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R. J. REYNOLDS TOBACCO COMPANY

INTEROFFICE MEMORANDUM

SENSORY EVALUATION DIVISION

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SUBJECT: Sensory Evaluation Research and Support Planning

DATE: July 18, 1988

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FROM: Margaret R. Savoca

Our meeting has provided SED with a great deal of information regarding the direction that test methods and resources need to take to meet R&D's sensory research and support requirements. I have summarized the general requirements communicated by each group and will then consolidate these into key areas for sensory research, methods development and resource development.

BRANDS

Brands will continue to apply the sensory support philosophy which has been successful for the past few years. That is to utilize SED diagnostic testing for the measurement of the sensory characteristics and PGT testing for prototypes selection and consumer direction. This approach is very efficient and, as long as sufficient PGT resources are available, will continue.

There are three areas where sensory testing needs will be higher than what has been seen over the past year. There may be the need for a large volume of discrimination and diagnostic testing for all brands if and when alternate G-13 processes are identified for implementation. If the emphasis on the 18-24 year old smoker increases, diagnostic testing for prototype screening will become a high priority. There will be more emphasis on increased menthol delivery efficiency. Changes in menthol application methods may require storage and stability studies. There may also be interest in knowing how the sensory perception of menthol during smoking is altered by other menthol application systems.

MAJOR ISSUES:

* Increased diagnostic testing resources for product improvements and G-13 changes.

* Menthol QDA to determine acceptable menthol delivery systems.

* The use of real-time perceptual measures for menthol perception.

NEW PRODUCT TECHNOLOGY

There are several major areas that will need to be addressed in the next six months to support the short term product improvement program. The main areas for the improvement effort will be to improve the taste characteristics, improve aroma, reduce cost, reduce CO, and material substitution. A key area of flavor development will be the characterization and development of cigarette smoke taste. The use of novel flavors is also being explored but is not as high a priority as these other issues. Storage and stability concerns will also be issues.

There are two types of decisions that require sensory evaluation data. The first is product changes which are not designed to alter the perception of the product. Due to the complexity of launching a new product with an accompanying new process, many changes will be necessary in a short period of time. The sensory data necessary will be required for these go-no-go decisions. It is advisable to test as many of these in combination as is possible so that several changes can be implemented at one time. The second type of information will support product improvements. This is where perceptual changes are desired and the direction and acceptability of such changes need to be measured as efficiently and reliably as possible. The use of prototypes on an extended usage basis will be important because of the novelty of the product in general and single cigarette evaluation may not provide sufficient exposure.

To date, SED has not been requested to provide any claims substantiation information for the project. This situation may change, but there are not any plans to involve SED in claims prior to the introduction of the product.

MAJOR ISSUES:

* Product improvement, especially cigarette smoke taste.
* Product changes to address cost and other concerns.
* Odor acceptability (ETS).
* Shelf-life and storage.
* The need for extended usage data for acceptance.
* The need for quick decisions for process and material changes.
* Possible Claims Substantiation.

ADVANCED PRODUCT TECHNOLOGY

This group is working in two major areas. First is product improvements for the current NPT product. This includes material replacements, CO reduction, and tobacco smoke flavors. They are also working on varying nicotine levels and the incorporation of nicotine-like tastes and sensations. The second area is focused on the novel concepts and the completion of initial product design. These various concepts will vary considerably and those with the greatest consumer interest or benefit will go on to the optimization phase in New Product Technology.

The important considerations regarding NPT product improvement have already been mentioned. Understanding characteristics of cigarette or tobacco smoke taste is a key issue. There may be many approaches to this problem which are viable but capturing those which are most appropriate will be difficult without very directed sensory research in this area.

The need for screening novel products in their infancy is very critical. We need to be in a position where we can identify consumer benefits and maximize these as well as minimize the disadvantages as early as possible. It is also important that we determine which of the product options have the greatest number of benefits with the fewest trade-offs for the consumer.

