

Case Examples of Solvent Exposures in India

Dr. Aruna Dewan

Source of Case Examples



Toxicovigilance by Poison Information Centre at
National Institute of Occupational Health, Ahmedabad,

1,2-Dichloroethane exposure in Agarbatti workers

- Problem was identified nearly 10 years back
- Two separate cases of acute poisoning referred to NIOH Poison Information Centre
- Both had ingested a solvent (called solution)
- They developed hepat-renal failure and died

Further investigations of the cases

- This solvent was used as a glue for packing of agarbattis in PVC paper which was used as a wrapping material
- The solvent was sold in unlabelled containers at the rate of Rs.30/litre (app.70 cents)







Small amount in a cup

Unlabelled
Solvent container

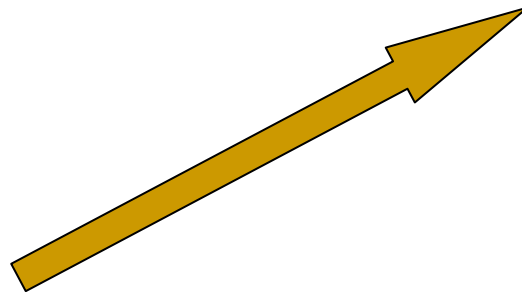
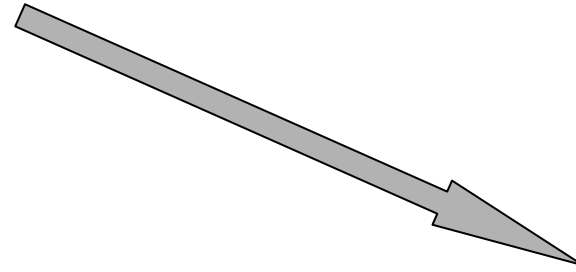
- Solvent was purchased from the market
- It was analysed in the laboratory and found to be 1,2-Dichloroethane (Ethylene dichloride)
- Literature search was done for its toxicity
- Acute poisoning with the solvent was found to lead to hepato-renal damage
- Chronic toxicity: Group 2B carcinogen (*possibly carcinogenic to humans* and it is also a mutagenic and genotoxic agent.

Why there was need to reduce exposures to this solvent

Poor
Working
Conditions

Hot climate

Mutagenic and
Genotoxic
Chemical



High
Probability of
Chronic toxicity
In Vulnerable
Groups such as
Women and
Children

What was done to reduce exposure

- SEWA (Self Employed Women's Association), one of the largest Ahmedabad based NGO was contacted
- A meeting of SEWA members engaged in Agarbatti making was called
- Toxicity of the solvent was explained to the SEWA members in the local language and risk to children was highlighted

What happened

- Aggarbati making is a cottage industry and is not covered under the factories' act. Therefore, there was no legal provision to stop the use of this solvent
- The employers threatened to stop giving work if any health related study was carried out among the agarbatti workers
- Even today the same solvent is used and working conditions remain the same

Benzene exposures in Diamond Workers



Benzene exposures in Diamond Workers

- 500,000 workers are employed in Diamond industry in the city of Surat (about 250 km) from Ahmedabad
- According to a survey carried by an NGO, 5-10% of these workers are children. Most of them are boys between 14-18 years of age. The employment of children is denied by the factory owners

How was the problem recognized

- On 21st June 2005, three cases of Aplastic anemia were brought to the notice of Poison information Centre .
- All were young males who had been working in a diamond cutting and polishing unit at Surat.
- They had been using a whitener and a solvent for marking and cleaning the diamonds for the past 2 years since the introduction of computerized machines.

'Don't know why only my workers are hit'

■ Owner of Pankaj Diamonds has no clue but workers talk about careless use of benzene, poor ventilation

EXPRESS NEWS SERVICE
AHMEDABAD, JUNE 25

NARAYAN Padiyadra, chairman of Pankaj Diamonds Private Limited, is a loss to understand why only workers of his unit have been found suffering from aplastic anaemia when every unit is using benzene.

"I do not know anything about benzene or its toxicity and have studied till class two only. But, I have promised to bear the cost of treatment of the victims", says Padiyadra.

He says he is aware of six cases of benzene poisoning from his unit, but Dr Ravi Sattaria, whose nephew Ashok Ansodaria was the first to be affected with aplastic anaemia, said there were two more workers in Surat in addition to the four already reported.

