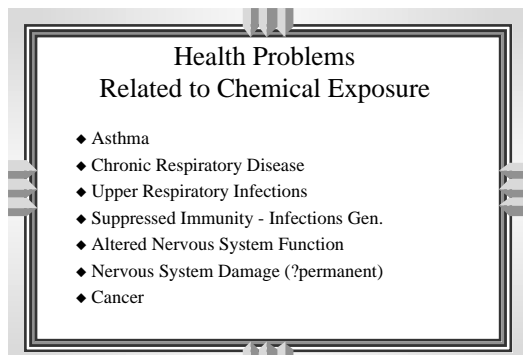


## Introduction

In my current work with the Australian Comprehensive Medicine Association (ACMA) and Environmental Health Consulting, we are attempting to move on from trying to repair the medical disasters, to investing in research to identify the causes of the problems. We are now in a position where we have enough information, I believe, to look at pro-actively altering our home, work and school environments, for the benefit of everyone's health.

I want to put to you a proposal which is based partly on experience, partly on research and partly on an existing plan. The Minister for Education has already made nice noises about the concept of investing in the health of students at school. I think that there are positive signs that not only are we raising an issue of the adverse health effects in the schools, we are raising issues that can and should be changed. At the end of my talk I'm going to focus on the kind of changes which we could expect to make a significant difference in health.

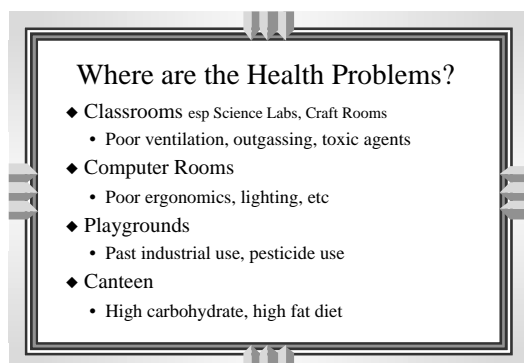


The first question that has to be answered is "Is it proven that health problems are related to long term, low level chemical exposure?" There are still doctors, legislators and scientists who claim there are no proven adverse effects.

The difficult, in this messy world, lies in proving that one single thing causes cancer, asthma or heart disease in people whose lives

are filled with multiple toxins, multiple stresses, varied diets, and so many other variables. We have turned to the scientific method, and have spent three years of intensive research in determining the link between one type of pesticide, organochlorines, and an illness known as Chronic Fatigue Syndrome. The effort, energy and time that would be required to prove the more general links between chemical exposure and disease, given the vast number of chemical combinations, is going to be enormous. Given this, it is important that we move back to the

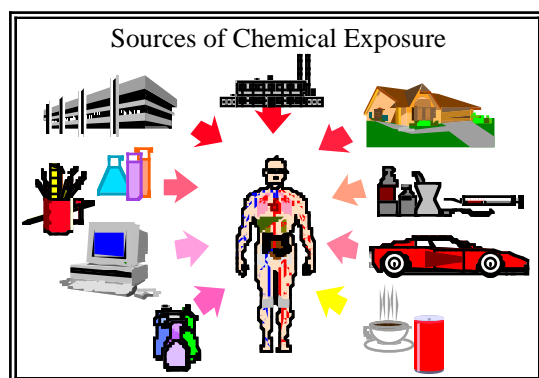
precautionary principle, and minimise exposure. In the past we have learned of the lack of safety of chemicals only after the damage has been done.



There are many different diseases which are important in relation to school children, and for which we now have good, solid evidence of their relationship with environmental contaminants. These include: asthma; chronic respiratory disease; upper respiratory infections (which is the most significant reason for children not being at school); suppressed immunity (with a susceptibility to infections generally); altered nervous system

function (decreased concentration, decreased short-term memory, confusion and fatigue); and potentially permanent nervous system damage (usually at the higher doses of the chemicals which I will cover later). The cancer risk is the hardest to unravel, is the most controversial, and is best left to a more detailed forum.

## Sources of Chemical Exposure



I do not want to put forward the view that schools are the one and only place ruining the health of our children. Most of the responsibility for adverse health effects is our own, but if you look at the slide entitled "Sources of Chemical Exposure", you will note the chemicals from a laboratory, art and craft gear, computers and cleaning agents, and down the bottom on the right hand side, the fizzy drink can, and the cup of coffee.

