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NICOTINE AND TARS IN CIGARETTES

LABORATORY TEST REPORT
THE CIGARETTE INDUSTRY
THE HEALTH HAZARDS

POLAROID CAMERAS

KNIFE SHARPENERS

TIRE GAUGES

REAR-VIEW MIRRORS

TWO RECORD CHANGERS

EASY-TO-USE SOLDERS

TEEN-AGE CONSUMERS

ROAD TEST REPORTS ON:

THE HILLMAN MINX

THE MERCURY MONTCLAIR





The cancer scare has
Have the new filters and new
present medical view of

CIGARETTES

TESTS FOR NICOTINE AND TAR IN THE SMOKES OF 33 BRANDS

CU tested 33 brands of cigarettes for the nicotine and tar content in their smoke. The results of these tests, when compared with the results of previous tests, shed some interesting light on the reaction of the tobacco industry to the charges over the past six years that cigarette smoking is a cause of cancer of the lung and of other diseases. Have the companies found ways to reduce the nicotine and tar content of the cigarette smoke? Have filters and new sizes reduced the hazard?

A number of interesting facts stand out from a study of the data obtained in this and previous tests:

- King-size cigarettes produce more nicotine and tar in the smoke than the shorter "regular-size" cigarettes do, if both are smoked to the same butt length.
- As between filters and no filters, there's very little to choose so far as nicotine content of the smoke goes.
- While the nicotine content is about the same, the average filtered-cigarette smoke contains somewhat less tar than unfiltered smoke.
- So-called low nicotine cigarettes do show low nicotine content as compared with others—about a third as much, on the average, as the ordinary brands.
- Unfiltered cigarettes, both regular and king-size, are remarkably similar in nicotine and tar levels to their levels of two years ago. In contrast, the average nicotine and tar levels of filter-tip cigarettes have risen.

The brand-by-brand comparison (see Table on page 101) reveals some facts worthy of special mention:

- Among popular regular-size, non-filter cigarettes, *Chesterfield* was lowest in both nicotine and tar levels.
- Among popular king-size, filter-tip cigarettes, *Tareyton* was lowest in nicotine level and about average in tar; *L&M*

was lowest in this class in tar level and second only to *Tareyton* in nicotine.

▪ *John Alden*, a cigarette made of tobacco especially bred for low nicotine content had, indeed, the lowest nicotine level, but it was among the highest in tar.

▪ *Sano*, made of a denicotinized tobacco, was lowest of all the cigarettes in tar level and higher only than *John Alden* in nicotine.

▪ The lowest in both nicotine and tar levels among cigarettes sold with no special claim to low nicotine content was *Yorkshire*, a brand distributed only by Sears-Roebuck retail stores.

▪ Reynolds Tobacco Co. held the dubious but indisputable distinction of supplying more nicotine for the money than any of its competitors. Its *Winston* ("tastes good like a cigarette should") and *Cavalier* brands edged out its mentholated *Salem* by an insignificant fraction; the fourth Reynolds product, *Camel*, exceeded all other regular-size cigarettes in nicotine level. *Cavalier* was also the tarriest of all cigarettes tested.

The case history of *Kent* cigarettes provides a rather illuminating sidelight on the cigarette industry's reaction to the health problem. First put on the market in 1952 as P. Lorillard's answer to the raging cancer-of-the-lung scare, the *Kent* cigarette did a creditable job of filtering out a high percentage of both nicotine and tar from tobacco smoke. But *Kent's* "Micronite" filter ("developed by researchers in atomic energy plants") was, it would appear, a shade too effective. Smokers complained that it was hard to draw smoke through the filter and that all they got for their effort was a mouthful of tasteless warm air. CU's 1952 tests showed that the original *Kent* contained, in the smoke of one cigarette, 1/2 milli-

brought many changes to the industry.

sizes affected the nicotine and tar content? What is the effect of smoking on health?

gram of nicotine and 2 milligrams of tar. By 1955 the filter had been loosened up and made easier-drawing, and Kent's nicotine level had about quadrupled while its tar level had increased about six-fold. As of CU's current investigation, Kent had, without fuss or furor, abandoned the original Micronite completely and substituted a filter tip which appears similar to the almost universally used cellulose filter tip. And its nicotine and tar levels had risen so that it had about five times as much nicotine and about eight times as much tar as the original 1952 Kent.

CU shoppers in 18 cities from coast to coast bought 16 packs of each brand, and, as in the earlier tests, one cigarette from each pack was mechanically "smoked" with the apparatus shown on page 105. Since neither the true medical significance of tars nor the permissible level, if any, of nicotine in cigarette smoke is known, CU does not rate the brands, but simply presents the results of its tests.

No attempt was made to gauge the effectiveness of filters as such nor to measure the quantity of nicotine and tars in the tobacco of the cigarettes. The tests were confined to the *smoke*, because this obviously is the smoker's only real concern.

Significantly, brands which have appeared in all three of CU's projects have ranked, within type, in roughly the same order of nicotine content in all three. As before, *John Alden*, made with low-nicotine tobacco, produced the least nicotine of any brand in the latest tests. Next in line this time came denicotinized *Sano* (also low in the earlier projects) and *Lords* (included for the first time), both made with tobacco from which a large part of the nicotine had been extracted by processing.

L&M filter regulars took the biggest jump in nicotine from 1955 to 1957. Of the ten filter brands covered in both 1955 and 1957, six—led by *Parliament* and *Old Gold*—were somewhat higher in tar content in the latest tests.

In contrast to the variety of filter materials—absorbent cotton, paper with activated carbon, cellulose-acetate fiber, creped and uncreped paper, asbestos fiber, and combinations of these—that turned up in the 1955 tests, most of the filters encountered this time were made of a cellulose derivative. Regardless of their effectiveness as filters, all appeared to offer two advantages: they help to keep bits of tobacco out of the smoker's mouth, and they provide a firmer butt for his lips to grip.

Continued on next page

RESULTS OF TESTS FOR NICOTINE AND TAR

The listing is in order of increasing nicotine content of the smoke. Small differences in nicotine and tar content are of no significance.