Padiyadra employs over 1,000 men in his business which has an annual turnover of Rs. 150 crore. He suspects that the Sarin computerised cutting machines in his factory may have something to do with the cases of aplastic anaemia. He has eight of these machines and benzene is used for marking diamonds before these are put on the machine.

However, the victims says that is not the only purpose for which they use benzene. Twentyone-year-old Ashok Ansodaria, who is undergoing treatment at Gujarat Cancer Research Institute, says careless handling of benzene



Ashok Asodaria (above) and Jaydeep Manjapra, patients of aplastic anaemia, at Gujarat Cancer Research Institute in Ahmedabad. Photos by Harsh Shah



ting diamonds on a computerized machine. We also used The room was poorly ventilated and there were times

SDA banishes benzene

EXPRESS NEWS SERVICE
SURAT, JUNE 25

DIAMOND manufacturers in the city, who were caught off guard by media reports that benzene exposure has caused serious bone marrow problem in some workers, on Saturday decided to stop using the chemical.

An emergency meeting of the Surat Diamond Association (SDA) took the decision.

SDA president Nanu Vanani said diamond manufacturers using planner

machines had been asked to send their employees for medical tests.

He said the unit owners were not aware that benzene is a harmful substance. "Even I was not aware. Now, benzene has been totally banned in the diamond industry", Vanani said.

He said benzene was introduced by Sarin Technologies about five years ago. "But benzene is not the only dilutant; manufacturers can use petrol and kerosene as the dilutant in the coating liquid," he said.

'Unit owners negligent'

SURAT: WHILE diamond unit owners are blaming Sarin Technologies India Private Ltd, the manufacturer of planner and marking machines, for the cases of plastic anaemia, caused by exposure to benzene, the company accused the unit owners of negligence.

"We stopped recommending the use of medical benzene some time ago", said Rajeshwari Mehta, vice-president of the firm.

EXTRAORDINARY
IN EVERY

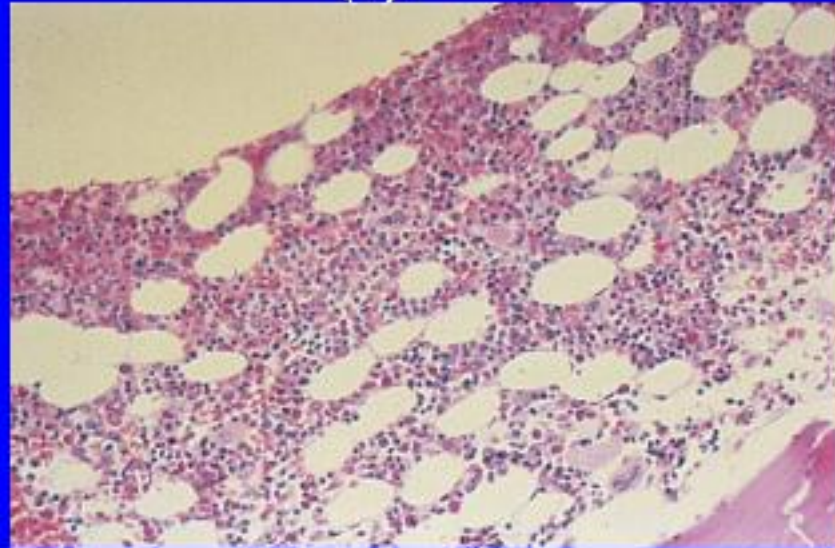


More Information on Diamond workers

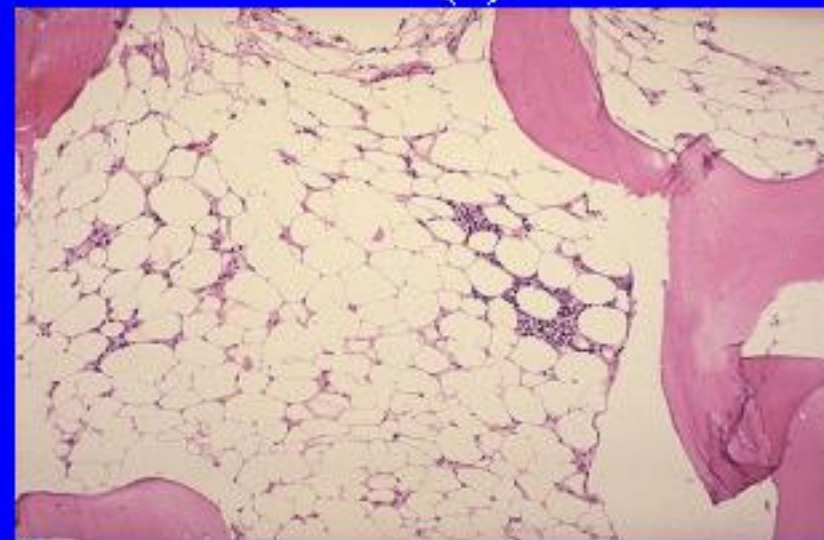
- On further enquiry it was found that 10 workers from a single Diamond unit had similar problems and they were being treated at different hospitals
- In this particular unit 40 workers were working in three shifts in one room having 13 planar machines
- This room was situated in the basement of the building and had no ventilation and the owner as well as workers were not aware of the toxic nature of the solvent

