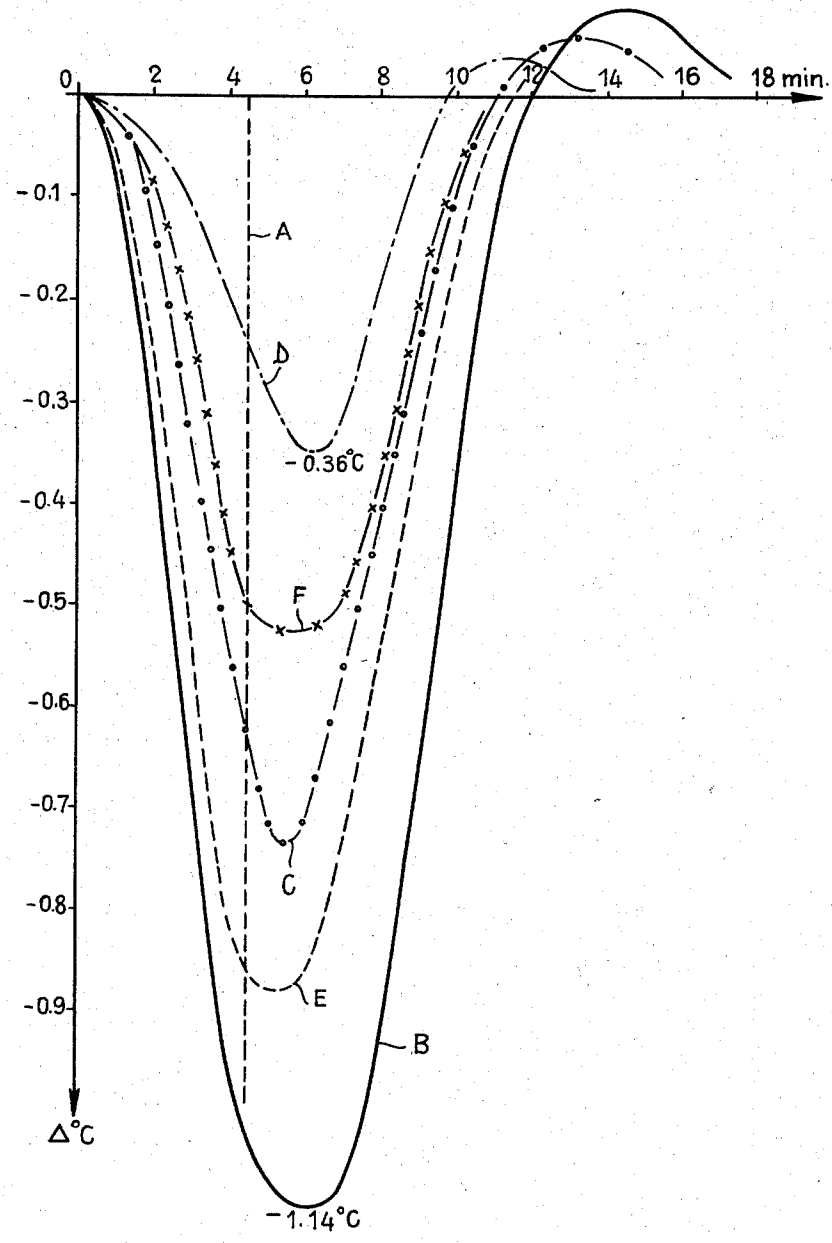
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TREATING TOBACCO AND CIGARETTE PAPER

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TREATING TOBACCO AND CIGARETTE PAPER

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5 Claims. (Cl. 131—17)

This invention relates to tobacco preparations for smoking and aims generally to neutralise toxic and cancerogenic effects of tobacco.

