

**Report upon the alleged adulteration of pale ales by strychnine / by [Thomas] Graham and [August Wilhelm] Hofmann.**

**Contributors**

Graham, Thomas, 1805-1869.

Hofmann, August Wilhelm von, 1818-1892.

Allsopp, Henry, first Baron Hindlip, 1811-1887.

Royal College of Physicians of London

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183 Euston Road  
London NW1 2BE UK  
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E [library@wellcomecollection.org](mailto:library@wellcomecollection.org)  
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# REPORT

UPON THE

ALLEGED ADULTERATION OF PALE ALES BY STRYCHNINE,

BY PROFESSORS GRAHAM AND HOFMANN.

London, April 26th, 1852.

Having undertaken at the request of Mr. Allsopp an inquiry into the purity of bitter beer, with particular reference to its alleged adulteration by strychnine, we now submit the results which we have obtained upon the subject.

Strychnine or strychnia, the alleged substitute for the hop, is a fine crystallizable substance, extracted from *nux vomica*, and belonging to the class of vegetable principles termed alkaloids, of which quinine from Peruvian bark, and morphine from opium, are the most familiar examples. These substances, although susceptible of the most valuable medical application in small doses, are, generally speaking, remarkable for their energy as poisons, and for the intense bitterness of their taste; two properties which are developed in strychnine in the highest degree. Half a grain of the latter substance would poison and the bitterness of the same minute quantity is perceptible in every drop of six or eight gallons of water in which it is dissolved. XX

It may be stated at once, that the quantity of strychnine, which we find necessary to impart to beer the degree of bitterness possessed by pale ales, is for a gallon of beer one grain of strychnine, or double the fatal dose. The price of strychnine is about 16s. the ounce, which does not amount to so much as one penny per grain. Estimating the annual production of pale ale in Burton as

200,000 barrels, the strychnine required as a bitter would, however, amount to 16,448 ounces, and cost £13,158; while nobody believes that so much as 1,000 ounces of strychnine are manufactured over the whole world. The bitterness obtained by means of strychnine is equal in degree to that of the hop, but very different in kind and easily distinguished when the two bitters are compared. The bitter of the hop is immediate in its action upon the palate, is accompanied by a fragrant aroma and soon passes off; whilst that of strychnine is not so instantaneous; but when the impression is once made it is more lasting, and becomes, from its persistence, like that of a metallic salt. The bitter of strychnine is, indeed, easily distinguishable from that of the hop, when deliberately tasted.

Still it would be highly desirable to be able to identify strychnine in beer, by the actual extraction of the substance, and the application to it of a chemical test of absolute certainty. Fortunately those poisons which have the most violent action upon the animal economy possess often also the best marked reactions, or their physiological and chemical properties are equally salient. Thus arsenic and hydrocyanic acid are the most easily detected of chemical substances; and strychnine proves to be not far behind them in this respect.

A quantity of strychnine, not exceeding  $\frac{1}{1000}$  of a grain, is tested and recognised to be strychnine in the following manner. The powder is moistened with a single drop of undiluted sulphuric acid, and a small fragment of chromate of potash placed in the liquid. A beautiful and most intense violet tint immediately appears at the points of contact, and is speedily diffused over the whole liquid. Although most intense, the colour disappears entirely again in a few minutes. The admixture of the smallest quantity of organic matter, however, interferes with the success of the process. In order to apply the test, in operating upon a complex liquid like beer, the strychnine must first be extracted from the liquid and obtained in a pure or nearly pure condition. This difficulty, which appears at first considerable, may be readily surmounted, and the strychnine, if it really exist in beer, be separated, and its nature established in the most certain manner.

For this purpose, two ounces of ivory-black, or animal charcoal were shaken in half a gallon of beer to which  $\frac{1}{2}$  grain of strychnine had been purposely added. After standing over night, the liquid was found to be nearly deprived of all bitterness; the strychnine being absorbed by the charcoal. The liquid was now passed through a paper-filter, upon which the charcoal containing the strychnine was collected and drained.

