ALUM IN OUR BREAD.

In order that the people of the country may fully understand the causes of the present excitement as to the use of alum in baking powders, a history of the agitation is necessary:

In the *Scientific American* of Nov. 16, appeared an article by an eminent chemist of New York, showing the presence of alum in large quantities in a number of baking powders.

This article was copied into many newspapers, creating great excitement in every household where baking powder was used. The popular feeling grew so strong that in the early part of December, at a meeting of the Brooklyn Board of Health, on motion of President Crane, the Sanitary Superintendent was directed to procure samples of the various kinds of baking powders sold in Brooklyn, have them analyzed, and make a report thereon to the Board.

Sanitary Superintendent Raymond, M. D., has presented to the Board of Health substantially the following report on baking powders and cream of tartar, and the effects of alum on the human system:

The digestibility of bread depends, in great measure, upon its being porous. If it is compact and heavy, the digestive juices are unable to act upon it, and it remains in the alimentary canal, undigested, giving rise to those disagreeable sensations all know as indigestion. This porosity is given to bread by the carbonic acid gas liberated in the process of bread making, forming throughout the loaf little vesicles of gas which are held by the gluten of the flour until the baking has solidified the mass and made permanent the spaces originally produced by the carbonic acid gas. This gas is incorporated with the dough in various ways. It may be forced in as is done in the "aerated bread;" or the gas may be formed by fermentation. For this purpose yeast, a mass of minute vegetable cells, is employed; this acts upon the sugar of the flour, converting it into carbonic acid gas and alcohol; or again, the carbonic acid gas may be liberated from some salt, holding it in combination. This is the principle involved in the use of baking powders.

Without going, in detail, into the constitution of baking powders, it will only be necessary to say that they are made with bicarbonate of soda, or carbonate of ammonia and cream of tartar, chemically known as the bitartrate of potassa. These powders are especially used in making biscuit and cakes. Before the days of baking powders, and even now, in many families, the cream of tartar and bicarbonate of soda were purchased separately from the grocer, and a baking powder extemporized in each kitchen; but the lack of skill, resulting in lumps of soda in the product, led manufacturers to ascertain the proper proportion of these two salts, and to mix them, selling the compound as a baking powder. These manufacturers claim that the cream of tartar sold in the shops is very variable, and that nothing short of chemical analysis will determine the amount of cream of tartar in each sample; that this the householder cannot do himself, and therefore is unable to combine with it the proper proportion of soda.

This variability in the quality of cream of tartar, needs the chemist to detect it, and the extensive use of baking powders would seem to indicate that there is a popular demand for them, due to the inability of the average cook to make her biscuits and cakes successfully, when she herself mixes the cream of tartar and the soda. We have been unable to find, in any drug store or grocery, good cream of tartar sold at retail for less than 60 cents a pound, while in some places it was as high as 85 cents. Some of the manufacturers, in order to supply a cheap baking powder, have introduced alum as an ingredient, and this seems to be the only satisfactory reason for its use that can be given. Bicarbonate of soda is used in these alum powders, as in the others, and carbonic acid gas is similarly produced.

In many countries alum has long been used by bakers in bread making. The effects of alum on the human body are well known, and are, beyond doubt, injurious when taken in large quantities, or in small quantities often repeated. All authorities agree in this, and there is no room for discussion.

The report of the Brooklyn Board concludes as follows:

From a careful examination, I am satisfied that the weight of evidence is against the use of alum in baking powders, and that the risks incurred in its use are too great to be incurred for the sake of cheapness alone. The mucous membrane of the stomach, and the intestinal canal is a delicate structure, and materials which would produce no effect on the outside skin, might irritate and inflame these organs.

The *N. Y. Evening Post* has been giving this subject some attention, and has published the result of some remarkable investigations, which are worthy the close attention of thoughtful people.

From its recent exposure of the use of *burnt alum* in some brands of baking powders, in place of cream of tartar, the following extracts are mainly taken:

Pursuing the investigation of the quality of the food sold in this city, the representative of the *Evening Post* took up baking powder as one of the articles in most general use in our households. It is used by nearly every family in the city, and it is naturally of great importance to those who eat the food made with it to know whether it contains anything injurious to health.

