The ioduretted waters of Cheltenham : their nature, properties and application to the cure of various forms of disease / by D.W. Nash.

Richard Smith Esq^r
with the Author's Compl^ts & regards

THE IODURETTED WATERS OF CHELTENHAM,

THEIR NATURE, PROPERTIES, AND APPLICATION, TO THE CURE OF VARIOUS FORMS OF DISEASE.

BY

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Of the Bengal [illegible]ember of the Royal College [illegible]on, &c. &c.

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H. DAVIES, S. C. HARPER, J. LEE, J. LOVESY, T. E. WELLER, W. WIGHT, G. A. WILLIAMS.
LONDON: T. HURST, 65, ST. PAUL'S CHURCHYARD.
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1st Ed

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THE IODURETTED WATERS OF CHELTENHAM.

THE number of the treatises which have been written on the Cheltenham mineral waters, is not inconsiderable, nor are those productions without value; their authors have been for the most part men of ability and professional reputation, and have well illustrated the subject which they undertook: but not one of those treatises has ever alluded to the presence of a most active and useful mineral substance contained in some of the Cheltenham saline waters, to the diseases in which it is found to be beneficial or the proper mode of its application. Nor could this be otherwise, since no medical treatise on the mineral waters of Cheltenham has appeared since the discovery of the presence of iodine in a spring at the Montpellier Spa in 1833, with the exception of an

anonymous publication,* in which that most important mineral water, the "Ioduretted saline" is only casually mentioned as "likely to be of great utility." The subject, therefore, can hardly be considered as worn out; on the contrary, that portion of it to which the present pamphlet is devoted, has never been entered upon, and it is to be hoped, that by calling the attention of the public to a comparatively new feature in the mineral waters of this celebrated resort of invalids, much good may be effected, and new curative methods pointed out in many distressing and most unmanageable disorders. Such is the object of this short treatise, which, without assuming any undue importance, and without any imputation on the value of its predecessors, lays claim to the merit of being the first to show the intrinsic value and practical utility of the "Ioduretted Waters of Cheltenham."

These waters derive their principal curative virtues from the presence of a mineral substance of a very energetic nature, acting on the human body, when judiciously administered, by exciting to increased action the vessels of the absorbent system. This substance is Iodine, an elementary or undecompounded principle,

*The Cheltenham Waters, &c. 1836.

analogous in its chemical relations to chlorine, bromine, and fluorine. In appearance it resembles small scales of a greyish-black colour, and metallic lustre, becoming a violet coloured gas, at a temperature below that of boiling water. It is from this violet colour of the vapour of iodine, that the name given to it is derived from the Greek word "ιωδης," a violet.

The value of iodine, as a therapeutic agent, has, within a few years only, been really and fully understood. Long known and appreciated as a powerful means of increasing the action of the absorbent vessels, and facilitating the removal of tumors, especially when seated in the glandular organs of the body, its utility and application were for a long period circumscribed by its devotion to such cases alone.

In the present day its employment is no longer confined to bronchocele and enlargements of the lymphatic ganglia, but is extended to a great variety of disorders, and with the most brilliant success. Diseases which had been considered the opprobria of medicine, which had baffled the skill of the practitioner, and set at defiance all attempted methods of cure, have yielded to the influence of this modern discovery. Scrofula, cancer, obstinate eruptions, bronchocele, long standing

affections of the joints, &c., have rapidly disappeared before its beneficial agency: and we may with reason expect, that every day will add to our knowledge of the best methods of availing ourselves of its powers, and thus increase a sphere of utility already so extensive.

Medical practitioners and the public in general, were well acquainted with the excellent effects produced by the employment of burnt sponge, in those obstinate swellings of the neck, known by the name of goitre. The efficacy of burnt sponge in this complaint, was solely and entirely owing to its containing a minute portion of iodine.

The accidental discovery of this latter substance, in 1812, by M. de Courtois, a manufacturer of saltpetre at Paris, opened out a fertile source for the supply of one of the most powerful remedies of which our Pharmacopeia can boast. M. de Courtois having remarked, that the iron vessels in which he operated on large quantities of sea weed, for the sake of the soda which they contain, became very rapidly corroded, was induced to examine into the nature and cause of the corrosive action, and was rewarded by the discovery of a new elementary body hitherto unknown to chemists. Since that period iodine has been found in a great variety of sea weeds, in

many marine animals, such as the oyster, venus, doris, &c., in several species of zoophytes, in sea water, in many mineral waters, and amongst others in several of the saline springs of Cheltenham.

The presence of this mineral substance in the Cheltenham saline waters is not difficult of explanation. These springs derive their origin from the strata of the new red sandstone formation, underlying the great lias formation of clays and limestones, on which the town of Cheltenham stands. The new red sandstone in which the springs originate, continuous with the strata of the same kind, of Worcestershire, Lancashire and Cheshire, is a formation of marine origin, and strongly impregnated with saline matter, to which the salt mines and numerous brine springs of Worcestershire and Cheshire, bear ample testimony. The very small quantity of iodine contained in sea water, exists in the form of hydriodate of soda, and it is in this form that it is most frequently met with in mineral waters. The particular circumstances connected with the derivation of these minerals will presently be considered. The Cheltenham saline springs, so long and justly celebrated for their remarkable efficacy in cases of glandular and cutaneous disorders, in obstructions and torpid states

of the secreting organs; in scrofulous and asthenic complaints, and in debilitated states of the constitution, have no doubt owed a considerable portion of their reputation to the unrecognized fact, that many of them contain iodine in combination with an alkaline base.

On the continent, many mineral waters which have long been successfully employed in the cure of scrofula, goitre, and long standing glandular swellings, have been found, on being submitted to chemical analysis, to contain either free iodine or some salt of hydriodic acid.

