

**THE EFFECT OF ALUM UPON THE
HUMAN SYSTEM, WHEN USED IN
BAKING POWDERS: ELABORATE
EXPERIMENTS UPON LIVING
ANIMALS**

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HENRY A. MOTT

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THE EFFECT OF ALUM
UPON THE HUMAN SYSTEM,
WHEN USED IN
BAKING POWDERS.

ELABORATE EXPERIMENTS UPON LIVING ANIMALS.

RESEARCHES MADE BY

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Pharmaceutical Society, etc., etc.

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1880

SUPPLEMENTED BY REPORTS OF THE
EXPERIMENTS BY ALPH. DEVERGIE, M. ORFILA,
R. F. RUTTAN, M.D., ETC., ETC.

AND THE LATER
IMPORTANT INVESTIGATIONS OF PAUL SIEM.

(REPRINT, 1901)

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B / M /
1901

THE EFFECT OF ALUM BAKING POWDER, WHEN USED IN BREAD, UPON THE HUMAN SYSTEM

Journal of the American Chemical Society, Vol. II.*

Page 13. Before proceeding to a consideration of the effect of alum baking powders, the author thinks it advisable to briefly present the principal points so elaborately set forth in the following chapters. In the first chapter on the "Proving of Alum in Animals and Man," from the elaborate investigations of Devergie and Orfila, it is conclusively demonstrated that alum in its hydrated and anhydrous (or calcined) condition has a corrosive action on the mucous membrane, and further, that it is sure to produce vomiting, constipation, extreme weakness, and loss of appetite, even in very small doses, and in such cases, if either by accident or intention, vomiting is prevented, death is sure to follow.

It is the opinion of both Orfila and Devergie that if the stomach of man be not in a perfectly healthy condition the evil effects of alum, when taken internally, manifest themselves much sooner, as the alum acts more energetically.

The base of alum, that is to say alumina, may be detected in the liver, the spleen, and the urine.

Several cases of poisoning by the accidental use of alum are reported in the first chapter, some of which terminated fatally. The first case was of a Mrs. B., reported by Dr. Fournier, who took by mistake a swallow of about three teaspoons of a solution of 16 grammes of calcined alum dissolved in a litre of water. Scarcely had she drunk it when she pushed it away, "complaining of nausea, severe heat, tearing pains in all parts that had come in contact with the alum; the pulse had become rapid and the face animated; the muscles had been agitated by slight convulsive movements; the desire to vomit had increased; the thirst had become unextinguishable." Under treatment of the physician she recovered in time. It must be remarked that Mrs. B. was an invalid, but it must also be remarked that the quantity of alum contained in the swallow of the solution she took was very small, demonstrating how powerfully active alum is in persons of weak constitutions.

The case of death reported by Dr. Ricquet is not without interest. In this case a Mr. V. M., wishing to purge himself, ordered some sulphate of magnesia, but, in mistake, alum was given him. On dis-

* Subsequently rewritten and enlarged by the author and republished, as here given.

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solving 30 grammes in water and drinking the same, he succumbed after horrible pains. "He felt a burning sensation in the mouth, throat, and stomach, followed by a single sanguineous vomiting. No stools, extreme uneasiness, then insupportable anguish, repeated lipothymies; intelligence and senses intact. Finally intermittent, filiform pulse; cold skin. The deglutition of liquid was almost impossible. He died eight hours after taking the remedy." Besides the last mentioned case of death, resulting from taking alum internally, must be mentioned three cases of alum poisoning by Von Hasselt, Taylor, and Husemann, and two cases by Tardieu, all of which terminated fatally.

Tardieu speaks of a woman who wilfully murdered her three-months-old child by administering to it about 0.9 grammes (fourteen grains) of alum. In the majority of other cases the alum was taken by mistake for other medical preparations. Von Hasselt states that cases of poisoning arise sometimes from the administration of too large doses of alum by order of the physician.

