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FROM R.L. Rice
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TO Mr. R.S. Wade
Laboratory Manager

December 21, 1961.

Re: Nicotine Transfer to Micro-tar Pyrolysate

Reference: Letter from Dr. I.W. Hughes to R.S. Wade dated Dec. 11, 1961.

In reply to Dr. Hughes' queries in his letter of December 11, I would like to point out that our data is rather limited but I hope the following information will prove useful to him.

Conditions of Pyrolyses

The procedure of Griffith and Moll (Report No. C.005) was used with the following modifications:

- a) Stainless steel planchets (1.25 inches in diameter x 0.01025 inches) were used instead of foil cups.
- b) The inner diameter of the collection funnel was 11 mm. instead of 8 mm.
- c) Heating rate: See attached figure, total heating time was five minutes.

The heating rate of the planchet was determined by holding a platinum-platinum (87%) rhodium (13%) thermocouple against the upper surface of the planchet and recording the E.M.F. generated with a Speedomax recorder. Thermocouple wire of 2/1000 inch was used and the thermocouple was held against the planchet by resting the tip of a glass rod (0.25 x 5 inches) on it.

Heating rates were determined without the trap in place or without tobacco on the planchet. I do not know if the tobacco and/or the funnel would provide sufficient insulation to affect an increase the rate of heating or alternately if the higher air flow over the planchet (during the micro tar determinations) would have a cooling effect.

d) Air flow: In packing the funnel, air was drawn through at the rate of 2400 cc/minute and approximately 1 gram of α -cellulose (sieved through a 35 mesh screen) slowly added with occasional tapping until a vacuum equivalent to 8.5 inches of Hg was obtained between the funnel and the pump. The funnel was then attached to the combustion manifold and the air flow through the funnel adjusted to 1900 cc/minute by a needle valve (each part had a needle valve between the funnel and the main line to the pump). The measurement of air flow through the funnel was accomplished by holding a round plastic disc fitted with an "O" ring against the inside of the funnel. An inlet tube in the center of this disc was connected to an air flow meter.

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e) We used a somewhat larger particular size of tobacco than used by Louisville. The tobacco was ground through a 1 mm. screen in a standard Wiley mill. On sieving tests, approximately 50% of the sample passed through a 35 mesh screen (U.S. No.40) and the entire sample through a 20 mesh screen (U.S. No.20). No significant difference was found between the micro tar values of the finer and coarser samples but nicotine contents of the micro-tar were not compared.

Determination of Nicotine in Micro-tar Solutions

The total micro-tar solution representing 0.1 gram of tobacco was transferred to a 100 ml. beaker and 5 ml. of 0.1 N H₂SO₄ added. The solution was evaporated on a steam bath under a jet of air to a volume of 2-3 cc. After evaporation, the residue was transferred to a Griffith still using a wash bottle, MgO added and the normal nicotine procedure followed.

We did not carry out an acid distillation prior to the alkaline distillation.

The spectrum for nicotine was good other than having a high background.

In one experiment we "backed up" the α-cellulose trap with a HCl trap. We found no nicotine in the HCl solution although there was pyridine and possibly picolines.

Results

All the results we have are presented in Tables 1 and 2.

a) The nicotine transfer of sample RL 54 (lug grade) is slightly lower than the other three grades but this difference could be due to experimental errors. If the nicotine in the micro-tar were 1.29 mg. (within the confidence limits of the data) the percent transfer would be 76%.

b) The nicotine transfer of sample 29-30 is lower than the other extracted tobaccos but this sample is in the middle of a group of toluene and benzene extracted samples (in respect to the level of nicotine in the tobacco) and the other samples do not differ between themselves or from the control (RL 54B).

Comments

1. One main purpose in determining the nicotine transfer to the micro-tar pyrolysate was to evaluate any major differences in this property between extracted and unextracted tobacco. Our data would indicate that there is no difference between the extracted and unextracted tobaccos.

2. I would be very interested to know at what part of the heating cycle the nicotine is released from the tobacco. Considering the comparatively slow heating rate of the micro-tar pyrolyses, I have wondered if the nicotine transfer to the smoke is independent of the aerosol formation. We have noted, in one "bad run of micro-tars, low values for the micro-tar values but no difference for the nicotine transfer values.

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