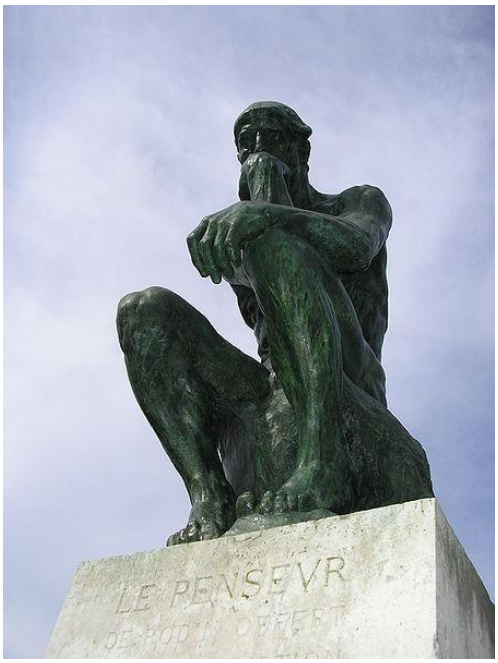
Debates científicos

Conocimiento científico, controversia y dinámica social en el debate sobre la fluoración de agua potable

Foro 1



Métodos de levantamiento y análisis de datos

Posgrado en Gestión de Áreas Protegidas y Desarrollo Ecorregional

Jorge Fallas

Jfallas56@gmail.com

No hay palabra verdadera que no sea unión inquebrantable entre acción y reflexión. Todos nosotros sabemos algo. Todos nosotros ignoramos algo. Por eso, aprendemos siempre. Paulo Freire

INDICE

AGUA FLUORADA Y SU RELACIÓN CON EL CÁNCER

La controversia sobre la fluoración de agua potable se remonta a los años 50 cuando el Servicio de Salud Pública de los Estados Unidos de América (USPHS, por sus siglas en inglés) aprobó la fluoración de agua para consumo humano. Este tema permite examinar la dinámica entre ciencia, discrepancias entre científicos, su repercusión política y la participación ciudadana.

La configurción de los actores a favor y en contra de la fluración del agua se ha mantenido con muy pocos cambios desde 1940 hasta la fecha. Los primeros afirman que la fluoración reduce los índices de caries en los dientes, que no tiene consecuencias adversas probabas para la salud (excepto manchas insignificantes en los dientes, que es sólo un aspecto estético), y que además es la forma más barata y eficaz de asegurar la ingesta de fluoruro a todos los miembros de la población. Por otra lado, los opositores argumentan que los beneficios están sobrevalorados, que hay una variedad de consecuencias negativas comprobadas para la salud así como otros posibles efectos adversos (e.g. fluorosis ósea, reacciones de intolerancia y el cáncer), y que la fluoración obligatoria no era ética, ya que el gobierno obligaba al ciudadano a consumir "un medicamento" sin un control real sobre la dosis que ingiere.

La mayoría de las fuentes de agua natural poseen una concentración de flúor inferior a 0,2 ppm; valor demasiado pequeña para proporcionar el impacto deseado en la reducción de caries dentales. En 1939, se propuso por primera vez agregar fluoruro al agua para alcanzar una concentración de alrededor de 1,0 ppm.

A mediados de 1970, la investigación de Yiamouyiannis y Burk (1977) concluyó que existía un vínculo entre la fluoración y el cáncer, y, desde entonces, el tema se ha mantenido como una controversia tanto en las esferas científicas como políticas. Otro lado en el caso del oponente es una crítica de la evidencia de que la fluoración reduce enormemente la caries dental.

El material preparado para el foro no pretende ser exahautivo ni cubrir de una manera balanceada los diferentes puntos de vista. El objetivo del ejercicio es analizar la evidencia y que usted tome una posición sobre el tema en discusión.

A continuación se brinda un breve resumen del estudio de Yiamouyiannis y Burk 1977; citado por Manly ,1992 sobre el efecto del consumo de agua fluorada en la tasa de muertes por cáncer.

