Texas Preventable Disease
NEWS

Vol. 52, No. 6
March 21, 1992

contents:

Bureau of Disease Control and Epidemiology,
1100 West 49th Street, Austin, Texas 78756 (512-458-7455)

ANEMIA AND A FOREIGN BODY IN A MENTALLY ILL PATIENT

On March 28, 1989, a 33-year-old black male, hospitalized since 1979 for undifferentiated paranoid schizophrenia and pica, was evaluated for anorexia and weight loss. The patient's therapy included fluphenazine and molindone (a major tranquilizer structurally unrelated to phenothiazines, butyrophenones, and the thioxanthenes).

The patient's prior medical history was significant for a colostomy in 1987 for the removal of an ingested spring and a positive tuberculin skin test, also in 1987, followed by INH chemoprophylaxis. He had no history of gastrointestinal bleeding. A complete blood count done on November 4, 1988, had been normal. In October of 1988, he weighed 150 pounds.

When examined on March 28, 1989, his blood pressure was 144/80 mm Hg; his pulse, 88/min; and his respiratory rate was 12/min. Although he was not weighed on March 28, a few weeks later his weight was recorded at 122 pounds. The patient had no apparent change in mental status. His lungs and heart were normal. His abdomen was soft and nontender, without hepatosplenomegaly. A stool specimen obtained on initial evaluation was guaiac negative.

Initial laboratory evaluation revealed a mildly hypochromic, normocytic anemia with a hemoglobin of 9.6 gm/dL, hematocrit of 28.5%, and 3.29 x 10^{12}/L RBCs. Increases in the patient's indirect bilirubin (2.2 mg/dL, normal 0.1 - 1.0), aspartate aminotransferase (47 U/L, normal 7-39 U/L), alanine aminotransferase (113 U/L, normal 2-54 U/L), alkaline phosphatase (159 IU/L, normal 41-133 IU/L), and gamma glutamyltransferase (337 IU/L, normal 8-69 IU/L) were also noted.

A work-up was begun for a hemolytic anemia. The peripheral smear showed mildly hypochromic cells, occasional polychromatic cells, and occasional cells with prominent basophilic stippling. A rare nucleated red cell was noted. No schistocytes, fragmented RBCs, or target cells were noted.

The patient's haptoglobin was < 100 mg/dL. His direct Coombs' test was negative for IgG and weakly positive for complement. His serum iron, folate, and B12 levels were within normal limits. A serum ferritin was 521 ng/mL (normal 20-403 ng/mL). A G6PD and hemoglobin electrophoresis were normal, as was a urinalysis.

On April 3, 1989, a computerized axial tomographic (CAT) scan of the abdomen demonstrated a normal liver and spleen and a square, metallic foreign body in the upper right quadrant of the abdomen. The object was approximately 3 cm in diagonal measurement and appeared to be in the antrum of the stomach. Further GI studies were unremarkable with the exception of the intragastric foreign body.

On a serendipitous viewing of the x-ray, a laboratory technician familiar with the patient's hematologic parameters suggested that the foreign body might be a lead drapery weight. A free erythrocyte protoporphyrin level measured

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April 12 was 66 μg/dL (normal < 35 μg/dL), and a blood-lead level was 170μg/dL (normal in adults < 40 μg/dL). The patient was promptly taken to surgery. Three lead curtain weights were removed from the patient, and all of the drapery weights in the facility were subsequently removed from the drapes.

Post-operatively, the patient was treated with $FeSO_4$, 325 mg by mouth, 3 times a day; a daily multivitamin with zinc; and a high-carbohydrate diet with three dietary supplements a day. The patient's blood-lead level declined from 170 μg/dL on April 12 to 77 μg/dL on May 10 and 58 μg/dL on July 7. By July, the patient's red cell indices and liver function tests were normal.