Bone marrow biopsy pictures of (a) normal person and (b) a diamond worker exposed to benzene

(a)

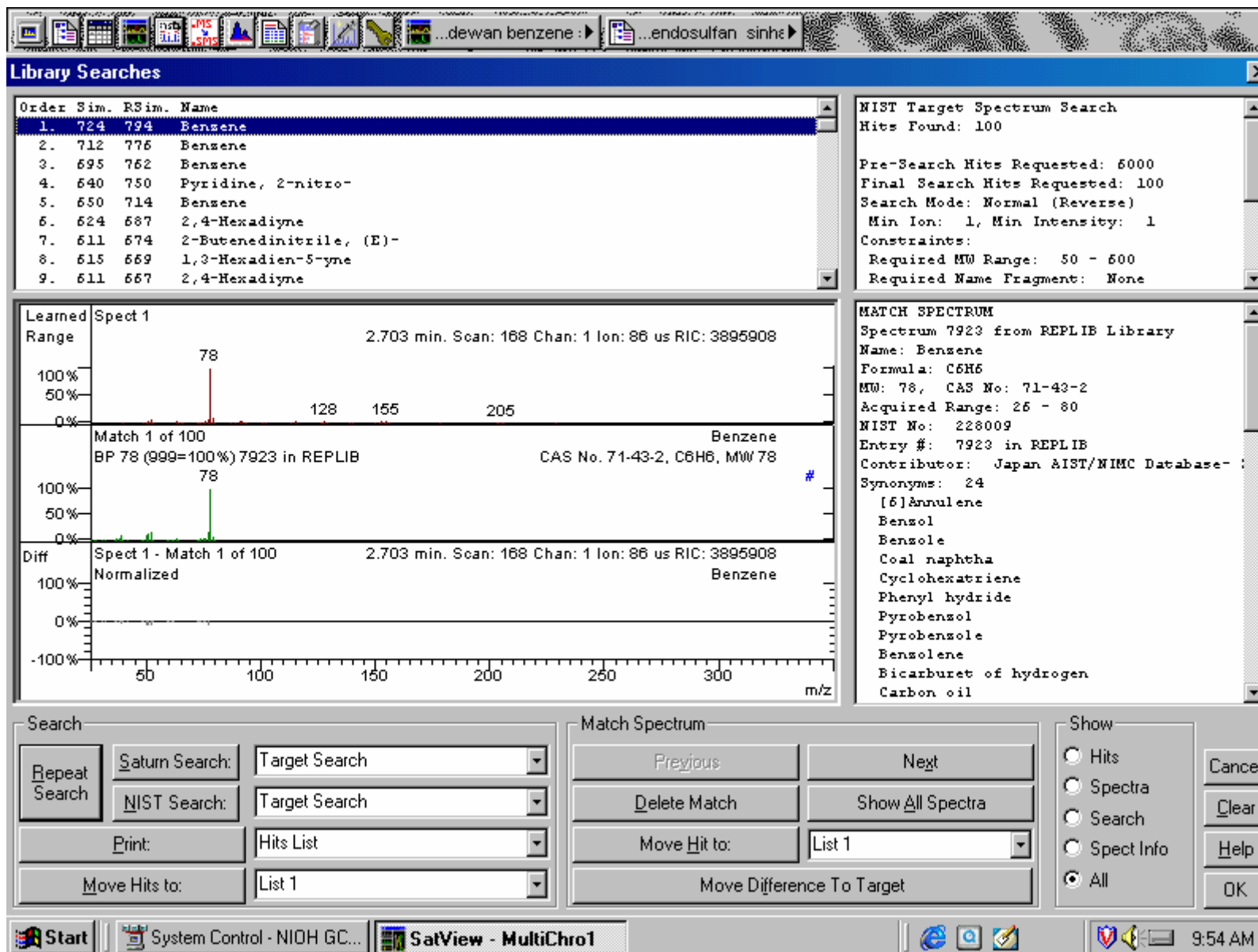


(b)