BRAND AND TYPE	AVERAGE NICOTINE IN SMOKE PER CIGARETTE (MILLIGRAMS)	AVERAGE TAR IN SMOKE PER CIGARETTE (MILLIGRAMS)
JOHN ALDEN Low nicotine tobacco, regular	0.7	21
SANO Denicotinized, king-size, filter-tip	1.0	11
LORDS Denicotinized, regular	1.2	16
YORKSHIRE Regular	1.3	15
MURAD Regular	1.3	17
CHESTERFIELD Regular	2.1	17
TAREYTON King-size, filter-tip	2.3	19
L & M Regular size, filter-tip	2.6	15
L & M King-size, filter-tip	2.6	15
LUCKY STRIKE Regular	2.6	19
KENT Regular size, filter-tip	2.7	16
OLD GOLD Regular	2.7	18
VICEROY King-size, filter-tip	2.8	18
KOOL Mentholated, regular	2.8	20
MARLBORO Long, filter-tip	2.9	18
PHILIP MORRIS Regular	2.9	18
HERBERT TAREYTON King-size	2.9	22
HIT PARADE King-size, filter-tip	3.0	20
CHESTERFIELD King-size	3.0	22
PALL MALL King-size	3.0	24
KOOL Mentholated, king-size, filter-tip	3.1	16
SPUD Mentholated, long, filter-tip	3.1	17
OLD GOLD King-size, filter-tip	3.1	19
PHILIP MORRIS Long	3.1	21
REGENT King-size, filter-tip	3.1	21
FATIMA King-size	3.1	24
CAMEL Regular	3.2	17
OLD GOLD King-size	3.2	19
PARLIAMENT Long, filter-tip	3.4	20
SALEM Mentholated, king-size, filter-tip	3.7	19
RALEIGH King-size	3.7	23
WINSTON King-size, filter-tip	3.8	22
CAVALIER King-size	3.8	26

continued

Although the king-size brands, on the average, had more nicotine and tars in their smoke than the regular-size cigarettes did, these results should be viewed in the light of the fact that all samples, regardless of size, were smoked to the same butt length (approximately one inch). Consequently, more tobacco was burned in smoking the king-size cigarettes. Whether or not "fine tobacco filters best,"

as the *Pall Mall* ads claim, it is a fact that if you leave a proportionately longer butt when you smoke a king-size cigarette (in other words, smoke the same length of tobacco as you would with a regular-size cigarette), the extra tobacco left in the butt will act as a filter and reduce both the nicotine content and tar content of the smoke.

NICOTINE AND TAR LEVELS BY CIGARETTE TYPE

	AVERAGE NICOTINE IN SMOKE OF ONE CIGARETTE (MILLIGRAMS)			AVERAGE TAR IN SMOKE OF ONE CIGARETTE (MILLIGRAMS)		
	1957	1955	1953	1957	1955	1953*
REGULAR SIZE NO FILTER	2.5	2.6	2.0	18	18	17
REGULAR SIZE WITH FILTER	2.7	1.9	2.1	16	12	14
KING SIZE NO FILTER	3.2	3.3	2.5	22	23	18
KING SIZE WITH FILTER	3.1	2.7	**	18	16	**
SPECIAL LOW NICOTINE	1.0	0.7	0.8	16	14	13

* Different methods were used for tar extraction in the 1953 tests than in the 1955 and current tests. The 1953 figures have been increased by 20% in an attempt to make them directly comparable.

** This type of cigarette was not among the popular brands on the market at the time of the test.

THE INDUSTRY: NEW BRANDS AND NEW TYPES HIT THE GROWING MARKET

In a recent issue of a tobacco trade publication, the editors, speaking of the research that has indicated a relationship between cigarettes and lung cancer, tossed off this seemingly lighthearted comment: "The only certainty that has emerged is that mice shouldn't smoke!"

The editors' flippancy may have been inspired by the apparently complete recovery of the cigarette industry from the staggering punches medical investigators landed on it a few years ago.

Last year, according to authoritative estimates, Americans broke all records by spending nearly five billion dollars for 395 billion cigarettes. This was 170 million more dollars and 13 billion more cigarettes than in 1955 and 570 million more dollars and about a billion more cigarettes than in the previous record year: 1952, the year before the full impact of cigarette-cancer publicity hit the cigarette business.

Obviously, 1956 was a banner year for most big cigarette companies and their stockholders. So it is not surprising that industry spokesmen now appear to be taking the health problem considerably less seriously than they did a year or two back. In those days, president Edward A. Darr of R. J. Reynolds (*Camel, Winston, Cavalier, Salem*) accused the American Cancer Society of "trying to destroy the tobacco industry." Last December in *Printers' Ink*, an

advertising trade magazine, tobacco-business consultant Harry M. Wootten wrote that "the smoking-and-health controversy . . . may be collapsing for lack of nourishment." Even the Department of Agriculture concedes that many people who had reduced their smoking or cut it out entirely in 1953 and 1954 "probably have resumed or increased their consumption, mainly using filter-tip cigarettes."

At least a million and a half of this country's 38 million smokers (54% of all men and 24% of all women over 18) gave up the habit between the fall of 1953 and early 1955, a Census Bureau survey for the National Cancer Institute indicates. How many more simply cut down, the published findings do not reveal, but it must have been a sizable number, because in 1953, after 21 years of uninterrupted growth, cigarette sales dropped by 7.3 billion cigarettes. The slide continued through the next year, to bring the total drop for the two-year period to 25.4 billion cigarettes.

Sales turned upward again in 1955, however. That year's total, although still well below 1952's, bettered the 1954 mark by some 13 billion cigarettes. Then came 1956—and joy was complete again in the hearts of the men who know tobacco profits best.

Last year's cigarette sales and profits records (and 1955's partial recovery) were largely the result of the soaring popularity of filter-tip cigarettes, and the upsurge

of this once-minor cigarette breed has wrought some fairly startling changes in the cigarette business. The major ones are: a spate of new brands, new versions of old brands, new packages (in the face of a traditional, virtually industry-wide reluctance to make any change in the products for fear of spoiling a good thing); an upheaval in the tobacco market (resulting from the fact that filter cigarettes not only require less tobacco than nonfilters, but are being made with lower-grade leaf and, in some cases, with parts of the tobacco plant that used to be thrown away); the highest profits in years (because most filter cigarettes cost less to make than non-filter cigarettes, but have sold at premium prices); and, finally, a marked weakening of the time-honored sales dominance of three or four top brands.

Filter-tip cigarettes are far from being a new product. Handmade ones were on sale in Europe at least as far back as 1900, and such brands as *Obak* and *Imperiale* turned up in the United States a few years later. Benson & Hedges' *Parliament*, introduced in 1931, and Brown & Williamson's *Viceroy*, which appeared five years later, were the first major domestic brands, but they made no dent worth mentioning in the American market. As a matter of fact, a mass market was the last thing their manufacturers had in mind at the time: the advertising pitch was aimed at snobs only.

In 1952, P. Lorillard Co. trumpeted its new filter-tip *Kents* onto the stage with full-page newspaper ads describing the virtues of the "Micronite" filter ("developed by researchers in atomic-energy plants").

