U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45202

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 76-31-392

BECTON-DICKINSON
DIVISION OF BECTON-DICKINSON & COMPANY
JUNCOS, PUERTO RICO

MAY 1977

I. TOXICITY DETERMINATION

Based on the environmental/medical evaluation conducted on February 18-20, 1976, it has been determined that production workers at the Becton-Dickinson Thermometer factory in Juncos, Puerto Rico are exposed to potentially toxic concentrations of mercury vapor. The vapor concentrations ranged from less than 0.3 micrograms to greater than 0.418 milligrams per cubic meter. Eight workers had signs and symptoms consistent with those seen in clinical mercurialism, however, blood and urine mercury measurements failed to confirm this diagnosis.

RECOMMENDATIONS

1. In view of the mercury in blood, urine, and air measurements, a reappraisal of the company's surveillance procedures would be advisable:

   (a) The company's urinary mercury estimations should be cross-checked periodically with established reference laboratories in the continental United States, (b) measurement of mercury in blood should be considered for those workers whose urinary mercury was found to be elevated, (c) the company should consider contracting to obtain personal sampler TWA values on "high-risk" groupings as a method of environmental control supplemental to the Lamaire vapor meter.

2. Smocks in the Degas and Fill room should be changed daily.

3. Evaluation of clothing contamination among other workers in the facility and daily changes of clothing should be instituted elsewhere if necessary.

4. A program should be established to prevent contamination of shoes. For example, shoes should be nonporous (dispensable shoe covers could be used), contaminated shoes should be readily identified, and footwear to be worn home should be restricted.

5. Pre-meal handwashing and overall changing should be enforced.

6. Instruction programs should be intensified to achieve a high degree of employee awareness of the hazards of working with mercury and the need to maintain scrupulous cleanliness at work.

7. There are some data that describe abnormal reproductive or developmental changes in animals associated with mercury exposure. As a precautionary measure, any exposure to mercury should be minimized in women of reproductive age.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are currently available upon request from NIOSH, Division of Technical Services, Information and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office at the Cincinnati address.

Copies of this report have been sent to:

a) Becton-Dickinson; Juncos, Puerto Rico
b) Secretary of Health for Puerto Rico
c) U.S. Department of Labor - Region II
d) Authorized Representative of employees
e) NIOSH - Region II

For the purpose of informing the approximately 207 "affected" employees the employer shall promptly "post" the Determination Report for a period of 30 calendar days in a prominent place(s) near where exposed employees work.

III. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) and the Bureau of Epidemiology, Center for Disease Control, received a request from the Secretary of Health for Puerto Rico to evaluate "reputed mercurialism in workers at the Becton-Dickinson Thermometer Factory in Juncos, Puerto Rico". Subsequent to this, NIOSH received a similar request from an authorized representative of employees.

Under Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 699(a)(6), authorizes the Secretary of Health, Education, and Welfare, following a written request by an employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

For this reason, these requests were handled as a single request for a Health Hazard Evaluation. This evaluation was a joint project conducted by representatives from NIOSH and the Bureau of Epidemiology.

IV. HEALTH HAZARD EVALUATION

A. Plant Process - Condition of Use

Thermometers are produced at a high rate by an overall process which includes several proprietory intermediate steps.

Opening and Cavity, Seal and Bulb

Production of these clinical thermometers begins by preparing the glass in a room adjacent to the main production area. No mercury is handled in this room. The two operations conducted in this room are 1) Opening and Cavity and 2) Seal and Bulb.

The Opening and Cavity in the glass is formed by applying heat. This operation is conducted by seven employees who utilize specifically designed machines to perform this operation. Each of the seven machines is locally exhaused.

On the opposite side of the room twelve employees use specifically designed machines to "Seal and Bulb" the glass rods prepared in the "Open and Cavity" area.

Ventilation (conditioned air) is provided through eight louvered inlets five in the Bulb Forming Area and three in the Opening and Cavity Area. Air is exhausted through the seven canopy type hoods located above the mcahines and in the "Opening and Cavity" operation.

Degas and Fill Room

Two employees in the Degas and Fill room introduce mercury into the "thermometers" received from the "Seal and Bulb" operation. This is done by first creating a vacuum and then introducting the mercury after the "thermometers" have been annealed.

