

Indications and Stocking of Antidotal Therapy for Common Heavy Metal Poisonings



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Introduction

- Heavy metals may enter the body in food, water, or air, or through the skin.
- Heavy metal toxicity is an uncommon diagnosis. If unrecognized or inappropriately treated, heavy metal exposure can result in significant morbidity and mortality.



Introduction

- The antidotes of metal poisonings are chelation agents, such as British anti-Lewisite (dimercaprol, BAL), calcium disodium edetate (CaNa_2EDTA), dimercaptosuccinic acid (DMSA), 2,3-dimercaptopropanesulfonic acid (DMPS), which forms a complex with toxic heavy metals and leads to their removal.
- Chelators are of great importance in the treatment of metal poisonings, including arsenic, mercury, lead, copper, chromium, iron, thallium and other forms of toxic metal poisoning.

Common Metal Poisoning

- Lead (Pb)
- Mercury (Hg)
- Arsenic (As)
- Chromium (Cr)
- Iron (Fe)

Common Cause of Poisoning

- Intentional
- Folk or herbal Medicine
- Occupational and take-home exposure
- Environmental
- Accidental

Mineral drugs in Traditional Chinese Medicine

砒石, 砒霜	Pishi, Pishuang	As_2O_3
雄黃	Xionguang, Realgar	As_2S_2
雌黃	Cihuang, Orpiment	As_2S_3
水銀	Shuiyin, Hydragyrum	Hg
升藥、紅粉	Shenyao, Hongfen	HgO
紅升丹	Hongshengdan	$\text{HgO}/\text{As}_2\text{S}_2$
輕粉、粉霜	Qingfen, Calomel/Fen-shuang	Hg_2Cl_2
朱砂	Zhusha, Cinnabar	HgS
黃丹、密陀僧	Huangdan, Lithrage	PbO
紅丹, 鉛丹	Hongdan, Qiandan	Pb_3O_4

Inorganic Lead

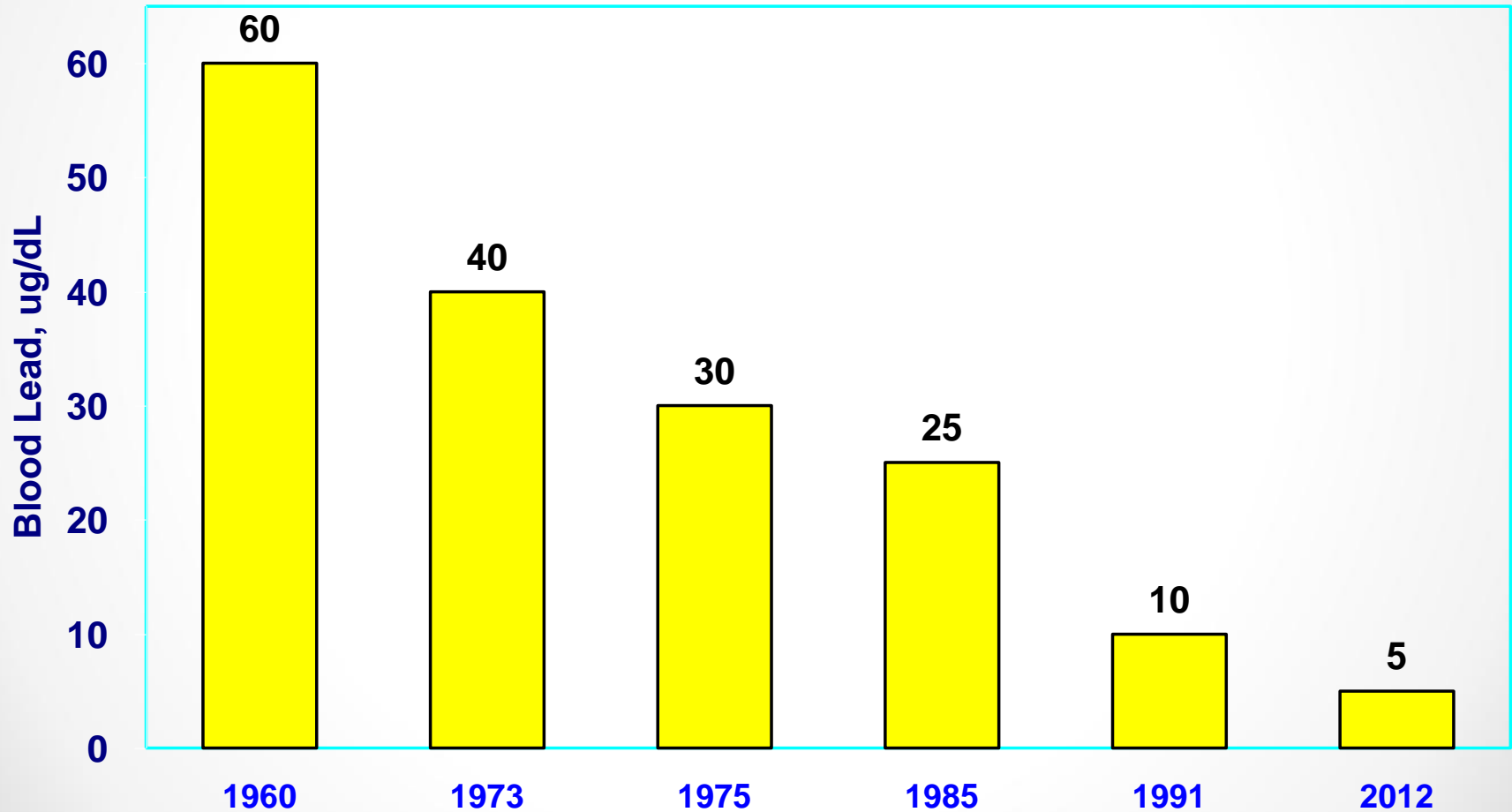
Acute effects

- Abdominal pain
(lead colic)
- Encephalopathy
- Hemolysis
- Acute renal failure
- Elevation of liver enzyme

