that, let the station they select be ever so healthy, a warm climate has the tendency of lessening the power which the body possesses of generating heat; consequently, cold, even to a moderate extent, will be felt much more keenly by them than it would in a colder country. Few escape a chilly sensation on the coast of the Mediterranean, when, after being out in the sun at a temperature of 65 deg. Fahr. (blackened bulb-thermometer graduated on glass, and freely exposed to the sun, a thermometer in the sun against a shutter showing 93 deg. Fahr.), a spot in the shade is reached at a temperature of 52 deg. Fahr. (readings observed on January 30th, 1874, at noon). This feeling of cold is not so much the result of contrast, as is usually thought to be the case, as of the fact that the body is deprived, by the high temperature in the sun, of the power of producing the necessary amount of heat in the shade. It becomes accustomed to rely upon the sun for the temperature it requires for the performance of its functions, and, when no sun is to be had, a feeling of cold is at once experienced.

What are, therefore, the best means of preserving health in a warm winter climate? As so much heat is derived from the direct action of the sun in the day time, it will be important to restrict the heat-generating power of the body by taking but a moderate amount of food; moreover, as the sun's heat must be productive of motion in the body, commencing probably with an increased action of the heart and excited state of the circulation, it is advisable to avoid any additional stimulation, such as that which would result from alcoholic beverages, in any but very moderate quantities. Invalids wintering in the south of France should be careful not to sit down in the sun; however tempting this may be, it is much safer for them, I believe, to keep walking on slowly, watching the ripple on the blue water of the Mediterranean, or the foam as it blows about on a gentle breeze, or the waves as they curl over gracefully in regular succession breaking upon the beach. The main point is to give the heat absorbed a sufficient quantity of work to do in the body, so as to use it up, otherwise it is pretty certain to do mischief. Thence I should conclude that a moderate degree of muscular exercise, while out on a hot sunny day in a warm climate, is beneficial. It is true that muscular exercise, although it requires heat for its performance, also promotes the formation of heat by exciting the circulation and respiration, thereby causing the consumption of an increased quantity of oxygen; but muscular movement must, it appears to me, begin by making use of the heat obtained directly from the sun, which is within immediate reach, thus lessening the necessity for heat-production by the body.

A high temperature of the body in disease is probably owing to the united action of a number of different causes. In fevers, the total amount of urea excreted, and the quantity of carbonic acid expired, being greater than under normal conditions, it is usually thought that increased oxidation is the source of excessive heat. Now, under normal circumstances, the amount of food taken is considered as regulating the excretion of urea; and consequently, in health, a great excess of urea may be formed without any rise of temperature. This oxidation-process, consequent on the ingestion of food, must be a source of much heat in addition to that formed while fasting, and which is clearly taken up by some function also related to the ingestion of food, otherwise the body would necessarily become warmer. The function thus supplied with potential heat must be that of *nutrition*, which I consider as including all the phenomena connected with digestion and the formation of tissues. By taking food after fasting, or increasing the amount of food taken, an additional formation of heat is produced, together with increased nutrition; and the amount of heat generated must be exactly proportional to the degree of nutrition necessary for its consumption. In fevers, we have an excessive formation of urea, while very little food is taken, and where, consequently, the function of nutrition must be all but in total abeyance. The rise of the temperature is therefore owing, it appears to me, quite as much to the arrested function of nutrition, as to the increased production of urea, if not more so.

Taking the present view of high temperatures in fevers, we shall conclude that they are due to the disturbed balance between oxidation and nutrition, or between the formation and consumption of heat in the body; and the same remark will apply to increased temperature in phthisis and inflammatory diseases.

Wunderlich expresses a similar idea in his work on *Medical Thermometry* (translated by Dr. Bathurst Woodman). He states (p. 193): "A general elevation of temperature may also occur through an extensive overproduction of heat, resulting from chemical processes which are more or less unknown in the healthy body, by means of which so much heat may be generated that the channels of heat-abstractors are quite unable to compensate it; whilst in these also, through the extension of the disturbance, irregularities and anomalies may be developed. Very much, indeed, may be said for this; and something of this sort occurs in very many cases of fever."