The degas and fill is done in two machines, each of which contains two chambers. Also contained in this room are two laboratory type hoods, five locally exhausted thermometer storage cabinets, two work tables, five mercury stills, a mercury transfer pot, an oven, and an inspection station.

One of the locally exhausted hoods is used to load and unload trays of thermometers; the other hood is used to store bottles of mercury and is kept more enclosed by utilizing plywood panels at the face of the hood.

In addition to the local exhaust system, general room ventilation is provided by forcing tempered air through several inlets (along the floor

and ceiling) into the room and exhausting through several outlets near the floor.

Employees in this room are also provided with a protective smock and a respirator; the respirator is used during the transfer of mercury and when loading and unloading thermometers that contain mercury.

Combination Machine

The combination machine is housed in a small room adjacent to the Degas and Fill room. This machine is almost completely automated; one employee is required to feed one-end open thermometers to the machine one at a time. The machine seals the top and forms a bulb-type chamber and grades the thermometers.

Ventilation in this room is provided by exhausting at three points; the make-up air is through an open door way which leads to the general work area. Two of the exhaust intakes are located on the ceiling while the third is a canopy-type hood located above the combination machine, where heat is applied to the thermometers. The general air flow is from the door way, past the combination machine operator, to the exhaust points.

The operator is provided cloth gloves to avoid contact with the mercury.

General Workroom Area

The remainder of the operations described are conducted in the general work room area.

Approximately]7 employees are involved in "Preparing for Contracting" (spin down mercury with centrifuge), "Contracting" (forming a check valve), Air Removal (get mercury all together by using a centrifuge), and Testing Check-valve Efficiency (by using centrifuge). After this test, thermometers may be sent for rework if not satisfactory.

Centrifuges are locally exhausted in case of thermometer breakage.

After testing the check valve thermometers are classified either by hand or by utilizing a machine appropriately identified as the "Classifier". The desired scale and other information is then screen printed on to the thermometers by one of six employees. Thermometers are then baked so that the information screen printed on will better adhere to the glass. After the baking, they are washed with a dilute sulfuric acid solution.

Since the mercury has traveled thoughout the thermometer as a result of baking and a significant portion of it is in the upper chamber, thermometers are spun down with a centrifuge.

After this, preparation to drive excess mercury into the top chamber is made by first bathing the thermometer at a set temperature and locating the desired

point by laser. Location of this point is done also by hand and is identified as "pointing". The column is then split by using the lasers. Excess mercury is driven to the top chamber.

The baths used to achieve the desired temperature and the lasers are also locally exhausted.

Several people are also employed to certify that the point located is correct. This job is appropriately identified as "Certifying".

The pull top operation is the next intermediate step and consists of severing the bulb-type chamber which contains the excess mercury. This is accomplished by utilizing a machine identified as the "Pull-top" machine. A hot flame is used to sever the glass rod. The bulb-type chamber drops off onto a strategically located chute and then into large waste cans which contain water. There are four of these locally exhausted pull top machines, some of which differ slightly in that they are also used to place a small colored plastic bead at the top.

Quality control inspections are conducted after several intermediate steps as well as before packaging.

The final step is the packaging of the thermometer to be shipped.

General Information

A. Environmental

In addition to the local exhaust system(s) previously described, the ventilation system includes one ton of conditioned air/75 sq. ft. of floor space or an equivalence of 36 air changes per hour.

Other control measures used throughout the factory include: submerging broken thermometers in trays of water and a continuous clean-up program.

Of the 207 employees listed as production workers, seven are actually janitors. These janitors (four of which were on the day shift) continually vacuum the various work stations and general rooms.

The vacuum system is plumbed in and is a permanent fixture. Only the hose and trap used by the janitor are movable. Several connection points are provided throughout the factory.

It was reported by the company that close surveillance was maintained of absence due to sickness, and that routine urinary mercury measurements were taken on all staff every 3,4, or 6 or 12 months depending on their potential risk; further the company physician requests urine samples at his discretion. Also, it was reported that any illness suggestive of mercurialism was apparently promptly investigated. The frequency of such biological monitoring seems appropriate and should be continued.

B. Evaluation Progress

The request for technical assistance was received February 12, 1976. The environmental/medical evaluation was conducted on February 18-20, 1976; key personnel were met with on February 17, 1976.