In the case cited by Dr. Riequet, at the autopsy yellowish-gray deposits were found on the mucous membrane of the mouth, pharynx, and œsophagus; the tongue and palate were swollen; the stomach, intestines, and kidneys were hyperemic, but without noticeable loss of substance. Chemical tests were repeatedly employed for the poison, continually demonstrating its presence. From the above recapitulation of the first chapter, it is conclusively shown that alum is a powerful poison, producing a series of disorders in the system when taken internally, and finally ending in the death of the victim.

It now becomes important to look into the effects of alum, when used in bread, upon the human system. To this part of the subject the second chapter (omitted from this reprint) has been devoted. To review all the expressions of opinion of the prominent authorities mentioned in this chapter is unnecessary. The conclusions they arrive at, as to the effect produced in the system by the continued use of alumed bread is, that such bread will produce headache, indigestion, flatulence, constipation, diarrhœa, dysentery, palpitation, and urinary calculi. Dumas says: "It is to be feared that this salt exerts a deadly action by its daily introduction into the stomach, especially in persons of a weak constitution." Dr. Ure says: "The habitual and daily introduction of a portion of alum into the human stomach, however small, must be prejudicial to the exercise of its functions, and particularly in persons of a bilious and costive habit. . . . Every precaution of science and law ought therefore to be employed to detect and stop such deleterious adulterations." Dr. Pereira says: "Whatever doubt may be entertained as to the ill effects of alum on the healthy stomach, none can exist as to its injurious influence in cases of dyspepsia." Lombard says: "There is no need of saying how much these different modes of falsification are injurious to the health, though they do not provoke fatal accidents."

Dr. Gibbon says: "Its use in the manufacture of bread is injurious to health, and concurs, indirectly with other things, in increasing the mortality, especially of young children, the staple article of whose dietary is bread. The fatal diarrhœa of infants under three years of age may also have arisen from or been aggravated by this cause."

Dr. Daughlish says: "Its effect on the system is that of a tropical

astringent on the surface of the alimentary canal, producing constipation and deranging the process of absorption. But its action in neutralizing the efficacy of the digestive solvents is by far the most important and unquestionable . . . and the consequence is that a large portion of the gluten and other valuable constituents of the flour are never properly dissolved, but pass through the alimentary canal without affording any nourishment whatever."

Meyer says: "Alum exerts, especially in continued use, very injurious (constipating) effects on the body, and exactly this method of adulteration is one of the most dangerous, being carried on very often in the most refined way." Dr. Parkes says: "Looking, then, to the positive evidence, and the reasonableness of the evidence, it seems to me extremely likely that strong alumed bread does produce the injurious effects ascribed to it." Benoit says: "The habitual introduction of alum into the stomach of man, however slight it may be, must necessarily trouble the exercise of the functions of this organ, particularly in persons of a bilious or feeble constitution and constipated by temperaments, and especially in individuals leading sedentary life. Such a fraud should, therefore, be severely repressed by the police."

It is a notable fact that, in the whole course of my research on this subject, I was unable to find one scientific man who recommended the use of alum in bread making. Such being the case, it is my opinion that any intelligent person cannot help but condemn such a fraud, especially as it is denounced by the leading scientific men of the world, such as Dumas, Chevalier, Ure, Benoit, Gibbon, Schlossberger, Parkes, Booth, Morfit, Pereira, Normandy, the late Baron Liebig, and many others.

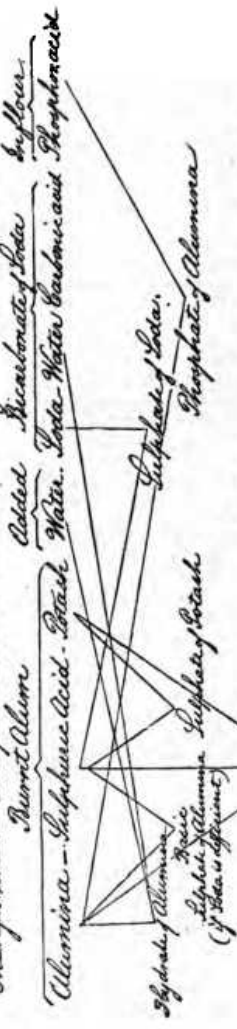
The introduction of alum as a substitute for cream of tartar in baking powders is a recent fraud on the public, and, strange to say, has been upheld by a few scientific men who, it would be supposed, in the face of losing a large fee, would condemn its introduction in the strongest possible terms, but unfortunately, for lack of time to properly investigate the subject, or tempted by the fee, have been influenced away from the proper line of action, which should be, not to see how near it is possible to poison a man and not do it, but rather how far it is possible to keep from poisoning him.