Another circumstance in favour of the view which I am advocating is, that the excess over the normal degree of oxidation (supposing the heat resulting from this normal degree of oxidation to be absorbed or used up) is apparently insufficient to account for the excessive heat in fever. Wunderlich (p. 193) clearly expresses his opinion that such is the case, and that the weight actually lost by the body in fever does not correspond with the amount of destruction of the constituents of the body which might have been preconceived as resulting from the increased production of heat. Murchison, in his admirable treatise on the *Continued Fevers of Great Britain*, remarks (p. 15): "The preternatural heat of fever is the result of vital and chemical action exalted above the standard of health, assisted perhaps by a disturbance of the processes by which heat is carried away." He therefore suggests a possible cause of increased temperature which is usually little thought of, namely, the lessened consumption of heat in the body.

Indeed, the more I look into this subject, the more it is apparent to me that the diminished activity of the various functions in disease is intimately connected with increased temperature of the body.

This excess of animal heat in disease, which is commonly considered only as a symptom, is necessarily a serious cause of morbid action, as it must be employed in doing work. A portion, it is true, is lost by radiation, but the remainder is a source of motion; and, as most of the functions are in a state of abeyance, this agent exerts its power on the heart, and is a means of exciting perhaps abnormally those chemical changes which take place in the blood and tissues. It is therefore of much importance to effect, if possible, a reduction of the temperature in diseases attended with increased heat of the body; and, without entering at present into the merits of cooling baths, the rule for attaining this object must be to aim at increasing the various secretions, taking care lest they should be productive of too great a drain upon the system. Purgative medicines will be useful by causing heat to be absorbed towards the formation of the intestinal secretion; and I believe this is the explanation of the beneficial action of purgatives in many different affections and minor complaints. Again, Turkish baths and vapour baths, and the various means for promoting perspiration, will be advantageous, by causing an absorption of that amount of heat necessary to the increased exercise of this function. Any method calculated to bring on free perspiration without requiring the use of heat may be expected to prove one of the most efficient agents for lowering the temperature of the body in disease; and on that account I feel assured that no means of diaphoresis is so effectual as the application of the wet sheet. The well known fact that a return of perspiration frequently succeeds in reducing the temperature and lessening the action of the pulse in febrile affections is a strong argument in favour of the view I am advocating.

I might continue adding largely to the present remarks, but hope they will suffice to show the importance towards the maintenance of health of endeavouring to transform the sun's heat into motion in the body, and also to draw the attention to one of the causes of increased temperature in disease, together with the means of counteracting it by transforming the excess of heat, or at all events part of it, into physiological motion.

ON PYÆMIA.

By J. HUGHES BENNETT, M.D.,

Professor of Physiology and of Clinical Medicine in the University of Edinburgh.

I HAVE been greatly interested in the discussion which has taken place on pyæmia in the Clinical Society of London. Nothing could be more reasonable than the suggestion of Mr. Hulke, that there should be a clear understanding as to what the Society were talking about. "It appears to me", he is reported to have said, "that Dr. Bastian's remarks are most pertinent on the question of septicæmia, but I do not see their bearing on the subject of pyæmia". In truth, in this, as in many other discussions which take place in medical societies, accurate definitions and logical precision of language have been too frequently forgotten. A notable example was presented last year, in a discussion which took place in the Pathological Society of London, on the subject of tubercle. In no sense whatever could it be said to have advanced our knowledge, all the speakers apparently having puzzled themselves and bewildered one another, in a vain effort to explain German mysticisms, and apply new terms to very old and well known morbid conditions. The confusion which prevailed on the subject of pyæmia may, I think, be dissipated; and I propose, in this short communication, to make an effort to do so.