Since 1952, sales of filter-tip cigarettes have shot up from 5.2 billion a year to a 1956 record of over 119 billion, from a relatively insignificant 1.4% of total cigarette sales to nearly 30%. Not only were they the only cigarette type to sell better in 1956 than in 1955: their gain amounted to nearly 60%. In achieving it, they passed the king-size group for the first time and captured second place among the three major cigarette types. By the end of this year, they are expected to have 40% of the market.

The chief loser in the shifting cigarette market has been the erstwhile mainstay of the business, the regular-size nonfilter cigarette. As smokers turned to filters, sales of regulars have fallen off—from 319 billion cigarettes in 1952 to 182 billion in 1956, a drop of nearly 43%. Regulars still hold the top spot, but in contrast to 1952, when they were in command of four-fifths of the entire cigarette market, their share last year was under 46%. Kings have slipped too, but their decline last year was only about 6%, compared with the regulars' 10%.

Within the general pattern of a rising filter-tip market and a shrinking market for regulars and kings, individual brands have been having their ups and downs.

Camel, the best-selling brand since 1950, is still on top, despite a sales drop of 34% since 1952. *Pall Mall*, top seller among kings and third-ranking among all brands, was the only king to buck the filter tide successfully last year. Hardest hit by the filter competition were *Chesterfield* and *Old Gold* regulars, both down about 20% in 1956 sales from 1955.

Winston's 1956 sales of 34 billion not only made it the

top filter for the second straight year, but lifted it to fourth place among all brands, well ahead of such oldtimers as regular-size *Chesterfield*, *Philip Morris*, and *Old Gold*. *Viceroy*, the filter leader until 1954, came in second again, with *L&M* hot on its heels and coming up fast. *Marlboro's* 1956 gain (120%) was the biggest of all, and by the end of the year, it had shot past seven older brands to become the fourth-ranking filter.

New brands appear

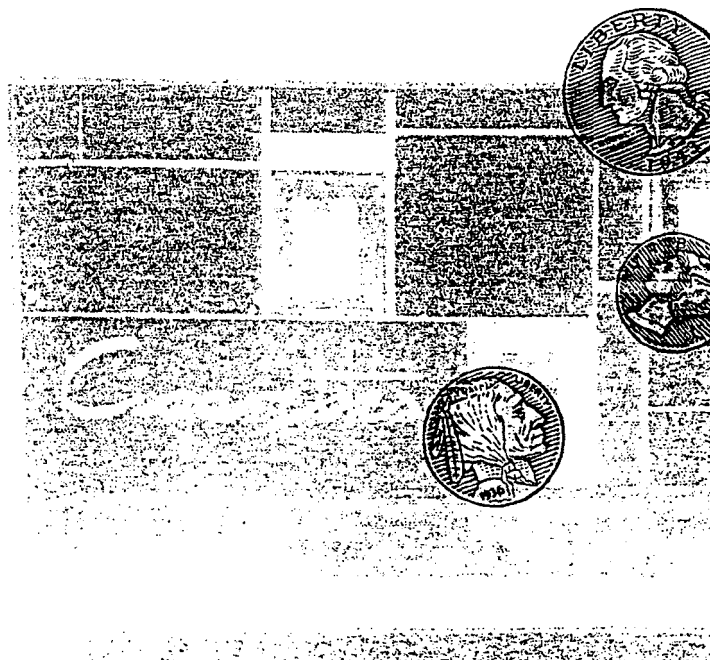
Not since the emergence of 10c-a-pack cigarettes during the Great Depression has there been such a rash of new brands and changes in old brands as the last few years have seen. As a result, the industry's take is being split more ways, and three or four brands no longer dominate sales as they once did. While the four leading brands of six years ago, for example, accounted for 80% of total cigarette sales, last year's top four did only 57% of the overall business.

Every one of the industry's giants sent a new entry into the filter race last year—including American Tobacco, the last of the Big Three (the other two being R. J. Reynolds and Liggett & Myers) to bring out a high-powered contender. Perhaps because its *Pall Malls* and its *Luckies* had held their combined sales volume against the filters, American didn't get around to launching its king-size filter-tip *Hit Parade* until last October. *Hit Parade* was not expected to achieve national distribution until early this year, but even without this it had scored sales of \$1.8 billion by the end of 1956.

The nation got its first mentholated filter brand when Reynolds trotted out *Salem* last May. A few weeks later, Philip Morris reintroduced *Spud* (a mentholated brand it had acquired in the liquidation of the Axton-Fisher Tobacco Co. some years back) as a filter-tip, mentholated, king-size cigarette. Then, in August, a new filter-mentholated-king (Brown & Williamson) *Kool* hit the market, replacing nonfilter king-size *Kool*.

So-called brand splitting (using the same brand name

Continued on next page



continued

for two or more cigarette types) has grown apace. Liggett & Myers was the first of the brand splitters (with king-size *Chesterfield* in 1952). Later, P. Lorillard took the process a step further, splitting *Old Gold* three ways (regular, king, and filter), and last year both Philip Morris and Liggett & Myers went three-way too (regular, long, and king).

Other recent cigarette-business debuts included the advent of the "long"-size cigarettes (*Marlboro*, *Philip Morris*, *Parliament*, *L&M*, *Regent*, *Spud*), 80 mm in length, as compared with 70-mm regulars and 85-mm kings, and Philip Morris' introduction of formerly premium-price filter-tip *Parliament* in a flip-top box, to sell for only 1¢ to 2¢ above "popular" filter prices.

Although the tobacco crop—at least four-fifths of which goes into the making of cigarettes—ranks near the bottom of the list of United States crops in acreage (1,366,000 in 1956) it stands near the top in cash value. In 1955, it brought its growers about one and a quarter billion dollars (about 9% of total U. S. farm income for that year).

Tobacco is grown from New Hampshire to Florida and as far west as Minnesota, but as a result of differences in soil, climate, and plant varieties, nearly every region produces a different kind and quality of leaf. Some cigarette tobaccos are flue-cured; others are air-dried or fire-cured. Flue-curing, in which the leaves dry quickly in a heated barn, results in a light brown, almost yellow, leaf, while fire-cured leaves, dried in the smoke of wood fires, are very dark. Maryland tobacco, and Kentucky and Tennessee burley usually are air-dried in unheated barns.

For many years, flue-cured tobacco, which comes mainly from North Carolina, was used straight in American cigarettes, but now nearly all the leading brands are made with "blended" tobaccos. The mixture varies, but "popular" nonfilter cigarettes are said to contain 45% to 75% flue-cured leaf, 15% to 45% burley, 5% to 13% Turkish, and 5%, more or less, Maryland. Other ingredients include a "humectant," or moistener, and one or more of such flavoring materials as rum, wine, brandy, honey, oil of cloves, oil of cinnamon, oil of peppermint, and licorice.