MAJOR ISSUES:

* Tobacco Smoke Taste: what it is and what are the best approaches for using modified tobaccos to achieve it.
* Screening of novel products.
* Understanding the role of nicotine in taste or flavor perception and what other materials can impart nicotine-like perceptions.
* Shelf-life and storage.

CIGARETTE TECHNOLOGY (Watt Dufour)

The current emphasis has been on VRP/SRP products and the product characterization program. The use of pellet technology and low sidestream (TF) will continue and expand to include other types of flavors and aroma precursors. If our experience with these projects is any indication, the degree to which the social acceptability aspects of a product is improved will become important sensory information for product developers.

The XGT product research is exploring methods for increasing nicotine delivery in conventional products. This area would benefit from sensory research in nicotine perception. There will also be an increased emphasis on identifying ways of altering the intensity of sensory characteristics of aftertaste. This area has not been systematically studied from a sensory research perspective.

Cigarette Technology will be drawing from several research areas to identify possible new approaches to new products (those which are more closely related to conventional cigarettes). In order to focus resources on the most promising of these, screening studies will be necessary. These studies will be useful in order to identify consumer benefits and trade-offs as well as to eliminate those options which are not worth pursuing at all. As mentioned earlier, the screening criteria must include the social acceptability issues. The shelf-life issue will also become an important factor in judging the viability of a particular technology.

To what extent claims substantiation testing will continue is not known. As we begin to introduce products which have direct consumer benefits, we will establish a standard for the industry. This may require that we re-test our own product with that of any competitor which is positioned the same to have consumer product benefit.

MAJOR ISSUES:

* Social Acceptability measures.
* Technology screening (smokers and non-smokers).
* Shelf-life and storage.
* Nicotine perception.
* Aftertaste.

At this point it is not possible to develop specific plans for each area but it is feasible to identify areas for sensory research and testing resource requirements that are necessary to assist in achieving our development goals. I will discuss each of these briefly from SED's perspective.

SENSORY RESEARCH PROGRAMS

1. ETS

R&D has been developing prototypes in the area of social acceptability for almost ten years. From a sensory evaluation frame of reference, we have not shifted our development perspective but added a new dimension to it. We now are concerned with not only the quality of the mainstream smoke we deliver to the smoker but sensory characteristics of the smoke in the environment. There is not a great deal of definitive information concerning the variables which influence ETS perception. The response to changes in concentration has been studied but this is no more helpful than knowing that less strength is obtained from mainstream smoke when the "tar" is reduced. It is important that a program be developed and supported which will at least identify the effects of nicotine and study the relationship between gas phase and particulate concentrations. This information will be critical to developers who are attempting to develop products. They need to know where to go in order to provide significant as well as meaningful differences to consumers.

In addition to understanding the variables within ETS which can alter perception and acceptability, we must also incorporate research in the area of additional odor characteristics which may prove useful in changing acceptability.

2. Cigarette / Tobacco Smoke Taste

In the past, development of new or improved products has been focused in a fairly narrow perceptual range. The use of tobaccos with normal properties in a conventional configuration offered a range of taste possibilities, but this range was fairly limited. The inclusion of various processed tobaccos has occurred over a long period of time and given the consumer ample opportunity to adapt to taste changes. The presence or absence of cigarette smoke has not been an issue, it was a given. Now there are product possibilities which have benefits beyond the traditional taste and strength advantages. The possibilities for such products provide radical changes for the consumer. Given the nature of the changes, it is not possible to make a gradual transition to these. We are now faced with having to understand a range of perceptions which, even within the traditional product world, are somewhat elusive.

Studying cigarette / tobacco taste will be a very difficult challenge. Included in the flavor and aroma characteristics are trigeminal (sensation) perceptions which can not be ignored. To characterize and quantify the relative intensities of the taste of smoke and then to capture the positive elements of this in a non-traditional product or flavor system will be necessary. SED has begun to discuss the problem with Tragon and is developing an experimental strategy for the research. The first product which will be used to evaluate the question will be the current NPT cigarette and the available means to provide cigarette / tobacco smoke characteristics. It must be a joint program with the developers in NPT and APT. The capability will be wasted if we use the panel as merely as screening device rather than an integral part of a research program.