The term pyæmia was introduced by Piorry, and literally means pus in the blood, or purulent blood. He supposed that the formidable symptoms which constitute the dread of surgeons, namely, the rigor,

typhoid fever, depression, and multiple abscesses, generally terminating in death, following operations or injuries, were owing to pus in the blood. However the pus was introduced, whether by absorption from wounds, or from phlebitis, or from an imaginary lesion he called hæmitis, or inflammation of the blood itself, the result was purulent blood, or pyæmia, and the cause of the fatal symptoms. But M. Piorry was no histologist. Had he examined the blood with a microscope, he would have found no pus-cells there; for, in fact, the blood of pyæmia contains no pus. Our present knowledge, therefore, demonstrates that the disease called by practical surgeons and obstetricians pyæmia is not necessarily caused by pus in the blood. This is further shown by the fact that if, as Mr. Hulke truly stated, we inject recent or so-called laudable pus into the blood of an animal, it produces no injurious effects. I have frequently performed this experiment (*Clinical Lectures*, 5th ed., p. 906), as have Sédillot and other pathologists. But, if putrid or ichorous pus be so injected, then we have the symptoms of so-called pyæmia; and the same result occurs if we inject putrid fluids, irrespective of purulent formations. It follows, therefore, that it is not pus, as pus, which produces the mischief, but any organic fluid in a state of putrefaction, that causes the blood-lesion, and, as a result, the group of symptoms now called those of pyæmia. That pus is easily decomposed has been long known; and to the absorption of that fluid, when putrid, the French surgeons Boyer and Bonnet, many years ago, attributed the noxious effects referred to as pyæmia. This condition was well named by Vogel ichorrhæmia, which is one of the varieties of septicæmia.

It appears to me, therefore, that Mr. Savory expressed the correct view on this subject, but did not appear to see that the term pyæmia ought to be abolished from medicine and surgery, and that the form of septicæmia to which he referred is correctly expressed by the term ichorrhæmia. In what the nature of septicæmia consists, is unknown. Why one variety should produce the phenomena of small-pox, another of measles, and a third of ichorrhæmia, we are ignorant. It is the same ultimate fact in pathology that exists in therapeutics, in reference to the proportion of different poisons or drugs. All we can do is to guard against the morbid influences, or modify them when present. It is in this point of view that the observations of Dr. Bastian are of direct practical importance. All trustworthy research indicates that the poisonous properties are not attached to imaginary germs constantly floating in the atmosphere, but rather to the ultimate molecules of organic matter, animal or vegetable, which belong to or enter the economy. I believe these not to be hypothetical, but visible molecules, detectable by good microscopes, and that, in the case of ichorrhæmia, the histological examination of the granulations of, and discharges from, suppurating surfaces will do much to indicate how and when they are to be removed or destroyed.

Although I have endeavoured to show that, in the morbid condition called pyæmia by practical surgeons, there is no purulent blood, and that the expression is wholly inapplicable, there can be no question there is a true pyæmia, or suppuration of the blood. This I described so long ago as 1845 (*Edinburgh Medical and Surgical Journal*, October 1845), in a case where I found, in a case of hypertrophied spleen and liver, that the blood was crowded with pus-cells. But, in that case, I took great pains to show that there was no inflammation anywhere in the economy—no suppurating sore, no phlebitis. Nevertheless, as I had no doubt that pus existed in the blood, I called the case one of suppuration of that fluid without inflammation. But the pathologists of that day could not comprehend the existence of suppuration without inflammation, and hence I subsequently called the morbid condition I discovered leucocythæmia, or white cell-blood, because that term “expresses the simple facts, or a pathological state, and involves no theory”. By some, it was supposed that the colourless corpuscles of the blood were different from pus-cells, and that they rendered the blood white, producing the white blood of Hippocrates. This error still prevails among the German pathologists, who call this morbid condition leukhæmia. It is now, however, recognised that pus-cells, lymph-cells, young mucus and epithelial cells, and the colourless cells of the blood are identical, and hence Robin has applied to the whole group the name of leucocytes, or white cells. To have retained the term suppuration of the blood, or true pyæmia, in face of the constant employment of this last term by surgeons, to express a fatal poisoning of the blood, could only have led to confusion; although, as a matter of fact, leucocythæmia is the only purulent blood known in pathology, and the only suppuration of that fluid with which we are acquainted.

I propose, therefore, in order to avoid the confusion which now prevails from the incorrect employment of terms that can only mislead, to suggest the following definitions.

