

# Lead Content of Printed Media (Warning: Spitballs May Be Hazardous to Your Health)

MORRIS M. JOSELOW, PhD, FAPHA  
JOHN D. BOGDEN, PhD

---

*An unsuspected source of environmental lead contamination may be printed media, particularly since the use of lead-based pigments in printing inks seems to be so pervasive. Spot analyses of the colored pages of several newspapers, national magazines, and children's books revealed inordinately high lead concentrations. Mastication of such pages, as might occur with pica or the fabrication of spitballs, could result in ingestion of amounts of lead in excess of "safe" or acceptable limits. Incineration or recycling of such paper also present additional problems of air pollution or food contamination.*

---

## *Another Source of Environmental Lead Exposure*

The habit of pica—the eating of nonnutritive material—is strongly implicated in the etiology of childhood lead poisoning, with attention generally focused almost exclusively on lead-based paint as the prime source of the ingested lead.<sup>1</sup> Another source, not yet widely recognized, though readily available to children, may be the printed media—newspapers and magazines—particularly those that use lead-based or lead-contaminated inks for printing.

---

Dr. Joselow is Associate Professor of Preventive Medicine and Community Health and Director of the Division of Environmental Toxicology, College of Medicine and Dentistry of New Jersey, Newark, New Jersey 07103. Dr. Bogden is Instructor, Department of Preventive Medicine and Community Health. This paper was received for publication November 30, 1972, and accepted February 6, 1973.

## *Analyses*

In spot tests conducted in the New York City area, analyses were made for lead in several leading local newspapers including their comic sections, large circulation magazines, and some children's books. The analytical technique employed was essentially a modification of Delves cup-atomic absorption spectrophotometry,<sup>2</sup> with measured quantities of paper placed in the microcrucibles. Results of these analyses, which can easily detect  $10^{-9}$  gm lead,<sup>3</sup> are shown in the accompanying tables. For colored print, lead values can vary considerably, depending on the intensity and shading of the color; the lead contents shown are for the colors judged to be most nearly equivalent to the tabulated designations.

All of the newspapers tested had clearly detectable levels of lead, with concentrations for the black and white sections generally between 5 and 35 ppm (Table 1). These

**TABLE 1—Lead Content of Newspaper Pages without Color\***

Newspaper	Newsprint (Blank)	Regular Column	Half-Tone (Picture)	Headline (Solid Type)
ppm				
1. Daily morning paper	5	10	10	20
2. Daily tabloid	5	10	5	15
3. Daily evening paper	5	5	5	10
4. Sunday magazine	5	10	15	35

\* Printed media tested were as follows: (1) New York Times, July 24, 1972; (2) New York Daily News, July 18, 1972; (3) New York Post, July 18, 1972; (4) New York Sunday Times Magazine, July 23, 1972; (5) New York Sunday Times Magazine, July 23, 1972; (6) New York Sunday News Magazine, July 30, 1972; (7) Parade, August 13, 1972 (8) New York Sunday News Comic Section, August 13, 1972; (9) Newark Sunday Star-Ledger Comic Section, August 13, 1972; (10) Life, April 21, 1972; (11) Newsweek, August 7, 1972; (12) Consumer Reports, August, 1972; (13) Science, September 1, 1972; (14) Chemical and Engineering News, September 11, 1972; (15) American Journal of Public Health, August, 1972; (16) Playboy, December, 1969; (17) Children's Digest, May, 1972; (18) Dumbo (Garden City Publishing Company); (19) Mini-Golden Book (Western Publishing Company).

relatively low lead levels could be due to contamination from the lead type in printing presses, or perhaps even from the lead-containing driers often used as a component of printing inks.<sup>4</sup>

Inordinately high levels of lead, however, were found for almost all the colored pages tested among newspapers, Sunday magazine supplements, comics, and large circulation national magazines (Tables 2 and 3). Greens and yellows were the most heavily laden with lead. In a children's magazine, distressingly, concentrations in excess of 4000 ppm (0.4 per cent) were found. The use of lead-based pigments in printing inks is apparently a common and pervasive practice.

There were some notable exceptions. One of the Sunday newspaper comic sections (no. 9) obviously did not use lead-based pigments for their colors. Similarly, the relatively low circulation professional journals did not rely on leaded pigments for the colors on their pages. Quite clearly, nonleaded colors are available and are being used in some printing inks.

### Health Implications

The public health significance of lead in printed media is difficult to assess. Ordinarily, newspaper, though it may be chewed, is not likely to be ingested except by those with the habit of pica. Children's books, playing cards, comics, and magazines probably less so, are tempting targets, readily available, to the pica-prone child. While no reports could be found attributing lead poisoning to the ingestion of lead from printed media, any comfort derived from the absence of such observations must be mitigated by the fact that few physicians, nurses, or even mothers suspect such sources and are therefore not likely to impute them.