Chronic effects

- Fatigue and asthenia
- Arthralgias and myalgias
- Anemia
- Peripheral neuropathy (motor)
- Neurobehavior disturbances and chronic encephalopathy
- Gout and gouty nephropathy
- Chronic renal failure
- Hypertension
- Impaired fertility

CDC's Action Levels for Blood Lead in Children



Acceptable Blood lead level

Current suggestions in Taiwan

- **References for general population: $< 5 \mu\text{g}/\text{dl}$**
- **Action level of child: $5 \mu\text{g}/\text{dl}$**
- **Action level of adult: $10 \mu\text{g}/\text{dl}$**
- **Legal limit of female worker: $30 \mu\text{g}/\text{dl}$**
- **Legal limit of male worker: $40 \mu\text{g}/\text{dl}$**

從鉛水管的恐慌談鉛的風險溝通

Lead pipe problem

吳明玲醫師

衛生福利部暨臺北榮民總醫院臨床毒藥物諮詢中心

臺北榮民總醫院臨床毒物與職業醫學科

民國104年10月27日

<http://www.pcc-vghtpe.tw/tc/index.asp>

Management Recommendations: Adult Population

Blood lead level (µg/dL)	Management recommendations and requirements ^a for adults
< 5	No action needed
5–9	Discuss health risks Reduce exposure for pregnancy
10–19	Discuss health risks. Decrease exposure. Monitor BLL Remove from exposure for pregnancy, certain medical conditions, long-term risks
20–29	Remove from exposure if repeat BLL in 4 weeks remains ≥ 20 µg/dL
30–79	Remove from exposure. Prompt medical evaluation and consultation advised for BLL > 40 µg/dL OSHA requirements may apply Chelation not indicated unless BLL > 50 µg/dL with significant symptoms
≥ 80	Urgent medical evaluation and consultation indicated OSHA requirements may apply Chelation may be indicated if symptomatic and/or BLL ≥ 100 µg/dL

Inorganic mercury poisoning

- Acute: corrosive and nephrotoxic.
 - salivation, metallic taste, abdominal pain, bloody diarrhea
 - proteinuria, and acute renal failure.
 - fatal hypovolemic shock may result.
 - aspiration: irritation, pulmonary edema, ARDS.

Arsenic Poisoning

Acute

- N/V, abdominal pain, diarrhea, dehydration, shock, **QT prolonged**, TDP, Liver & kidney damage, acute encephalopathy (seizure, delirium, coma)
 - peripheral neuropathy, bone marrow depression, hair loss
- Industrial arsine gas : garlic odor, hemolytic anemia, AKI

Chronic

- peripheral neuropathy, bone marrow depression
- Hyperkeratosis, hyperpigmentation, Mee's line,
- Skin cancer, peripheral vasculopathy (black foot disease)

Chromium poisoning (Acute)

- Intensive GI irritation or ulceration and corrosion, epigastric pain, nausea, vomiting, diarrhea
- Hemorrhagic diathesis, intravascular hemolysis
- Toxic nephritis, renal failure, liver damage
- Circulatory collapse, peripheral vascular collapse, acute multisystem shock, coma, and even death, depending on the dose.

Iron Poisoning

Clinical course

- **Phase I (0.5-2 h):** Vomiting, hematemesis, abdominal pain, diarrhea, hematochezia, lethargy, shock, acidosis, and coagulopathy.
- **Phase II (6-24h):** apparent recovery and may contribute to a false sense of security.
- **Phase III (2-12 h after phase I):** profound shock, severe acidosis, CNS depression cyanosis, and fever.
- **Phase IV (2 to 4 days):** possible hepatotoxicity. Acute lung injury may also occur)
- **Phase V (days to weeks):** GI scarring and strictures.

Chelating agents

Chelator	Main indication	Other application
CaNa ₂ EDTA	Lead	manganese, cobalt
DMPS	mercury, arsenic, lead (chronic)	copper, chromium, cobalt
DMSA	lead, arsenic, mercury	
Prussian blue	thallium, radioactive cesium	
Dimercaprol (BAL)	arsenic, mercury, lead (in addition to EDTA)	copper
D-Penicillamine	copper (Wilson disease)	lead, mercury rheumatoid arthritis, cystinuria
Deferoxamine	iron, aluminum	

Chelator Stocking

- Taiwan Poison Center established a chelator storage and distribution system for the response of the various metal poisoning accidents since 2001. The most life-saving chelators (**EDTA, DMSA and DMPS**) were chosen for the most common forms of heavy metal intoxication- **lead, arsenic, or mercury**.
- ✓ The clinical use of BAL is now limited due to its adverse effects and availability of safer chelators.
- ✓ Penicillamine and iron chelator are available in major hospitals because they have other applications.