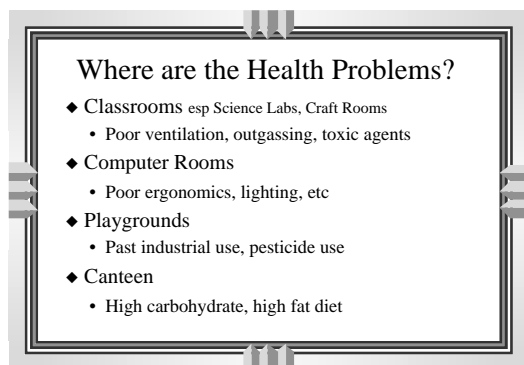
These are the agents which are in the school place, with constant exposure on the part of students, and they are modifiable. In other words, given that the health risks are moderate to mild, we are looking at long term health risks over a large population. If you expose one child to this environment they may get off scott free, if you expose a million children over twelve years of their schooling then many thousands will suffer adverse health effects. We want to modify the school environment for the benefit of those children most likely to suffer. There are factors that are requirements of the family, the home, and the community at large that are not controlled from the school. For example, the factories, the home itself (with the same internal air pollution problems), and the medications and drugs given by doctors may all become added problems.

Doctors frequently mistake upper respiratory infections for something that requires antibiotics. Instead of fixing the factors which I have outlined above, the doctors provide a medication which itself can provide extra complications for a child. The number of children who have been on unnecessary doses of antibiotics during their school years now numbers in the millions in this country. I would put it to you that virtually every person at this conference has been abused with antibiotics in the strict

sense, meaning that the dosages you have received are many times that which would be generally recommended under the stricter guidelines of antibiotic use today. The problem we run into with this antibiotic resistance. That is the antibiotics do not work when we need them, because they are so commonly given to us when we do not need them. So medicine also contributes its own part to the problem, whereas it should have the focus of looking at environmental factors, taking those into account and minimising risk for their patients. Doing away with the private automobile would be a good start!

Looking at Australian blood results compared to American averages back in 1988, the benzene levels of people in Australia was about fifty percent of the levels found in the Americans. I would suggest to you now that we are on unleaded people that the lead levels would be lower and the benzene levels higher. It is a trade off of a chemical for a chemical when the problem is the over use of cars in transport and the solution is public transport, not a change of pollutants. This approach is akin to upgrading one's cabin on the Titanic!

## Where are the Health Problems?



Firstly I would like to raise the issue of the classrooms generally. It is probably true that the science labs and the craft room are worse than the majority of the rest of the school. This may be because of the agents used, because of bunsen burners and volatile agents, paints, thinners and cleaning agents. While these may be the worst rooms, the problem is also in the general classroom. The problem increases as winter arrives, when the doors and windows

are closed, the ventilation goes down to a minimal level, the heaters go on, and the fumes are trapped inside the classroom. Also, because of our technologies, rooms are getting "tighter", more efficient at retaining their heat and more efficient at retaining pollutants.

The biggest problem I have seen involved teachers and students in classrooms with unflued gas heaters. Some years ago, that was quite a dramatic story, and I believe it was in the Metherill era. Unfortunately, other problems assumed centre stage, and the health problems tended to go on the back burner, so to speak! The problem still remains, and a person I knew well who was in the Department at the time said, "It's unrealistic for us to go and change all the gas heaters. It costs too much and the ongoing costs of replacement are too much." Even at that time it occurred to me that it's not a "cost" it's an investment. If you are putting children to sleep in schools around the country what is the point of the education?