C. Evaluation Methods

1. Environmental

After an introductory meeting with company officials on February 18, a walk-through survey was conducted in the production area. A sampling protocol was established as a result of the walk-through survey. Listed in Table I are the various job classifications sampled during the evaluation.

In addition to using a mercury vapor "sniffer" to detect mercury vapor sources, iodine impregnated charcoal tubes were used to determine employees' exposure to mercury vapor. These personal samples were collected with a low flow battery operated pump which was attached to the employee belt. The charcoal tube was positioned as close as possible to the workers' actual breathing zone. The flow rate and volume were varied at the discretion of the investigators. The flow rates were approximately 200 cc/min. on the first day, 50 cc/min. on the second and third days. An exception to this is that several short term samples were collected at 1 lpm. At no time was the flow rate greater than 1 lpm.

These samples were analyzed by atomic absorption, using the Tantalum Boat Technique.

2. Medical Evaluation

The medical evaluation included administering a specifically designed questionnaire to a random stratified sample of 51 current employees. It also included conducting physical examinations and collecting blood samples from each of these 51 employees. Twenty percent of the various job categories were included in the medical evaluation. All six of the allegedly "high-risk" employees present were included (See table below).

Sample Population Characteristics

Department	Population	Sample	Percentage
Permanent Mark	77	15	19
General Workroom Workers (Contract, Letout, Classifier)	32	6	19
Night Shift	29	5	17
Watchman/Porters/Supervisors/ Managers	25	5	20
Tube Manufacture (Open and Cavity, Set on Bulb)	32	6	19

Quality Control/Shipping/ Maintenance	23	4	17
Office/Personnel	18	4	22
High-Risk Group (Janitors, Degas, Fill and Combination)	6	6	100
TOTAL	242	51	21

	Sex Ratio (M:F)	Mean Age (S.D.) Males	Females
Sample	1:2.2	35.9 (7.12)	32.7 (6.14)
Total Population	1:2.6	36.0 (6.8)	34.3 (7.26)

Both the blood and urine samples were anlyzed by flameless atomic absorption.

D. Evaluation Criteria

a. Environmental Standard

The primary sources of environmental criteria considered are (1) an article entitled "Effects of Exposure to Mercury in the Manufacturing of Chlorine: by R.G. Smith, Ph.D., A.J. Vorwalk, M.D., L.S. Patil, M.D., and T.F. Mooney, Jr. Ph.D., November-December issue of the American Industrial Hygiene Association Journal, Vol. 31, pages 687-700, 1970; (2) the NIOSH Criteria Document for a recommended standard . . . Occupational Exposure to Inorganic Mercury; (3) the American Conference of Governmental Industrial Hygienist (ACGIH) Threshhold Limit Value (TLV) and Supporting Documentation on Mercury; (4) Federal Occupational Health Standards Promulgated by the U.S. Department of Labor (29 CFR Part 1910.1000).

The NIOSH recommended standard for occupational exposure to mercury and the ACGIH TLV are 0.05 milligrams of mercury per cubic meter of air determined as a time-weighted average (TWA) exposure for an 8-hour work day. The Federal Standard for occupational exposure to mercury is a ceiling value of 1 mg of mercury per 10 cubic meters of air (0.1 mg/m^3).

b. Medical Criteria

Mercury has been used since the first century BC when Pliny described "mercurialism" in slaves employed in mercury mines. Ramazzini (1) provided a classic description of the disease in the mirror silverers of Murano in the 17th Century. The major symptoms resulting from metallic mercury exposure include erethism (a complex neuropsychiatric disorder characterized by irritability, outbursts of temper, excitability,

shyness, paranoia, headache, fatigue, and indecision), intention tremor, and gingivitis (2). Detailed epidemiologic studies of chloralkali workers (3) revealed that although there was a good correlation between mercury in air measurements and body burden mercury levels (urine or whole blood), most classical symptoms and signs correlated poorly. Good predictors included loss of weight, anorexia, objective tremor, diastolic blood pressure, insomnia, shyness, and frequency of colds. Considerable variation exists, however, in terms of an excretion rate in excess of 300 ug/l is likely to be accompanied by symptom or sign, but similarly exposed individuals have remained asymptomatic while excreting urinary mercury levels greater than 300 ug/liter.