Indeed, it appears very probable, when we consider the sources of these saline springs, that iodine exists in all waters which take their rise from strata of marine origin, and which contain a large proportion of the chloride of sodium; but in many instances it is in so very small a quantity as not to be discoverable by chemical analysis, and is quite unimportant in a medical point of view.

Another simple elementary body very nearly allied in its nature and properties to iodine, is also contained and far more abundantly than the latter, in sea water. It exists also but in smaller quantities, in many mineral waters, and in some marine plants. It is obtained most abundantly from the mother water of salt works, and

derives its name of bromine, from the Greek word "*βρωμος*" *fœtor*, on account of its very offensive smell. It is very frequently found associated with iodine, but in general where one of these minerals is present in large quantities, the other is either nearly or altogether deficient.

Thus in the Middlewich brine spring in Cheshire, which contains more than one grain and a half of bromine to the pint of water, only a trace of the presence of iodine can be discovered, while in the iodurettted waters of Cheltenham, bromine is either absent or in barely appreciable quantity.

Where it does exist in the Cheltenham waters, it is in the state of hydrobromic acid, in combination with either soda or magnesia, the state in which it is most frequently found in nature.

Hitherto, bromine has not been much employed in medicine. M. M. Pourché, and Barthez, have published some observations upon its medicinal properties, in which they report several cases of its successful employment in scrofula, goitre, and enlarged glands. These trials have been repeated by others with equally good results, and tend to prove, what reason and analogy had before shown to be extremely probable,

that the action of bromine on the animal economy, and its power over certain forms of disease, resemble, in most particulars, those of iodine, to which substance it is so nearly analogous in all its chemical relations.

As all those Cheltenham saline springs in which compounds of bromine have been detected, contain much larger proportions of iodine, the value of these waters as curative agents may be attributed, in the calculation of their effects to the iodine alone, leaving out of consideration the hydrobromates, which, though not without their share of efficacy, are in a state of such extreme division as to be almost inappreciable in their effects upon the system.

To this statement, however, there is one exception: in the saline spring, No. 1, at the Pitville Spa, bromine exists in a larger quantity than iodine, though even here the proportion is extremely small, not exceeding one grain of bromine to rather more than six gallons of water, or one fiftieth of a grain to a pint; while of iodine there is to be found only a trace. This is the only instance of the kind in the Cheltenham springs, and must be attributed to some particular modification in the locality whence this spring arises, assimilating it more nearly to some of the Leamington springs, as

regards the quantity of bromine, than to any other spring in Cheltenham.

But when setting aside the consideration of bromine as a medicinal agent, owing to the extremely minute quantity in which it exists in the ioduretted waters, it should not be forgotten, that this very condition is the most favourable to their action on the constitution. The combinations naturally formed in the subterranean laboratories, and the diffusion of the solid matters to which the waters owe their curative virtues, in a state of minute division, through a large quantity of fluid give to these mineral springs a value and an efficacy, which therapeutists vainly try to imitate in their artificial solutions; and many circumstances tend to show, without yielding to the absurdities of those who preach up the false doctrines of infinitesimal doses of medicine, that certain powers of remedial agents may be obtained by the passage into the circulation of quantities of medicine far more minute than would formerly have been conceived capable of producing any appreciable effect. The inoculative method of applying medicines lately introduced by some able continental physicians, sufficiently demonstrates the truth of this assertion. These remarks particularly apply to iodine; given in

even moderate doses it seldom fails to produce, after a certain period, unpleasant symptoms, in the shape of sickness of stomach, diarrhea, headache, and sore throat. Occasionally, indeed, if injudiciously employed and too long continued, iodine produces what has been called by M. Coindet, an iodic saturation of the whole system, attended with peculiar and alarming symptoms, which, though soon controlled by appropriate measures, should always be carefully guarded against. If no other evil attended these evidences of iodic saturation, they necessitate the discontinuance of the remedy, though the object for which it has been given, has most probably not been accomplished.

But in iodurettted mineral waters, nothing of this kind is to be apprehended. The extremely minute state of division in which the mineral exists, sufficiently guards against the occurrence of evil from its administration, while its combination with alkaline aperient salts, and with minute doses of iron in the same water, or with the saline aperients alone, presents remedial means of the highest value in a very great number of the disorders to which the human frame is liable.

The various mineral waters of Cheltenham have been repeatedly analysed, and with nearly the same results,

until the discovery of iodine by Mr. Cooper, in sufficient quantity to render it of importance in a medical point of view, in a newly found spring at the Montpellier Spa, in 1833. Dr. Scudamore had previously ascertained the presence of iodine in three of the Cheltenham springs, viz.: the Old Well, No. 1; the Old Sherborne now Imperial, No. 4; and Thomsons, No. 2; but as the greatest quantity of the mineral in the strongest of these springs does not amount to more than one grain in thirty gallons of the water, the honor of the discovery of the iodurettted waters, properly so called, may fairly be attributed to Mr. Cooper.

The following are the latest analyses of the mineral waters of Cheltenham, by various chemists, taken from several treatises and other public sources, which analyses have furnished me with the data whence the therapeutic value of each spring has been calculated.

MONTPELLIER SPA.

No. 1.—Saline Chalybeate.

Specific Gravity, 1.005

Gaseous contents in a Pint :

Carbonic acid gas . . . . . 2.5. cub. in.

Saline contents:

Sulphate of soda	14.7
" of lime	1.3
" of magnesia	4.0
Muriate of soda	27.0
Bicarbonate of soda	1.1
Oxide of iron	.3
Hydriodate and hydrobromate of soda	a trace
	48.4

This water does not enter into the list of iodurettted waters, though containing both iodine and bromine; the quantity of either mineral being too minute to be of practical utility.

No. 2.—Sulphuretted Saline.