La pregunta que el estudio pretendía responder era: ¿Existe evidencia estadística para suponer que el consumo de agua fluorada aumenta la probabilidad de morir de cáncer? El estudio consistió en comparar la tasa de muertes por cáncer por 100.000

habitantes para 20 de las ciudades más grandes de los Estados Unidos, 10 con servicio de agua fluorada y 10 sin servicio de agua fluorada para los años 1950 y 1970. El servicio de fluorado de agua se inició en los Estados Unidos entre 1952 y 1956.

El estudio indicó que se observó un incremento de 36 muertes por 100.000 habitantes en las ciudades con servicio de agua fluorada comparado con solo 16 muertes por 100.000 habitantes en las ciudades sin servicio de agua fluorada. La conclusión evidente fue que el flúor en el agua potable aumenta la tasa de muertes por cáncer. Sin embargo el colegio Real de Médicos, el Instituto Nacional de Cáncer y la Sociedad Real de Estadística de los Estados Unidos rechazaron las conclusiones argumentando que no existía evidencia estadística válida para afirmar que el flúor en el agua potable aumentara la incidencia de cáncer ya que el efecto aparente del flúor estaba confundido con el efecto en los cambios sistemáticos observados en la estructura de la población (Ej. tasa de crecimiento, composición por grupo de edad, sexo, grupo étnico) de las ciudades analizadas así como por cambios ambientales (Ej. Niveles de contaminación entre las ciudades) (Oldham y Newell, 1977 citado por Manly (1992).

La conclusión final es que para el set de datos analizados no es posible determinar sí el flúor en el agua potable causa un efecto adverso o positivo en la tasa de muertes por cáncer y que por tanto no existe evidencia en los datos para argumentar que el flúor causa cáncer.

Este ejemplo ilustra cómo un diseño observacional aparentemente bien planeado puede generar conclusiones erróneas cuando no se considera el efecto de otras variables que influyen en el comportamiento de la variable respuesta.

1. EVIDENCIA DÉCADA 70S

Fluoridated drinking water and the occurrence of cancer. J Natl Cancer Inst. **1976** Oct;57(4):757-68. **Hoover RN**, **McKay FW**, **Fraumeni JF Jr**.

A recent report by the National Health Federation, a private agency, related cancer mortality patterns in the United States to fluoridation of water supplies, triggering much public health concern and some political response. To clarify the issues raised, we studied cancer mortality and incidence statistics for U.S. counties, 1950-69. No trends could be ascribed to the consumption of water that is artificially or naturally fluoridated.

Fluoridation of water and cancer mortality in the U.S.A. **Doll R**, **Kinlen L**. Lancet. **1977** Jun 18; 1(8025):1300-2.

Authoritative statements that fluoridation of public water supplies is not associated with any increase in cancer have been challenged on the basis of data which, it is claimed, show that cancer mortality in the United States rose more sharply in cities with fluoridated water than in those without. However, during the period of study (1950-70) the population structures of these cities changed substantially. When account is taken of age, sex, and ethnic group the ratio between observed cancer mortality and expected cancer mortality fell slightly in the cities with fluoridated water and did not change in the non-fluoridated cities.

Mortality in selected cities with fluoridated and non-fluoridated water supplies. N Engl J Med. **1978** May 18; 298(20):1112-6 **Erickson JD**.

Mortality rates (for blacks and whites only) in 24 cities with fluoridated and 22 with non-fluoridated water supplies in the United States were compared for the years 1969-1971. During these three years 570,671 deaths occurred in the cities with fluoridated water; the 1970 reference population in those cities was 15,972,817. The figures for the cities with non-fluoridated water were 351,053 and 11,106,746 respectively, so that the crude death rates for all causes were 1190.9 (fluoridated) and 1053.6 (non-fluoridated) per 100,000 person-years. Adjustments for age, sex and race reduced differences for some causes and removed them for others. Further correction, using analyses of covariance for city characteristics that influence mortality, gave adjusted death rates for all causes of 1123.9 and 1137.1, and for malignant neoplasms 195.3 and 196.9, in the cities with fluoridated and non-fluoridated water respectively. I found no evidence of a harmful effect of fluoridation.