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Toxicology Commentary: **Anemia and a Foreign Body in a Mentally Ill Patient.**

The setting of a mental health facility creates a difficult environment for obtaining an accurate medical history. Pica only amplifies the already vast differential diagnoses for the symptoms of anorexia and weight loss. Some of the more likely medical conditions include: reactivation of TB, hepatitis, colitis, ulcerative disease, renal disease, cardiac disease, medication reaction, and parasitic or other infectious diseases. From a toxicologic perspective, the differential diagnosis focuses on chronic exposures such as heavy metals (eg, iron, mercury, lead, cadmium, and arsenic), pesticides (eg, organophosphates or carbamates), solvents and other hydrocarbon solutions, and dye products. Carbon monoxide poisoning should also be considered.

Moving through the above differential, a careful medical examination and laboratory evaluation, including chest x-ray and ECG, will eliminate many of the medical and toxicologic considerations. A careful assessment of the patient's cardiac status is indicated. Lack of evidence of arrhythmias, ECG abnormalities, symptoms, or cardiac failure should make this a fairly straightforward elimination. A hepatitis screen for epi-demiologic considerations may have been helpful.

Evaluations performed on this patient effectively ruled out many of the potential medical and toxicologic problems. It focused the evaluation on the hypochromic normocytic anemia. The clinical picture of vague constitutional symptoms and pica, along with the given laboratory findings, particularly the anemia with basophilic stippling, should focus the evaluation on heavy metal toxicity. In this case, these classic hematologic findings suggest lead toxicity.

Lead has no known physiologic function. Its toxicity principally effects the gastrointestinal (GI), hematologic, renal, and neurologic systems. Lead appears to inhibit multiple enzyme systems by its ability to bind to sulfhydryl, amino, and carboxyl groups. It is widely distributed in the body and ultimately accumulates in bone. Its hematologic effects result from increased red-cell death and inhibition of hemoglobin synthesis. GI manifestations include anorexia, constipation, and abdominal pain usually described as colicky. Neurologic symptoms vary from vague weakness to classic sensory deficits (eg, wrist drop) to encephalopathy, seizures, and ultimately death.

A 24-hour urinary screen for both renal function and mercury/arsenic exposure might have been helpful in this case. Lead screening is well served by the two tests that were performed on this patient. The free erythrocyte protoporphy-

rin level and the **whole blood** lead level are elevated in toxic cases.

Removal of the contaminating source is the cornerstone of managing chronic lead toxicity. In treating symptomatic cases such as the one reported here, many authorities also would have initiated either parenteral chelation therapy with calcium EDTA and dimercaprol or oral therapy with penicillamine. However, the former treatment is painful and nonspecific, while the latter is of limited efficacy. The conservative approach taken in this case had a good result and is also strongly endorsed in the literature.

A newly approved oral agent with greater efficacy and specificity, dimercaptosuccinic acid, may be a reasonable alternative. This agent does not appear to redistribute lead to the central nervous system; does not effect zinc, iron, or magnesium levels; and has no inherent renal toxicity.

It must be emphasized that such elevated lead levels in a child, it is universally agreed, would require chelation therapy.

Prepared by: John F. Haynes, MD, Medical Toxicologist, Texas Tech University Health Sciences Center at El Paso.

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ELEVATED BLOOD LEAD LEVELS AMONG WORKERS IN THE PLASTICS PIGMENTS INDUSTRY — TEXAS, 1990

In June 1990, a physician reported an elevated blood lead level to the Dallas County Health Department. The affected individual, an employee of a company that formulates color concentrates for the plastics industry, had a blood-lead level (BLL) of 52 μg/dL of whole blood and complained of severe headaches. The physician reported the elevated BLL to the Occupational Safety and Health Administration (OSHA) and consulted the medical toxicologist at the North Texas Poison Control Center about treatment.

Since the company lacked an ongoing medical monitoring program for employees, as mandated by OSHA,* the physician consulted with the company officials and performed blood lead analyses on 22 other employees. Seven additional employees had BLLs exceeding 40 μg/dL (range 43-107 μg/dL, mean 62 μg/dL). Two employees, with BLLs of 78 and 107 μg/dL, were hospitalized for chelation therapy (one with calcium ethylenediaminetetraacetic acid [EDTA] and D-penicillamine, the second with EDTA, D-penicillamine, and dimercaprol). Two other workers received chelation therapy with D-penicillamine as outpatients.