(Sulphurioduretted Saline.)

Specific Gravity, 1.008

Gaseous contents in a Pint:

Carbonic acid gas	0.4 cub. in.
Sulphuretted hydrogen gas	1.6 cub. in.

Saline contents:

Muriate of soda	35.3
Sulphate of soda	28.4

Sulphate of magnesia	7.2
" of lime	3.1
Oxide of iron	.42
Hydriodate of soda	.15
	74.57

This is a very valuable water, and will prove particularly serviceable in cutaneous disorders, containing as it does two remedies of such known value in those complaints, iodine and hydrosulphuric acid. From the circumstance that this water contains precisely the same quantity of iodine as the succeeding one, it will be convenient to separate it from the simple iodurettted waters, which may then be arranged and numbered according to their strength.

No. 3.—Weak Sulphuretted Saline.

(Iodurettted Saline, No. 1.)

Specific Gravity, 1.007

Gaseous contents in a pint:

Carbonic acid gas	0.4 cub. in.
Sulphuretted hydrogen gas	0.7 " "

Saline contents:

Muriate of soda	32.3

Sulphate of soda	26.5
" of magnesia	6.1
" of lime	3.3
Oxide of iron	.41
Hydriodate of soda	.15
	68.76

This and the preceding water contain each, one eighth of a grain of iodine in one pint of the water, and as the quantity of hydrosulphuric acid in this water is much less considerable than in the preceding sulphuri-oduretted water, I have thought it better to commence the series of iodurettted waters with this one which contains the smallest proportion of the mineral, and from which a regular gradation will be found up to the strongest, or that which contains the greatest proportion of iodine.

No. 4.—Pure Saline.

Specific Gravity, 1.009

Gaseous contents in a Pint:

Carbonic acid gas	1.4 cub. in.

Saline contents:

Muriate of soda	52.4

Sulphate of magnesia	14.2
" of soda	17.2
" of lime	2.7
Bicarbonate of soda	1.2
Carbonates of lime and magnesia	1.1
Hydriodate and hydrobromate of soda . .	a trace
	88.8

This well known aperient saline does not enter into my list of ioduretted waters, being in the same condition, with regard to iodine and bromine, as the saline chalybeate water No. 1; containing about one grain of the former in 30 gallons of the water.

No. 4, " A."—Ioduretted Saline.

(*Ioduretted Saline, No.* 3.)

Specific Gravity, 1.0101

Gaseous contents in a Pint:

Carbonic acid gas	1.6 cub. in.
Sulphuretted hydrogen gas	a trace

Saline contents:

Muriate of soda	51.4
" of lime	8.3
" of magnesia	7.5

Sulphate of soda	14.0
" of magnesia	17.1
" of lime	2.1
Bicarbonate of soda	2.4
Carbonates of lime and magnesia . . .	3.2
Hydriodate of soda	.25
	106.25

This is the spring which was first analysed by Mr. Cooper, in 1833; it contains one fifth of a grain of iodine in every pint of water. It is the most valuable of all the iodurretted waters yet discovered, with the exception of the one following, which, however, from its containing both iron and iodine, requires more caution in its administration.

No. 5.—Chalybeated Magnesian Saline.

(Iodurretted Saline, No. 4.)

Ferriodurretted Saline.

Specific Gravity, 1.009

Gaseous contents in a Pint:

Carbonic acid gas	1.2 cub. in.

Saline contents:

Sulphate of magnesia	47.0

Sulphate of lime	3.1
Muriate of magnesia	10.5
of lime	13.1
of soda	9.7
Bicarbonate of soda	1.7
Oxide of iron	.4
Hydriodate of soda, with a very small quantity of hydrobromate of soda	.35
	85.85

This water contains more than one fourth of a grain of iodine in every pint of water, the largest proportion of the mineral which has yet been discovered in any natural mineral water in this country. This is, therefore, the strongest ioduretted water in Great Britain. I have not been able to procure the analyses of the mineral waters of the Continent containing iodine, and am not, therefore, prepared to state that it is the most powerful ioduretted water known; but the assertion is undoubted as far as regards Great Britain.

No. 6.—*Muriated Saline.*

(Ioduretted Saline, No. 2.)

Specific Gravity, 1.009

Gaseous contents in a Pint:

Carbonic acid gas	0.7 cub. in.

Saline contents:

Muriate of soda	58.7
" of lime	9.3
" of magnesia	4.5
Sulphate of lime	2.0
" of soda	12.3
Bicarbonate of soda	1.8
Hydriodate of soda	.2
Carbonate of magnesia	a trace
	88.8

This ioduretted water contains about one sixth of a grain of iodine in one pint of the water, and has been numbered accordingly.

These five springs, the sulphuretted saline, the weak sulphuretted saline, the ioduretted saline, and the chalybeated magnesian saline, are the only waters in this neighbourhood to which the term *ioduretted* can with propriety be applied, but as iodine does exist in several other springs, I shall proceed to give their

composition.*

Chalybeate at the Laboratory.

(Hydrosulphuretted Chalybeate.)

Specific Gravity, 1.0044

Gaseous contents in a Pint:

Carbonic acid gas	0.35 cub in.
Sulphuretted hydrogen gas . . .	0.45 " "

Saline contents:

Muriate of soda	41.21
Sulphate of soda	3.18
Muriate of lime	2.00
Oxide of iron	0.35
Bicarbonate of soda	0.27
Hydriodate and hydrobromate of soda . .	a trace
Carbonate of lime	a trace
	47.01

* I would suggest to the Proprietors of the Montpellier Spa, to number and name these ioduretted waters, as in the preceding pages, viz.:—

No. 2 Sulphuretted saline	Sulphurioduretted saline
No. 3 Weak sulphuretted saline....	Ioduretted saline, No. 1
No. 6 Muriated saline	ditto No. 2
No. 4 "A" Ioduretted saline	ditto No. 3
No. 5 Chalybeated magnesian saline	ditto No. 4 / Ferrioduretted saline.