2.EVIDENCIA DÉCADA 80S

An examination of the relationship between fluoridation of water and cancer mortality in 20 large US cities. **Smith AH**. N Z Med J. **1980** Jun 11;91(661):413-6.

A comparison of mortality of 10 US cities with fluoridated water supplies compared with 10 non-fluoridated cities has been used as evidence that artificial fluoridation of drinking water causes cancer and has been widely publicised in New Zealand. Several deficiencies are noted in the analysis used by the investigators in this study and it is shown that appropriate analysis of the data from these cities yields additional evidence for the safety of fluoridation. This finding agrees with that from previous examinations of the same data in spite of the fact that they included an error in the mortality report from one city.

Cancer mortality by site and fluoridation of water supplies. **Chilvers C**. **:** J Epidemiol Community Health. **1982** Dec; 36(4):237-42.

Site-specific cancer mortality data for 20 United States cities have been abstracted from United States Government publications to explore further the hypothesis that fluoridation of water supplies causes cancer. Changes in mortality (standardised for age, sex, and ethnic group) between 1958-62 and 1968-72 in 10 fluoridated and 10 non-fluoridated United States cities have been examined. Of the seven sites (or groups of sites) examined, for only one is there a statistically significant difference between the fluoridated and non-fluoridated cities with respect to average change in mortality. This difference, for cancers of the genital organs, favours the fluoridated cities. These data do not provide evidence of a positive association between fluoridation of water supplies and cancer of any of the sites considered.

This is an analysis by the University of California documenting how the pro-fluoridation side distorts the medical statistics. University of California, Davis Department of Mathematics

Davis, California, 95616 May 28, **1980**
Dr. Ernest Newbrun Medical Sciences Bldg. 653 San Francisco, CA 94132
Dear Dr. Newbrun:

Thank you for your telephone inquiry about my course on statistical frauds, and "The Statistical Frauds Group". It was given in The Experimental College at this campus for a number of years. In the course of time, "The Statistical Frauds Group" arose from it. The course and the Group have been dormant for a couple of years, but after my retirement in July 1980, I may revive them. There does seem to be some demand.

We investigated all manner of questionable statements and activities, some qualitative, but most of them quantitative. We conducted interviews and collected published matter, and analyzed all these, using standard statistical procedures.

In addition to deliberate frauds, errors in judgement or method were examined. Often it was difficult to detect if there was a deliberate fraud. We looked over statements by manufacturers or purveyors of consumer goods. But a very copious source was papers in medical research journals. Particularly good examples of blatant statistical misconduct were found in the Public Health Service reports.

The announced opinions and published papers favoring mechanical fluoridation of public drinking water are especially rich in fallacies, improper design, invalid use of statistical methods, omissions of contrary data, and just plain muddleheadedness and hebetude. Many of the blunders were so glaring that I gave them to my beginning freshman classes in statistics at the very first meeting. The students see through them straightway, and are afforded great amusement.Uproarious laughter frequently ensues. No special statistical equipment is necessary to detect those peccancies. Of course the class and the Group soon tired of those infantilities, and sought and foundgreater challenge.

By the way, a study by John Yiamouyiannis and Dean Burke on possible connection between cancer and waterborne fluoride was fairly tightly reasoned. The statistical procedures were standard, and much better applied than in much of the Public Health work.

As I pointed out in a letter published in the proceedings of a congressional committee investigating the above connection, the real point is that direct chemical and controlled experimental research by unbiased uncommitted agencies is urgently indicated. Clearly fluoridation should be discontinued everywhere until definitive results on safety are obtained.