Treatment of metal poisoning

- Removal of the patient from the source of exposure
- Prevention of the absorption of orally ingested metals
- Prevention of local corrosive action of metals on the mucous membranes
- Supportive care,
- Binding of the metals in body fluids (especially blood) and conversion to less toxic complexes

Metal poisoning through dermal route

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Lead, Mercury, and Arsenic Poisoning Due to Topical Use of Traditional Chinese Medicines

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Lead poisoning through lead-containing patch

- 75/M, use 3-month herbal patch due to leg ulcer
- S/S: anorexia, N/V, BW loss, headache, dizziness, constipation and weakness for 2 months.
- **Hb 7.1** g/dl, **MCV 70** fl, **ALT 82** U/L, **AST 64** U/L, **Na 128** mmol/L, **K 2.9** mmol/L ; Panendoscopy: reflux esophagitis.
- **Dx: Lead poisoning** **Tx: EDTA, DMSA**

Lead content of herbal patch

516,898 ppm (52%)



Case 1: 75 /M, leg ulcer
topical use for 3 months
Blood Lead: 225.7 $\mu\text{g}/\text{dL}$

250,000 ppm (25%)



Case 2: 56/F, breast cancer
topical 1 bid for 1 year
Blood Lead: 199.0 $\mu\text{g}/\text{dL}$

Arsenic and mercury poisoning through anal use of herbo-metallic ointments

- 51/M, developed peri-anal gangrene and progressive limbs weakness after usage of herbo-metallic ointments for 2 weeks. The prescriptions was got from an unlicensed herbalist and used for his **anal fistula**.
- In the beginning of treatment, he had **fever and anal pain**.
- Day 8, 10: visit a TCM clinic due to **dizziness, rash, skin itching, anorexia**, herbal powder was given. He developed diarrhea which subsided after DC the powders (Hg 13.2 ppm, 12 ppm).
- Day 11: **numbness over distant end of fingers and toes** started
- Day 15: Worsening numbness and unstable gait appeared, high fever, severe anal pain, walking difficulties. The Fournier's gangrene was noted, so wound debridement and colostomy were performed.

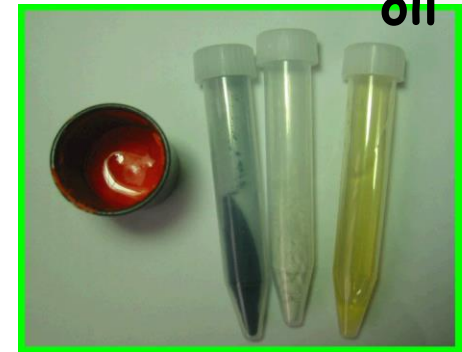
Lead, Mercury, and Arsenic Poisoning Due to Topical Use of Traditional Chinese Medicines Wu ML, et al.. Am J Med 2013;126:451-4.

Herbal Suppository (for anal fistula)

■ 8 kinds of materials prescribed, mixed as 5 medication

- A : **indigo naturalis+musk+hong-dan(Pb_3O_4)**
- B : Tung oil+hong-dan
- C : **hong-dan+rice wine**
- D : gypsum
- E : sulfanilamide ointment+mercurochrome

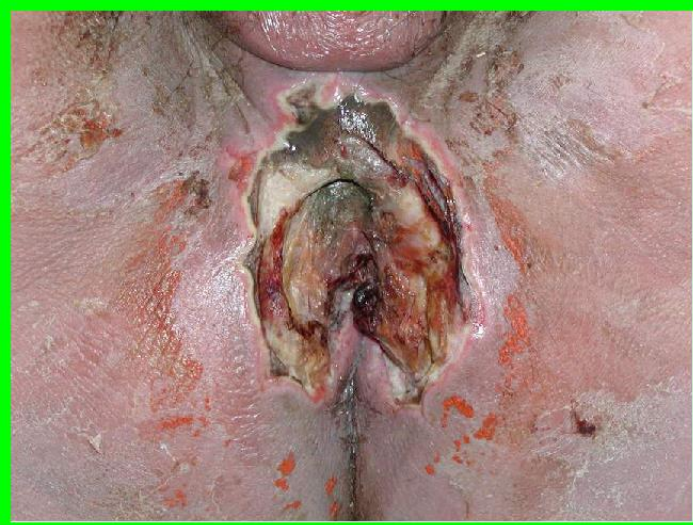
C A D Tung
oil



■ Therapy course :

- 1st week:A+D qd, 2nd week:B qd, C prn if itchy(use everyday)

	Lead	Mercury	Arsenic
A:Blue powder	71.9	4.67	13.3
C:Orange ointment 1	166,700	24.5	—
C:Orange ointment 2	12,200	16.5	—
D:White powder	—	—	—



**anal wound (Day1)
after debridement**

**hand and lower limb atrophy (Day 26)
EMG:severe axonal sensori-motor polyneuropathy**



Day 26: Hyperkeratosis

Hair loss

Leg edema

Toxic epidermal necrolysis after dermal use of realgar-containing herbal ointment

- 24 y/o man visited a TCM clinic for **atopic dermatitis**. Multiple herbal prescriptions were used orally and topically for **18 days**.
- Day 7: diminished appetite, dizziness, itching skin rash, and exfoliation
- Day 15: **generalized edema, nausea**, vomiting, diarrhea, **vesicular formation and discharge with poor odor**
- Day 16: fever and near-syncope 2-3 times per day.
- Day 18: visit TCM twice, syncope at clinic. He received some treatment and was sent back home.
- Midnight of day 18: whole body discomfort, visit ED.