3. Nicotine

Following closely on the heels of cigarette / tobacco smoke taste is the area of nicotine perception. The perception and consumer response to various levels of nicotine have been studied in the conventional cigarette environment. With new technology products and various forms of processed tobaccos, a better understanding of the relationship between nicotine and its perception is needed. The investigation of the interaction between nicotine and other flavor materials which are perceived similarly is also of interest, particularly for lower nicotine products.

This is a problem that will be easier to tackle than cigarette / tobacco smoke taste but is still quite challenging. This will require a concerted effort from those who can provide the nicotine variables which will be necessary to investigate.

4. Aftertaste

The perception of aftertaste in conventional cigarettes is an important concern in current products and may be a way to provide a consumer benefit for conventional cigarettes. The perception of aftertaste can not be viewed as an independent measure. By definition it follows the smoking experience and when altered it stands a great chance of shifting the perceptions during smoking.

This in an opportunity to employ conventional products to gain an understanding of aftertaste. There needs to be a concerted effort to organize the correct areas to address the issue in a systematic manner. If more than one group proceeds with this independently, time and resources will be lost. Tragon has been asked to identify a possible approach to these questions and that, along with SED internal expertise, should make it possible to provide information within the next six months (providing the program takes on some structure in the near future).

SENSORY METHODS AND RESOURCES

1. Time-intensity Measures

For almost all of these research areas the understanding of the relationship between the duration a stimulus is perceived and the intensity of specific sensations is a key part of the puzzle. For example, what can cause an aftertaste to be long-lasting and low intensity versus high-intensity and short duration. The perception of ETS has always lent itself to time-intensity measurements. As other new technologies are employed in our products, it is more likely that the intensity of sensory characteristics at various times during smoking will be altered. SED has already studied (with the time intensity methods), VRP (ETS), TSB (strength perceptions) and NPI (menthol) perceptions. These results offer great potential for future research possibilities.

Fortunately, SED has had enough experience with these techniques to be able to apply and adapt the methods for high priority projects. These approaches are more time-consuming than single judgments. In order to incorporate this method of data collection on a more frequent basis, data collection must be streamlined and this will be possible once the direct data entry systems are installed next year.

2. Extended Usage

The application of extended usage for sensory research and support offers two advantages. First, it allows for the smoking perceptions to be measured after repeated exposure to determine adaptation and build-up to certain characteristics. Second, it provides an understanding of the usage characteristics for the smoker and the social acceptability dimensions for the smoker and the non-smoker. This is possible because the testing is done within a home environment and can be more closely compared to an actual-use situation. These methods can assist in identifying consumer benefits and trade-offs which might not otherwise be seen in a single cigarette booth test. It should be mentioned that this type of testing should not replace single cigarette evaluations. It is more time consuming and suffers from the lack of control that one would expect.

In 1987, SED and Tragon developed the Extended Usage QDA Panel which operates from the Tragon facility in Redwood City, California. This panel is comprised of pairs of smokers and non-smokers who reside in the same household. The smokers and non-smokers have been separately trained to evaluate the perceptions that are experienced before, during and after the smoking process in a home environment. To date, low sidestream papers, variations in nicotine, pellet technology and EVG applied to paper have been studied with this method. The next step is to develop acceptance capability which is structured similarly. This is anticipated for 1989. This is another method which is feasible but it is expensive, time-consuming and should be used judiciously.

3. Shelf-life and Storage

These needs are not going to require new testing methods but the problem arises in terms of resources. Each time a study designed to measure a series of products at specific time intervals begins, it necessitates blocking out testing resources in advance and thereby limiting testing capability for other areas. This could be justified if only one group at a time was testing and if the testing could be considered final for that product. Unfortunately, many groups will be working with products that need shelf-life data. Product design is never set until it absolutely must be and new materials, etc. continue to require testing.