The following parameters were used to evaluate workers and to suggest those who might have clinical mercurialism: objective tremors, plus objective gingivitis, weight loss, or insomnia; or the syndrome of irritability, anxiety and nervousness.

Listed below is a suggested guide for interpreting mercury levels in the blood and urine.

Level of Mercury in ng/ml of Urine	of Blood	
less than 15	less than 10	Normal exposed population
above 15	above 10	Evidence of occupational exposure
above 30	above 25	Increased Absorption in occupationally exposed
above 150	above 35	Equivalent maximum allowable concentration

E. Evaluation Results and Discussion

Table I shows the results of the iodine impregnated charcoal tube samples for three different days.

Approximately half of the concentrations reported exceeded the NIOSH recommended standard of 0.05 mg/M^3 and four exceeded the federal standard of 0.1 mg/M^3.

The actual exposure concentration for the Degas and Fill employees may be lower in a few cases since the employees wore a respirator when transferring mercury.

Samples CT-31 and CT-39 are reported as minimum concentrations because the tubes were saturated and the reason for the saturation was that the sample volumes were too large. This was not the case for sample CT-59.

Engineering controls appeared to be adequate in all areas except in the small room which houses the combination machine. The exhaust system in this room was too far from the tray of open and thermometers, which in turn is directly in front of the operator and at about waist height.

Blood Samples

Inorganic mercury-in-blood concentrations ranged from 4.0 to 39.9 ng/ml. No regulations exist for maximal levels of mercury in blood, but extrapolations have been made based on the OSHA standard of 0.1 mg/m^3 for mercury-in-air as a time-weighted average (10). Such calculations suggest that 35 ng/ml is the "equivalent" MAC for blood, according to a personal communication of T.W. Clarkson. One individual (a janitor) exceeded this level (39.9). Nonoccupationally exposed persons rarely exhibit mercury-in-blood concentrations in excess of 15 ng/ml, and increased absorption exists when the level exceeds 25 ng/ml.

Results of Blood and Urine Samples

Inorganic Mercury in Blood (ng/ml)

Hg levels	No. of Employees	% of Total
0-9	25	49
10-24	25	49
25-34	0	0
35+	1	2

Inorganic Mercury in Urine (ng/ml)

Hg levels	No. of Employees	% of Total
0-15	1	2
16-30	23	46
31-150	26	50
150+	1*	2

* Urine contaminated with menses, therefore unreliable

Urine Samples

Inorganic mercury in urine concentrations ranged from 10 ng/ml to 120; 1 urine sample with a value of 210 ng/ml was frankly contaminated with menses and therefore was excluded from analysis. Under the same extrapolations and assumptions for urine as were cited above for blood, the equivalent maximal allowable concentration is 150 ng/ml; evidence of

increased absorption in occupationally exposed populations commences at levels in excess of 30 ng/ml.

Symptoms and Signs

There is poor correlation between mercury concentration in body fluids and the symptomatology associated with clinical mercurialism. About one-half of those workers examined had blood or urine values consistent with increased mercury absorption for an occupationally exposed group. The signs and symptoms elicited from these workers had no relationship to their body fluid levels.

CONCLUSION

Beckton - Dickinson has gone to great lengths to reduce mercury vapor levels in the working environment to an acceptable level. This has been done by providing local exhaust wherever deemed necessary, providing 36 air changes of conditioned air per hour, stressing good industrial hygiene work practices, and instituting and maintaining a mercury clean-up program. Despite these numerous precautionary measures, mercury vapor levels were high in several cases (See Table I). Because of this situation, it does not appear to be economically feasible to provide any additional engineering control. It is suggested that consideration be given to increasing the frequency of which work stations are vacuumed. A second suggestion (to be considered) is to reduce employees' exposure to mercury vapor by reducing the amount of exposure time. These suggested solutions are not to be interpreted as an alternate to the recommendations.

RECOMMENDATIONS

1. In view of the mercury in blood, urine, and air measurement, a reappraisal of the company's surveillance procedures would be advisable:

   (a) The company's urinary mercury estimations should be cross-checked periodically with established reference laboratories in the continental United States, (b) measurement of mercury in blood should be considered for these workers whose urinary mercury is elevated, (c) the company should consider contracting to obtain personal sampler TWA values on "high-risk" groupings as a method of environmental control supplemental to the Lamaire vapor meter.