Realgar-related death

- Diagnosis: **toxic epidermal necrosis, complicated with soft tissue infection and sepsis**
- ICU care, He died 2 days later
- Direct cause of death: **Pseudomonas aeruginosa bacteremia with septic shock and multiple organ failure syndrome.**
- **Post-mortem blood arsenic level: 1225.4 ug/L.**

Wu ML, Deng JF. Toxic epidermal necrosis after extensive dermal use of realgar-containing (arsenic sulfide) herbal ointment. Clin Toxicol (phila) 2013;51:801-3.

中藥處方

- **當歸飲子(複方)**：當歸、白芍、川芎、生地黃、白蒺藜、防風、荊芥、何首烏、黃耆、甘草、生薑
- **人參養榮湯(複方)**：人參、白朮、黃耆、甘草、陳皮、肉桂、當歸、熟地黃、五味子、茯苓、遠志、白芍、大棗、生薑
- **溫經湯(複方)**：吳茱萸、人參、桂枝、川芎、生薑、半夏、甘草、當歸、芍藥、阿膠、牡丹皮、麥冬
- **桂枝湯(複方)**：桂枝、白芍、甘草、生薑、大棗
- **五苓散(複方)**：豬苓、澤瀉、白朮、茯苓、桂枝
- **越婢加朮湯(複方)**：麻黃、石膏、白朮、生薑、甘草、大棗
- 蒲公英
- 地膚子

Arsenic content of herbal ointment

45,427 ppm

5,512 ppm

Anti-inflammatory-analgesic oint:7640 ppm

Skin cure and reactivation oint.: 8171 ppm



4,229 ppm

1.14 ppm Face



Mercury poisoning after using skin whitening cream

- 50 y/o F, topical use of skin cream for 1.5 month
- S/S: tingling pain, paresthesia over face, aggravated headache, severe dry eye and eye itching
- PH: tension headache, goiter s/p subtotal thyroidectomy >10 years and follow-up thyroid function remain normal.

The product was claimed to be manufactured in China and sold in USA



urine Hg: 39.6, 87.2 ug/g creatinine

blood Hg: 33.46, 15.45 ug/L

■ Mercury: 26,992 ppm

Chromium poisoning

- 22 y/o M, worker, entering chromic acid-containing tank
- Chemical burn, 15%TBSA
- Urine chromium 88,208 $\mu\text{g/L}$
- Presentation: acute renal failure, acute pulmonary edema with respiratory failure, chrome ulcer, leucocytosis, anemia, thrombocytopenia, elevation of liver enzyme and CK.
- Treatment: mechanical ventilation, plasmapheresis, CVVH, hemodialysis, **DMPS**, N-acetylcystein.

Acute severe chromium poisoning after dermal exposure to hexavalent chromium.

Lin CC, Wu ML, Yang CC, et al. J Chin Med Assoc 2009; 72:219-21.

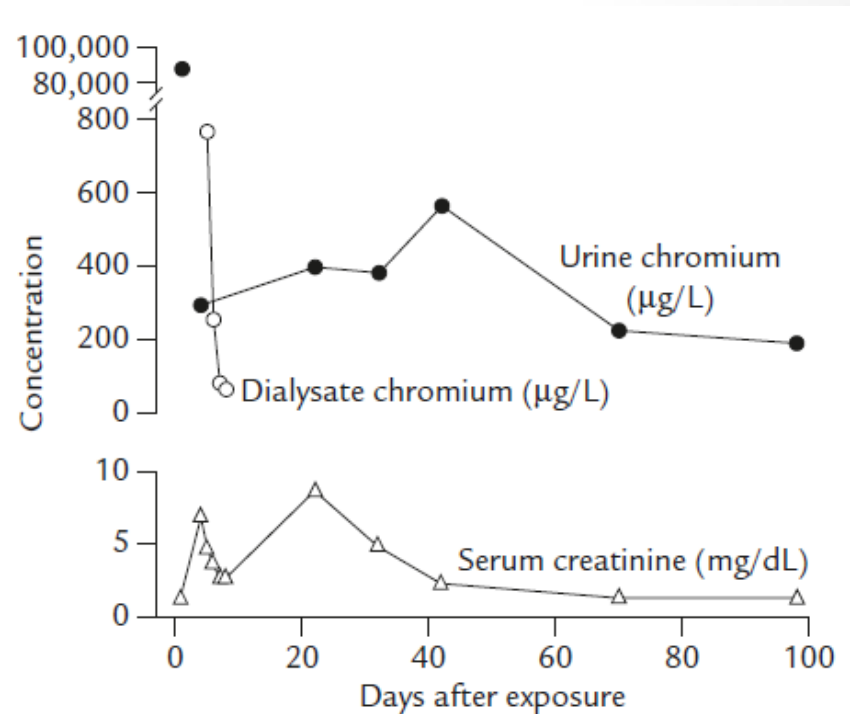
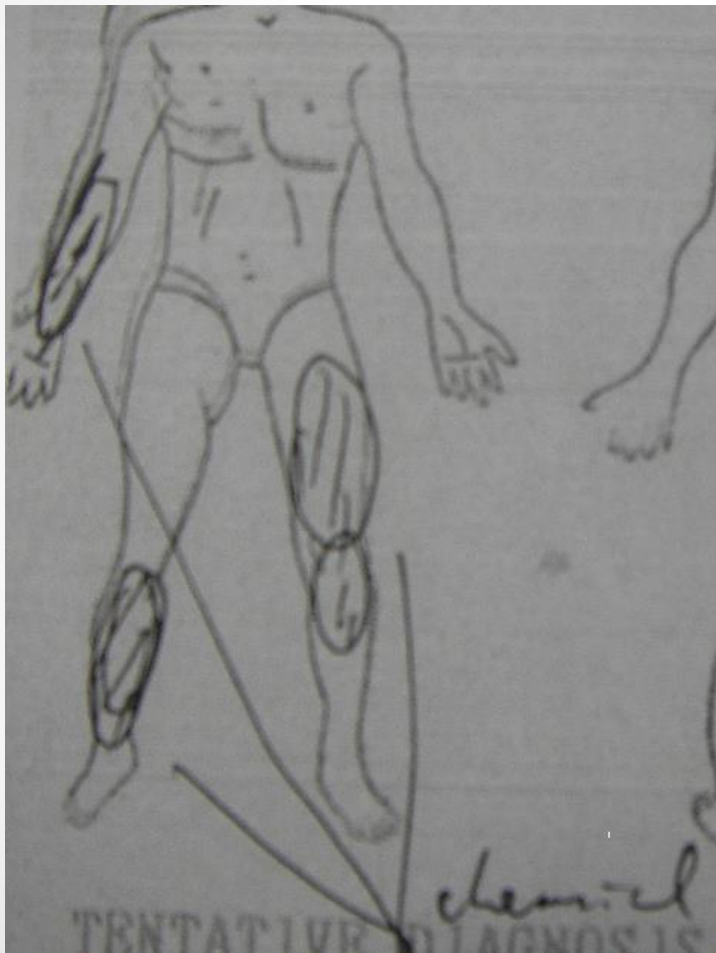