Normal bone marrow biopsy This is a low power view of an H&E-stained section of normal marrow. Note that the nucleated cellular elements account for about 40 to 50 percent and the fat (*clear areas*) accounts for about 50 to 60 percent of the area.

Aplastic anemia This marrow section of a diamond cutter (aged about 22 years) shows only fat with nearly complete absence of hematopoietic tissue.



GC-MS analysis confirmed it to be pure Benzene

What was done ?

- Dept of Industrial Health and Safety, Govt. of Gujarat, was notified about the incident.
- The Department initiated immediate action to carry out surveys in diamond industries.
- One of the workers died due to secondary infection

Unkind cut: Benzene poisons diamond workers

By Radha Sharma
& Amarendra Jha/TNN

Ahmedabad/Surat: In a development that has raised an alarm in the Rs 50,000-crore diamond polishing industry in Gujarat, at least four diamond workers from Surat have been admitted to hospitals in Ahmedabad with serious health complications arising out of benzene poisoning. These cases are not isolated and the problem could be widespread in diamond polishing bases in the state.

The victims were working with Pankaj Diamonds in Surat and have been diagnosed with aplastic anaemia and pancytopenia wherein their bone marrow function has been suppressed and blood producing cells destroyed. This has led to dangerous complications like lack of oxygen supply, severe infection and spontaneous haemorrhages. The workers also run a high risk of developing blood cancer. One of the workers Anil Patel (27), admitted to Sterling Hospital, is in a critical condition.

"Benzene is a listed dangerous chemical and should not have been used so freely without protection. It is also a known carcinogen. We have

already spent Rs 3 lakh for his treatment and is yet not sure if he will recover.

Jaydeep Munjhapara (22) said he was one among 13 workers cramped in a basement room of the diamond unit with no air ventilation.

"This is a serious violation of the Factories Act which clearly specifies that benzene is a dangerous chemical," said director of NIOH Dr HN Saiyad. He said the industry

TOXIC JEWEL?



- Majority of the 10,000 diamond processing units in Surat use benzene as a cleaning agent
- Factories Act clearly specifies benzene as a dangerous chemical
- Workers run a high risk of developing blood cancer

should immediately substitute benzene with less harmful substances.

Investigations have re-

Media were informed immediately and the problem was highlighted in local and national press

AHMEDABAD Newsline

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AHMEDABAD | SATURDAY | JUNE 25, 2005

SKYWATCH
FORECAST Light to heavy rain
TEMP: MAX 34.2 degrees C, 3 degree below normal
MIN 26.4 degrees C, one degree below normal
SUNRISE: 5.55 am.
SUNSET: 7.29 pm.
RAINFALL: 14.2 mm

Benzene exposure gives diamond workers bone-marrow failure

■ Four workers using the chemical for marking facets develop aplastic anaemia, which experts say could be fatal

EXPRESS NEWS SERVICE
 AHMEDABAD, JUNE 24

FOUR diamond workers from a unit in Surat have been diagnosed with bone marrow failure, a serious condition in which the body stops producing RBC, WBC, and platelets, resulting in lowered resistance that could even prove fatal.

Cancer experts treating them blame it on exposure to benzene, used for marking facets on roughs being cut and polished on computerised

machines.

Given the fact that exposure to benzene fumes can take effect in as less as three months, several diamond workers in the state are running the risk of bone marrow failure and other diseases. There are some 125 computerised machines — introduced some three years ago — in use in Surat alone. Pankaj Diamonds, the unit at which the four were working, employs 30 workers.

The problem came to light about 15 days back, when Dr Ravi Sakasia of Surat had a blood test done on his nephew

Ashok Nanjibhai, who works at the unit. Alarmed by the extremely low blood count, Sakasia had him brought to the Gujarat Cancer Research Institute (GCRI) in Ahmedabad, where he was diagnosed with bone marrow failure, or aplastic anaemia.