So I don't want to focus solely on the science labs. The issue of getting the ventilation right, of choosing appropriate materials inside the classrooms generally, of removing toxic agents when they can be replaced with better, safer or less damaging agents is a general one for the school. Something that is often forgotten in our rush to computers is that the computer rooms in the schools I've seen are disastrous. The same precautions that are taken not to have laser printers beside a secretaries face, of

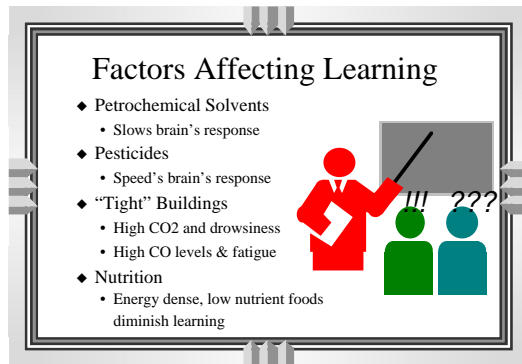
proper work-stations with good ergonomics and with training in the ergonomics are ignored entirely. Computers are dotted around the countryside in schools with slouching seats in front of them with dreadful ergonomics. We should not forget the musculo-skeletal injuries and the strain injuries that occur to children. It is not *toxic* but it is health damaging. Lack of thinking and lack of investment in proper materials is affecting the health of children who use them.

In terms of playgrounds, the outside area, we should to remember that many of the schools are in areas which were once industrial. There are estimated to be fifty thousand contaminated sites throughout Australia. These are sites which can adversely effect the health of people living or working nearby. We know of the location of about two thousand of these sites it only leaves about forty eight thousand to find! Dotting schools around the place on previous dump sites, petrol stations and refinery sites is a less than ideal way of identifying contaminated sites! The extra problem with young children, who are most at risk of damage to the delicate, developing immune system and nervous system, is that young children play in the dirt. Adults are relatively free from the effects of contaminated sites. They walk with shoes on. The youngsters get into the dirt, even eat the dirt. Thus, the ingestion of these toxins is potentially a highly damaging event. Assessing the previous history of sites for schools and ensuring there is no actual contamination is again a sensible investment in our future.

Schools and child care centres because of the nature of the food crumbs and the dirt left around are prone to pests, as you're probably aware and pest extermination is not unknown in schools. Pest control done at the cheapest and least effective ways tend to lead to *over* use of pesticides, and the choices that we have made with termiticides and with chemicals generally have not always been very clever. We still have many schools which have had yearly spraying of organochlorines for twenty or twenty five years. The contamination in the soil around the foundations of the school will not be gone for another fifty years. To change to newer pesticides is one thing, but to ignore the residual contamination of persistent chemicals can be a disaster. Integrated pest management seems to be an emerging solution to a problem of reliance on toxic agents for pest control.

I would like to focus on the canteen as well, not as a toxic site in the general sense of the word, but as one of the main areas where we give children an appalling example of how to grow up healthy. The canteens still involve high carbohydrate, high fat foods, and high sugars. They tend to provide what the consumers, namely the students, want, with very little guidance. We have an emerging catastrophe whereby the government will promote healthy lifestyles with ads for apples and oranges, yet on the other hand will take no action to ensure that children are sensibly feed while in the care of the government at school.

## Factors Affecting Learning



The petro-chemical solvents have a particular effect that I am interested in. I, and the other doctors that I have been working with for the past five years, have been testing how they affect nervous system function, and we have found that they slow down certain electrical activity, known as the "P3" wave, in the brain. Without going into complexities, when new information is presented to the brain, and when the brain is required to make a decision, the

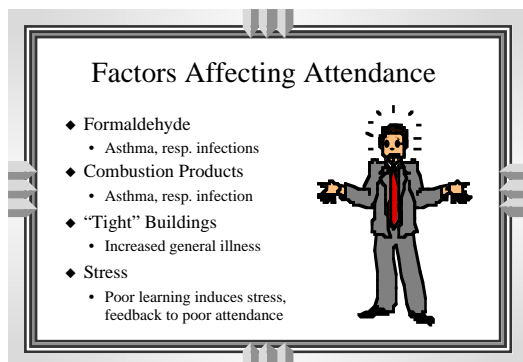
information is processed, and a set of "squiggles" are produced on an EEG, or electroencephalogram. . The timing in the brain is critical for short-term memory, and for putting aside information for decision making. We are able, with very simple and non-invasive technologies, to check this in various workers who have high exposures to solvents in their work places such as the printing and pest industry. We have not done this at all with children. The assumption has been made that children are safe and that they are working to the best of their ability. Given that petro-chemical solvents slow the brain's response, alter the amount of information which can be retained, and alter the short-term memory, it is clearly critical that solvent exposure is minimised. What is the point of sending kids to school and damaging their brains, so that they cannot remember what they have been taught.