When alum is used alone in bread, it is partly decomposed into phosphate of alumina and basic sulphate of alumina; this change is brought about by the soluble phosphates of the flour; there is also some unaltered alum left in the bread. In an *alum baking powder*, another change takes place, owing to the presence of bicarbonate of soda, and hydrate of alumina is formed, a very soluble modification of alumina, as compared to the phosphate, or basic sulphate; but only just so much of the hydrate of alumina is formed, as there is bicarbonate of soda present in the powder to form it, and as the alum is always in excess, being the acid of the compound, there is also formed phosphate of alumina, basic sulphate of alumina, and some alum is left unaltered in the bread. This was clearly demonstrated by Professor Morton in his experiments. He found, by steeping a biscuit made with alum baking powder in water, that such water, when filtered, evaporated to dryness and ignited, and the residue dissolved in hydrochloric acid, and again evaporated, and then

Changes which take place when Alum is used alone in Bread.
in flour.



Changes which take place when an Alum Baking Powder is used in Bread.



* This has been actually demonstrated from
 Prof. Plücker's experiments on cats - in all cases where
 an excess of water is not first used.

dissolved a second time, did contain a small quantity of alumina after the phosphate of lime had been separated out. I have found the same thing myself any number of times. This experiment shows the presence of alum, as this is the only alumina salt present in the biscuit which could be soluble in water.

From this it will be seen that just the same alumina salts are present in the baked products, when an alum baking powder is used in baking, as when alum is used alone, with the addition of a far more soluble salt hydrate of alumina, and this in large quantities. It, therefore, naturally follows as the simplest logical deduction, that, whatever has been said against the use of alum used alone in bread, applies with all the more force to an alum baking powder. Because of the decomposition of the alum by the bicarbonate of soda, some scientific men have been induced to say "there was no alum in the baked product in which the powder was used," thus leading the public to believe by a trick in wording that the elements which compose the alum are driven off in the process of baking, while the truth of the matter is that every element which composes the alum remains in the baked product, which, if eaten, enter the stomach and are absorbed by the blood, acting the same as alum.

This is not only my opinion, but it is the opinion of the leading scientific men of this country, such as Chandler, Barker, Johnson, Hays, Willard Parker, Alonzo Clark, Wm. A. Hammond, Ryland T. Brown, J. A. McCorkle and J. H. Raymond, of the Brooklyn Board of Health, and many others.

THE EXPERIMENTS ON DOGS

It hardly seems necessary for any experiments on animals to decide a question of this nature so that the use of alum baking powders can be condemned, for a thorough scientific investigation of the subject can lead to no other conclusion. Still, as Professor Patrick, of Missouri, conducted some elementary experiments on cats to sustain his position in stating that alum baking powders are not injurious to health, and as such experiments were interpreted by him favorably—although I hope to show, and am quite positive I will, that his experiments are most detrimental to his views, and most favorable to the side which condemns the use of alum baking powders—I thought it advisable, in search of the truth, to conduct an exhaustive series of experiments on dogs, believing that such an investigation would meet with the approbation of the public.

It was with difficulty I found a suitable place to conduct the experiments so that the animals would not disturb the neighborhood; but through the courtesy of the Commissioners of the Dock Department, I secured a shed on their premises foot of Sixteenth Street and East River. This shed I had completely remodeled into a suitable house, having the dimensions of about 16x14x12 feet high. Sixteen stalls were made inside, having the dimensions of 3½ feet by 2 feet by 2½ feet. The bottom of each compartment was covered with straw, making a pleasant bed for the dogs. I then secured 16 dogs from the pound, which were all carefully examined to see if they were in a perfect state of health. None but strong, healthy