After receiving reports of these elevated BLLs, the TDH Environmental Epidemiology Program, as part of its follow-up activities, contacted the physician and scheduled an industrial hygiene inspection of the facility in August 1990 to determine the sources of exposure to lead and other chemicals.

In this plant, powdered metal-based pigments are mixed in a formulation "laboratory" and are then blended with plastic pellets in 500- to 2,000-gallon mixers. The pigment pellet mixes are then heated and extruded, forming colored pellets that are infused with the pigments. These completed pellets are sold for use in the production of various colored plastic products.

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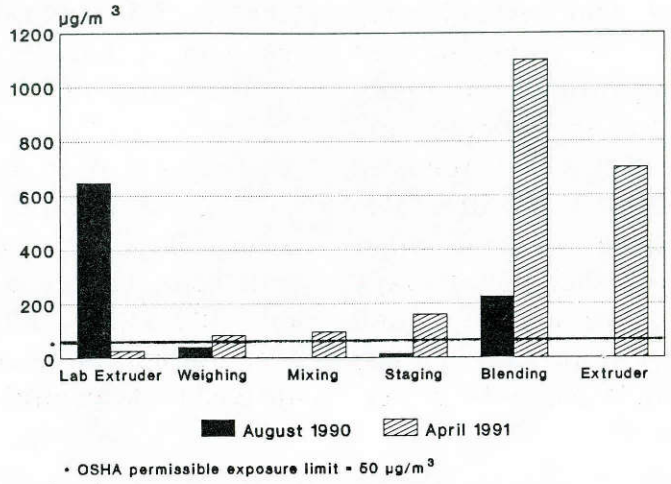
* The OSHA Lead Standard requires that, in workplaces where lead is used, employers must monitor for airborne exposures. When airborne lead levels exceed 30 μg/m³ (as an eight-hour, time-weighted average), employers must provide an industrial hygiene program and a medical monitoring program that includes monitoring of BLLs.[1]

The TDH industrial hygiene inspection determined that ventilation and other engineering measures in the plant inadequately controlled the dusts generated by the process.

Employees were equipped with half-mask, air-purifying respirators, which were fitted with organic vapor cartridges and particulate filters. However, in several environmental samples, airborne lead exposures exceeded the protection factors provided by these respirators. Environmental monitoring demonstrated that the highest exposures occurred during the following operations: hand weighing the pigments into open paper bags, blending, emptying the blenders into open bins, cleaning the blenders with compressed air, and manually agitating the mixes when blenders and extruders became clogged.

Personal breathing-zone exposure samples revealed that employees had substantial exposures to lead, chromium, and cadmium, which were components of the various pigments used in the process. Exposure to lead in the extruding area was 648 $\mu g/m^3$ (as a 10-hour, time-weighted average) and 226 $\mu g/m^3$ in the blending area† (Figure 1). Chromium exposure (as chromates) in the extruding area was 132 $\mu g/m^3$, above the OSHA personal exposure limit (PEL) of 100 $\mu g/m^3$ (as a maximum concentration). The highest airborne cadmium exposure (48 $\mu g/m^3$) did not exceed the current PEL of 200 $\mu g/m^3$.

Figure 1.
Personal airborne-lead exposure levels in a plastics plant, by site — Texas, 1990-1991



Wipe samples taken from a desk next to the pigment table, from the top of the coffee maker in the formulation lab, and from the lunchroom showed both lead and chromium contamination. The highest lead (20.4 $\mu g/m^2$) and chromium (3.7 $\mu g/m^2$) levels were found on the handle, door, and controls of the lunchroom microwave oven.

Based upon the findings of the industrial hygiene survey, recommendations were made to correct the observed violations of OSHA standards. After medical treatment, increased use of personal protective equipment, and worksite cleanup had taken place, the mean BLL for the eight workers who initially had elevated BLLs decreased to 36 $\mu g/dL$ (range 23-46 $\mu g/dL$) by April 1991, although environmental monitoring at that time showed that airborne lead exposures continued to be very high.

Further investigation by TDH is proceeding to determine if the overexposures found in this plant reflect a problem common to this industry in Texas.