What kinds of tobacco are going into filter cigarettes these days seems to be largely each company's secret. Manufacturers are reported to be switching from light-

colored, light-bodied, flue-cured tobacco to darker, heavier-bodied leaf in an effort to compensate for a loss of flavor that occurs as the smoke passes through a filter. In making this switch, they are turning the tobacco market upside down. The price of "low-grade" darker leaves, which used to be much lower than that of flue-cured leaf, is climbing rapidly, while "high-grade" flue-cured tobacco is bringing bids below government support prices—and going begging at that. At the end of last year, the supply of flue-cured leaf on hand had mounted to a record 3.5 billion pounds, enough to last almost three years—even at the old rate of consumption. As a result, the government, which, in connection with the price-support program exercises strict control over tobacco acreage, has ordered a 20% cut in flue-cured growing for 1957.

Growers not happy

For the growers, the "tremendous switch," as *Business Week* magazine calls it, is only one of three setbacks they have suffered at the hands of the cigarette and cigar makers during the last few years. In the first place, the growers are somewhat less enthusiastic than the manufacturers about the filter-cigarette boom, for the simple reason that filter cigarettes take less tobacco than plain ones (7% to 20% less).

Not only that, but some manufacturers have taken to buying and using parts of tobacco plants that used to be thrown away: stems, broken and inferior leaves, and fragments. These are ground into small particles, mixed with a binder to form a paste, rolled out into a sheet, dried, shredded, and then blended with higher-grade tobaccos and made into cigarettes. The use of such "homogenized" (or "reconstituted" or "synthetic" or "processed," as it is variously called) tobacco could cut tobacco costs by up to 50%, according to some estimates. The companies are said to be ready, after eight to ten years of experimenting, to begin using the homogenized product in a big way.

When a Senate-House agriculture subcommittee tried to look into the matter last May, it found the manufacturers pretty close-mouthed. The reason for this reticence, *Business Week* guessed, were the companies' uncertainty about the public's reaction and fear on the part of manufacturers who are using or planning to use homogenized leaf that the competition might begin boasting of its "100% top-grade" tobaccos. However, a spokesman for R. J. Reynolds, which is said to have been using homogenized tobacco for several years, insists that its man-made leaf, being a controlled blend, is milder and more flavorful than natural leaf.

Even though homogenized tobacco does not appear to have come into general use yet, filter cigarettes are proving considerably more profitable than plain ones. Value Line Investment Survey credits them with an important role in the 6% rise in the tobacco companies' net income last year. The reason is clear: Three-quarters of the cost of making a cigarette goes for the tobacco, according to *Forbes*, a business magazine, hence filter cigarettes, which take less tobacco and can be made with lower-grade leaf, can mean an appreciable saving to the manufacturer. At the same time, the filters have been selling for up to 5¢ more

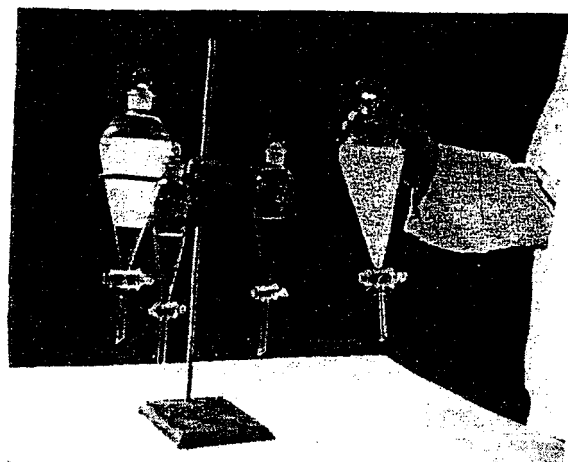
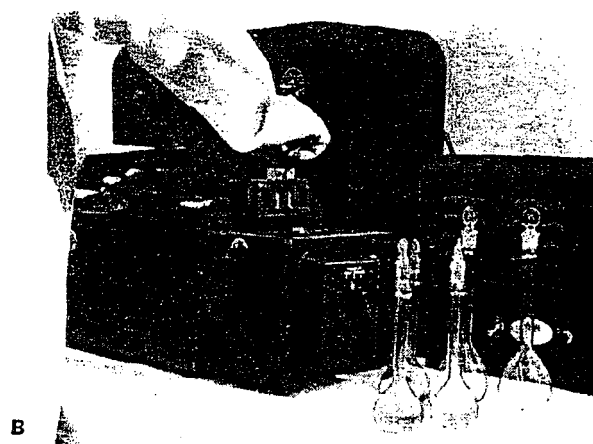
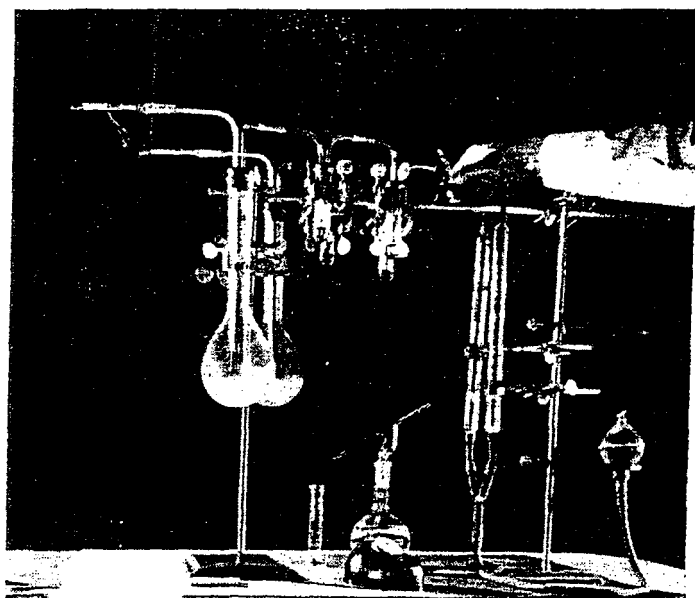
TOTAL CIGARETTE SALES*

	1952	1953	1954	1955	1956
BILLIONS OF CIGARETTES	394	387	369	382	395

CIGARETTE SALES BY TYPE*

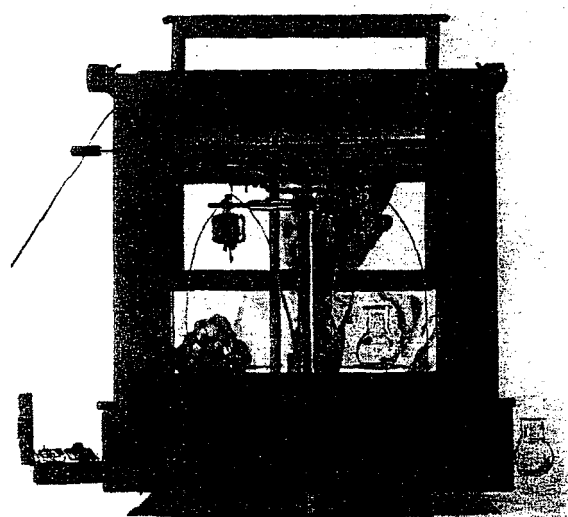
REGULAR	80.3%	69.8%	61.8%	53.2%	45.8%
KING SIZE	18.3%	26.9%	28.1%	27.2%	24.3%
FILTER	1.4%	3.3%	10.1%	19.6%	29.9%