Figure 1. Sequential change in chromium and creatinine levels.



Day 3



Day 1



Day 6

Lin CC, Wu ML, Yang CC, et al. Acute severe chromium poisoning after dermal exposure to hexavalent chromium. J Chin Med Assoc 2009; 72:219-21.

Metal poisoning through Inhalation

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Cinnabar vapor inhalation

(HgS)

- 73 y/o M, inhaled cinnabar for management of his insomnia. dizziness, general weakness, severe cough, and progressive dyspnea after 3-hour exposure for 2 consecutive days
- **Acute respiratory distress syndrome**
- On ETT day 7, Refer to our service day 9.
Blood Hg 319 $\mu\text{g/L}$, Urine Hg 357 $\mu\text{g/L}$
- Treat with DMPS and NAC, died on day 19

Mercury Vapor Poisoning- 4 Cases Report

- A 43 y/o men **heated mercury** for gold electroplation at bedroom.
- All four family members exhibited symptoms of acute mercury vapor poisoning with weakness, fatigue, diarrhea, sore throat, anorexia, generalized soreness, cough and dyspnea.
- **Two dogs and four pet mice died later**

Initial Mercury Level

Day 4 (after DMPS use for 3 days)

- Father: **5396.1** (U), **326.7** (B)
- Mother: **2698.2** (U), **390.5** (B)
- Girl: **3026** (U), **141.3** (B)
- Boy: **2381.2** (U), **120.3** (B)