Besides Ashok, three other workers of the unit — Anil Hasmukh Patel, Jaydeep Munjpara, and another Anil Patel — were also found suffering from the same disease. While Ashok and Jaydeep Munjpara are being treated at GCRI, Anil Hasmukh Patel is

at Sterling Hospital, where his condition was described as critical. The other Anil is being treated in Surat.

"Anil was exposed to benzene, which is a hazardous chemical, for long," says Dr Bhavin Shah of Sterling Hospital, who is treating him. "His blood count is too low, he's also suffering from infections."

The National Institute of Occupational Health (NIOH), Ahmedabad, had the liquid used for marking analysed and found it to be "pure benzene." "Exposure to the fumes of

this highly volatile chemical should stop immediately," says Dr H.N. Saiyed, NIOH director. "Workers should be monitored for some time and even people working or living near units using this chemical should be monitored."

His colleague Dr Aruna Dewan said factory law required many guidelines to be followed wherever benzene is used — workers must be informed they are using a dangerous substance, they must be given protective gear, and the vapour levels must be monitored constantly.

At the units, none of this is done. Office-bearers of the Surat Diamond Association said they weren't aware benzene was hazardous. And Devshree Bhadyadara of Bharat Diamonds said, "We were asked by Sareen of Israel, the company that makes these computerised machines, to use benzene for marking and cleaning. We never knew it is hazardous."

Learning of these cases, Surat Diamond Association president Nanu Vanani has said he will have the use of benzene banned immediately.

How serious

■ UNDER Sec 91 (a) of the Factory Act, the punishment for not following guidelines laid for hazardous substances is seven years' imprisonment with fine of up to Rs 2 lakh. Continued non-compliance or non-payment of fine invites additional fine of Rs 5,000 per day.

But for Anil Patel and the others, treatment will be a long and costly affair. "Blood transfusion and bone marrow transplant are the only options," said Dr Dewan.

How diamond units stay off scanner

■ Only one diamond unit in the city is registered under the Factories Act; in Surat, a dismal 431 out of over 10,000

pertaining to non-registration of units are pending in the court.

According to officials of Department of Industrial Safety and Health, there are a number of reasons why so many units have not registered. "Getting these units registered has always been a problem. A strong lobby works against registration," says N D Joshiyara, Director of Industrial Safety and Health. He says many a times his officials are not allowed to enter the units for inspection or information collection.

Registration of units under the Act has 5,566 cases

"We have to resort to other ways like disguising ourselves as workers

from another factory. But people instantly become hostile when we reveal our identity," Joshiyara adds. According to officials, once units get themselves registered, the first thing they have to do is to keep their records straight. "But they cannot do this as a huge amount of black money is generated in the industry," said one official, adding that "that is why they avoid being registered."

And Joshiyara says if the units are not registered, officials of his department can neither inspect them nor ask the units to follow the regulations. "For this, the diamond

industry goes largely unregulated," he says.

Avoiding registration also means not sticking to proper working condition inside the factories and also avoiding regular inspection. There are also other reasons why units avoid registration: they have to follow provisions of EPF, ESI and I-T, which they do not want to do. Officials say the workers are also equally responsible for the state of affairs.

"Because of a very high rate of mobility, workers themselves never want to deduct a part of their salary

towards the various funds," says D K Dave, Assistant Director, Industrial Safety and Health.

However, associations refute these allegations. "The labourers in our factories shift jobs within hours because they are paid by the number of pieces they have worked on. So in such a scenario, it is not feasible to provide them with such securities," says Vinubhai K. Jogani, president of Ahmedabad Diamond Association.

Surat Diamond Association president Nanubhai Vanani blames it all on the psychology of unit owners. "You come and see the diamond

THERE'S SOME ACTION

■ Notice has been sent to four diamond units in Surat to stop the use of benzene or face legal action. They are: Pankaj Diamond, D Navinchandra & Co, S Vinod Kumar, and H Vinod Kumar.

■ 25 units, where machines of Sarin Technologies are used, will be inspected.

■ All chemical industries where benzene is being used will be surveyed throughout the State.

units. "They are as good as five star hotels. We pay handsome salaries. So why should we bear interference from any outside authority?" he asks.

