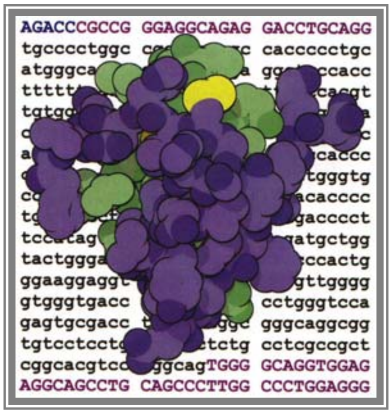

Appendix 2: Taste Test Papers

By Louis R. Hundley, Assistant Professor of Biology, Virginia Military Institute.

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Ever since Arthur L. Fox[4,5] first showed that many people are unable to taste phenylthiocarbamide (PTC), the use of this chemical and other compounds in testing taste reactions has caught the interest of geneticists, particularly those interested in human genetics. To most people PTC is extremely bitter, while to the remainder it is completely tasteless. Blakeslee[1,2] and Salmon[2,10] report, however, that a small minority of the people tested will assign different tastes to the substance. Taste sensitivity to PTC has been an important character in investigations of population genetics and racial research.

The ability to taste PTC is inherited, and the taste dimorphism in sensitivity appears to hinge on a pair of genes[11]. Individuals having the recessive gene homozygously are nontasters. Some of the frequencies of the recessive gene in different races have been reported[8,9] as follows: North American white population 0.550; Japanese, 0.266; Jewish (Ashkenazic), 0.524; Hindu, 0.581; and Indian (Brazil), 0.111. In the North American white population approximately 20 per cent are homozygous tasters, 50 per cent are heterozygous tasters, and 30 per cent are nontasters. The square of the frequency of the gene (0.55) gives the frequency of the trait (0.30). The other percentages are derived from the Hardy-Weinberg formula[6,12].

Even among the tasters of PTC, unless the chemical has dissolved in the taster's own saliva, it is tasteless[3]. If PTC is dissolved in some one else's saliva or in water and placed upon the dry tongue of a taster, it cannot be tasted.

This simple classification of people as either tasters or nontasters is misleading. As Blakeslee[1] demonstrated, a substance “must have a certain strength or concentration before it can be tasted and . . . this concentration is different for different people.” He reports that a 0.02 per cent solution of PTC was tasteless to 75 per cent of his sample but that a 0.64 per cent solution was tasted by 85 per cent. In other words, some people have a higher taste-sensitivity threshold for PTC than others. Blakeslee[1] also reports that at the exhibit of the American Museum of Natural History in connection with the Eugenics Congress in 1932, 79.7 per cent (out of 6,377 people) tasted PTC in medium concentration. Of these people, 65.4 per cent reported its taste as bitter, 5.4 per cent as sour, 2.1 per cent as sweet, 4.8 per cent as salty, and 1.9 per cent as some other taste such as bitter almond, camphor, or sulphur. Harris and Kalmus[7] report that out of a sample of 441 persons, one could detect a bitter taste in a solution of only 0.16 milligrams of PTC per liter, but 31 out of the group could not taste it until its concentration was greater than 1300 milligrams per liter. Consequently, it is now believed that the classification into tasters and nontasters was essentially a reflection of the bimodal distribution of taste threshold[9].

Harris and Kalmus[7] also report that various taste reactions may be registered by both tasters and nontasters to many substances closely related chemically to PTC. One such compound, thiocarbamide or thiourea, to both tasters and non-tasters had a nauseating taste, not bitter, not sour.

Sodium benzoate is another substance which can be tasted by some people but is tasteless to others. This compound in concentrations of around 0.1 per cent is sometimes used as a food preservative, but its use for this purpose is subject to controversy because some experiments led to the conclusions that benzoates were distinctly detrimental to health. State regulations regarding the use of benzoates as preservatives vary widely; some states prohibit their use, others place severe restrictions on their use, and still others have liberal regulations which control the utilization of benzoates as food preservatives. Blakeslee[1] reports that a 0.1 per cent solution of sodium benzoate had a distinct taste to over a quarter of the 250 people tested. Williams[14], using information received in personal communication from Arthur L. Fox, says that both tasters and nontasters for PTC can be subdivided into five subgroups depending on whether sodium benzoate is to them (1) salty, (2) sweet, (3) sour, (4) bitter, or (5) tasteless.

Fox found "that after testing about 1500 people that practically every possible combination of tastes could be found except that in which PTC was tasteless and sodium benzoate bitter. The more numerous cases were (giving the tastes in the order: PTC-sodium benzoate): (1) bitter-salty, (2) bitter-sweet, (3) bitter-bitter, (4) tasteless-salty. It further appears the 'bitter-salty' group finds the taste of a variety of foods which may be considered controversial (sauerkraut, buttermilk, turnips, spinach, etc.) more attractive than average, whereas those who are in the 'bitter-bitter' group like the taste of such foods less than average."

Taste dimorphism is noticed with other substances, such as barium sulfate emulsions[14], which are drunk by people before their gastro-intestinal tracts are X-rayed. To most people the "barium milkshake" is tasteless but to some it is bitter. Creatine is tasteless to some people but bitter to others[13], and, since lean meat contains creatine, this taste idiosyncrasy may well account for the distinctive flavors different individuals notice in various meats.

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