In this connection, a great source of entertainment to the Group was the ferocity with which the researchers attacked any criticism. Invariably they violated in their own work the very principles they insisted on in others' work.

The Group found that corrections for age, race, etc. were applied in a most perfunctory and indiscriminate manner, without regard to whether they appertained to the given situation. The Group found over and over that new, unbiased, research was almost impossible to instigate.

The old "Frauds Group" should be revived and reorganized. If funds are forthcoming, I may consider the undertaking. Every campus should have an invulnerable group that punches holes in stuffed shirts and lets the air out.

If I may help further, please let me know.
Sincerely, (Signed) Hubert A. Arnold, Ph.D.
HAA: mr c.c.: Dr. John Yiamouyiannis Dr. Dean Burke Rep. Delaney, Rep. Vic Fazio, Sen. Edward Kennedy, Sen. S. Hayekawa, Sen. Cranston

3. EVIDENCIA DÉCADA 2000

Belgium prohibits - as the first country in the world - fluoride supplements
July 29, 2002 http://www.nofluoride.com/BelgiumBan.cfm

Fluoride tablets, fluoride drops and fluoride chewing gum, for decades promoted as the crown jewels of dentistry, are going to be taken off the market because they are poisonous and pose a great risk for physical and psychological health. This has been decided by the Federal Minister of Public Health Magda Aelvoet. As soon as the royal decision is published in the government's "Staatsblad", the prohibition will become valid. Thus Belgium becomes the first country in the world to prohibit fluoride supplements.

In a report from 1999 UNICEF complained that certain governments knew insufficiently how poisonous fluoride is - especially for children, as their young organism absorbs more fluoride than an adults'. In the same year HUMO wrote a dossier about the dangers of fluoride (Humo Nr.17/33059, April 20, 1999). We got a lot of reaction at the time, particularly from dentists who, though undoubtedly with good faith, echoed the arguments of fluoride proponents. Then it became quiet around this question again.

But the usefulness of fluoride has been doubted worldwide for a long time already. Over the years at least 12 Nobel Prize winners in Medicine and Chemistry have warned of the associated health risks. To make children take fluoride is not only useless against caries, it is plainly dangerous. Tooth and bone decalcification as a result of fluoride even has a name - fluorosis. Fluoride is very reactive and it goes deep into the bones and cells where it is accumulated. Yes, the tooth surface becomes much harder, but the tooth itself becomes more brittle. From a lot of research it seems that fluoride causes joint problems, skeletal deformations, osteoporosis, and that it can even cause bone cancer. Also the brain cannot escape from it. Fluoride has a negative influence on the nervous system and the immune system, and in children it can lead to (chronic) fatigue, a lower IQ, learning disabilities, lethargy and depression.

GONE & RICH

Sodium fluoride, which is used in the so-called food supplements, is 80 times more poisonous than the naturally occurring calcium fluoride, with which it is often confused even by medical professionals. And - not unimportantly - it is a poisonous waste product of the aluminum and artificial fertilizer industry. Multinationals, like Exxon, US Steel and Alcoa, can get rid of their waste totally legally, and they even get rich from it. Especially in the US does the fluoride lobby everything to add more fluoride to the drinking water. And who has President Bush named as Minister of Finance? Paul O'Neill, head of Alcoa, the biggest aluminum producer in the world.

The industry will follow with argus-eyes what the effects will be of the decision by the Belgian Green Minister. Aelvoet has proposed to the European Commission to prohibit fluoride supplements in all of the European Union, but the Commission thought it was a bit too early: the ban was put on the slow track in expectation that the issue would be "harmonized". Thus for now Belgium is on its own, but experience teaches that if one of the members prohibits a dangerous material, the rest of Europe reluctantly follows suit.