Attempts have been made for a long time to treat tobacco or cigarette paper with a view to neutralizing or at least reducing toxic effects of smoke inspired by smokers. So, for instance U.S. Patent 1,842,266 to Calvin S. Hicks suggests to admix tobacco with a proportion of yeast (0.01–10%). This prior proposal is based on the acknowledgment that the effects of smoke on human organism are the same as or similar to those produced by the deficiency of vitamin B, more particularly depression of growth, depression of the physiological system, autointoxication, loss of appetite, dyspepsia, intestinal stasis or stoppage, disruption of neuro-muscular control and general lowering of vitality and ability to ward off infection. Since, as is well known, yeast is a product relatively rich in vitamin B, Hicks exactly proposes to admix tobacco blend with yeast, so that vitamin B can be inspired by the smoker and absorbed by the organism for neutralizing the above toxic effects.

A more recent work in this field is due to Pierre Steiner (French Patent No. 932,560, published on March 25, 1948). According to Steiner, the smoke from the cigarette, cigar or the like should be admixed generally with at least one body or compound adapted to intervene into the cellular metabolism of human organism, more particularly into the cellular respiratory process. These bodies or compounds are for instance vitamin B, vitamin PP (known as nicotinic acid or betapyridin-carboxylic acid), vitamin C, adenylic acid and pantothenic acid, as well as ferments and co-ferments.

In experiments, which have preceded my invention I ascertained that the discoveries by Hicks and Steiner actually involve improvements in reaction against smoke by the human organism, consisting more particularly in a smaller lowering of cutaneous temperature upon smoking a cigarette, as well as in more rapid restoring to normal temperature.

It should however be added now that, according to more recent scientific opinions, objectionable smoke effects are due prevailingly to tar substances generated on combustion of tobacco, said substances when inspired by the smoke being responsible not only for most of the above mentioned intoxication symptoms, but also above all, of some forms of cancer, such as lung cancer. Therefore in determining the useful effects of neutralizing agents such as yeast, nicotinic acid etc. a fundamental importance should be attributed to the contents of tar substances in the smoke from cigarettes which have been admixed with such agents. Unfortunately as will be explained in greater detail hereafter, neutralizing agents proposed heretofore are incapable of substantially and appreciably reducing said content. So, for instance, combustion of one gram tobacco of cigarettes known in Italy by the brand "Nazionali" yields about 0.047 gram of tar substances. Combustion of one gram of the same tobacco blend which has, however, been admixed with

10 mg. of brewers yeast yields about 0.041 gram of tar substances. These contents are further lowered when adding 100 mg. of yeast. However, in the latter case, the cigarette taste is however fully altered, while the reduction in tar substance content does not reach even 20% with respect to the original value.

Nicotinic acid (betapyridincarboxylic acid) has been found more advantageous under this aspect as a proportion of 0.05% of said acid reduces the tar substances content to a value of about 0.036 gram per gram of tobacco and, when added in relatively high proportions (50 mg./g.) which are not always cheap, said content is lowered down to 0.024 gram (about a half of the original content).

These results cannot be regarded as satisfactory both because they require an excessive proportion of neutralizing agents and because a reduction down to 50% of the tar substances content can be reached even through suitable filters, which are considerably less expensive and do not alter the cigarette taste.

Now in considering these results obtainable heretofore I conceived that better results could be reached if a neutralizing agent could be built up comprising at least two components, one of which should exert a synergetic action in respect of the other. It should be noted that this concept of the synergetic action is thoroughly novel in this field, inasmuch as, contrarily to the proposals by Steiner or Hicks, it is not based on the choice of one or other compound merely because it contains a vitamin or an enzyme, but involves a combination of at least two compounds which, by acting jointly, yield immediate results (substantial reduction in tar substances content) beyond any expectation.

Starting from this idea I have found that the neutralizing effect due to betapyridincarboxylic acid becomes highly appreciable if this acid be accompanied by the adenosinetriphosphoric acid or a salt of the latter which, by decomposing, exactly yields adenosinetriphosphoric acid. Such salt could be more particularly sodium adenosinetriphosphate. Moreover, I further ascertained that further improved results are obtained by adding to the two abovementioned components (betapyridincarboxylic and adenosinetriphosphoric acid) a coenzyme selected from the group consisting of cozymase I and cozymase II.