Unit: $\mu\text{g/L}$

Metal poisoning through oral route

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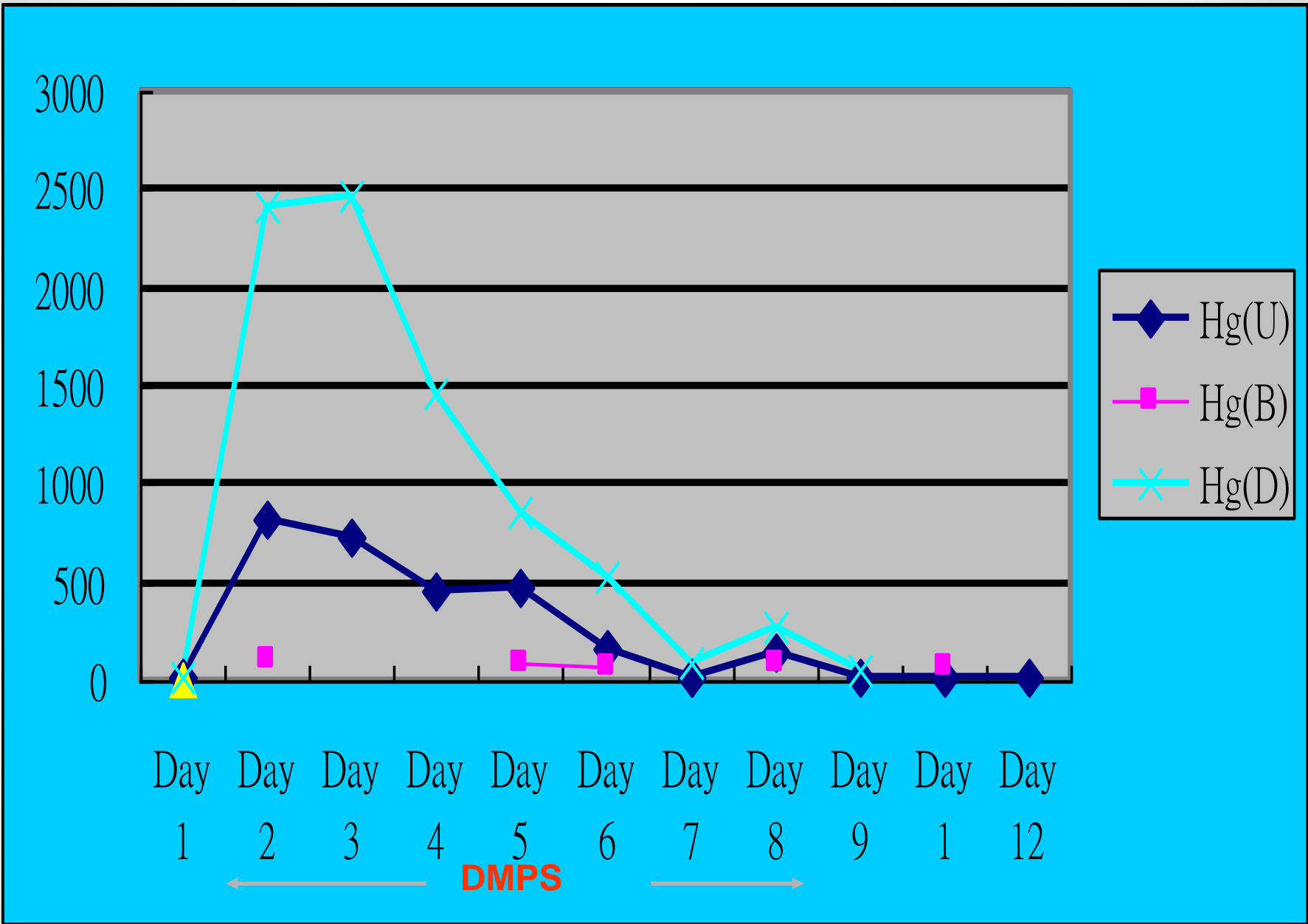
Lead Poisoning - mineral herb

- 30 y/o M, one week use of herb drug (PbO) for management of urolithiasis.
- S/S: nausea, vomiting, abdomen fullness, acid regurgitation, weakness, anemia, elevation of liver enzyme.
- Blood lead 42 $\mu\text{g}/\text{dL}$
- Herbal powder: Pb 23750 ppm 、 Hg 127 ppm
- DMPS therapy: 250 mg IV q6h*2days , then 100 mg po q6h (June 20-July 1, total 12 day)

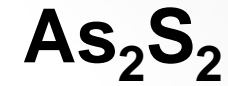
Mercuric Nitrite Poisoning



- 20 y/o girl presented with **GI upset (vomiting, sore throat, abdomen pain)** after ingesting 150 ml **insecticide** (cypermethrin and tetramethrin) & unknown amount of **mercury-containing chemical** at 00:05 AM
- **PE: oral ulcer, lip erosion, pinkish vomitus, epigastric tenderness**



Realgar intoxication



- 59 y/o M
- Realgar 150 g in 5 days
- Drowsy
- Pancytopenia
- Acute hepatic, renal function impairment
- Progressive numbness, pain and weakness of distal four limbs → Severe sensorimotor polyneuropathy, axonal type, with active denervation

As: 635,573 ppm

Cd: 1028 ppm

Pb: 92.43 ppm

Hg: 11.52 ppm

	Day 1			Day 2	Day 4	Day 6
	Urine ($\mu\text{g/g Cr}$)	Urine ($\mu\text{g/g Cr}$)	Blood ($\mu\text{g/L}$)	Blood ($\mu\text{g/L}$)	Urine ($\mu\text{g/g Cr}$)	Blood ($\mu\text{g/L}$)
As	7,714	20,141	135	171	1727	8.25
Hg		136	10.14	7.72	18.6	5.36



50/M

Realgar ingestion 50 g?

S/S: Dizziness, severe vomiting, hiccup and diarrhea

Reference level:

1-18 $\mu\text{g/L}$ (blood)

<120 $\mu\text{g/g}$ creatinine (urine)

Iron Poisoning

- 1 y/o girl ingested 30 tablets of ferrous sulfate
- Presentation: vomiting, ataxia, drowsy
- Metabolic acidosis (pH 7.35, PO₂ 100, PCO₂ 35, HCO₃ 19.3)
- WBC 17,400/cumm, ALT/AST 229/100 U/L
- Prolonged APTT (48.1/29.9 sec)

Antidote: deferoxamine IV

Clinical experience of acute ferric chloride poisoning.

Wu ML, Tsai WJ, Ger J, Deng JF. *Vet Hum Toxicol* 2003, 45: 243-6.