† The OSHA permissible exposure limit (PEL) for lead is 50 $\mu g/m^3$, as an eight-hour, time-weighted average. If an employee is exposed to lead for more than eight hours in a work day, the PEL is adjusted according to the formula: maximum permissible limit = 400 $\mu g/m^3$ / hours worked in a day. As employees at this facility worked 10-hour shifts, the application PEL in this case is 40 $\mu g/m^3$.[1]

PDN Editorial Note: Although the Consumer Product Safety Commission (CPSC) banned lead in residential paints in 1977[2], pigments containing lead are still used in many industrial and commercial applications, and uncontrolled use of these pigments continues to pose a significant risk to workers and their families. In 1983, according to the National Institute for Occupational Safety and Health (NIOSH) National Occupational Exposure Survey, 24 industries were noted to use lead chromate (NIOSH, unpublished data). An estimated, 30,600 US workers are potentially exposed to lead chromate, of whom 12,500 are exposed in the miscellaneous plastics products industry (Table 1) (NIOSH, unpublished data).

Table 1.
Estimated number of workers potentially exposed to lead chromate, by type of industry — US, 1991

INDUSTRY	SIC*	Number of Workers Potentially Exposed
Misc. plastics products	3079	12,500
Rubber and plastics footwear	3021	4,000
Ship building and repairing	3731	2,400
Paints and allied products	2851	2,100
Electric services	4911	1,900
Plastics materials and resins	2821	1,600
Motor vehicles and car bodies	3711	1,100
Painting, paper hanging, decorating	1721	1,000
Coated fabrics, not rubberized	2295	700
Farm machinery and equipment	3523	600
All others		2,700
Total		30,600

Source: National Occupational Exposure Survey as of May 23, 1991

* Standard Industrial Code

The investigation reported here describes the first identified cases of elevated BLLs in the plastics industry in Texas. In addition to the risk of lead exposure for workers who produce plastic pellets infused with lead chromate pigment, as reported here, subsequent use of this material by manufacturers of colored plastic products presents potential for lead exposure through the heating, remolding, cutting, and use of processed plastic parts.

In 1988, states that conducted surveillance of elevated BLLs received 17 reports of elevated BLLs in the plastics materials and resins industry (Standard Industrial Code[3] [SIC] 282) and 11 reports in the miscellaneous plastics products industry (SIC 307) (NIOSH, unpublished data). The risk, if any, of lead exposure to consumers from plastic products colored with lead chromate is not known, but would be expected to be minimal.

An elevated BLL in an adult (BLL ≥40 μg/dL) is a reportable condition in Texas. Since inception of the Texas law on May 27, 1985, through the end of 1990, the Department of Health has received

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5,952 reports representing 1,054 adults. Currently, 15 states require the reporting of elevated BLLS. Identification of cases of elevated BLLS in the plastics pigmenting industry demonstrates the utility of lead surveillance systems for identifying new or unrecognized sources of occupational exposures.

Reported by: J Pichette, MS, L Schulze, DM Perrotta, PhD, JP Henry, MS, Epidemiology Division, Texas Department of Health; C Kelly, Dallas County Health Department; Division of Surveillance, Hazard Evaluations and Field Studies, National Institute for Occupational Safety and Health, CDC.

References:

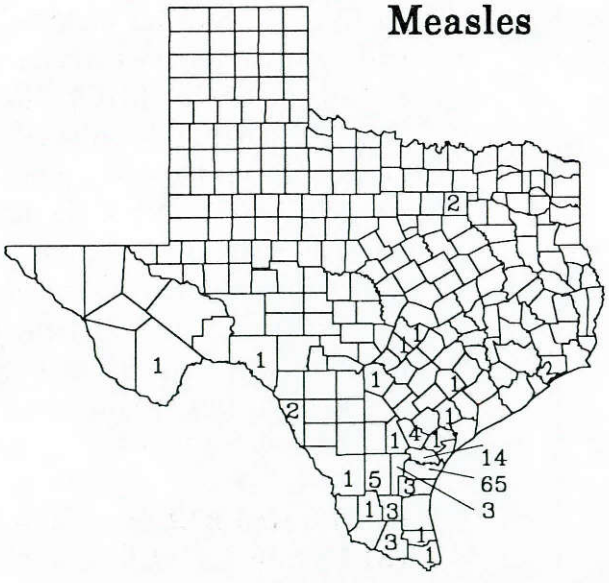
1. Office of the Federal Register. Code of federal regulation: occupational safety and health standards. Subpart Z: Toxic and hazardous substances -- lead. Washington, DC: Office of the Federal Register, National Archives and Records Administration, 1985. (29 CFR 1910.1025).