**TABLE 2—Lead Content of Newspaper Pages with Color**

Newspaper	Blue	Green	Yellow	Red
ppm				
5. Sunday magazine	500	2000	1500	1800
6. Sunday tabloid magazine	900	2000	1600	1600
7. Nationally distributed Sunday supplement	50	50	1100	1000
8. Sunday tabloid comics	70	1200	1400	1200
9. Sunday comics	30	30	30	30

### Spitballs and Lead Ingestion

There is one human activity, however, during which paper is deliberately and repeatedly taken into the mouth and serves as an abundant source of raw material: the fabrication of spitballs. Under such circumstances, newspaper could, theoretically at least, be evaluated as a "food," and would probably be considered as unduly contaminated with lead. Though there are at present no specific permissible limits set in this country for lead in foodstuffs, Great Britain recently recommended a limit of 0.5 ppm for infant foods.<sup>5</sup> When limits are set here, they will probably be close to the British recommendations, and thus far below the level of lead found in any of the printed media tested.

An estimation of the lead content of a spitball can be made by approximating the dimensions of such missiles. For almost all the papers tested, a moderately effective spitball could be made from 25 sq cm of newspaper, and weighed about 140 mg (anhydrous). With a paper lead content of 10 ppm, a spitball might thus contain a total of

TABLE 3—Lead Content of Magazine Pages with Color

Magazine	Blue	Green	Yellow	Red
	ppm			
10. Picture news magazine	700	3100	2200	900
11. News magazine	400	2000	1400	1500
12. Consumer magazine, cover	—	—	—	30
13. Science journal, cover	—	—	—	20
14. Professional news magazine	50	100	100	150
15. Professional journal	—	50	100 (brown)	100
16. Men's magazine	100	2300	1100 (flesh)	700
17. Children's magazine	70	4300	1100	2900
18. Children's book	—	1600	2300	2100
19. Children's book	20	700	700	800
20. Children's playing cards	100	—	300	300

about 1.4  $\mu\text{g}$  of lead. This amount may not be significant in view of the 300  $\mu\text{g}$  recently proposed as the maximum daily intake from all sources for children.<sup>6</sup> However, the fashioning of spitballs from a colored page would be decidedly more hazardous to health. The green, red, or yellow areas may easily contain more than 100  $\mu\text{g}$  per spitball. Even if only a part of this is leached out with saliva, or some of the paper is shredded and swallowed, it would require the manufacture of only a few spitballs to exceed a 300- $\mu\text{g}$  intake, particularly if a daily unavoidable intake of 100 to 200  $\mu\text{g}$  of lead from other sources (food, water, air) is assumed.<sup>6</sup> Some newspapers, magazines, and children's books could thus be considered as hazardous substances, possibly within the purview of the Federal Hazardous Substances Act.

### *Atmospheric Contamination and Other Problems*

Of uncertain public health significance also is the contribution that the burning or incineration of lead-bearing papers makes to the atmospheric burden of lead. The incineration of one Sunday magazine section alone, assuming a total weight of 200 gm and an average lead content of 25 ppm, might release as much as 5 mg of lead to the atmosphere—a not insignificant amount. Nor does recycling of paper offer a satisfactory solution to this problem: the ultimate destination of the recycled material, particularly if the colors are not removed before the recycling treatment, may well be food packaging where contamination of the food by direct contact or migration

of lead from the paper is a distinct possibility. The wisdom of some recommended uses for newspaper, e.g., as an ingredient in mulch preparations, as an extender for cattle food, or as bedding for pets, may also be questioned because of the danger of lead pollution that such uses present.

In view of all of the foregoing, the claim of a famous newspaper to offering all the news that's fit to print might well be qualified with the admonition that all that's printed is not fit for consumption.

### References

1. Lin-Fu, J. Undue Absorption of Lead among Children. *N. Engl. J. Med.* 286:702-710, 1972.
2. Joselow, M. M., and Bogden, J. D. A Simplified Micro Method for Collection and Determination of Lead in Blood Using a Paper Disk-in-Delves Cup Technique. *Atomic Absorption Newsletter* 11:99-101, 1972.
3. Fernandez, E. J., and Kahn, L. H. Determination of Lead in Whole Blood by Atomic Absorption Spectrophotometry with the "Delves Sampling Cup" Technique. *Atomic Absorption Newsletter* 10:1-5, 1971.
4. Gleason, M. N., Gosselin, B. E., and Hodge, H. C. *Clinical Toxicology of Commercial Products*. Williams & Wilkins Co., Baltimore, 1963.
5. Joint Announcement of Ministry of Agriculture, Fisheries, and Food, and Department of Health and Social Security, Great Britain, no. 190, June 28, 1972.
6. King, B. G. Maximum Daily Intake of Lead without Excessive Body Lead-Burden in Children. *Am. J. Dis. Child.* 122:337-340, 1971.