Organochlorine pesticides, on the other hand, may "speed up" the brain's response. Now here's a lovely thought isn't it. If we just mix this with the brain-slowng solvents, we might get a reasonable outcome! I'll tell you a story of a person previously exposed to organochlorines who effectively managed his health by drinking five glasses of alcohol a day to slow down. On testing his brain wave function was normal, his liver function was not! Speeding up or slowing down the brain's response is not effective; speeding up or slowing down any form of switching is not effective. Having a computer running too fast or too slow causes exactly the same scrambling of information. The issue is keeping the brain running at the right speed with minimal stress and load that would otherwise stop information flow.

In tight buildings high carbon dioxide is associated with drowsiness, you see people yawning when the building becomes tight, the heating goes on, the oxygen goes down and the carbon dioxide goes up. It is not conducive to learning! What we may forget with gas heating is the rising carbon monoxide and nitrogen dioxide levels. We do not gas our children in the garage, but we do gas them when we put them in poorly ventilated rooms with unflued gas heaters. The carbon monoxide binds to the haemoglobin in the blood, and does not let it go. This results in a permanent reduction in the oxygen carrying capacity of the blood, decreasing brain function, causing fatigue and weakness as well.

In nutrition, we have energy dense, low nutrient foods. There is evidence now that when you have this type of food, without sufficient nutrients (B vitamins, minerals and appropriate nutrient density) which should go with fresh and available food in season, then you also give artificial highs and lows in the blood sugars and the overall learning and retention rate goes down in adults and children alike.

## Factors Affecting Attendance



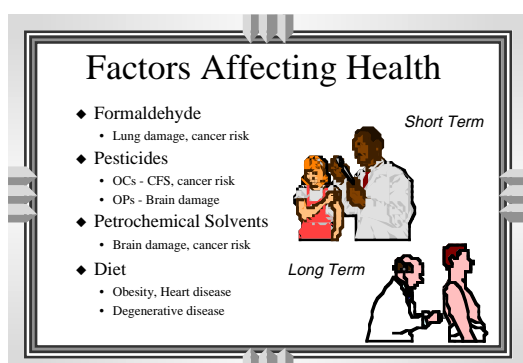
The second issue which is often forgotten in learning is the child has to be at school to learn. Things which diminish attendance at school are also going to affect our investment in education.

Formaldehyde which causes asthma and respiratory infections, irritates the airways and contributes to, or even causes, upper-respiratory infections. It is a prime example of

a chemical which is able to increase the absenteeism rate in business and in schools significantly. The products of petrol combustion cause asthma and respiratory infections and increase absenteeism. The most common causes for missed days at school is upper-respiratory infection and asthma.

Tight buildings are associated with non-specific illnesses, frequently involving headaches, weakness, fatigue and difficulty in concentration. We know that productivity goes down in businesses which have tight buildings with little air flow and increased contaminants. We must assume the same thing goes on in school buildings. Again, it is an *unmeasured* variable, but it is very likely that these factors will increase general illness, with people being away from school as a result. I think there is a feedback mechanism at work as well, stress. If you stress the person with the chemicals in the first place, and diminish their learning capacity, certain children will become the slow learners. These are the “problem children” in the school. They may be chemically affected in the first place, then become even more stressed because they are often absent and always behind, and this feeds back on that process. So stress in itself can result from environmental illness and can feed back in families and individuals, to cause absenteeism.

## Factors Affecting Health



Formaldehyde is a very simple hydrocarbon (1 carbon, 1 oxygen and 2 hydrogen atoms comprise the molecule) It is a partial combustion product of virtually all hydrocarbons. When you burn gas in air at fairly low temperature, such as occurs in gas heating, you release a significant amount of formaldehyde. It is accepted world-wide to be a carcinogen. I would say that there is still controversy about whether or not it actually

does cause cancer in humans, but the general view is that it is a carcinogen. There is no doubt however that it is an irritant. It can irritate the eyes, lungs, and nose, causing sinusitis, conjunctivitis, symptoms similar to an upper-respiratory infection. Hundreds of thousands of children have received courses of antibiotics for what was really irritation from formaldehyde. Many courses of antibiotics are prescribed for inflamed mucous membranes, where the doctor has assumed that there is an infection, when it has in fact been chronic irritation from an external irritant,

commonly formaldehyde.