Table 1. Summary of clinical data with ferric chloride poisoned patients reported to PCC-Taipei VGH

Case No	Age/ Sex	Route/Reason of exposure	Ingested dose (ml)	Major presentations	Upper GI Endoscopy	Severity of poisoning	Special management	Serum iron ($\mu\text{g/dl}$)*	Hospital days
1	35/F	inhalation/ occupational	---	nausea, vomiting	---	mild	---	NA	---
2	31/F	inhalation/ occupational	---	nausea, sore throat, weakness	---	mild	---	NA	---
3	27/F	inhalation/ occupational	---	nausea, vomiting	---	mild	---	NA	---
4	12/M	oral/accidental	a little	nil	---	asymptomatic	---	NA	---
5	40/F	oral/accidental	30	sore throat	---	mild	---	NA	---
6	35/M	oral/accidental	NA	sore throat	---	mild	---	NA	---
7	21/M	oral/suicidal	NA	vomiting, sore throat	---	mild	DFO	NA	5
8	70/M	oral/suicidal	50	vomiting, diarrhea, sore throat, abdominal pain	gastritis	moderate	lavage, milk, DFO	day 3: 47	5
9	20/M	oral/suicidal	150	sore throat, oral ulcer, lip bleeding, abdominal pain	---	moderate	NaHCO ₃	NA	5
10	56/M	oral/suicidal	50	vomiting, abdominal pain, metabolic acidosis	gastric and esophageal erosions and ulcers	moderate	lavage, DFO	3.5 h: 304	5
11	26/M	oral/suicidal	25	vomiting, sore throat, oral ulcer, epiglottic erosions and ulcers	esophagitis	moderate	lavage, DFO	day 2: 40	3
12	26/F	oral/suicidal	30	sore throat, oral ulcer, abdominal pain	gastritis	moderate	DFO	5 h: 200	5
13	31/F	oral/suicidal	25	nausea, vomiting, sore throat, oral ulcer, cyanosis, pneumonia	---	severe	DFO, ventilator	NA	NA
14	18/M	oral/accidental	120	vomiting, sore throat, oral ulcer, abdominal pain, hematemesis, bloody diarrhea, pneumonia, hypotension, metabolic acidosis	---	severe	DFO	13 h: 216	12
15	29/M	oral/suicidal	450-500	nausea, vomiting, sore throat, oral ulcer, abdominal pain, metabolic acidosis	severe gastritis	severe	lavage, DFO	12 h: 127	8
16	25/F	oral/suicidal	200	vomiting, metabolic acidosis hemolysis, coagulopathy, pneumonia, shock	---	death	---	4 h: 2440	<1

* Reference values of serum iron=50-160 $\mu\text{g/dl}$

DFO = deferoxamine

NA=non-available

Deferoxamine

Indications

- If patient is **symptomatic** (more than transient nausea/vomiting, diarrhea, lethargy, hypotension, bloody emesis or diarrhea)
- If patient is **acidotic**
- The peak **serum iron exceeds 350 to 500 $\mu\text{g}/\text{dL}$** (most patients with serum iron in this range will be symptomatic)

Thallium Poisoning outbreak

- 31 y/o m, an orthopedic doctor.
- ⇒ Admission 3 days due to Flu-like symptoms, ileus; alopecia loss 2 weeks later
- ⇒ 1.5 month later, painful feet, sleepy, hair loss
- ⇒ admission presentations: Progressive distal numbness in feet/fingers(1 m), distal weakness, difficulty in walking (walking on cotton), dysarthria, nystagmus, poor accommodative ability of eyes, BW loss, Hair loss and Mees' Line
- Discharge Dx: Thallium intoxication with polyneuropathy, optic neuropathy and brainstem dysfunction.

Thallium level

Case 1 (severe poisoning)

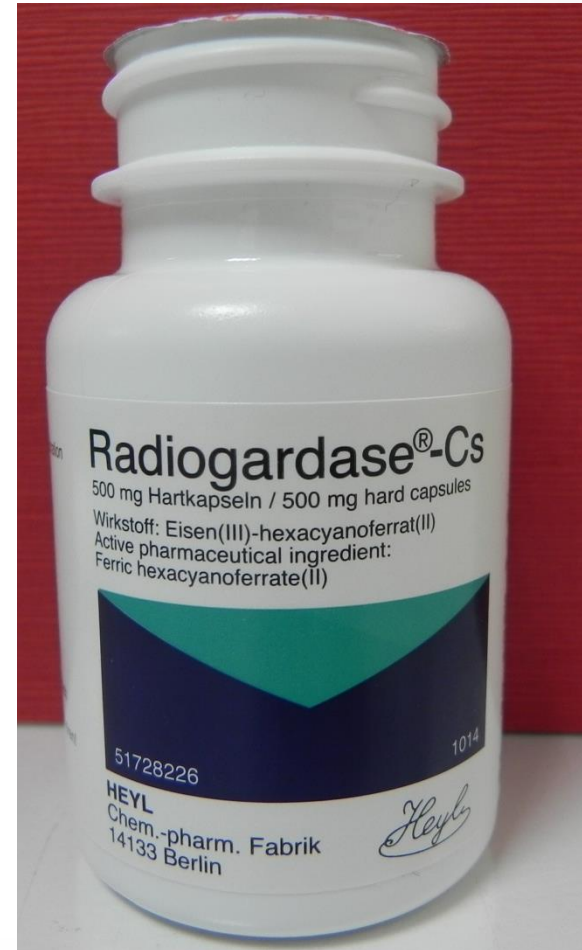
- Blood: 111.64 $\mu\text{g/L}$, Urine: 616.79 $\mu\text{g/L}$
- Hair: 10.499 ppm (< 0.01)

Case 2 (moderate poisoning)

- Blood: 102.91 $\mu\text{g/L}$, Urine: 434.85 $\mu\text{g/L}$
- Hair: 1.654 ppm

Antidote for thallium poisoning

- Prussian blue



Insufficient Stocking

- Although chelators are very essential for heavy metal poisonings, yet insufficiently stocked in health care facilities.
- The cause appears to be related to **low incident of metal poisonings, limited hospital resources, cost and unfamiliarity with chelators.**