There are certain constituents of good baking powder which may be regarded as entirely free from danger. They consist of pure grape cream of tartar, bicarbonate of soda, and carbonate of ammonia. The cream of tartar unites with the other two ingredients, and carbonic acid gas is thrown off, producing the same effect as yeast in a much shorter time. It has been found, however, that alum will also unite with the other two articles, and carbonic acid gas will be produced. As alum costs less than three cents, while cream of tartar costs more than thirty cents a pound, it is easy to see why alum is substituted for the latter by some baking powder manufacturers. It is admitted by all medical authorities that cream of tartar leaves no injurious substance in the bread; alum, on the other hand, is in itself an astringent, and there is wide and deep-seated prejudice against its use. In England and other countries the adulteration of food with alum is forbidden by law under heavy penalties. The chemical effect of alum used in bread to whiten it is to form two salts of alumina—the sulphate and the phosphate of alumina. When used in baking powder the alum forms a third salt, the hydrate of alumina, as well as the other two. This hydrate of alumina is far more easily soluble than the other two; hence any objection that may exist as to the use of alum alone in bread applies with greater force to its use in baking powder. This fact can be proven by the following named authorities:

Parke is the leader of the new school of hygiene in England. In his "Treatise on Hygiene," he says:

Looking then to the positive evidence and the reasonableness of that evidence, it seems to me extremely likely that strongly alumed bread does produce the injurious effects ascribed to it. These effects, as he previously states, are indigestion, griping, constipation, and kindred troubles resulting from irritation of the mucous membrane, produced by the astringent properties of alum.

Persons who have not strong constitutions, growing girls, young children, and nursing mothers, are particularly liable to the evil effects produced by this use of alum. Heartburn and the prevalent forms of indigestion are often solely traceable to the action of alum on the delicate coats of the stomach.

To make sure of knowing the action of alum, the *Evening Post's* representative obtained the following expressions of opinion as to its effect when used in baking powder from some physicians of New York of the highest reputation and ability.

Dr. William A. Hammond, formerly Surgeon-General United States, of No. 43 West Fifty-fourth Street, expressed himself as perfectly certain of the injurious effects of alum, whether used alone to whiten bread, or as an adulterant of baking powders. Alluding to the claim advanced that the alum was neutralized and changed into an insoluble salt, he said that this was a wholly improbable assumption, since such a perfect change could not take place unless the amounts of the alum and the bicarbonate of soda were combined in the exact chemical ratio necessary for each to absorb all of the other. Not only was this impossible in the manufacture of large quantities of baking powder, but the homogeneous character of the compound could not be exactly maintained throughout the whole mass, and therefore there would be sure to be a certain amount of free alum in any bread made with an alum baking powder. But even if the exact propor-

tion were maintained, the salts formed would retain their injurious properties, as they would be dissolved in the gastric juice. The gastric juice contained not only lactic acid, but a large amount of hydro-chloric acid, and both the sulphate and hydrate of alumina would be dissolved. The phosphate might not be, but in that case the bread would be deprived of one of its most desirable ingredients, making the use of alum not only dangerous to the stomach, but deteriorating to the food.

"The hydrate of alumina," Dr. Hammond said, "would certainly be injurious to the mucous membrane. It would inevitably tend to constipate the bowels and interfere with digestion; and anything that tends to render the albumen of the bread insoluble, and therefore takes away from its nutritive value, is injurious."

Dr. Willard Parker said that if alum was substituted for cream of tartar in baking powder, in his opinion such powder would be injurious to health.

Dr. Alonzo Clark considers that alum has its uses, but it should not be ignorantly taken into the stomach in food. A substance which can derange the stomach, and in certain cases produces vomiting, should not be tolerated in baking powder.

Other great authorities, such as Carpenter, Thompson, Gibbon, and Normandy, all agree that the continued use of bread containing alum will bring about dyspepsia and other troubles.

Dr. Sayre, former President of the Broad of Health, said to one of the representatives of the New York press:

After the experiments in this line by Liebig, and other distinguished chemists, and vivisectors, with alum on cats, dogs and other animals, with the published results, we may well ask what is the use of such experiments if we do not apply them to practice, in the preservation of human life and health? The Board of Health should see to this.

Dr. Waller, chemist for the New York Board of Health, when asked by a *Sun* reporter as to the injurious effects of alum, replied:

You know what the effect of alum is when you take some of it in your mouth; well, that is just the effect it has upon the coats of the stomach.

The analysis of the various baking powders, as officially reported by the Brooklyn Board, reveals only two brands containing alum being sold in that city.

This is a much smaller proportion of alum baking powders than the number in use as reported by Dr. Henry A. Mott, Jr., as Chemist for the Indian Department of the United States. He found seventeen alum baking powders out of the forty-two that he analyzed. Whether this is the usual proportion of alum baking powders in the market or not is not of so much consequence. It is undoubtedly true that some very popular baking powders are made with alum for one of the basic salts.