Nevertheless, the industry can still get rid of its toxic garbage: fluoride toothpaste, fluoride mouthrinse, fluoride floss, and even toothpicks with fluoride are not under the scope of the ban. And the dentists are still allowed to smear fluoride onto the teeth of children - how risky this is. The American researcher Dr. Phyllis Mullenix has demonstrated that the same treatment in test animals causes the fluoride levels in the bloodstream to rise to such a degree that the animals within the hour displayed behaviour disturbances. On top of this, there exist all kinds of dental filling materials with fluoride which continuously leaches into the mouth. Dentists use such materials to fill cavities in children's teeth. It is a hallucinatory practice when you know that fluoride is only slightly less toxic than arsenic.

TOBACCO AND FLUORIDE

Although the ban on fluoride supplements is only a first step, it is however a brave decision, and Aelvoet can expect without doubt a lot of wind from the opposite direction in the next fews days, in and out of the country.

MAGDA AELVOET: "Naturally in those sort of issues harmonizing within the European Union is desirable, but I cannot always wait until the European Union is this far. The Belgian High Committee of Health has advised me to prohibit fluoride supplements and I can do nothing else than be content with the scientific arguments with which this advice is backed up. We're going to tell our decision officially to the other European members in the hopes that they will follow us quickly. For years I have been worried about the signals from the scientific world which warned of fluoride use. I have never given fluoride to my own children."

HUMO: "In the meantime, the majority of the Flemish people have swallowed fluoride on a daily basis, and on medical advice to boot. And there are few children who do not know the famous white tablets."

AELVOET: "Once a habit is firmly entrenched and it has a so-called scientific basis, and industry has an associated concern, which in this issue is clearly the case, then it often takes a lot of time, a lot of arguments, and a lot of incentive to turn the tide. Earlier, the tobacco industry also had scientific arguments which made it appear that smoking wasn't harmful."

HUMO: "To make children swallow fluoride, no matter what the source, is a medical mistake of great magnitude, as it is completely useless against caries."

AELVOET: "That fluoride prevents cavities has, in the meantime, been contradicted, yes."

HUMO: "You cannot blame the fluoride industry for not being creative: the market is swamped with fluoride gels, fluoride mouth rinses, fluoride whiteners, fluoride floss, and even fluoride toothpicks."

AELVOET: (surprised) "What? Toothpicks with fluoride? Do they exist as well? Within the limited scope that Europe gives me, I want to end this kind of fluoride use. We will contact the other European members to broaden the base."

HUMO: "Professor Dirk Vanden Berghe, microbiologist at the Antwerpe University UIA, has for decades been an opponent to fluoride. He asks: 'And what will the ministry do about fluoride toothpaste? Children often swallow 30 to 40 per cent of the paste or they get it through the saliva. In this way they often have an overdose of fluoride.' "

AELVOET: "My administration will ask the manufacturers to make toothpaste fluoride-free. But we cannot force them into this. The problem is that toothpaste doesn't fall under food laws, but is regulated under the cosmetics act, which is regulated by Europe. There is a lot of work to do still."

HUMO: "There is more. There exist all kinds of dental filling materials which consistently leach fluoride. These are used officially to fill cavities in children's teeth. One cannot estimate what a child like that absorbs of this poison from the saliva."

FRANS GOSSELINCKX (Cabinet Advisor, Pharmacist) "The prohibition of the fluoride supplements is a sign of things to come. The model 'fluoride helps against tooth decay' is still in the head of nearly all the dentists. We have to start to break this model. They

have now received the first signal from the Minister. Besides, we have only recently learned that these filling materials exist. I am sure that my colleagues in the other member states don't know this yet."

AELVOET: "Then it is high time that we take this on as well. I will take it on at the European level. We have to turn the tide. It will take time but we are going to return fluoride to where it came from."