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ચના
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શુક્રવાર
આવેલી
ના મામલે
ન્યતા રહ
રી વિના
માધ્યમની
મા નિર્ણય
વેશ નહી
સ તાકીદ

ન
કીદ

ને છે કે,
ના સિદ્ધી
જિલ્લા
ધરી છે.
તા રચના
કાર્યરત
શીતિઓ
ધ્યમિક
જિલ્લા
કીયાએ
છતાંયે
હોવાની
કરવામાં
વેદ્યાર્થિ
વ્યા હશે
રી રહેશે.

હીરાધસુઓમાં 'એપ્લાસ્ટિક એનેમિયા' નામના જીવલેણ રોગે દેખા દીધી !

અમદાવાદ, શુક્રવાર
હીરાને કમ્પ્યુટર દ્વારા સાફ કરવા માટે
ઉપયોગમાં લેવાતા જેરી રસાયણ
'બેનઝીન'ને કારણે હીરાધસુ કામદારોમાં
એક નવા ગંભીર રોગે દેખા દીધી છે જેને
તબીબો 'એપ્લાસ્ટિક એનેમિયા'થી ઓળખે
છે. આ રોગને કારણે રાજ્યમાં હાલ ચારેક
હીરાધસુને અમદાવાદ શહેરની હોસ્પિટલમાં
દાખલ કરાયા છે. નેચરલ ઈન્સ્ટિટ્યુટ ઓફ
ઓક્યુપેશનલ હેલ્થ રસાયણનું વિશ્લેષણ
કરતાં આ રોગ વિશેની જાણકારી અહાર
આપી છે. આ ઉપરાંત આગામી દિવસોમાં
અમદાવાદ-સુરતના હજારો હીરાધસુ
કામદારો 'એપ્લાસ્ટિક એનેમિયા'નો ભોગ
બને તેવી તબીબોએ ચેતવણી ઉચ્ચારી છે.

રાજ્યમાં અમદાવાદ અને સુરતમાં
હીરાઉઘોળ ખુબ વિકસિત થયો છે. અગાઉ
હીરાને ઘસવા માટે પંટીનો વ્યાપકપણે
ઉપયોગ થતો હતો, પણ બદલાતા યુગમાં
હવે આ હીરા વ્યવસાયમાં પણ કમ્પ્યુટર
પોતાનું સ્થાન જમાવ્યું છે. હીરામાં વધુ વજન
ધાર તે માટે તેને ડિઝાઈન મુજબ કટીંગ
કરવામાં આવે છે તે માટે કમ્પ્યુટરમાં મૂકતા
અગાઉ તેને 'બેનઝીન' નામના રસાયણથી
સાફ કરવામાં આવે છે. આ જેરી રસાયણનો
ઉપયોગ હવે વ્યાપકપણે વધી રહ્યો છે.

નેશનલ ઈન્સ્ટિટ્યુટ ઓફ
ઓક્યુપેશનલ હેલ્થના પ્રાપરેક્ટર ડૉ.
એચ. એન. સેંપટે આ અંગે જણાવ્યું હતું કે,
પોઈઝન ઈન્ફર્મેશન સેન્ટરમાં 'બેનઝીન'

- સુરતના ચાર હીરા
કામદારોને હોસ્પિટલમાં
દાખલ કરાયા
- હીરાને કમ્પ્યુટર દ્વારા
સાફ કરવા થતા
'બેનઝીન' રસાયણના
ઉપયોગથી થતી બીમારી
- આ રોગમાં દર્દીને તાવ,
શરીર પર ચાહાં અને
પેશાબમાં લોહી પડે છે
- લોહી બનવાની પ્રક્રિયા
રૂંધાતા કેન્સરની
શક્યતા વધે છે

રસાયણ વિશે જીણવટભર્યું અધ્યયન કરતાં
હીરાધસુઓમાં એક નવા પ્રકારના
'એપ્લાસ્ટિક એનેમિયા' નામના રોગે દેખા
દીધી છે.

આ રોગના લક્ષણ સામાન્યપણે દેખાતા
નથી અને રોગમાં સપડાયાના બે વર્ષ બાદ
વ્યક્તિને ખબર પડે છે. રાજ્યમાં હાલ ચારેક
વ્યક્તિમાં આ રોગના લક્ષણો જાવા મળે
છે. તે પૈકીના ત્રણેક કામદાર અશોક
નાનજીભાઈ અને જયદીપ ધીરુભાઈ
મુંજપરા-સુરતને સિવિલ હોસ્પિટલમાં
વધુ સારવાર અર્થે દાખલ કરાયા છે,
જ્યારે અનિલ હસમુખભાઈ પટેલને
સ્ટેલિંગ હોસ્પિટલમાં દાખલ કરવામાં
આવ્યા છે.