*Figures are from *Printers' Ink* magazine



C

D



HOW CU TESTED CIGARETTES

Two cigarettes at a time were fitted into glass holders and then "smoked" by the laboratory apparatus (A). Raising and lowering the leveling bottle at the right raises and lowers the level of the water in the vertical glass tubes (below technician's hand) at the end of the "train." When the water level in the tubes falls, air is drawn through the cigarettes. The smoke is collected in acidified alcohol in the flasks (left); any smoke that escapes the flasks is trapped in the vials between the flasks and the end of the train. The apparatus took one puff a minute, each puff lasting for two seconds and containing about two cubic inches (35 cubic centimeters) of smoke. The cigarettes were smoked down to a butt of just under an inch (23 mm.) Sixteen samples of each brand were smoked in two runs of eight cigarettes each, and the results of each run were determined separately and averaged. After each run, the washings from the vials were added to the smoke solution in the collecting flasks. One portion of the solution was steam-distilled to isolate the nicotine, which was measured with an ultra-violet spectrophotometer (B). Chloroform and water were added to another portion of the smoke solution (C) and then the tars were separated out in a series of steps and weighed on a chemical balance (D).

per pack than the nonfilters. Small wonder, then, that as Mr. Wootten has said, filter cigarettes, once "reasonable unit volume" is attained, "are, in most instances, the most profitable end of the tobacco business."

Cigarettes probably are sold in more places—and more kinds of places—than any other manufactured product: cigar stores and stands, drug stores, grocery stores, restaurants, bars, liquor stores, newsstands, and just about any other place where they can pay, in cash or good will, for the space and trouble they take. However, such traditional retailers as tobacco shops, cigar stores, and drug

stores are gradually yielding ground to supermarkets, which now have become the principal outlets. Self-service merchandising (via supermarket and vending machine) is supplanting over-the-counter sales. The latest available statistics, released in 1952 by the National Association of Tobacco Distributors, show food stores making 32% of total sales, followed by vending machines with 16%, drug stores with 13%, and cigar stores and stands with 12%. Along with the shift of business to supermarkets has gone a shift, on the consumer's part, from buying packs to

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continued

buying cartons. At least half of all cigarette sales today are said to be by the carton.

Fifty per cent of the 490,000 vending machines in operation in 1955, according to a *Redbook* magazine report were run by wholesale tobacco distributors. The same source quotes trade informants as saying that the big cigarette companies pay annual subsidies of \$3 to \$12.50 per column per machine to have their brands stocked.

The recent outpouring of new cigarette brands and types has created more than its share of stocking, inventorying, and pricing problems for the retailer. Some supermarkets, report *Printer's Ink*, are refusing to carry any but the best-selling (regular, king, filter) of any brand, and a "brand survival battle, with weak entries forced out" is predicted. Operators of vending machines, most of which have only ten columns, now are confronted with the fact that it takes at least 20 columns to offer even minimum coverage of the current cigarette crop. Price differences among the many cigarette types on the market today are another headache, because vending machines can handle money in only two or three denominations.

Until January, 1955, when Philip Morris brought out *Marlboro* in a flip-top box, cigarette packaging had remained practically unchanged since *Camel* appeared in the first "cup" pack in 1913. The only intervening packaging developments worth noting were the addition of the cellophane wrapper to the cup pack, the "zipper" pull tabs (mid-'30s), the white *Luckies* package of World War II ("Lucky Strike green has gone to war!"), and Philip Morris' 1954 "snap-open" pack, with an extra tab that opened the package itself along with the cellophane wrapper. Many observers credit the *Marlboro* box with a sizable share in the brand's rapid sales growth.

Philip Morris (which now boxes *Philip Morris*, *Parliament*, and *Spud* as well as *Marlboro*) imported its flip-top-box-making machines from England at \$30,000 each and had exclusive American rights to them through last summer. Since then Liggett & Myers has bought some

machines and adopted the box as an alternative package for L&M filters ("Pick the pack that suits you best . . ."). Other companies are reported to be experimenting with box-packaging.

In the past 20 years, the retail price of a pack of major-brand cigarettes has risen from an average of about 13c (two for 25c) to about 25c. Tax hikes—cigarettes are one of the most heavily taxed of all products—have accounted for part of this increase. The Federal excise tax now amounts to 8c a pack, while the average of the taxes imposed by 42 states and the District of Columbia is 3 $\frac{3}{4}$ c. On top of these, there is a local tax of a penny or so in many areas. For the fiscal year that ended last June, Federal and state taxes alone were expected to total about 2.1 billion dollars.

Movement in unison

As they always have, the retail prices of "popular" cigarette brands continue to move up or down virtually in unison—despite a 1946 Supreme Court anti-trust case decision convicting the three largest companies (American Tobacco, R. J. Reynolds, and Liggett & Myers) of collusion to prevent retail price competition. The companies accomplished their end, the court found, by keeping their own price the same and by putting pressure on dealers to prevent any but a few recognized cheap brands from being sold for less. At the same time, the companies were judged guilty of manipulating the tobacco market to hold down the prices paid to growers.

According to testimony in the case, which was begun in 1940, the Big Three dealt ruthlessly with the manufacturers of the 10c brands (*Wings*, *Avalons*, *Marvels*, etc.) that burst on the scene during the Depression. When these upstarts captured 22% of the market for a brief period in 1932, the big companies went into action, dropping their own prices and buying up the kind of tobacco used in the 10c brands. To date, the only apparent price competition in the cigarette business is at the retail level, generally between small dealers and supermarkets and drug chains.

It is a popular notion that most of the price of a pack of cigarettes goes to pay for the advertising. Actually,

TOBACCO COMPANIES AND THEIR OFFSPRING

	AMERICAN TOBACCO	REYNOLDS	LIGGETT & MEYERS	PHILIP MORRIS	LORILLARD	BROWN & WILLIAMSON
REGULAR SIZE NO FILTER	Lucky Strike	Camel	Chesterfield	Philip Morris	} Old Gold Murad	—
REGULAR SIZE WITH FILTER	—	—	L & M	—	Kent	—
KING SIZE NO FILTER	} Tareyton Pall Mall	Cavalier	} Chesterfield Fatima	Philip Morris	Old Gold	Raleigh
KING SIZE WITH FILTER	} Hit Parade Tareyton	Winston	L & M	} Marlboro Parliament	Old Gold	Viceroy
MENTHOLATED	—	Salem	—	Spud	—	Kool

figures published several years ago indicate that the manufacturers of the major brands spend only about a fourth as much for their advertising as they do for their tobacco, that advertising accounts for a little over 14% of their total cost of doing business. Even so, six cigarette companies made a list of the 100 leading advertisers of 1955 published in the trade weekly *Advertising Age* last December.