This application is a continuation-in-part of my application Serial No. 491,545, filed March 1, 1955, now abandoned.

It should be noted at this stage that all these components are to be found in yeast which, however, also and prevailingly contains numerous further components of compounds while, for the purposes of this invention I have found it important for the relative proportions of said components to be maintained above certain minimum values. So, for instance, for the synergetic action to develop fully and in order to attain a maximum reduction in tar substances there should be to each gram tobacco 0.5–30 mg. (0.05–3%) betapyridincarboxylic acid (nicotinic acid) and 0.5–5 mg. (0.04–0.5%) adenosinetriphosphoric acid or its abovementioned sodium salt possibly with at least 0.1–1 mg. (0.01–0.1%) cozymase I or cozymase II. Greater importance should be attributed to lower limits for, if desired, top limits can be exceeded which is, however, detrimental to the cigarette taste and economy, since proportions exceeding those indicated above do not lead to appreciable further improvements. Moreover, generally, the ratio of betapyridincarboxylic acid to adenosinetriphosphoric acid should range between about 10:1 and 10:4, it being understood that in the presence of cozymase I or cozymase II the proportion of adenosinetriphosphoric acid should be displaced towards its lower limit.

A typical composition according to this invention is as follows:

Tobacco ..... 1.0 g.
Nicotinic acid ..... 5 mg. (0.5%)
Sodium adenosinetriphosphate ..... 0.5 mg. (0.05%)

the percentages being by weight and being referred to the tobacco quantity.

The effects obtained by this invention can be looked upon as surprising in respect of the tar substances content and lowering of the cutaneous temperature during smoking and after smoking, as will be better explained hereafter.

From tobacco composing the cigarettes of the brand "Nazionali" seventeen different batches were prepared, numbered 1 to 17 in the following table, of the composition given in the table. From each batch 100 cigarettes were manufactured, which were smoked in an apparatus comprising a mouthpiece connected with a suction pump through a number of Drechsel (bubbling) bottles followed by a Liebig cooler. Each Drechsel bottle contained 50 ml. chloroform which is known as an elective solvent for tar substances. With an apparatus prepared as above, a cigarette is inserted into the mouthpiece, suction by the pump is adjusted to be, as will be ascertained from the extent of bubbling, rather moderate and uniform, the cigarette being then lit. Under these conditions the tar substances evolved on combustion of tobacco are absorbed by chloroform and any non-absorbed proportion are condensed in the Liebig cooler. Upon smoking the 100 cigarettes of one batch, the apparatus is disassembled, all its component parts are washed with chloroform in order to collect any trace of tar substances, the whole chloroform containing the tar substances being evaporated on a boiling water bath. The tar residue is weighed, the resulting weight being divided by the weight of the burnt tobacco. This yields the weight of tar substances referred to one gram tobacco from the batch.

The same procedure was followed with further 16 batches, the results being as follows:

Batch No.	Composition referred to 1 g. of tobacco	Tar content per 1 g. of tobacco
		G.
1	not treated	0.04733
2	5 mg. nicotinic acid	0.03587
3	50 mg. nicotinic acid	0.02352
4	5 mg. nicotinic acid + 0.5 mg. sodium adenosine triphosphate	0.01321
5	5 mg. nicotinic acid + 2 mg. sodium adenosine triphosphate	0.01296
6	5 mg. nicotinic acid + 0.5 mg. sodium adenosine triphosphate + 1 mg. Cozymase II	0.01271
7	5 mg. nicotinic acid + 2 mg. Cozymase II	0.02783
8	30 mg. nicotinic acid + 5 mg. sodium adenosine triphosphate + 10 mg. Cozymase II	0.01063
9	5 mg. nicotinic acid + 0.5 mg. adenylic acid	0.02662
10	5 mg. nicotinic acid + 0.5 mg. adenylic acid + 1 mg. Cozymase II	0.02317
11	5 mg. nicotinic acid + 0.5 mg. sodium adenosine triphosphate + 1 mg. Cozymase I	0.01295
12	5 mg. nicotinic acid + 0.5 mg. adenosine triphosphoric acid + 1 mg. Cozymase II	0.01214
13	1 mg. yeast (dry, powdered)	0.04712
14	10 mg. yeast (dry, powdered)	0.04161
15	100 mg. yeast (dry, powdered)	0.03912
16	0.5 mg. sodium adenosine triphosphate	0.04683
17	0.5 mg. adenosine triphosphoric acid	0.04627