OLD WELLS.

No. 1—*Original or Old Well.*

Specific Gravity, 1.0091

Saline contents:

Muriate of soda	58.20
" of lime	6.21
" of magnesia	2.54
Sulphate of soda	14.56
	81.51

Hydriodate of soda . . . . . a trace in the proportion of one grain of iodine to sixty gallons of the water.

Dr. Daubeny was unable to ascertain the existence of iodine in any of the remaining springs at the Old Well Spa; but it is extremely probable, that a careful examination might be rewarded by its discovery, as the analyses of these waters are not of very recent date.

The only mineral water which remains to be noticed, is that of the Pittville Spa, which is remarkable among the waters of Cheltenham, for the quantity of bromine which it contains.

PITTVILLE SPA.

No. 1.—*Strong Saline.*

Specific Gravity, 1.006

Solid contents in a pint, 52 grains:

Carbonate of lime	0.20
Sulphate of lime	0.89
Sulphate of soda	17.55
Chloride of sodium	27.16
Magnesia	a trace
Bromine	.02
Iodine	a trace

This water contains more bromine than any other water in Cheltenham, and as has been previously stated in the proportion of one grain, to six and a quarter gallons of the water.

This analysis is by Dr. Daubeny, Professor of Chemistry in the University of Oxford, whose labours in the analysis of mineral waters, are well known to the public.

Several mineral waters besides those of Cheltenham, contain both iodine and bromine, and Dr. Daubeny, has discovered these minerals in various localities in Great Britain.

The following table is extracted from Dr. Daubeny's treatise "on the occurrence of iodine and bromine, in some mineral waters," published in 1830, with the addition of that part of the table which relates to the Cheltenham waters.

Table comprehending a List of certain Springs in South Britain, which contain common Salt in considerable quantity, with a statement of the proportion of Iodine and Bromine contained in each.

Geological Position.	Locality of the Spring.	Name of the Spring.	Total Saline contents in the Pint.	Proportion of Iodine in the Water.	Proportion of Bromine in the water.	Authority for the Analysis.
Transition Slates.	Llandrindod, Radnorshire.	No. 1, the pure saline.	31.35	1 gr. in 343 gal.	A trace.	DAUBENY.
	Bualt, Radnorshire.	No. 1, the saline.	77.6	As above.	As above.	Ditto.
Coal Formation.	Ashby-de-la-Zouch, Leicestershire.	The Moira-brine spring.	179.88	None detected.	4.68 gr. in 1 gal.	THOMSON.
	Near Newcastle-on-Tyne.	The Walker colliery brine spring.	192.0	None detected.	A trace.	DAUBENY.
New Red Sandstone Formation.	Northwich, Cheshire.	Brine spring.	1696 gr.	None detected.	1.2 gr. in 1 gal.	HENRY.
	Middlewich, Cheshire.	Ditto	1824 gr.	A trace.	9.36 gr. in 1 gal.	Ditto.

Table continued.

Geological Position.	Locality of the Spring.	Name of the Spring.	Total Saline contents in the pint.	Proportion of Iodine in the Water.	Proportion of Bromine in the water.	Authority for the Analysis.
New Red Sandstone Formation.	Nantwich, Cheshire.	Ditto	1760 gr.	1 g. in 12 gal.	6.32 gr. in 1 gal.	HENRY.
	Wheelock, Cheshire.	Ditto	1440 gr.	A trace.	A trace.	Ditto.
	Shirleywich, Staffordshire.	Brine Spring.	1552 gr.	None detected.	4.32 gr. in 1 gal.	DAUBENY.
Lias Clay.	Leamington, Warwickshire.	No. 1, Robins's Well.	95.9 gr.	1 gr. in 10 gal.	1 gr- in 10 qts.	THOMSON.
	Ditto	No. 2, Royal Pump saline spring.	134.74	Rather less than in No. 1.	Nearly as above	Ditto.
	Ditto	No. 3, Smith's pump.	109.99	1 gr. to 192 gal.	A trace.	Ditto.
	Ditto	No. 4, Wise's pump.	107.39	As above.	A trace.	Ditto.
	Ditto	No. 5, Smart's saline.	92.5	As above.	A trace.	Ditto.
	Ditto	No. 6, Lord Aylesford's.	113.99	None detected.	A trace.	Ditto.

Table continued.

Geological Position.	Locality of the Spring.	Name of the Spring.	Total Saline contents in the Pint.	Proportion of Iodine in the Water.	Proportion of Bromine in the water.	Authority for the Analysis.
Lias Clay.	Leamington, Warwickshire.	No. 7, Reid's sulphureous.	79.14	Ditto.	A trace.	THOMSON.
	Ditto.	No. 8, Reid's saline.	102.5	Ditto.	A trace.	Ditto.
	Gloucester.	No. 1, Sulphureous saline.	84.2	1 gr. to 50 gal.	1 gr. to 10 qrts.	DAUBENY.
		No. 2, Chalybeate saline.	84.2	As above.	As above.	Ditto.
		No. 3, Strong saline.	76.5	1 gr. in 96 gal.	Rather less than in No. 1.	Ditto.
		No. 4, Weak saline.	75.22	As above.	As above.	Ditto.
	Tewkesbury.	The Walton Spring.	46.1	1 gr. to 36 gal.	None detected.	Ditto.
	Cheltenham.	Pittville, No. 1. Strong saline.	45.8	A trace.	1 gr. in $6\frac{1}{4}$ gal.	Ditto.
	Ditto.	Old Well No. 1.	81.51	1 gr. in 60 gal.	None detected.	SCUDAMORE.
	Ditto.	Sherborne, No. 4.	84.44	1 gr. in 90 gal.	None detected.	Ditto.