Through the years and into the present, the three main themes of cigarette advertising have been pleasure, health, and snob appeal, sometimes used separately, sometimes in combination. In the '40s and early '50s, the emphasis was on health: "Just what the doctor ordered," "Guard against throat scratch," "Safe for your T-zone," "More doctors smoke *Camels* than any other cigarette," etc.)

Most of the industry's run-ins with the Federal Trade Commission in the past 15 years or so were brought on by health claims. For example, in 1942, *Old Gold* ads claimed that impartial tests reported in the *Reader's Digest* had shown that *Old Gold* had less nicotine than any other cigarette tested. The FTC objected to this claim, pointing out that the actual difference in average nicotine content per cigarette between *Old Gold* and the other two brands tested was 1/177.187 ounce.

At other times, the FTC has ordered an end to claims, all of which it found to be untrue, that "*Camels* will never harm or irritate the throat," that *Philip Morris* "protects against smoker's cough," and that among "independent tobacco experts, it's *Luckies* two to one!"

In September, 1955, the FTC released an eight-point guide for its staff's use in judging cigarette advertising. According to the guide, the following claims are improper:

- References to the presence or absence of any physical effects of smoking in general or in any brand in particular.
- Unproved or insignificant claims concerning nicotine content.
- References to the effects of cigarette smoking on the nose, throat, nerves, or other parts of the body, or on energy.
- Claims of medical approval of cigarette smoking in general or any brand in particular.
- Comparisons of the sales volume of competing brands without substantiating data.
- Unprovable claims to the use of particular types or qualities of tobacco.
- Testimonials that are not genuine and the current opinion of the testifier.
- False or misleading disparagement of other cigarette companies and their products.

As *Business Week* observed, the guide, if it were enforceable would eliminate "nearly every selling point that the tobacco companies have used in the past generation."

But 1954 brought a new look in cigarette advertising. *Business Week* summed it up this way: "The FTC couldn't do it. The tobacco growers couldn't do it. Warnings from marketing experts went unheeded. But economics did the trick. Faced with dropping sales, cigarette manufacturers have pulled an abrupt about-face in advertising tactics. . . . Today there is no word of fear, no talk of throat scratch—just comfortable, reassuring phrases about how good a cigarette tastes. Smoking, it seems, is no longer a health cure: it's pure pleasure."

MEDICAL ASPECTS: THE CANCER LINKAGE IS STILL NOT CLEAR

Although smoking has been a human activity for hundreds of years, it is only in the last decade or so that it has become the subject of intensive scientific study. Occasional reports of the effects of smoking on both body and mind have appeared since the middle of the last century, when a famous Irish physician, Dr. Robert J. Graves, found heart disturbances in heavy smokers. However, most of the studies on living subjects were made without adequate statistical controls, diagnostic precision, or the benefits of chemical and pharmacological analysis. Often the emotional attitude of the observer toward smoking would result in either exaggeration or underestimation of the effects of tobacco. The development of improved medical, biological and statistical techniques in recent decades has made possible more reliable studies of the properties and effects of tobacco smoke.

According to present knowledge, tobacco smoke contains tars, nicotine, carbon monoxide, arsenic and a miscellaneous group of acids, phenols, aldehydes, and other chemicals. The relative amounts of these chemicals vary in different tobacco leaves. The ingredients which are introduced by the burning of the cigarette paper are not fully known, but

current research efforts should provide useful information in this neglected field. Physical factors associated with smoking—holding a hot pipe stem in the mouth, or holding hot smoke in the mouth and the respiratory tract—may have irritating properties independent of the chemical composition of the smoke itself.

Smoke is absorbed

Because many of the chemicals in tobacco smoke are absorbed from the mouth and respiratory tract into the blood stream, smoking probably affects all the organs and tissues of the body. The most important known effects are on the gastrointestinal tract, the heart and blood vessels, the respiratory tract, and the nervous system. People vary a great deal, however, in their reaction to tobacco. For one person, 15 cigarettes a day constitutes heavy smoking; for another, heavy smoking means 40 cigarettes a day. British investigators usually term more than 25 cigarettes a day as "heavy smoking." In American research the term "heavy smoking" means from 20 to 40 or more cigarettes daily.

Notwithstanding the testimonials of movie stars and fa-

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continued

mous sports personalities regarding the mildness or non-irritating properties of the cigarettes they are paid to advertise, tobacco smoke does irritate the mucous membrane. Dentists are familiar with the stains and tar deposits on the teeth and gums of habitual smokers, and some believe that heavy smoking aggravates gum diseases. "Leukoplakias"—pre-cancerous, localized surface thickenings of the tongue, cheek and other parts of the mouth—are seen predominantly in heavy smokers, and they usually disappear if smoking is discontinued. "Birdcage mouth," the flat, morning taste well known to heavy smokers, is in part due to the local irritative effects of tobacco smoke.

The nausea-producing action of nicotine is well known to almost everyone who remembers his first attempt at smoking. Fine discrimination in taste sensation and smell are known to be impaired by smoking, and gourmets make a point of never smoking before dining and wining. Even in some habitual smokers, hunger contractions of the stomach are suppressed by smoking, and it is a common complaint that there is a great increase in appetite after the smoking habit is broken.

While smoking does not of itself cause stomach or duodenal ulcers, most doctors prohibit smoking in the presence of active ulcer symptoms. The apparent effect of the after-breakfast cigarette in promoting a bowel movement is believed to be due to the stimulating action of nicotine on the autonomic ganglia supplying the colon. Because of this effect, persons with diarrhea or with acute or chronic colitis are sometimes advised to avoid tobacco.

The effect of smoking on the heart and blood vessels was perhaps the first aspect to engage the attention of physicians. Smoking accelerates the heart rate, raises the blood pressure, increases the work of the heart and constricts the blood vessels of the extremities. The degree to which such changes occur varies a great deal in different persons. Persons sensitive to tobacco often complain of "extrasystoles" or other irregularities in the heart beat.