એલ. જી. હોસ્પિટલના સર્જરી
ડિપાર્ટમેન્ટના એસોસિએટ પ્રોફેસર ડૉ.
રવિ સતાસીયાના જણાવ્યા મુજબ
'એપ્લાસ્ટિક એનેમિયા' રોગમાં વ્યક્તિને
વારંવાર તાવ આવે, શરીર પર અચાનક
ચાંદા પડે છે અને શરીરમાં કોઈ પણ સ્થળેથી
લોહી આવે છે. આ ઉપરાંત પેશાબમાં પણ
લોહી પડે છે. શરીરમાં લોહી બનવાની
પ્રક્રિયામાં ખલેલ પડે છે અને તે કેન્સરનો
ભોગ બને છે. હીરાધસુ કામદારો એ
બેનઝીનનો ઉપયોગ ઓછો નહીં કરે તો
કદાચ આ રોગ વધુ વકરે તેમ છે. આ
ઉપરાંત આગામી દિવસોમાં હજારો
હીરાધસુ કામદારો આ રોગમાં સપડાય તેવી
શક્યતા છે.

અમદાવાદ-સુરતના હજારો કામદારો ભોગ બને તેવી તબીબોની ચેતવણી

Follow up action

- The diamond industry issued directives to ban the use of Benzene with immediate effect.
- Working conditions of the workers were improved
- Legal action was taken against unregistered unit



Units using benzene to be closed

■ Govt team in Surat to inquire into use of benzene by diamond units, will submit report tomorrow

BASHIR PATHAN
GANDHINAGAR, JUNE 26

ALARMED over the reports of four diamond workers from Surat being diagnosed with aplastic anaemia due to exposure to benzene, the Directorate of Industrial Safety and Health on Saturday rushed a four-member team of senior officials to Surat to inquire into the use of this hazardous substance by diamond units.

Director of Industrial Safety and Health N D Joshiyara said the team, led by his

deputy D C Chaudhary, would study the situation and submit a report by Monday. "I have also directed the team to use the provisions of the Factory Act and order closure of units using benzene without prior permission of the directorate. We have reports that some 15 to 20 units in Surat have been using this hazardous substance for marking facets on roughs before cutting and polishing them," Joshiyara said.

However, reports from Surat indicate that the use of benzene isn't confined to just

"15 to 20 units"; the chemical is also commonly used for cleaning diamonds. Workers just place some diamonds on one palm, drop a little benzene, rub the diamonds with bare hands, and then just blow air from mouth to dry them.

The director said the possibility of diamond units in other parts of the State also using benzene could not be ruled out. "It is a very serious matter. The directorate will also conduct checks at diamond polishing units in other towns and cities, like Bapunagar in Ahmedabad",

he said.

In addition to the registered units, the State has thousands of unregistered diamond polishing units, mainly in Surat and Ahmedabad. "The diamond lobby in Gujarat is so powerful and influential that teams of inspectors are prevented from entering the premises of such units. There are about 5,000 cases pertaining to unregistered diamond polishing units pending in courts," Joshiyara said.

He said that benzene, if handled without using protective gear, could harm the

human body. Benzene is toxic as well as a fire hazardous chemical, he said. It is used mainly by chemical factories.

"We regularly carry out checks at chemical factories. Though, these factories use benzene in large quantities, the directorate has not come across any worker showing its adverse effects, maybe because of safety measures being implemented effectively in factories," he said.

Joshiyara said benzene poisoning in a diamond unit was unusual. "In diamond units, benzene is used in in-

significant amount, so we never expected something of this sort from here".

Dr H N Saiyad, Director of National Institute of Occupational Health said they had conducted a study on "occupational health hazards faced by the diamond workers" about five years back, not benzene poisoning did not figure in it. "The use of benzene is a recent phenomena that has started with the introduction of the computers in the diamond cutting process. Earlier everything was done manually", he said.