2. Smocks in the Degas and Fill room should be changed daily.

3. Evaluation of clothing, contamination among other workers in the facility and daily changes of clothing should be instituted elsewhere if necessary.

4. A program should be established to prevent contamination of shoes. For example, shoes should be nonporous (disposable shoe covers could be used), contaminated shoes should be readily identified, and footwear to be worn home should be restricted.

5. Pre-meal handwashing and overall changing should be enforced.

6. Instruction programs should be intensified to achieve a high degree of employee awareness of the hazards of working with mercury and the need to maintain scrupulous cleanliness at work.

7. There are some data that describe abnormal reproductive or developmental changes in animals associated with mercury exposure. As a precautionary measure, any exposure to mercury should be minimized in women of reproductive age.

Recommendations 2, 3 and 4 were discussed with local management at the end of the study in February.

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9. Magos L. Clarkson TW: Atomic absorption determination of total inorganic mercury in blood. J Assn Of Anal Chem 55:966-971, 1972

10. Maximum Allowable Concentrations of Mercury Compound. Arch Environ Hlth 19:891-905, 1969

11. Federal Register, June 27, 1974, Vol. 39, No. 125, Title 29, Chapter IVIII, 1910 Subpart G, Table G#.

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Table I

Mercury Concentration in Workers' Breathing Zone

Becton-Dickinson
Juncos, Puerto Rico

Job Classification	Sample Number	Time	Concentration in mg/M^3	Comments
		February 18, 1976		
Janitor (A)	CT 11	1525-1718	0.044	
Janitor (B)	CT 9	1529-1708	0.045	
Janitor (C)	CT 4	1544-1654	0.039	
Degas & Fill Operator (D)	CT 6	1503-1655	0.036	
Combination Machine Operator (E)	CT 10	1506-1718	0.077	
Pull Top Machine Operator (F)	CT 14	1515-1713	0.062	Machine #3
Pull Top Machine Operator (G)	CT 16	1518-1711	0.054	Machine #2 switched to screen printing at 1521
Pull Top Machine Operator (H)	CT 5	1520-1657	0.031	Machine #1
Area Sample	CT 13	1554-1716	0.029	Near Pull Top Machine
Operator on Classifier (I)	CT 12	1512-1715	0.028	
Laser Machine Operator (J)	CT 7	1532-1705	0.023	
Centrifuge Operator (K)	CT 3	1507-1656	0.035	Air Removal
Contractor (L)	CT 15	1536-1715	0.023	#7 Machine
Contractor (M)	CT 17	1541-1713	0.057	#1 Machine
Pointer (N)	CT 2	1546-1657	0.056	
Visual Inspector (O)	CT 10.032			
Area Sample	CT 18	1552-1727	0.016	On Desk

Table I (c..d)

Becton-Dickinson

Job Classification	Sample Number	Time	Concentration in mg/M^3	Comments
		February 19, 1976		
Janitor (B)	CT 42	0842-1124		
	CT 66	1218-1617	0.087	TWA for 42 & 66
Janitor (A)	CT 43	0841-1155		
	CT 63	1341-1620	0.070	TWA for 43 & 63
Janitor (P)	CT 35	0844-1055		
	CT 59	1159-1500	0.419*	TWA for 35 & 59
Degas & Fill Operator (D)	CT 44	0810-1150		Resp. Part of the Time
	CT 65	1306-1624	0.092	TWA for both 44 & 65
	CT 37	0810-1055	0.071	Short Term Sample; no exposure during 1/2 hour physical exam
Degas & Fill Operator (Q)	CT 38	0811-1055		Resp. Part of the Time
	CT 56	1202-1441	0.119	TWA for both 38 & 56
	CT 30	0811-0851	0.065	Short Term Sample
	CT 31	0851-0938	0.085*	Short Term Sample
	CT 39	0956-1055	0.068*	Short Term Sample
	CT 49	1227-1237	0.090	Short Term Sample; Emptying Trays of Thermometers by Hand
	CT 48	1238-1248	0.050	Short Term Sample; Wearing Resp. & Gloves
Combination Machine Operator (R)	CT 53	0845-0951		One Sample; Pump
		1036-1428	0.086	Turned Off During Lunch
	CT 41	1117-1127	0.050	Short Term Sample
	CT 47	1209-1219	0.030	Short Term Sample
	CT 50	1400-1410	0.070	Short Term Sample
Pull Top Machine Operator (S)	CT 34	0857-0954		No Hg. Detected
	CT 58	1032-1416	0.050	On Sample 34
Pull Top Machine Operator (T)	CT 33	0826-0954	N.D.	
	CT 51	1042-1417	N.D.	
Pull Top Machine Operator (U)	CT 40	0830-1100		
	CT 62	1159-1520	0.084	TWA for 40 & 62