Table continued.

Geological Position.	Locality of the Spring.	Name of the Spring.	Total Saline contents in the Pint.	Proportion of Iodine in the Water.	Proportion of Bromine in the water.	Authority for the Analysis.
Lias Clay.	Cheltenham.	Montpellier, No. 1.	48.4	A trace.	A trace.	COOPER.
	Ditto.	Ditto, No. 2.	74.57	$\frac{1}{8}$ of gr. in 1 pint.	None detected.	Ditto.
	Ditto.	Ditto, No. 3.	68.76	As above.	None detected.	Ditto.
	Ditto.	Ditto, No. 4.	88.8	A trace.	A trace.	Ditto.
	Ditto.	Ditto, No. 4, "A."	106.25	$\frac{1}{5}$th of a gr. in 1 pint.	None detected.	Ditto.
	Ditto.	Ditto, No. 5.	85.85	More than $\frac{1}{4}$ gr. in 1 pint.	A trace.	Ditto.
	Ditto.	Ditto, No. 6.	88.88	1-6th g. in 1 pt.	None detected.	Ditto.
	Ditto.	Chalybeate at the Laboratory	47.01	A trace.	A trace.	Ditto.
Water of the present Ocean.	Off Portsmouth.	——	—	A trace.	1 gr. to 1 gal.	

This table, which is the result of much labour and research on the part of Dr. Daubeny, is particularly valuable, as showing at a glance the proportions of iodine and bromine, relatively to the total saline contents of the waters, and also the geological position, and localities of the several springs.

At the period when the original table was published, the analyses of the Cheltenham waters, had not been so accurately ascertained as at present, and consequently some alterations and additions to it, have been rendered necessary. As it at present stands, it gives a very concise and clear view of the principal points, in the composition of many of the most important British mineral waters.

It will be at once seen by a careful comparison of the analyses of the Cheltenham waters, by Mr. Cooper, that the proportion of iodine, is not, in any increasing ratio, to the quantity of common or sea salt contained in them; and a reference to the above table will shew, that the mineral is in greater quantity in the districts of the lias formation, than in any other. The following table shews, that no fixed relation at all exists between the quantities of iodine and sea salt respectively, in the Cheltenham Waters.

Table shewing the relative proportions of iodine and common salt, and total saline matter in the Cheltenham springs :—

Proportion of Iodine in grains to one pint of water.	Proportion of common salt in grains to one pint of water.	Total saline contents in 1 pint.	Geological Position.
One-4th of a gr.	9.7 grains.	85.85	Lias.
One-5th of a gr.	51.4 "	106.25	"
One-6th of a gr.	58.7 "	88.8	"
One-8th of a gr.	32.3 "	68.76	"
One-8th of a gr.	35.3 "	74.57	"
A trace.	52.4 "	88.8	"
A trace.	27.0 "	48.4	"
None detected.	97.0 "	129.2	"

By this table, it appears, that the greatest proportion of iodine is contained in a water in which common salt is less abundant in relation to the total saline matter than in any other spring in Cheltenham.

Bromine, on the contrary, increases in proportion, as the springs in which it is found, contain a larger quantity of sea salt; and also, in proportion, as the locality of the spring approaches the new red sandstone formation, being always more abundant in the strata of that formation, than in any other.

The Tewkesbury spring, though situated on the border of the new red sandstone, and therefore in a

locality very favourable for the existence of bromine, contains none of that substance, and is, therefore, an apparent exception to this rule, but the comparatively small quantity of saline matter, absolutely contained in this water, being only in the proportion of 46.1 grains to the pint, induces me to suspect this exception to be more apparent than real.

Table shewing the relative proportions of bromine, common salt, and total saline matter in certain mineral springs:—

Proportion of bromine in grains to one pint of water.	Proportion of common salt in grains in 1 pint of water.	Total saline contents in 1 pint.	Geological Position.
1.17 grains.	1793 grains.	1824 grs.	New Red Sandstone.
Eight-10th of ag.	1730 "	1760 "	Ditto.
Half a grain.	1490 "	1552 "	Ditto.
One-7th of a gr.	1677 "	1696 "	Ditto.
Three-5th of a gr.	133 "	179 "	Coal Formation

The results of this table are particularly striking, but hold good only in regard to strata of the new red sandstone; on arriving at the lias formation, all regular order, in the relative proportions of bromine and muriate of soda disappear.

From all this it is quite evident, that though both the iodine and bromine, owe their origin to marine substances, yet very different circumstances must operate in the localities where they are found, for if both minerals originated in the saline deposits of the new red sandstone, no other conditions being required, both would be found in the springs, in nearly equal quantities.

This we have seen is not the case, and, therefore, we must ascribe the difference in their proportions to local causes.

It is not impossible, that the presence of the iodine, may be owing to the circumstance of the waters which contain it, passing through circumscribed deposits of fossil algæ, or fucoidæ, in their course from the new red sandstone, through the lias, to the surface; while those which contain bromine only, have their sources in the salt deposits, and local brine springs, of the new red sandstone formation.

We have remarked, that the most fruitful source of iodine in nature, and that from whence all the iodine of commerce is procured, is to be found in the several varieties of seaweed, and other bodies of marine

origin, but that it is in barely discoverable quantity, in the water of the ocean itself.

Bromine on the other hand, is largely contained in the water of the ocean, and is less abundant in marine plants.

The explanation which I now offer, will serve to show, why numerous springs, rising out of the same geological formation, and in the immediate neighbourhood of each other, contain not only different proportions of the same substance, but also, why a mineral, which exists in one spring, is not to be found in another, arising close beside it.