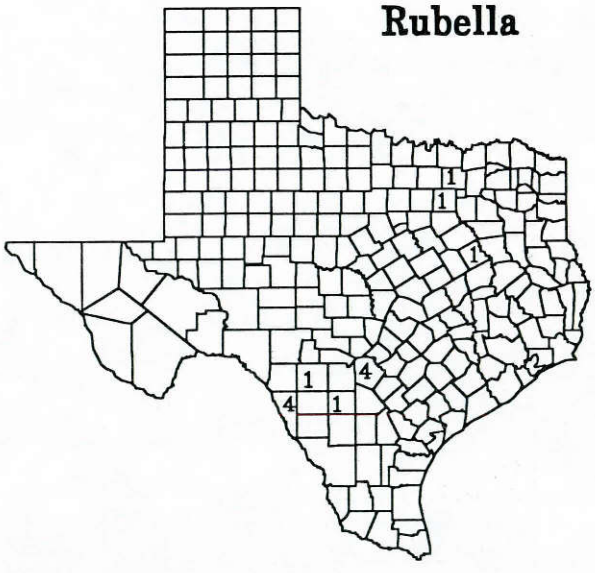
2. Consumer Products Safety Act. 16 CFR Part 1303. Ban of lead-containing paint and certain consumer products bearing lead-containing paint, 1977.

3. Office of Management and Budget. Standard industrial classification manual. Springfield, Virginia: National Technical Information Service, 1987. (NTIS order no. (PB) 87-100012).

VACCINE-PREVENTABLE DISEASE UPDATE *

Suspected/Confirmed Cases Reported
With Onsets From 02/23/92 --03/07/92
Weeks 9-10





Summary of suspected/confirmed cases YTD:

	Latest Onset Date	Total This Period	YTD Total
MEASLES	03/07/92	117	651
RUBELLA	03/07/92	13	49
PERTUSSIS**	02/12/92	—	9

* **Total cases with onset dates during reporting period**

** **No cases of Pertussis reported this period**

MONTHLY STATISTICAL SUMMARY OF SELECTED REPORTABLE DISEASES -- February 1992

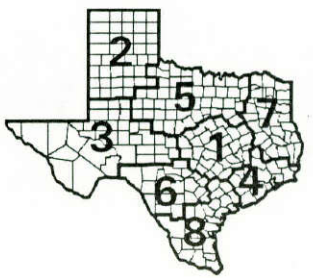
SELECTED DISEASES/CONDITIONS	PUBLIC HEALTH REGION								SELECTED TEXAS COUNTIES								THIS MONTH		CUMULATIVE (to this month)	
	1	2	3	4	5	6	7	8	Bexar	Dallas	El Paso	Harris	Hidalgo	Nueces	Tarrant	Travis	1991	1992	1991	1992
SEXUALLY TRANSMITTED DISEASES*																				
Syphilis, primary and secondary	.}	0	3	82	96	15	0	1	14	68	10	63	1	0	17	1	204	419	204	419
Congenital Syphilis	1	0	0	6	6	0	8	1	0	3	0	6	0	0	3	0	22	3	22	3
Penicillinase-producing Neisseria gonorrhoeae (PPNG)	4	0	1	7	41	6	0	1	6	24	0	6	0	0	16	0	60	184	60	184
ENTERIC DISEASES																				
Salmonellosis	6	1	2	2	5	2	0	4	1	2	0	1	0	0	1	0	22	86	66	203
Shigellosis	2	4	17	2	0	6	2	2	3	0	2	0	0	1	0	0	35	131	89	298
Hepatitis A	2	2	16	10	5	8	0	11	6	1	5	6	0	0	0	0	54	316	145	711
Campylobacteriosis	0	4	0	0	4	1	2	4	1	0	0	0	0	3	3	0	15	43	58	89
BACTERIAL INFECTIONS																				
H. influenzae, invasive	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	3	55
Meningococcal, invasive	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	12	10	25
Lyme disease	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6
Vibrio species	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
OTHER CONDITIONS																				
Influenza & flu-like illness	708	961	741	893	1,826	520	250	4,544	449	0	301	310	0	355	77	0	10,443	44,836	15,170	98,077
Hepatitis B	7	2	4	3	4	9	4	1	8	1	1	1	0	0	0	0	34	150	114	289
Adult elevated blood lead levels	0	0	2	0	0	0	0	7	0	0	0	0	0	0	0	0	3	9	5	15
Animal rabies - dogs and cats	1	0	9	2	11	1	2	12	0	0	0	1	0	0	0	0	25	38	48	65
Animal rabies - total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	72	117
TUBERCULOSIS DISEASE*																				
Children (0-14 years)	1	2	0	0	1	0	2	0	0	1	0	0	0	0	0	0	21	6	34	8
Adults (>14 years)	4	4	5	10	29	11	5	17	7	24	3	1	5	2	3	3	167	85	388	113
INJURIES*¶																				
Spinal cord injuries	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	5	44