The above table (batches 1, 13, 14, 15) shows first of all that the admixture of yeast, even in considerable proportions, leaves the tar substances content practically unaffected. This may be explained by the fact that nicotinic acid, adenosinetriphosphoric acid and cozymase are found in yeast in negligible proportions for practical use and are probably not in a condition suitable to promote a synergetic action. It will therefore be obvious that use of yeast as neutralizing agent could be justified by its vitamin B content but is not connected in the least with the spirit and scope of this invention. So, for instance, yeast probably exerts on the human organism delayed actions, connected with its vitaminic contents as well as a certain action which somewhat reduces the usual lowering of the cutaneous temperature, as will be explained in greater detail hereafter, but there is no question of it being capable of reducing to a practically appreciable extent the contents of tar substances formed on combustion of tobacco. Yeast can therefore be attributed healing rather than preventive properties.

The synergetic action according to this invention is clearly ascertained on comparing batches 2, 4 and 16, from which it will be seen that the tar substances content of batch 4 is incomparably lower than could be imagined on separately considering batches 2 and 16. It is further pointed out that the result yielded by batch 6 or 11 or 12 is undoubtedly surprising over the result yielded by batches such as 7 or 10 which lacked adenosinetriphosphoric acid, which is the chief synergetic agent according to this invention.

The best results were yielded by batches 5, 6, 11 and 12 in which the tar substances content was reduced to about 0.012 g. per gram of tobacco through an addition of neutralizing agents which does not exceed 7 mg. The result yielded by batch 8 can be looked upon as exceptional, but has been obtained through larger proportions of neutralizing agents; further increased proportions enabled me to reduce the tar substances content down to about 0.0095 g.; however, this result was accompanied by an appreciable alteration of the cigarette taste and is therefore unacceptable.

Reference will hereafter be made to the accompanying drawing, showing a diagram on which the abscissae give in minutes and the ordinates the drop $\Delta°$ C. in temperature. The curves plotted on this diagram were determined by experiments on human subjects, each curve showing the average of the results of 44 tests.

Each time a cigarette was smoked by a subject in four minutes and thirty seconds, and the cutaneous temperature of the subject on the back of the index finger of the left hand was measured by means of a thermocouple, usually employed for measuring cutaneous temperature.

Smoking was started when cutaneous temperatures were stabilized, viz., when variations thereof were less than 0.1° C. Determination of the temperature was carried out every minute for a total time of at least fifteen minutes running from the start of smoking. The vertical line A corresponding to 4.5 min. indicates when smoking was interrupted.

Curve B refers to the batch 1 (untreated cigarettes). It appears from this curve that in about six minutes after smoking was started cutaneous temperature was subjected to $\Delta°$ C. decrease of 1.14° C., thereafter it began increasing and then stabilized to its initial value after more than sixteen minutes from the moment the smoking was started.

Curve C refers to cigarettes treated with nicotinic acid only (batch 2). The maximum decrease in temperature was in this case 0.76° C. only and temperature stabilized to its normal value after about sixteen minutes.

Curve D refers to cigarettes of batch 6, that is to cigarettes prepared according to one aspect of this invention. In this case, the maximum decrease was 0.36° C. only and temperature resumed its initial value at the thirteenth minute, that is, in 8.5 minutes after smoking was interrupted.

Curve E refers to cigarettes of batch 15.

In comparison with curve B, this curve E denotes a certain improvement in the sense that decrease in temperature was 0.81° C. only (instead of 1.14° C.) and temperature stabilized more quickly. However, the subjects all complained about a strange taste of the ciga-

rettes which, on the other hand, was not at all surprising, since each cigarette contained 10% yeast.