Septicæmia.—Poisoning of the blood from every source—a general term.

Ichorrhæmia.—Poisoning of the blood from ichorous matter or decomposed pus.

Leucocythæmia.—White cell-blood; excess of colourless cells in the blood.

Leukæmia.—White blood, from excess of fatty matter in the blood, so-called chylous or milky blood.

Pyæmia.—This term has no meaning, unless applied to ichorrhæmia or leucocythæmia. Its employment can only lead to confusion.

THREE CASES OF BLOOD-POISONING OCCURRING IN PRIVATE PRACTICE.

By G. H. EVANS, M.B., F.R.C.S.,
Acting-Surgeon to the Children's Hospital, Birmingham, etc.

THE following cases, three in number, I have ventured to place on record, as illustrating an outbreak of erysipelas, and two allied forms of blood-poisoning, which have lately come under my immediate notice, in a presumed healthy house, situated in an undoubtedly healthy suburb of Birmingham. The cases are of some interest as bearing upon the several communications which have lately appeared in the medical periodicals, on the subject of erysipelas and its allied complaints, as occurring in hospital and private practice. I refer more especially to the address of Mr. Prescott Hewett to the Clinical Society; and to a clinical lecture by Mr. Jonathan Hutchinson, delivered at the London Hospital.

During the early part of the present winter, a gentleman, holding a leading position in this town, about 60 years of age, had determined to submit to an operation for the removal of a small tumour, situated under the right lower eyelid. The tumour had existed for some years without giving rise to any inconvenience; latterly, however, it had occasionally caused oedematous swelling of the neighbouring parts, and had also increased in size. Thus a suspicion of malignity was entertained, and its removal was recommended by Mr. Solomon and myself. The patient was stout, of loose fibre, otherwise apparently in good health, never having suffered from a serious illness in his life. He was somewhat of a lethargic temperament, rarely taking the exercise which his excellent appetite, and consequently large consumption of solid food, demanded; as regards the use of stimulants, he was very moderate. With a view to the operation, he had spent a month or six weeks at the Isle of Wight. The operation was performed by Mr. Solomon, with my assistance, the patient being under the influence of chloroform. The tumour, which was about the size of a small hazel-nut, proved to be more firmly adherent to the lower border of the orbit than was anticipated, and necessitated the removal of a small portion of bone. Microscopically, its structure was found to be principally of a fibrous nature, with many small nucleated spindle-shaped cells mixed indiscriminately with the fibres; hence falling under the category of the fibro-sarcoma of Billroth.

On the second day after the operation, a violent shivering fit and vomiting occurred, followed, on the morning of the third, by an erysipelatous blush, and polished appearance of the skin, in the neighbourhood of the wound, with, towards the evening of the same day, a temperature of 102.0 Fahr., a full bounding pulse of 124, and other symptoms of fever.

During the next fortnight, the patient passed through a somewhat severe attack of simple erysipelas of the face and head, accompanied with delirium. The eruption then gradually passed from the scalp on to the back of the neck and shoulders, assuming the character of erysipelas ambulans, involving in turn the whole of the back and loins, and finally, at the end of a month from its first appearance in the neighbourhood of the wound, fading away on the buttocks and the upper part of the thighs. During the whole of the course of the complaint, more especially in its earlier part, there were considerable dysphagia and dyspnoea. These symptoms were explained by the obvious oedema of the fauces and pharynx, and the presumed similar state of the larynx, no visual examination of the latter being possible.

After the eruption had left the head, the fever gradually abated, and, with some variations, continued until its disappearance, about the thirtieth day of the disease, leaving the patient, however, in a very exhausted and feeble state, the radial pulse being small and compressible, and the heart-sounds more than usually enfeebled. Some ten days afterwards, I paid my last professional visit, with a caution to the patient himself, and a still more distinct warning to his attendants and friends, not to permit any undue bodily exertion or mental excitement, fearing that, from the feeble state of his heart, serious syncope might occur. This warning, I afterwards heard, he neglected, in many ways exerting himself beyond what his then powers of endurance warranted.