The solution to this resource problem is that the researcher must agree that some form of accelerated aging is essential. It has been our experience that the most critical changes take place in the first few weeks and these do need to be studied. Researchers must be required to use all of their previous data and not abandon studies in mid-stream because a product changes. There are experimental design techniques (such as RSM) that can be used to decrease the number of products to be tested and increase the amount of information gained from the research. Consumer research must also be built into the plan. Sensory data will pick up changes and some change is inevitable. Consumer research to verify the acceptability of the extreme changes needs to be added to provide direction.

4. ETS

The methods for measuring perceptions of fresh sidestream smoke (Olfactometer and Sidestream Descriptive Panel) and ETS (PETS facility and Visitor QDA Panel) were originally developed as research tools. Currently these are very busy areas but the experiments are now exclusively product support. The demands for these types of methods have far outstripped the capacity. The developers will require more of this type of information in the future.

The situation could be improved with the availability of a great number of panelists and increased flexibility for ETS evaluations. The recruitment of external subjects for routine testing is a possibility and, in the long run, less costly than using R&D employees. There is also a need to have a more efficient method for screening products under ETS conditions. Smaller chambers in addition to what we have are probably necessary. These needs will be taken into account when the overall facility needs are assessed later this summer.

5. Claims Substantiation

As is the case in other areas, the complexity and magnitude of these claims studies will continue to be a major resource drain. Each of these will probably require specially designed testing, large sample sizes, and analytical testing support. It is difficult to prepare resources in advance for these types of studies. One way to help the situation is for R&D to identify the consumer benefits for a technology so that the advertising that is developed can ultimately be directed toward those claims. This points to the need for product research in the areas already reviewed in order to improve the quality of product development guidance. Allowing developers to move toward those characteristics which provide meaningful consumer benefits. If the claims substantiation needs continue, contract lab testing should be considered so that development programs for new technologies do not have to be delayed. During 1988, less than one quarter of the year has been or will be available in the PETS rooms for anything but VRP/SRP claims substantiation. If this type of situation continues, the first and only time we will test a consumer benefit will be when the "official" claims test takes place.

6. Product Maintenance and "No Difference" Changes

This is the routine part of the sensory operation. When dealing with only conventional products the resources can be managed because conventional products may be evaluated by the existing sensory panels. In the future, when the products we produce are more diverse, the subjects will need to be screened and experienced for a wider variety of products. This should not be a problem. In food companies that produce a range of products, this is how it is done. Later this summer, we will begin to use the conventional cigarette discrimination panels in R&D to evaluate NPT products so that more flexibility is available. With this approach the resources can be more efficiently used throughout the year.

7. Sensory Acceptance Screening

Sensory acceptance testing has become a method used for NPT products for the past 18 months. The objective of such testing is to eliminate unacceptable products from among a wide range of alternatives. It is not suitable to pick a "winner". It is typically done in a central location setting although limited extended usage could also be considered a sensory acceptance method. The subjects are naive (meaning they are not trained sensory subjects) and should be users or potential users of the product category. This approach includes the use of employees provided it is just an initial screening. The use of employee panels is a useful step to take after screening by developers and before external testing. Sensory acceptance should be limited to new technology when there is a wide variety of options to consider. The method will not be sensitive to minor changes. Those types of questions need to be answered by MDD.

In order to expand this program to other areas, greater access to subjects must be found. For the most part, R&D employees are not suitable acceptance subjects. They are too close to the projects. Employees in other departments and locally recruited subjects are more appropriate. Central location testing in other parts of the country can be conducted in cases where we want to remain anonymous, the demographics are more specific, and there are a large number of products. This need will be covered as best we can in the 1989 budget and planning process.

I hope that this memo reflects the discussion and organizes the needs that we have for future sensory research and support. I appreciated your contributions to the discussion and welcome further input. This will not be the last time you will hear from me. I anticipate that the research program planning will take place in the next few months and the commitment necessary for these programs along with testing resources will be requested during the planning and budgeting process.

Margaret R. Savoca