Curve F refers to a cigarette from batch 10, which differs from batch 6 in that while in the latter 0.5 mg. sodium adenosinetriphosphate were employed, in the former 0.5 mg. adenylic acid were employed. Though curve F is more favourable for instance than curve C (nicotinic acid only), it will however be seen that it does not reach the advantage shown by curve D. This shows that adenylic acid cannot be looked upon as an equivalent of adenosinetriphosphoric acid (which evolves on decomposition of sodium adenosine triphosphate).

Considering the preceding description, it is believed that experts in the branch are now in a condition to fully appreciate the spirit and scope of this invention, as well as the differences between this invention and teachings of the prior art. More particularly, as shown by the preceding table and diagram on the accompanying drawing, this invention is based on a novel association of at least two components (nicotinic acid and adenosinetriphosphoric acid), preferably in combination with cozymase or cozymase II, in certain proportions to one another and to tobacco such as to yield a synergetic action not obtainable with yeast only (compare batches 13–15 and curve E on the diagram), in any case superior to the action of nicotinic acid in association with adenylic acid (batch 9). This leads to believe that, while adenylic acid chiefly acts on the subject and affects combustion by a small extent only, as distinct therefrom, adenosinetriphosphoric acid besides positively affecting the subject moreover gives rise to decomposition products which co-act with nicotinic acid in strongly affecting in a negative sense building up of tar substances, thereby preventing at the start possible effects on the human organism.

It will be moreover understood that, in order to carry out the invention, the individual components should be separately available for duly proportioning thereof. Generally, a mixture of 0.5–30 parts by weight nicotinic acid (betapyridincarboxylic acid) and 0.5–5 parts by weight adenosinetriphosphoric acid (or sodium adenosine triphosphate) is separately prepared, adding, if needed, 0.1–1 part by weight cozymase I or II, this mixture being uniformly distributed over 1,000 parts by weight tobacco. However, it is pointed out that, since the proportion of the agents according to this invention with respect to tobacco is generally significantly small, these agents can even be jointly incorporated for instance in cigarette

paper or any component of the cigarette or cigar taking part in combustion. This would not be possible with yeast which, as is well known, contains less than 0.05% cozymase I and similar irrelevant contents of nicotinic acid and adenosinetriphosphoric acid. Physical manipulation of the individual ingredients and tobacco for the purpose of thorough mixing, uniform distribution or impregnation is no problem per se and can be carried out in the usual manner in this branch, such as indicated by Steiner or Hicks.

What I claim is:

1. In a smoking preparation of tobacco, a neutralizing agent consisting of at least 0.5 mg. of betapyridincarboxylic acid, and at least 0.5 mg. of a compound selected from the group consisting of adenosine triphosphoric acid and sodium adenosine triphosphate per every gram of tobacco contained in the preparation.

2. In a smoking preparation of tobacco, a neutralizing agent consisting of at least 0.5 mg. of betapyridincarboxylic acid, at least 0.5 mg. of a compound selected from the group consisting of adenosine triphosphoric acid and sodium adenosine triphosphate, and at least 0.1 mg. of an enzyme selected from the group consisting of cozymase I and cozymase II per every gram of the tobacco contained in the preparation.

3. In a smoking preparation of tobacco, a neutralizing agent consisting of about 5 mg. betapyridincarboxylic acid, and about 0.5 mg. sodium adenosine triphosphate per every gram of the tobacco contained in the preparation.

4. In a smoking preparation of tobacco, a neutralizing agent consisting of about 5 mg. betapyridincarboxylic acid, about 0.5 mg. sodium adenosine triphosphate, and at least 0.1 mg. cozymase II per every gram of tobacco contained in the preparation.

5. In a smoking preparation of tobacco, a neutralizing agent consisting of about 5 mg. betapyridincarboxylic acid, about 0.5 mg. adenosine triphosphoric acid, and at least 0.1 mg. cozymase II per every gram of tobacco contained in the preparation.

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