Were the cause universal, the effects would of course be similar, but a local and circumscribed cause, gives rise to a local peculiarity. For the same reason, increasing the depth of a well, by even a few feet, might very materially alter its properties, for the borer might pass through a bed of mineral matter, which would impart qualities entirely new, to the water rising through it.

This explains why the water at the Pittville Spa, contains more bromine than any other in Cheltenham, and only a trace of iodine, and many other apparent

anomalies, in the composition and characters of mineral waters.

I have little doubt that if numerous trials were made, in the proper localities, with the improved means of boring, which the present advanced state of mechanical science affords, that these views would be borne out in their fullest extent, that the various proportions of mineral substances, would be found to bear a certain relation to the depth of the spring, and to local circumstances, of an extremely circumscribed nature, similar to those already hinted at.

Having premised thus much on the nature and properties of these iodurettted waters, we may pass to a brief examination of the diseases in which their employment is indicated.

The nature and medical uses of the saline aperient and chalybeate springs of this place, have been often the subject of investigation, and are now perfectly well understood : but the medical application of those Cheltenham saline waters, which owe their chief curative virtues to the presence of iodine has not yet been laid before the public.

It has already been stated, that in no locality in England, as far as the analyses of chemists have yet gone,

are there any mineral springs containing so large a proportion of iodine as those of Cheltenham. These waters alone contain it in sufficient quantity to render them efficient therapeutic agents, and to enable the practitioner to calculate with accuracy on their effects. Some brine springs in the midland counties, as that of Middlewich, in Cheshire, and Shirleywich, in Staffordshire, do indeed, as will be seen by reference to the table, contain a very large proportion of bromine, but no iodine; and bromine is by no means so safe or so manageable a remedy as the latter. The strongest iodurettted spring in the range of the lias clays, with the exception of those of Cheltenham, is that called Robins's Well, at Leamington, which does not contain more than one grain of iodine in 10 gallons of water, and one grain of bromine in 10 quarts, while the Cheltenham iodurettted waters contain iodine in the several proportions of one-eighth, one-sixth, one-fifth, one-fourth of a grain to the pint, thus affording an opportunity of apportioning the dose of the medicine to particular circumstances, with remarkable facility.*

* The proportions of iodine in these waters have not been before published, the analyses giving the quantities of the compounds of hydriodic acid. Every 158 parts of hydriodate of soda, contain 125 parts of iodine, and the calculation is hence easily accomplished. This is of the greater importance, because the iodine is the active ingredient, and any salt of hydriodic acid, when taken into the stomach is decomposed, and the iodine set free, to exert its peculiar action on the animal economy.

We have already in speaking of the iodic saturation, from an injudicious or too free use of the mineral, mentioned some of the effects of iodine, on the animal economy, which show it to be an irritant of a very energetic nature.

When applied to the surface of the body, or taken into the stomach, iodine is rapidly absorbed, and carried into the general circulation. Its presence is detected in the several secretions and excretions of the body, often at a remarkably short period after its administration. It stimulates the whole lymphatic system, and excites and increases the action of the absorbents in a particularly decisive manner.

This property of stimulating the lymphatic system, and increasing the action of the absorbents, is that which renders iodine so serviceable, in cases of scrofula and glandular swellings.

Scrofula, is a constitutional disorder, in which the lymphatic vessels, and ganglia, are chiefly affected. It is a disorder to which young children are peculiarly liable, and especially those who possess what is termed the lymphatic temperament. This lymphatic temperament is characterized by a fine, soft, and white skin, light hair, and large blue eyes, full forms, and a rosy

tint on the countenance, a large head, thick lips especially the upper one, little muscular strength, a gentle disposition, and a considerable degree of intelligence, too much developed in relation to the age.

Such is a picture of the lymphatic temperament, and such are the children whom scrofula selects for its ravages; endeared to their parents and friends by apparent health, their deceitful beauty of form, and precocious promise of intellectual power of a high order, these are nevertheless the most predisposed to the attacks of this terrible scourge of the human race.

In such children the slightest exposure to cold or moisture, an apparently trifling imprudence in diet or regimen, an unwitting and seemingly unimportant infringement of the laws of hygiene, is almost certainly followed by disastrous results; swelling of the glands in the neck, inflammation of the eyes, engorgements and obstruction of the mesenteric ganglia, the formation of tubercles, abscesses, ulcerations, enlargement of the joints, and caries and destruction of the bones.

There is no disease in which so great a number of different remedies have been tried as in scrofula, a circumstance which plainly indicates how little it has hitherto been under the control of medicine. It is now ad-

mitted on all hands by medical practitioners that from no remedy within our knowledge can so much be rationally expected in the treatment of scrofula as from iodine, and its employment in this disease has become more and more general since its first introduction into medical practice, by Dr. Coindet of Geneva.

M. M. Lugol and Baudelocque, two eminent Parisian physicians, have given to the world a great number of cases of scrofulous disorders entirely cured by the administration of iodine. M. Baudelocque who has written a valuable treatise on this subject expressly states his great reliance on the powers of iodine, as an antiscrofulous remedy. "Je me hâte de dire," says he, "que de tous les médicamens vantés pour le traitement des écrouelles, il est incontestablement celui dont on peut espérer le plus d'avantages. Je ne connais aucune substance qui, dans l'espace de six mois, ait procuré un nombre de guérisons égal à celui que j'en ai obtenu, et le docteur Coindet a rendu un servîce éminent à l'humanité, en l'introduisant dans la matiére médicale. Cette opinion sur la valeur anti-strumeuse de l'iode est celle que jai èmise en 1831 Je n'ai rien à y changer aujourd'hui. Le fréquent usage que j'ai fait de cette substance, depuis l'epoque que je viens d'indiquer, a confirmé de tout point le jugement

que j'ai porté sur son degré d'efficacité. L'iode est le medicamént que j'administre le plus habituellement aux nombreux scrophuleux, qui, chaque année se trouvent confiés à mes soins."