? nothing but strychnine removed by charcoal

The next step was to separate the strychnine from the charcoal. This was readily effected by boiling the mixture for half an hour in eight ounces of ordinary spirits of wine, avoiding loss of alcohol by evaporation. The spirits which now contained the strychnine were next filtered, and afterwards submitted to distillation. A watery fluid remained behind, holding the strychnine in solution, but not sufficiently pure for the test. The final purification was accomplished by adding a few drops of potash to the watery fluid, and then shaking it with an ounce of ether. A portion of the ethereal solution evaporated upon a watch-glass, left a whitish solid matter of intense bitterness, and this was recognized to be strychnine, by giving the violet tint previously described, upon the application to it of sulphuric acid and chromate of potash. *W. & C. G.*

Having satisfied ourselves by repeated experiments with samples of beer to which strychnine had been previously added, of the never-failing efficiency of the above method of extraction, we now proceeded to the actual examination of the commercial article. With this object, a series of samples were taken indiscriminately from the stores of a considerable number of the London bottlers, who supply the public with Allsopp's pale ale. We mention the beer of the following firms, whose goods were severally examined by the processes, which we have above described, and from whom we have documents in hand proving the origin of the beer, and the date of its arrival at their stores from Messrs. Allsopp's brewery.

\*C. Barron and Co., 19, Pall Mall.

Barker and Blewitt, 211, Sloane Street.

G. and M. Blockey, Duke Street, St. James's.

John Blockey, 104, Ebury Street, Pimlico.

\*C. H. Bowen, 101, Fenchurch Street.

\*R. B. Byass, Langbourne Chambers, Fenchurch Street.

Child and Co., Leicester Square.

L. Clow, Princes Street, Fitzroy Square.

Crimp and Ward, Old Broad Street.

Daukes and Rodick, Exeter Hall Vaults, Strand.

Nath. Eastey, 138, Upper Thames Street.

\*Findlater, Mackie and Co., 1, Upper Wellington Street, Covent Garden.

M. B. Foster and Son, 56, Brook Street, Bond Street.

Friend and Co., Abchurch Lane.

George Jones, 8, Billiter Street.

E. and G. Hibbert, 7, Jewry Gardens, Aldgate.

- W. J. Hollebone, 1, Lower Eaton Street.  
 W. Mabey, Lloyd's Coffee House, Royal Exchange.  
 J. Macdonald, 9½, Queenhithe, Upper Thames Street.  
 \*Moline, Harper, and Moline, London Bridge.  
 Nisbet, 11, Jermyn Street.  
 Padget and Son, Pantechmicon.  
 Rose, Brothers, 257, Oxford Street.  
 A. Suter, 65, Fenchurch Street.  
 J. Wallis and Co., Millbank Street, Westminster.  
 White and Price, Mark Lane.

It may be stated, that with the exception of the five varieties marked with an asterisk, the casks from which these samples were taken had all been received in London before the 20th of March, *i. e.*, the period when the possible use of strychnine in the manufacture of bitter beer was first brought before the English public.

*Not one of these varieties of beer, when tested with the greatest scrupulousness, gave the slightest evidence of the presence of strychnine.*

The charge of adulteration of beer by strychnine has been proposed in a manner so vague, that it is difficult to fix it, and try its validity. The existence of the adulteration is not alleged in any particular sample of beer, nor the practice ascribed to any individual brewer or dealer. An English journalist adopts the charge, upon the report that such an opinion is entertained and expressed by a French chemist of distinction, M. Payen, in his public lectures at Paris. From this gentleman we have since obtained explanations which define more closely the kind of charge which was actually made by him. The late M. Pelletier, the well-known manufacturer of organic products in France, had received at one time an order for an extraordinary quantity of strychnine, of which the destination was at first unknown to him; but which he afterwards learned had been entirely exported to England, and used, as he informed M. Payen, to complete the bitter of certain kinds of beer.

We have reason to know, although it is not stated by M. Payen, that these remarks of Pelletier refer to a period ten or twelve years past; and further, although not informed of the amount of the order, we have good authority to state that fifty or a hundred ounces would have been considered a large order for strychnine at that time. The calculation already given, shows how utterly insignificant such a supply of strychnine would be for its imagined application in the pale ale breweries. It is likewise known that

the manufacture of strychnine has not been on the increase in France of late years.

M. Payen excuses his statements on the ground that similar suspicions are conveyed in a French work, on "Adulterations and Falsifications," by Chevallier, published nearly a year ago, but which have not hitherto received any formal contradiction in England. Notwithstanding the latter circumstance, our distinguished correspondent concludes by expressing his regret that he ever said "that the fraud appeared to have been practised," although he had added the remark at the time, "that this falsification had no doubt ceased."

It thus appears, that the charge which has been put into the mouth of M. Payen, was never made at all by that gentleman, so far as it applies to the present practice of English brewers, and with reference to anterior times, that the charge reposes simply and exclusively upon the privately expressed opinion of a deceased chemist, the grounds of which are entirely unknown to the world, and must ever remain so.

