong dose of their antigen do not react to a second dose of the same antigen. That the desensitizing effect can also be produced by whole blood was shown by Young (1942). She investigated the reactions of three subjects who responded with a transfusion rash when receiving blood for the first time. When blood of another donor was used for repetition of the transfusion a rash developed again. On the other hand, when using the same donor's blood for a second time no reaction occurred. Apart from these cases no definite reports on desensitization by transfusion could be found in the literature. Concurrently with the change of reaction to serum there occurred in bronchial asthmatics a marked improvement of the general condition and a decrease of or even a freedom from asthmatic attacks. This may be due to immunological changes. On the other hand, it may be due entirely to psychological factors, as it cannot be denied that transfusion with "normal serum" means in practice for every patient some psychological impression.

Summary

Pooled human serum, dried and then reconstituted, when used for skin tests gave positive reactions in 77% of atopic subjects, but in only 20% of non-atopic. Sera from single individuals also gave positive reactions in the same recipient. Autosera failed to react. The skin-reacting properties of serum were independent of the group-specific substances.

On transfusion, such serum caused "allergic" reactions in 14 out of 17 atopic recipients, but in none of the 21 non-atopic.

On repeated transfusion in 14 atopic and in 14 non-atopic cases no sensitization occurred.

On repeated transfusion, desensitization was observed in 10 out of 11 serum-sensitive atopic cases.

In the course of the follow-up of patients who received serum transfusions a number of cases of homologous serum jaundice were observed. In some of the cases the hepatitis was mild (Loutit *et al.*, 1944), in others as yet unreported acute hepatic necrosis occurred. Further attempts at desensitization of allergic patients with human serum, therefore, are not at present advised in this country.

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INCIDENCE OF BLEEDING GUMS AMONG R.A.F. PERSONNEL AND THE VALUE OF ASCORBIC ACID IN TREATMENT

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Reports appearing in medical journals recording good results obtained by the treatment of various forms of gingivitis with ascorbic acid led to a very large consumption of that substance in the Royal Air Force for the treatment of all forms of bleeding gums. An investigation was therefore carried out between October, 1941, and May, 1942, to discover the incidence of bleeding gums in the R.A.F. and to assess the value of ascorbic acid in the treatment of this condition.

Experiment 1

This experiment took place at three R.A.F. stations during October and November, 1941. At each station all personnel available were examined, except those already taking ascorbic acid, those being treated for acute ulcerative gingivo-stomatitis, and those with no teeth. About two-thirds of those examined were airmen ; the remainder were airwomen and soldiers, with a few officers, sergeants, and naval personnel. The majority of subjects in this and later experiments were between the ages of 18 and 25. All those included in this experiment had been living on Service rations for six months or more. An estimation was made of the ascorbic acid content of the airmen's food during the experimental period and in the early spring of 1942.