This opinion coming from so distinguished a physician as M. Baudelocque, who has had better opportunities than most men of judging of the efficacy of the treatment, must carry with it great weight; at the Hôpital des Enfans in Paris, of which he is a physician, he has been able to try the value of iodine in several hundred cases of scrofulous disorders in children.

M. Baudelocque, is in the habit of prescribing an artificial iodurretted water, containing in each dose, one fourth of a grain of iodine, and half a grain of the hydriodate of potassa, to two fluid ounces of water. This quantity is given twice a day, and the dose gradually increased, according to the circumstances of the case.

He has remarked, that he could not without great inconvenience to the patient, lessen the proportion of water in this solution, and from some of his cases, even this state of concentration, appears occasionally, to have caused much gastric disturbance.

The diluted state of the natural ioduretted waters, insures the patient against such effects, and if during or after a course of these waters, it be deemed advisable to increase the quantity of the medicine required to be carried into the circulation, this can be done far more safely by means of cutaneous absorbtion, than by internal exhibition. The great object is, to introduce silently and gradually into the system, a sufficient portion of the remedy, without inducing any local irritation, which will check the progress of cure, and render a temporary discontinuance of the medicine unavoidable.

A child of three or four years of age, affected with scrofula in any form, may commence with the use of the ioduretted water, No. 2, in the dose of half a pint, in the course of the day.

This water, sweetened with sugar or syrup, will be readily taken by children, and has no unpleasant taste. The ioduretted water No. 1, would probably be rejected by children, on account of the disagreeable odour imparted to it, by the sulphuretted hydrogen gas which it contains. We, therefore, begin with the twelfth of a grain of iodine in the course of the day. The dose of this substance may be gradually increased,

by changing first the quantity, and then the number of the water.

During the period, in which the ioduretted waters are taken internally, local and external means may be employed. Frictions with an ioduretted ointment, on the tumours in the neck, or over the abdomen, may be employed; the ulcerations may be dressed with a cerate, containing the ioduret of lead, or touched with the "solution rubefiant," of Lugol.

At this time also, the use of the ioduretted baths, will be found eminently serviceable. These baths which were introduced into practice by M. Lugol, have been strongly recommended by their author, and not without reason.

The mode in which these baths are to be employed, requires some explanation. In the first place, the vessels used, must be of wood or porcelain, as iodine reacts upon, and corrodes metallic substances. For this reason, baths of the usual construction will not answer, but must be replaced by others, of the materials above mentioned. The formula given by M. Lugol, for the ioduretted solution, which enters into the composition of these baths, is as follows:—

Rain water, a pint and a half:

Iodine, two scruples and a half:

Hydriodate of potassa, five scruples. Dissolve the iodine, and hydriodate, in the rain water.

This solution is sufficient for a bath, containing twenty-five gallons of water. The quantity and proportion of the materials, must vary with the size of the bath, which may of course depend on the size of the child.

The wooden vessel having been filled with water, at a temperature of about 90°. Farenheit, the ioduretted solution is to be poured into it, and the whole well agitated, in order to insure an universal diffusion of the mineral throughout the water: the child is then to be immediately placed in the bath, and retained in it during a period, which must be determined by circumstances. In general from half an hour, to an hour, will be the time required. The best general rule is to allow the child to remain as long as it feels comfortable, and to remove it as soon as the face becomes much flushed, and covered with a copious perspiration. On being removed from the bath, the child is to be well dried with warm towels, and placed in a warm bed. These baths may be employed, once,

or twice a week. Should there be two, or more children in the same family affected with scrofula, they may without inconvenience, be placed in the same bath, all that is necessary, being to take care that the whole body up to the neck, is beneath the water, when the same quantity of the ioduretted solution, will serve for any number of children, the relative proportion of the water, remaining absolutely the same. Sometimes a rash is produced on the skin, by the action of the bath, in which case either the temperature of the water, or the strength of the bath, will require to be diminished.

These ioduretted baths constitute the most powerful means of administering iodine, and will be found of the greatest service, in conjunction with the use of the ioduretted waters taken internally; they exert a peculiarly beneficial influence, in checking the abundant and unhealthy discharge, which always proceeds from scrofulous ulcers, and give to these a disposition to heal, hardly produced by any other remedy. The whole system is rapidly affected by the mineral carried into the circulation by the process of cutaneous absorption, and the disease almost immediately bends to its influence.

Although these are the remedial means, which above all others may be depended on, in the treatment of scrofulous disorders, it must not be forgotten, that other measures will be required; that the strictest attention must be paid to diet, regimen, exercise, clothing, and general habits, without which, all medicine will prove unavailing.

These are matters which do not belong to the nature of the present short treatise, they will be discussed at length in a forthcoming work by the author, "On Scrofulous Disorders."

GOITRE OR BRONCHOCELE, that indolent swelling of the neck, so common in some localities, is another of those diseases which are peculiarly under the controul of iodine. It was to this disease that iodine was first medically applied, and time has shown that the treatment is usually successful. By the employment of the preparations of iodine both internally and externally, large goitres of many years growth, either disappear entirely, or diminish in a very great degree.

Next to scrofula and goitre, there is no class of diseases in which the ioduretted waters can be more safely recommended, than in the several varieties of *Cutaneous eruptions.*

In those skin diseases, for which the Harrowgate waters are frequently prescribed, the sulphurioduretted water will be found of great use, and in lieu of a sulphur bath, the iodurretted bath possesses superior advantages.

Those obstinate and intractable herpetic eruptions, which so often set all treatment at defiance, are particularly relieved by the use of the iodurretted bath, and by applications of the ointments of ioduret of mercury or lead, together as in all cases with proper doses of alterative aperients.