In conclusion, it is scarcely necessary to refer to the sifting nature of the chemical examination which the beers of Messrs. Allsopp's manufacture for many months past, have been subjected to, and which establish their uncontestible purity. Indeed, no one who has witnessed, as we have done, the open manner and gigantic scale in which the operations are conducted in their establishment, could entertain the idea for a moment, that any practice involving concealment was possible. But even in the absence of all such scrutiny, the idea of strychnine being mixed with beer anywhere, or in any circumstances, involves an amount of improbability which might well dispel all suspicion on the subject.

There is an act of Henry VII., which prohibits the *adulteration* of ale by brimstone or *hops*. The place of the hop was then supplied by sage, horehound, chamomile, and other indigenous bitter plants. Since that period, the character of the national beverage must have undergone a silent revolution, for all varieties of beer, both pale and brown, now owe their distinctive properties to the hops which are boiled in the malt-infusion, and fermented along with it, as completely as wine owes its peculiar character to the grape. Substitute any other bitter for the hop, and the fermented wort would no longer be recognised as beer. X

Were mere bitters all that is required, it would be easy to prove that the extract of quassia would supply a bitter which is perfectly harmless and agreeable, and infinitely less expensive than strychnine.

But the process of brewing pale ale is one in which nothing but

*Quite true but not the whole truth*

water, the best malt and hops of the first quality are used, and is an operation of the greatest delicacy and care, which would be entirely ruined by any tampering with the materials employed. Strychnine could not fail to be rejected, from the ungrateful, metallic character of its bitterness, independent of all objections of a more serious kind. This peculiarity of taste is also calculated to betray its presence. Small, too, as the proportion of strychnine may be, which is necessary to impart the degree of bitterness of pale ale, the quantity rises, as has been seen, to a poisonous dose in half a gallon of the fluid; and as this poison is one of those which are known to accumulate in the system, its poisonous action would inevitably follow, in occasional cases, upon the consumption of much smaller portions of beer when continued for many days without intermission. The violent tetanic symptoms of poisoning by strychnine are also such as could scarcely fail to excite suspicion and alarm. Add to these disadvantages, the certainty of the means of detecting strychnine in beer by the chemical tests described above, which any medical man or practical chemist can apply, and the chance of the use of so dangerous a substance for any purpose of adulteration, becomes in the last degree improbable.

THOMAS GRAHAM, F.R.S.,

Professor of Chemistry, University College, London.

A. W. HOFMANN, PH.D. F.R.S.,

Professor of the Royal College of Chemistry, London.

HENRY ALLSOPP, Esq.

Brewery, Burton-on-Trent.

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ON

## REINSCH'S PROCESS FOR THE DETECTION OF ARSENIC.

By HARRY RAINY, M.D.

PROFESSOR OF FORENSIC MEDICINE IN THE UNIVERSITY OF GLASGOW.

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FROM THE PROCEEDINGS OF THE GLASGOW PHILOSOPHICAL SOCIETY.

*Read 19th December, 1849.*

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This process consists in boiling the suspected fluid with about  $\frac{1}{10}$  of its bulk of muriatic acid along with copper. The arsenic is deposited on the copper in the form of a steel-grey film.

It is generally supposed that this process is equally applicable to all the compounds of arsenic soluble in dilute muriatic acid; and that in all circumstances it detects the presence of the metal, with a delicacy more than sufficient for every practical purpose.

Soon after the publication of Reinsch's method, I made various experiments, with the view of determining the limits within which its indications might be relied on. The result was unsatisfactory; for while, in some cases, it appeared to be fully as delicate as the method of Marsh, in other cases I failed to obtain the metallic deposit where the arsenic was present in a much higher proportion. Similar observations have been made by others; for it is stated by Fresenius and Von Babo that, "the presence of nitrates and various salts of mercury, and other metals, render the separation of arsenic by copper difficult or even impossible." It seems also to be a general opinion, that when the proportion of arsenic is extremely minute, the process of Marsh is decidedly preferable.

It is obviously important that the cause of such discrepancies should be investigated, as the great simplicity and rapidity of Reinsch's process render it peculiarly suitable for medico-legal investigations, and give it a decided superiority over every other, if it can be conducted in a manner that will ensure equal delicacy.

The following experiments were made with the view of ascertaining the cause of these discrepancies, and, if possible, the means of preventing them. The copper was used in the form of very thin foil, which was easily cleaned and polished, so as readily to show any change of colour; the fluid usually contained one *tenth* part, by measure, of muriatic acid

Calcinate water is a very soft  
I pure water acts powerfully  
on lead & contains only 1-18600th  
of ~~solid~~ solid residue  
of which one half is org matter  
see page 9 post