Nicotine tolerance

Although the habitual smoker acquires a certain tolerance to nicotine, and can absorb amounts of the drug that would kill a non-smoker, he never gets over the vascular effects of smoking. Elevation of the blood pressure and the heart rate, and constriction of the peripheral arteries, does occur after one or two cigarettes even in the heaviest smokers. The studies of Dr. Grace Roth of the Mayo Clinic, among others, have made it evident that nicotine is the agent chiefly responsible for the vascular changes induced by smoking. About $2\frac{1}{2}$ milligrams of nicotine are contained in the puffed smoke of an average, regular-length cigarette, somewhat more in the smoke of a king-size cigarette. About 90% of nicotine in inhaled smoke is absorbed, compared to about 25% to 60% absorption when the smoke is simply drawn into the mouth and then expelled, as is usual in pipe and cigar smoking.

Some investigators believe that the vascular disturbances occurring after smoking are little influenced by the nicotine

content of the tobacco or the extent of inhalation of the smoke: others consider that individuals sensitive to the nicotine effects of ordinary cigarettes may be able to tolerate a low nicotine tobacco (such as *John Alden*) or a denicotinized tobacco (such as *Sano*) with fewer harmful vascular effects.

Appreciable amounts of carbon monoxide are present in tobacco smoke, and in the heavy smoker as much as 5% or more of the circulating hemoglobin may be converted to "carboxyhemoglobin." Whether this concentration of carbon monoxide in the blood impairs physical and mental efficiency under ordinary circumstances is not known, but it has been speculated that heavy smoking may be a contributing factor in impairing judgment and nervous reflexes in auto driving and other activities requiring physical and mental alertness. At high altitudes, where there is a tendency to oxygen deficiency, a concentration of 5% carbon monoxide in the blood may have serious effects.

Smoking and the heart

Smoking tends to cause a significant rise in blood pressure in persons with a tendency to hypertension, and some doctors caution against smoking for those who have severe high blood pressure or hypertensive heart disease. Other doctors believe that the tranquilizing effects of moderate smoking on the nervous system offset the blood pressure elevating effects.

In the course of their studies on the association between heavy cigarette smoking and lung cancer, Drs. Hammond and Horn of the American Cancer Society reported that among 187,000 men aged 50 to 69, the heavy smokers had a death rate from coronary artery disease (hardening of the coronary arteries, "coronary sclerosis" or "thrombosis") twice as high as men who had never smoked. Even light cigarette smokers were somewhat affected, according to the report, though cigar and pipe smoking seemed to have little or no influence on death rates.

The thesis that heavy cigarette smoking imposes a serious burden on the coronary artery circulation and on the heart is not accepted by most physicians, however. An alternative explanation may be that nervous or psychological factors which dispose a person to indulge in heavy smoking also dispose to coronary artery disease. A scientific committee of the American Heart Association, appointed to appraise all available scientific evidence relating to smoking and heart disease, concluded (March 14, 1956):

1. There is evidence supported by clinical observations in a large number of cases that tobacco smoking is harmful in certain diseases of the peripheral blood vessels of the arms and legs. This harmful effect was demonstrated most clearly in the condition known as thromboangiitis obliterans (Buerger's disease). It is known that this disease will usually . . . become stationary or even improve if the patient stops smoking.
2. It is recognized that a small percentage of persons with known disease of the coronary arteries will develop symptoms and will display signs detectable by laboratory tests when they smoke. Such people may be harmed by smoking.
3. The committee believes that the available evidence is not sufficient to define the effect of tobacco smoking upon the coronary arteries or upon the heart itself, except in the small group mentioned above who already have coronary artery disease. It is believed that if smoking plays any part in the causation of heart disease, it is only one of many factors.

1. It is the belief of the committee that much greater knowledge is needed before any conclusion can be drawn concerning relationship between smoking and increased death rates from coronary heart disease.

It has been suggested that some of the vascular and other effects of tobacco are the result of allergy to some component of tobacco. Many persons with abnormal responses to tobacco show a positive reaction when tobacco extracts are injected into the skin. More studies are required, however, to determine the significance of allergy in relation to some of the effects of smoking.

Tobacco "amblyopia" is a relatively rare but serious eye disorder associated with smoking. There is a gradual or sudden decrease of visual acuity, especially for colored objects. If the connection with smoking is not realized, the condition may progress to optic nerve atrophy and permanent injury to vision.

While nicotine is chiefly responsible for tobacco's effects on the heart and blood vessels, the elements chiefly responsible for the effects on the respiratory tract—the nose, throat, bronchi, and lungs—are the tars, and possibly arsenic and other combustion products. The respiratory effects are of two types—irritating and carcinogenic (cancer-inciting).

Irritating effects

The irritating effects of tobacco smoke on the respiratory tract seem indisputable. Many otolaryngologists believe that chronic inflammation of the larynx and warty growths on the vocal cords can be caused by heavy smoking. Many studies indicate that heavy smoking can result in chronic bronchitis. So-called "cigarette cough" is believed to be caused by the chronic irritation of the nose, throat, larynx, trachea, and bronchi. Although tobacco smoke has not been demonstrated to cause bronchial asthma, in most cases asthma is made worse by inhalation of tobacco smoke.

Recent studies indicate—though final proof is still lacking—that inhaled tobacco smoke may reach far down into the smaller air passages of the lung, causing spasm of the muscles surrounding the passages as well as inflammation of the mucous membranes. This may lead to partial or intermittent obstruction of air from the alveoli of the lungs and eventually to "pulmonary emphysema"—a disease of the lungs marked by breathlessness, and almost always associated with coughing. The lungs become over-inflated, the tissues are stretched, the elastic recoil of the lung is reduced, and the diaphragm becomes low and fixed. The disease, which usually begins after the age of 40, tends to progress and to lead eventually to severe respiratory and even circulatory failure. Since pulmonary emphysema is much more common than lung cancer, if the relation between heavy smoking and pulmonary emphysema is confirmed, its public health importance may be even greater than the relation between smoking and cancer of the lung.

So far as public interest goes, the most important question is the extent to which smoking is responsible for the progressive rise in cancer of the lung in recent decades. Last year about 24,000 men and 4000 women died of cancer of the lung—about eight times as many as 20 years ago. Mortality from no other type of cancer is increasing at a comparable rate.

News on cancer and tars

As we go to press, investigators at the Radium Institute of the University of Paris report the discovery of a chemical in cigarette smoke—3,4,9,10-dibenzpyrene—"which invariably causes cancer when injected into mice." Although it has long been known that benzpyrene chemicals are capable of inducing cancer in mice, the amounts present in tobacco tars have not been found sufficient to produce cancer consistently in a high percentage of experimental animals. The newspaper report does not indicate the relationship between the amount of dibenzpyrene which caused cancer in the mice and the amount of the chemical present in cigarette smoke.

Without a great deal more information than is yet available, it is impossible to know whether the Paris studies make a significant contribution to previous knowledge based on animal experiments.