* Data for the STD's, tuberculosis, and injuries are provided by date of report, rather than date of onset.
¶ Voluntary reporting.

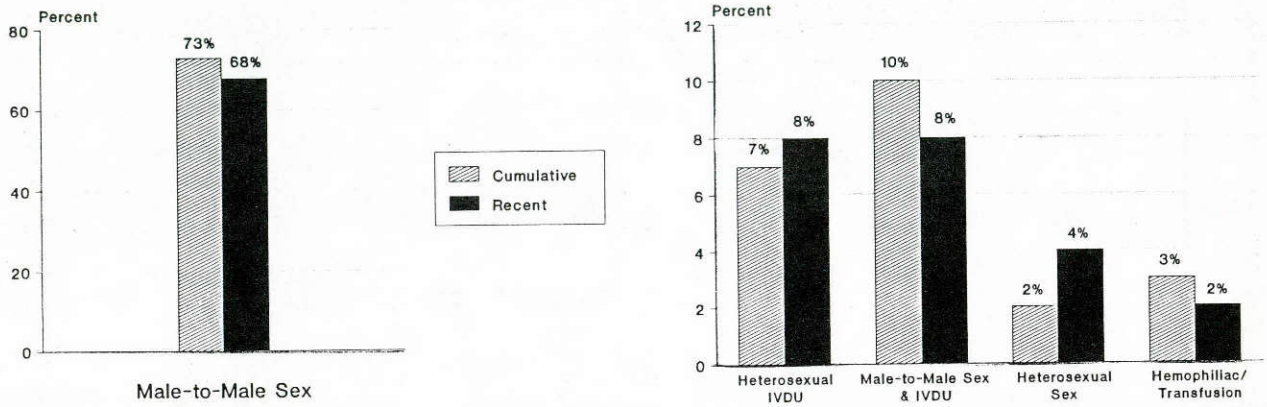
1991 POPULATION ESTIMATES

PUBLIC HEALTH REGIONS			
1	1,760,924	5	4,848,688
2	741,857	6	1,640,610
3	1,148,201	7	1,224,653
4	4,343,872	8	1,550,883

SELECTED TEXAS COUNTIES			
Bexar	1,195,510	Hidalgo	395,398
Dallas	1,870,753	Nueces	293,965
El Paso	604,389	Tarrant	1,177,915
Harris	2,872,645	Travis	584,682



Modes of Exposure for Cumulative and Recent AIDS Cases
(Adults/Adolescents)



Cumulative cases (N=13, 576) reported as of August 31, 1991. Recent cases (N=3,182) reported from September 1, 1990, to August 31, 1991.

TEXAS PREVENTABLE DISEASE NEWS (ISSN 8750-9474) is a free, biweekly publication of the Texas Department of Health, 1100 West 49th Street, Austin, TX 78756. Second-class postage paid at Austin, TX. POSTMASTER: Send address changes to TEXAS PREVENTABLE DISEASE NEWS, 1100 West 49th Street, Austin, TX 78756.

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