In terms of pesticides, the organochlorines will be banned by the end of June this year. It has taken my research colleagues and I three years to define the effects organochlorines have on Chronic Fatigue Syndrome (CFS). The association between organochlorines and CFS is now definite and statistically significant. It is a different issue as to whether these chemicals cause CFS, but we have demonstrated that organochlorines contaminate CFS sufferers more than they do a control (healthy) population.

There are also cancer risks with many of the organochlorine pesticides; HCB, dieldrin, heptachlor, chlordane, DDT and others are strongly suspected of being carcinogens (cancer causing agents), with the added problem that they are retained in the body for many years, or even decades. They have potential for adverse effects twenty to thirty years in the future. We had previously (1990) detected high levels of organochlorines in breast milk in people who have had no known exposure for over twenty years. The other thing that chemicals such as organochlorines are now being shown to do, is that they can mimic hormones in the body. This was an unexpected finding, but it has been shown that they can bind to steroid and sex hormone receptors on cells in our bodies. There is a suspicion that prostate, breast and other hormonally related cancers may be caused or accelerated by organochlorine pesticides.

So now we are getting rid of organochlorines, what are we doing? We are replacing them with a different type of pesticide, the organophosphates. Generally, the transfer has been from heptachlor / chlordane to chlorpyrifos. I must say that if I was to be exposed to one or the other, I would prefer organochlorines. Chlorpyrifos is much more poisonous, at least in terms of acute poisoning potential. It is a neuro-toxin, and is able to poison enzyme functions in humans far more effectively than the organochlorines could do in the short term. The difference is that it does not remain long in the body, so manufacturers are less likely to be caught twenty years later with blood levels of these linked to any disease. It is sexier for industry because they leave no "sticky fingerprints". Organochlorines have left these "sticky fingerprints" because of their long life in humans. This has allowed us to check whether they are possibly causing certain diseases.

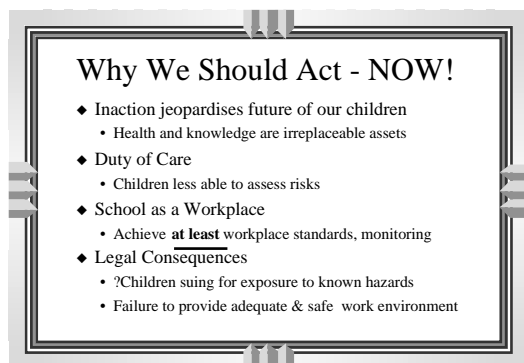
The problems related to organophosphates, like chlorpyrifos, are usually during the first few weeks after the spraying for pest extermination in schools and child care centres. There should be a period of time during which students do not re-enter the school. That withholding time probably should be measured in the order of a week to two weeks to be reasonably safe, rather than hours to a full day which is far less safe.

The petro-chemical solvents affect approximately fifty percent of those who work with them in industries with high levels of exposure, with measurable permanent brain damage after approximately eleven years exposure. Think of how long people are at school. I am not suggesting fifty percent of students will have permanent brain damage. I am saying that with the lower, but uncontrolled and unmeasured, exposure levels, there will be a percentage of students whose brains are functioning far less effectively at the end of school than they were at the beginning. That a

tragedy, because our carelessness contributes to the mental deterioration of certain students at school.

We all know that obesity, heart disease and degenerative diseases are strongly associated with poor dietary habits. Oxidative damage seems to cause degenerative diseases of the body such as arthritis, loss of vision and cataracts. Oxidative damage is triggered by pollutant exposure, and this type of damage is the result. A poor diet, high in sugars and certain fats, and low in fresh fruit, vegetables and essential fats, accelerates this damage.