Table I (contd)

Becton-Dickinson

Job Classification	Sample Number	Time	Concentration in mg/M^3	Comments
		February 19, 1976		
Operator on Classifier (V)	CT 52	1057-1421	N.D.	
Laser Operator (W)	CT 32	0834-0953		No Hg. Detected on 32
	CT 54	1032-1415	0.022	
Centrifuge Operator (K)	CT 45	0918-1150	0.021	TWA; No Hg. Detected on 67
	CT 67	1305-1618		
Contractor (X)	CT 57	0909-0956		Machine #10
		1040-1415	N.D.	No Exposure During Lunch
Contractor (Y)	CT 55	0912-0956		Machine #6
		1040-1415	N.D.	
Screen Printing Machine Operator (Z)	CT 3			
	CT 60	1132-1528	0.103	TWA
		February 20, 1976		
Janitor (P)	CT 77	0752-1050		
	CT 84	1159-1258		
	CT 85	1306-1426	0.294	TWA for 77, 84, 85
Janitor (AA)	CT 7			
	CT 90	1206-1440	0.066	TWA for 76 & 90
	CT 80	0805-1150		
	CT 92	1301-1444	0.317	TWA for 80 & 92, the Conc. for #80 was 0.462 mg/M^3

Table I (contd)

Becton-Dickinson

Job Classification	Sample Number	Time	Concentration in mg/M^3	Comments
		February 20, 1976		
Degas & Fill Operator (Q)	CT 78	0746-1045		None Detected on Either
	CT 87	1211-1434	N.D.	on 78 or 87
	CT 69	090		
	CT 82	0815-1146		No Hg. Detected On Either
	CT 97	1309-1529	0.079	Sample

* Minimum concentration
TWA Time Weighted Average
N.D. None Detected

Table II

Prevalence of the Symptoms and Signs of Mercurialism Among the Sample Group (n = 51) and the Total Plant Population

	Sample Group			Total Plant Population	
Symptoms	No. of Persons	Urine Hg (ng/ml) Mean (SEM)	Blood Hg (ng/ml) Mean (SEM)	Urine Hg (ng/ml) Mean (SEM)	Blood Hg (ng/ml) Mean (SEM)
Sore or bleeding gums	7	32.9 (3.9)	14.0 (4.4)	40.0 (2.7)	9.9 (0.6)
Loss of appetite	5	38.0 (3.7)	8.9 (1.7)	38.7 (2.7)	10.4 (0.6)
Loss of weight	15	32.0 (2.4)	9.4 (1.4)	40.5 (3.2)	10.7 (0.5)
Irritability	16	39.4 (3.1)	11.2 (1.0)	38.6 (3.3)	10.1 (0.6)
Tremor	6	40.0 (5.8)	10.3 (1.0)	39.6 (2.9)	10.5 (0.6)
Loss of mental concentration	6	31.7 (4.8)	8.5 (1.1)	38.0 (2.6)	10.7 (0.6)
Frequent colds	12	31.4 (4.0)	8.8 (0.8)	39.8 (2.8)	10.7 (0.6)
Signs					
Intention tremor	14	36.9 (3.8)	9.1 (0.9)	38.4 (3.3)	11.0 (0.7)
Incoordination	11	40.9 (3.9)	9.9 (0.8)	38.0 (3.0)	10.6 (0.6)
Dysdiado-kokinesis	1	85.0 (-)	12.0 (-)	38.6 (2.5)	10.4 (0.5)
Gingivitis	7	48.6 (12.2)	16.3 (4.7)	37.1 (2.1)	9.5 (0.5)