Enlargement of the bones, nodes and copper coloured eruptions depending on a syphilitic taint, or owing to the abuse of mercurial preparations, derive equal benefit from the same measures.

Two of the most terrible diseases to which mankind are liable have occasionally received much relief from the employment of iodine; these are *Pulmonary Consumption* and *Cancer*.

Consumption, is a disease, in some measure allied to scrofula, having many features in common, such as hereditary predisposition, the development of tubercular matter &c., and it appears, like scrofula, to be capable in some cases, of being controlled by the action of iodine.

The inhalation of aqueous vapour impregnated with iodine, has been resorted to in both disorders sometimes with successful results. But this method is somewhat difficult of management, and cannot be employed safely without great precaution. Not more than one eighteenth of a grain of iodine in solution is to be used at a time, and this is to be poured into a quantity of hot water placed in a proper apparatus. Baudelocque has found that the fifteenth of a grain of iodine in the water, produced great irritation and violent fits of coughing. The employment of the iodurettted water and of the iodurettted baths will be found far preferable. The invalid should commence with the weakest water, gradually increasing the dose of iodine. It is not too much to expect that in the early stages of pulmonary consumption, great benefit will be derived from a steady perseverance in the use of a remedy which is known to act so powerfully on the absorbent system. The aid of other remedial measures may be called in, and at the same time a strict regimen, and great attention to the general health, will be demanded.

Cancers of the tongue, have been repeatedly cured by the employment of iodine. M. Magendie, has related several cases. Cancerous tumours of the breast have

also been greatly benefited by the internal use of the hydriodate of potassa and topical applications of the iodurretted ointments and the caustic solution of M. Lugol.

On the continent, the mineral waters of Plondières, Barèges and Vichy, have been highly lauded as being serviceable in causing the resolution of schirrous and the cure of cancerous tumours. Iodine has not yet been detected in these waters, but as they all contain a considerable proportion of chloride of sodium, it is not impossible that its existence may be demonstrated. The water of Vichy, is remarkable for the enormous quantity of carbonate of soda which it contains. Judging from analogy, we should say, that the employment of iodine was likely to be of service in cases of cancer: successful cases of its action in removing malignant tumours of the breast, both in a schirrhous and in an ulcerated state, have been recorded by Graefe and Wagner, on the continent, and by Mr. Hill, of Chester, in this country.

Iodine is well known to exert a special and particular action over the uterus and its functions, and on this account great caution is required in its administration to females during pregnancy. M. Magendie, relates a case of miscarriage resulting from the action of iodine, in an individual whose pregnancy had been concealed from the

physician. For the same reason this medicine is peculiarly applicable to those cases in which from loss of tone in the uterus, its natural functions are disordered or suspended.

Cases of chlorosis and amenorrhæa, will necessarily derive the greatest benefit from the employment of a medicine which acts directly and specially on the organs immediately concerned in the disorder. By a steady and well regulated perseverance in its use, the tone of the uterus is restored; its natural functions re-established, and the general health soon participates in the good effects produced.

In cases of this kind, and in leucorrhæa, which depends on the same causes, and also is in general connected with the lymphatic temperament, the ferrioduretted water, (ioduretted saline, No. 4,) which contains the oxide of iron in the proportion of four-tenths of a grain to a pint of water, will be most advantageous.

A combination of iodine and iron, the ioduret of iron has been introduced into practice, by my friend Professor Thomson, of London, author of "The London Dispensatory," and by him most successfully prescribed in cases of the same nature as those under consideration; we may therefore with every probability

expect the best results, from a natural mineral water holding both iodine and iron in solution.

Chalybeate waters have long been recognized as efficient agents in the cure of these complaints, and the advantage of possessing one, which also contains iodine, is too great to be overlooked.

Iodine has been recommended in chronic enlargements and diseases of the joints. The affection of the knee joint termed white swelling, and the disease of the hip joint, both of which are almost always connected with a scrofulous diathesis, much good may be expected from its employment, in the early stage of the affection, while the disease is yet confined to the bone. After ulceration of the cartilages has commenced, little can be expected from its employment.

Those chronic enlargements of the joints which succeed long continued rheumatic affections, are certainly capable of receiving much relief from the iodine treatment. Cases of this kind are not uncommon among the native soldiery in India, and the use of iodine internally, and friction with an ointment of the ioduret of mercury, I have always found extremely serviceable. The ioduretted bath would be particularly

applicable to such cases. It would not be difficult to extend the list of the disorders, in which iodine has been of service, among which hypertrophy of the heart, enlargements of the liver and spleen succeeding fever, and some diseases of the nervous system may be included.

Sufficient has been said to show its value in a medical point of view, and to demonstrate the importance of those natural mineral waters which contain it. Most persons are content with drinking a certain quantity of a saline aperient, from which they expect a great deal, and must necessarily be sometimes disappointed: while perhaps if they had spent as much time in the employment of a different kind of water, they might have derived the desired benefits.

A more generally diffused knowledge of the nature and properties of those waters which contain iodine, can hardly fail to be of service to that portion of the public who from infirm health and long suffering, know how to appreciate the value of a powerful and successful remedy.

It must be borne in mind that all the Cheltenham waters *do not contain Iodine* in sufficient quantity to render it of any importance—a circumstance which leaves room for their employment in cases where the adminis-

tration of this mineral would not be deemed advisable. The pure saline, No. 4, and the saline chalybeate, No. 1, are free from all but an indistinct trace of its presence, and are, therefore, adapted to many forms of disease in which the iodurretted waters could not be recommended; these latter being specially applicable to, and exciting a peculiar influence over many organic and functional disorders, in which mere saline aperients would prove powerless and inefficient.

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