An Awareness programme in local language was arranged at Surat for Diamond Association including workers, local doctors and Govt. of Gujarat officials

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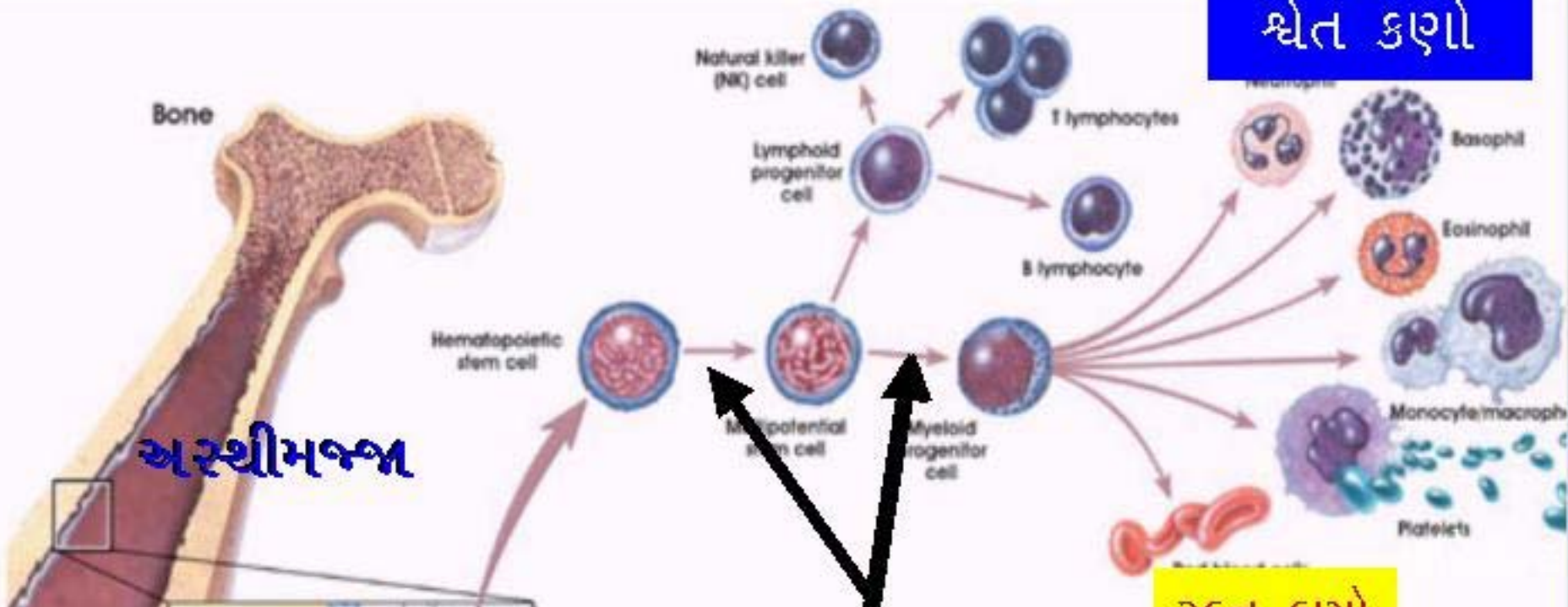
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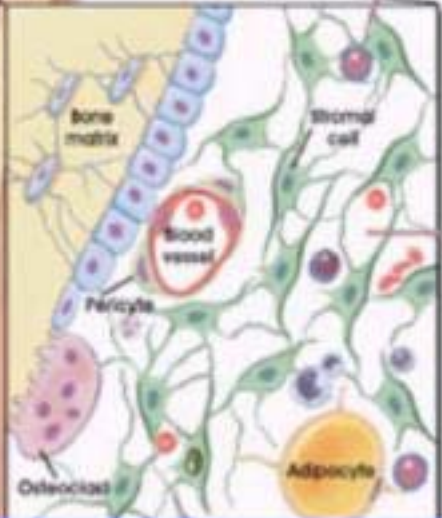
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Follow up action

- Hematological examination of 1400 workers, who were working in units using Benzene, was carried out
- 144 cases with hematological abnormalities were detected among these 1400 cases
- A Research study has been planned with special focus on these 144 cases

Lessons learnt

In the first case example, intervention was not successful due to following reasons:

- It was a cottage industry
- Workers were poor and dependent on employers for piece meal work
- There were no legal provisions

Lessons learnt

In the Diamond workers, intervention was successful due to following reasons:

- Legal provisions
- Media coverage
- Seriousness of illness
- Willingness of Employers
- Fear of International repercussions from DTC (Diamond Trading Corporation)