## Why We Should Act Now



We can say that actions should already have happened, but now we have strong information linking chemicals with adverse health effects. The major point I would make is that inaction jeopardises the future of our children. Their health and their intellectual function are the irreplaceable parts of the educational experience. If we damage their health and their brains, by contributing to problems in the school, then we are doing

them no favours whatsoever. We are also doing our country no favours by damaging our finest assets. The clever country can quickly become the stupid country if we refuse to protect the health and brains of those in school.

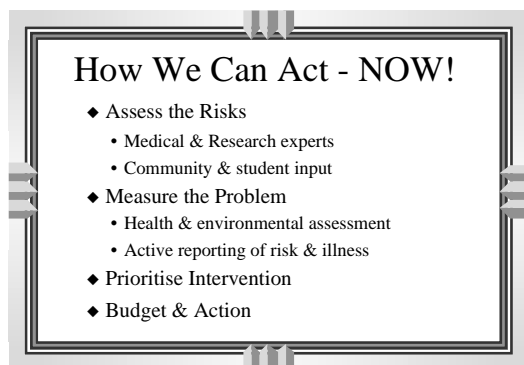
We have a duty of care. As we become aware of this information, we must act upon it. We are responsible for the people who are young and are entrusted to our care. Children, on the whole, are not organised into trade unions, do not have access to technical information that we have, and are dependent on our judgement for many of the decisions they make, at least until they become adults. Our duty of care is to assess the risks, take the required action, and ensure that our children remain the most valued asset in the community. We should put safety in the classroom first, not last. The fact that children have no political voice is no excuse for our inaction.

I would also put to you that the school is a work place, and should be assessed and accredited to at least work place standards. To say that the schools should be allowed to go fairly uncontrolled, with no surveillance of the quality of air and environment (which have largely gone unmeasured over the past twenty years) is a farce. We cannot do this in the workplace. The reason that we do check the work place, that we do create chemical exposure and indoor environment standards, is that workers have fought for these rights. Children may eventually take legal action when health problems arise after they leave school, where the link back to the school can be demonstrated.

I would go so far as to predict that the problems we are now discussing will not be addressed until students or their families threaten legal action, and sue for negligence. When the consequences are upon us, we as a community and a country will end up paying twice – through the loss of the mental capacity of our children, and through the court payouts to those with proven damage. If we neglect the

knowledge we already have about the adverse effects of chemical exposure, if we fail to provide an adequate and safe work place for schoolchildren, we can expect this outcome with great certainty. We cannot control the home at present. There are arguments that we should not legislate to control the home, and that this should be left to the individual choices of families. If so, we need to educate families about the potential health risks in the home, and support their adoption of safe practices. In the school, where we require children to attend, we do have obligations to protect their interests.

## How We Can Act Now

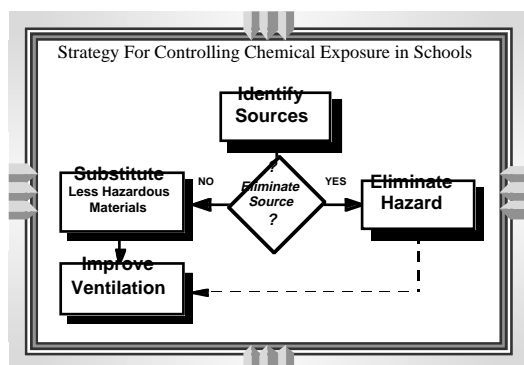


There is a process whereby we can act. It is not impossible to minimise risk and repair some of the damage which has already occurred.

Firstly we need to assess the risk, with medical and research experts working with community and student stakeholders. The aim would be to identify the major risks, and to work out methods of minimising those risks without breaking the bank. We need to measure the

problem, because we cannot change risks or change patterns of long-term exposure without knowing the problem. We need this information to be able to prioritise our actions.

There needs to be a system of active health reporting. Where there are suggestions of unhealthy buildings and school work areas, we should have a formal system of reporting. This provides teachers and children with a mechanism to provide feedback, and effect positive change in health damaging environments. This allows us to prioritise intervention.