As to the cream of tartar powders, the same report mentions the Royal Baking Powder as free from alum or any other substance injurious to life and health.

The are probably more than five hundred kinds of baking powder manufactured in this country, and, while some of them are sold from the Atlantic to the Pacific, the majority have only a local sale near their respective places of manufacture. Through Dr. Henry A. Mott, Jr., the well known chemist, one of the most competent, trustworthy and careful experts of this country, analyses were obtained, showing the presence of alum in large quantities in many of the baking powders having a wide sale. Dr. Mott kindly furnished not only the results of his own analyses, but also those of several chemists of high professional standing, including Professor Henry Morton, President Stevens Institute of Technology; Professor R. W. Shedler; Dr. Stillwell, of Walz & Stillwell, analytical chemists.

Having obtained the foregoing, the reporter called at the office of the Royal Baking Powder Company, 171 Duane street, the manufacturers of the Royal Baking Powder, a brand which the report of the Brooklyn Health Board revealed to be pure. Mr. J. C. Hoagland, President of the Company, gave the following replies:

REPORTER. "What is the cause of the present excitement about baking powders?"

MR. HOAGLAND. "It is due to the substitution of alum for cream of tartar by some manufacturers."

REPORTER. "Have you ever used any alum in the Royal Baking Powder?"

MR. HOAGLAND. "No, sir."

REPORTER. "But I find that it is used by others. What is it used for?"

MR. HOAGLAND. "I presume because it is cheaper than cream of tartar, which it replaces."

REPORTER. "You would, therefore, obtain a larger profit by using alum than by using cream of tartar?"

MR. HOAGLAND. "Yes, for a time such substitution would more than double our profits."

REPORTER. "Why, then, do you not use it?"

MR. HOAGLAND. "For two reasons: first, the authorities on this point are so positive and conclusive that the continued use of alum in this way is dangerous to health, that we could not conscientiously use it; if others choose to take risks on the public health, we shall not follow them, preferring to continue the use of pure grape cream of tartar, which is demonstrated to be wholesome; second, our experience during twenty years has satisfied us that that which is best for the public is best for us. We cannot afford to peril the reputation of the Royal Baking Powder."

REPORTER. "Can you give me any information about cream of tartar, how and where you procure it?"

MR. HOAGLAND. "Certainly. There are several substitute or 'patent' cream of tartars on the market, made from bones treated with strong corrosive acids; but the cream of tartar we use is a fruit acid; it exists naturally in the grape, and during fermentation of the tart wines in France, it is deposited on the sides and bottom of the casks. In its unrefined state it is called crude tartar or Argols, and is taken from the casks, after the wine has been drawn off. Each farmer has his crop of it, according to the amount of wine he has produced. This Company is the largest user of cream of tartar in the world, and we have our agents in Europe, collecting the crude material. It is imported into this country as Argols, and then subjected to the higher processes of refining, by which it is purified especially for our purposes, forming pure white crystals, which we grind to powder, and, in this form, we use it as an ingredient in our Baking Powder."

Other interviews were had, all to the same general effect, namely, that alum is used by many manufacturers to cheapen their powder, and enable them to undersell their competitors. Many of them are probably ignorant of the evil effects of alum on the system, while others are indifferent so long as they make money, and no one can be said to have dropped dead from taking their powder.

By this exposure of the injurious effects of alum in baking powder, the public must not be frightened from using baking powders when properly made.

In the report of Prof. Elwyn Waller, Assistant Health Inspecter of New York Board of Health, on baking powder in 1872, the public are recommended to purchase one of the well-known brands of baking powder, in preference to purchasing the cream of tartar separately, as this substance was found in all cases to be adulterated with sulphate of lime, commonly called terra alba, and to such an extent that in most cases the cream of tartar was really terra alba, to which a small quantity of cream of tartar had been added. The inspector further states that when the mixture is made on a larger scale in a factory, and the baking powder is put up in packages ready for use, the manufacturer experiences no difficulty, in the first place, of securing good materials, free from adulteration, and secondly, in mixing these materials in the proper proportions.

Dr. Mott, the Government Chemist, in his review of this subject in the *Scientific American*, makes special mention of having analyzed the Royal Baking Powder, and found it composed of wholesome materials. He also advises the public to avoid purchasing baking powders as sold loose or in bulk, as he found by analysis of many samples that the worst adulterations are practiced in this form—the label and trade-mark of a well-known and responsible manufacturer, he adds, is the best protection the public can have.