Conclusion

- **The chelators are effective in treatment of mercury, arsenic, lead, iron and thallium poisoning.**
- **Treatment should be initiated as early as possible in acute poisoning.**
- **Establish a chelator storage and distribution system for the response of the various metal poisoning accidents should be considered at the governmental level.**

Taoyuan
 Physostigmine: 20amp
 Methylene Blue: 20 vial
 Cyanide: 5pk
 Ca-EDTA: 16box
 DMS A: 20box
 DMPS(Cap): 2box
 DMPS(Amp): 8box

Taipei City
 Physostigmine: 45amp
 Methylene Blue: 45vial
 Cyanide: 6pk
 Hydroxocobalamin: 2set
 Ca-EDTA: 56box
 DMS A: 70box
 DMPS(Cap): 6box
 DMPS(Amp): 24box

Keelung
 Physostigmine: 10amp
 Methylene Blue: 10vial
 Cyanide: 1pk

Taichung
 Physostigmine:
 30amp
 Methylene Blue:
 30vial
 Cyanide: 4pk
 Hydroxocobalamin:
 2set
 Ca-EDTA: 24box
 DMS A: 30box
 DMPS(Cap): 2box
 DMPS(Amp): 8box

Hsinchu
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Miaoli
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Changhua
 Physostigmine: 15amp
 Methylene Blue:
 15vial
 Cyanide: 1pk
 Ca-EDTA: 8box
 DMS A: 10box
 DMPS(Cap): 1box
 DMPS(Amp): 4box

Yunlin
 Physostigmine: 5amp
 Methylene Blue:
 5vial
 Cyanide: 1pk

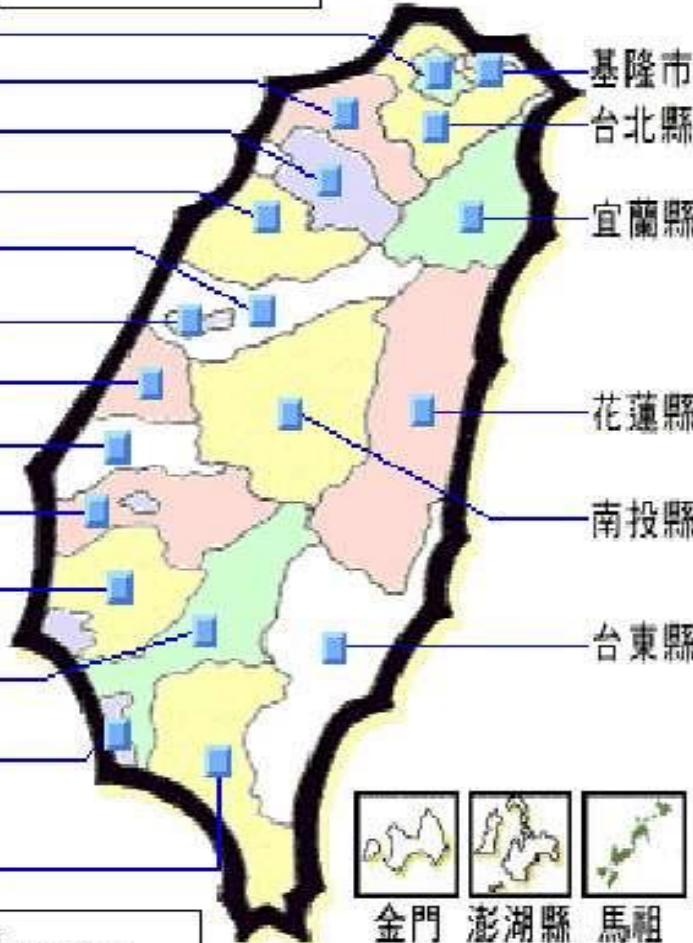
Tainan
 Physostigmine:
 15amp
 Methylene Blue:
 15vial
 Cyanide: 2pk
 Ca-EDTA: 8box
 DMS A: 10box
 DMPS(Cap): 1box
 DMPS(Amp): 4box

Chiayi
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Kaohsiung
 Physostigmine: 30amp
 Methylene Blue:
 30vial
 Cyanide: 4pk
 Hydroxocobalamin:
 2set
 Ca-EDTA: 32box
 DMS A: 40box
 DMPS(Cap): 3box
 DMPS(Amp): 12box

台北市
 桃園縣
 新竹縣
 苗栗縣
 台中縣
 台中市
 彰化縣
 雲林縣
 嘉義縣
 台南縣
 高雄縣
 高雄市
 屏東縣

Fingtung
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk



基隆市
 台北縣
 宜蘭縣
 花蓮縣
 南投縣
 台東縣
 金門
 澎湖縣
 馬祖

Taipei
 Physostigmine: 15amp
 Methylene Blue: 15vial
 Cyanide: 2pk

Ilan
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Hualien
 Physostigmine: 10amp
 Methylene Blue: 10vial
 Cyanide: 2pk
 Hydroxocobalamin: 2set
 Ca-EDTA: 16box
 DMS A: 20box
 DMPS(Cap): 1box
 DMPS(Amp): 4box

Nantou
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Taitung
 Physostigmine: 5amp
 Methylene Blue: 5vial
 Cyanide: 1pk

Comments or questions ?

Thanks for your attention !