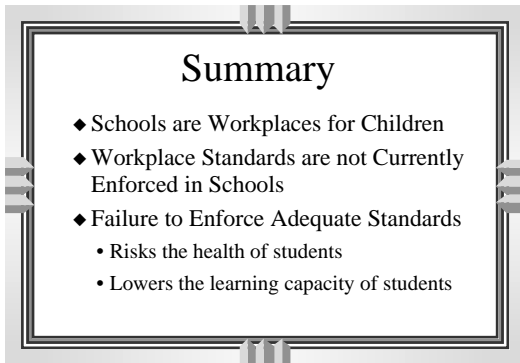


I am not suggesting that we go to all schools simultaneously. There are going to be priorities which we need to identify. Those children most at risk have the resources put their way first so that we do not have all schools grabbing for the extra resources. There are disastrous schools, in aboriginal and other neglected and disadvantaged communities, where disease is rampant and the health problems are enormous. Going to those places

first, to bring all schools up to a common standard, would be useful.

Finally we have to budget and commence action. We need to identify toxic sources, eliminate the hazards if possible, substitute with less hazardous materials, and aim always to improve ventilation.

## Summary

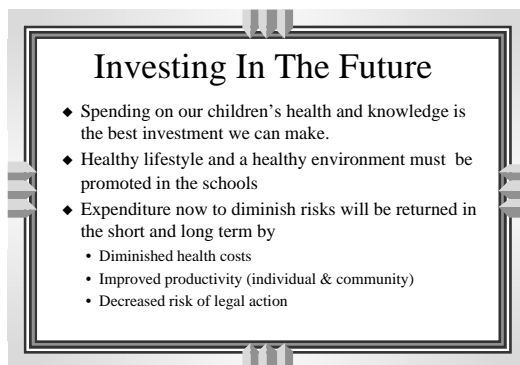
A decorative box with a double-line border and a drop shadow, containing a title and a bulleted list. The title is 'Summary' and the list items are: 'Schools are Workplaces for Children', 'Workplace Standards are not Currently Enforced in Schools', and 'Failure to Enforce Adequate Standards' with sub-bullets 'Risks the health of students' and 'Lowers the learning capacity of students'.

**Summary**

- ◆ Schools are Workplaces for Children
- ◆ Workplace Standards are not Currently Enforced in Schools
- ◆ Failure to Enforce Adequate Standards
  - Risks the health of students
  - Lowers the learning capacity of students

I am talking to you from two perspectives: as an environmental consultant, and as president of a medical association devoted to prevention and empowerment of the community. We have an obligation to regulate and monitor schools, just as if they were work places. Schools are the work places of our children, and we should provide them with at least the resources that we provide any other work place. Work place standards are not currently

enforced in our schools. Inspection rarely occurs, measurements are not taken, and adverse health effects are not identified or followed up. There is a “data-free zone” for health in schools that we need to reverse urgently. The failure to enforce adequate standards increases risk to the health of students and reduces their learning capacity. The aim for our children at the end of their twelve years at schooling should be that they are as healthy as possible, with the fullest possible achievement of their intellectual potential.

A decorative box with a double-line border and a drop shadow, containing a title and a bulleted list. The title is 'Investing In The Future' and the list items are: 'Spending on our children’s health and knowledge is the best investment we can make.', 'Healthy lifestyle and a healthy environment must be promoted in the schools', and 'Expenditure now to diminish risks will be returned in the short and long term by' with sub-bullets 'Diminished health costs', 'Improved productivity (individual & community)', and 'Decreased risk of legal action'.

**Investing In The Future**

- ◆ Spending on our children’s health and knowledge is the best investment we can make.
- ◆ Healthy lifestyle and a healthy environment must be promoted in the schools
- ◆ Expenditure now to diminish risks will be returned in the short and long term by
  - Diminished health costs
  - Improved productivity (individual & community)
  - Decreased risk of legal action

Finally, to invest in our future, I would suggest that spending on our children’s health and knowledge is the single best investment we can make in schooling. Healthy lifestyle and healthy environment must be promoted in schools, not just as a theory, but promoted in action and by example.

Expenditure now to diminish risks will be returned in the short and long-term by diminished health costs, and by increased attendance and higher achievement. The children will cost the community less by needing medical care less. As a result of improved learning capacity, they will be more productive at the end of their schooling, and the community will benefit from the work of more capable people doing a better job in a clever country.

Finally, if we are doing our best for them now, they are more likely to be gentle on us for our many other failings in the future.