There is no dispute among medical authorities that many materials in the air we breathe have cancer-inducing effects and probably play an important part in the rising incidence of cancer of the lung. There is dispute, however, as to the comparative importance of air pollutants as against heavy smoking as a causative factor in cancer of the lung. Heavy cigarette smoking is believed by many investigators—and by the American Cancer Society—to be an important, or even the major, factor contributing to the development of lung cancer. A different opinion is held by Dr. Clarence C. Little, Chairman of the Scientific Advisory Board of the Tobacco Industry Research Committee. "Any possible role of smoking in the etiology [cause] of lung cancer," says Dr. Little, "remains an unresolved question. It cannot be said that smoking has been absolved from suspicion; neither have the charges . . . been proven."

The point of view of the American Cancer Society, derived from several types of statistical studies on thousands of men and women with and without lung cancer, is summarized in a recent (1956) pamphlet "Where We Stand Today on Cigarettes and Lung Cancer," published by the American Cancer Society. According to this pamphlet, lung cancer is about 27 times as frequent among those who smoke two packages of cigarettes a day as among those who have never smoked. However, not everyone who smokes heavily develops lung cancer. The man who for many years has smoked heavily, two packages or so a day, has about one chance in ten of developing lung cancer eventually. A man who smokes less than a pack a day has about one chance in 36 of developing the disease. The chances of a non-smoker developing lung cancer are about one in 270.

Two important, large-scale studies on population groups in the United States and England, one by the American Cancer Society and the other by the British Medical Research Council, though not yet fully completed, appear to support the conclusion that heavy cigarette smoking is one

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of the most important causes of cancer of the lung. In both studies, lung cancer seems to occur less frequently in those who have given up cigarettes than in those who have smoked them continuously, though moderately. The British report considers significant a study of the smoking habits of doctors living in rural and urban districts. The high and closely similar incidence of cancer of the lung in the two groups of smokers could not, according to this study, have been affected by varying exposure to such atmospheric pollutants as industrial wastes and automobile exhausts.

Environmental factors

A different point of view about the relationship between environmental air carcinogens and cancer of the lung is contained in a recent Public Health Monograph by Dr. W. C. Hueper, head of the Environmental Cancer Section of the National Cancer Institute, U. S. Public Health Service. According to Dr. Hueper any final conclusion about the relative importance of cigarette smoking as a cause of lung cancer should be kept in abeyance until more valid and conclusive evidence becomes available. Dr. Hueper believes that tobacco smoking may play a role in causing cancer of respiratory organs, but that it is neither the only cause nor the main cause, nor is it predominantly responsible for the rising frequency of lung cancer observed during recent decades. He believes that exposure to many industrial fumes (chromates, nickel, arsenic and others), gasoline fumes, tire and asphalt dust, and radioactive dust is of great importance in producing cancer of the lung. Although only a small proportion of the 28,000 Americans who died of lung cancer last year were occupationally exposed to cancer-inciting environmental substances, it is Dr. Hueper's belief that in view of the far-flung pollution of the air, these carcinogenic substances are inhaled by the general population as well as by those occupationally exposed.

With the expansion of industry in the past 50 years, there has been a corresponding increase in air pollution. Fuel oil consumption is now 31½ times as great as it was 30 years ago. Exhausts from motor vehicles contribute to air pollution: motor fuel consumption is five times what it was in 1933. Roads surfaced with asphalt and oils are a source of fine dust which adds to air pollution.

Experiments with different animals to learn whether suspected substances in tobacco or tobacco smoke or in cigarette paper can actually produce lung cancer have so far provided inconclusive clues. Not only must one be cautious in relating to humans the results of experiments performed on mice, rats and other species, but these experiments have yielded contradictory results. However, recent experimental work by Dr. Ernest Wynder of the Sloan-Kettering Institute is of interest since it appears to show that carcinogenic effects depend upon the dose of the tar. Tars and hydrocarbons such as benzpyrene are at present among the suspected carcinogenic materials in tobacco smoke. As CU's tests show, all cigarettes contained appreciable amounts of tars. If Dr. Wynder's work is confirmed, low tar cigarettes should be less likely to induce

lung cancer than cigarettes with normal tar level.

It would be gratifying, says the American Cancer Society, if it could "cut through the smoking turbulence and produce a neat final answer" to the controversy about the relation between various environmental agents, including smoking, and cancer of the lung. However, it cannot. The Society's policy is this: "It intends to make widely available facts that bear on the question of whether to smoke or not to smoke. . . . The American Cancer Society has no plans for a campaign against cigarette smoking. Smoking is a habit which gives comfort and pleasure to millions, supports a great industry, and brings millions to the government in taxes. . . . The final decision on whether to smoke cigarettes rests with the individual. . . ."

A medical and statistical study of several hundred thousand veterans of World War I is being conducted by the U.S. Public Health Service to determine the relation between smoking and cancer of the lung and other disorders. It is hoped that the findings of this survey will help to clear up important aspects of the smoking controversy.

The most reasonable view of cancer of the lung at this time would relate its phenomenal and alarming rise partly to the diffusion into the air of carcinogens derived from industry and transportation, partly to unusual exposures to carcinogens in many occupations, and partly to excessive cigarette smoking. The control of lung cancer would, therefore, appear to require a three-pronged effort against 1) air pollution, 2) occupational exposure to specific carcinogenic agents, and 3) excessive cigarette smoking. Until more conclusive evidence is reported, it would seem prudent to reduce cigarette smoking to less than a pack a day, or to smoke a pipe or cigars in moderation.

Stop smoking?

For anyone to argue that everyone should stop smoking because of its hazards would be highly unrealistic. Relatively few smokers adopt the tobacco habit because of a sensuous appreciation of the fragrance of the cured tobacco leaf. In adolescence, smoking is frequently a symbol of emancipation from the fetters of childhood. Heightened nervous tension is the usual explanation given for the tobacco habit, and there is much evidence to support it.

During times of national crisis, as in a war, tobacco consumption rises sharply. At all times, man is exposed to a multitude of stresses and tensions. Smoking is doubtless one of the habits man has adopted to contend with these tensions. Reaching for a cigarette, cigar or pipe, holding it in the mouth, sucking on it, lighting it, inhaling it, and blowing out the smoke all tend to relieve tensions.

The stimulating or comforting effects of tobacco may be so valuable to some persons that they are willing to risk whatever physical harm may be associated with the habit. On the other hand, there are many for whom these risks are not worthwhile and who will, without too great a sacrifice, cut out or cut down their cigarette smoking.

It would be gratifying to conclude this article with a successful formula for giving up the tobacco habit. Mark Twain said that to stop smoking was easy. "I ought to know," he asserted, "because I've done it a thousand times." Modern-day medicine has no better answer.