POISON FOR THE NERVOUS SYSTEM HUMO: "We cite again Professor Dirk Vanden Berghe: 'Now that we are this far that the fluoride supplements will go, the big responsibility is with doctors themselves. We have so many new chronic conditions which are consistently rising in numbers. There are enough studies which make a direct link with fluoride use. The dentists have to warn the parents of their patients that it is careless to use fluoride, no matter what the method. One child will have symptoms of fluoride poisoning early, while in others the bad effects will only show at a later age.' "

AELVOET: "It is only logical that we will inform the medical community about the risks of fluoride."

HUMO: "You have prohibited the use of fluoride supplements, but the pharmacists are allowed to sell them as long as their supply lasts. How do you explain that?"

AELVOET: "The transition period is not meant to appease the pharmacists here. In my other responsibilities - environment and agriculture, we also work this way. For example, if we ban a pesticide then we always introduce a transition period to make the resistance not so big. When we issue a very innovative regulation, as now with fluoride, then the people need time to adapt themselves. At the moment everybody thinks that fluoride is not harmful. Fluoride is a slithering poison; it also slowly creeps into the brain."

GOSSELINCKX: "As soon as the news appears and the prohibition becomes valid, then the Algemeine Farmaceutische Bond (Pharmaceutical Organization) will call us with the question: 'What is all this about?' It will be terrible, but in cases like this, the pharmacists themselves will often take the initiative to return the stock, out of fear that they will get stuck with it."

HUMO: "Professor Vanden Berghe also warns of the new generation toothpastes which contain strontium. Also risk material, he says."
AELVOET: "It's always the same. They want to sell things we can do without, just like we can do without a toothache (laughs)."

HUMO: "Do you think this will be get straightened out in Europe?"
AELVOET: "The European governments are now composed entirely differently than a few years ago. Let's be honest: if it is about what comes first, the health or the economy, then I am afraid we will no longer have a great majority. It will not be easy, but it doesn't mean that we can't start it."

GOSSELINCKX: "We have to keep going until we are fluoride-free."

AELVOET: "Precisely. And in that context I want to give HUMO a compliment: you have played an important role with the 'fluoride dossier' from a few years ago."

- Chris Vermeire and Peter Cremers

UK report recommends further research on water fluoridation and health
September 10, 2002 Susan Mayor London

Further research on the health effects of adding fluoride to drinking water is needed—especially studies of people's total exposure to fluoride, a working group set up by the Medical Research Council recommended in a report published last week.

Fluoride has been added to piped drinking water in some areas of the United Kingdom, as well as in other countries, for several decades to improve dental health. However, public support for the measure has wavered after claims that water fluoridation might be associated with health problems.

The Department of Health asked the council's working group to identify areas of uncertainty on the balance of risks of water fluoridation and to recommend research needed to clarify the situation.

Dr Paul Harrison, acting director of the council's Institute for Environment and Health, Leicester, who chaired the group, said: "There is no reason to think that water fluoridation is responsible for any adverse health effects. But there is a lack of research on some important aspects, which is why we're highlighting the need for more research."

One of the main recommendations made by the working group was to compare the amount of fluoride that the body absorbs from naturally fluoridated water supplies with the amount absorbed from artificially fluoridated water. It has previously been assumed that fluoride absorption from either source was similar.

Members of the working group considered that this was a reasonable assumption but recommended that research be carried out to discover whether there were any differences, including looking at the influence of water hardness on fluoride absorption.

The report also calls for new studies on the extent of dental fluorosis, a condition which affects the appearance of teeth and which is associated with a high intake of fluoride.

Dr Harrison explained: "In the past, people got most of their fluoride from their water. This has changed with the wider use of toothpastes and other dental healthcare products containing fluoride. We need a better understanding of how much fluoride we're all absorbing."

The Department of Health has agreed to commission a project on the absorption of fluoride, in accordance with the report's recommendations.

The report also reviewed a range of health issues relating to fluoride, including cancer, effects on the immune system and on reproduction, and birth defects, which have been anecdotally associated with water fluoridation. It found no evidence linking fluoridation to cancer in general, or to specific cancers, but recommended an updated analysis to provide definitive data on cancer rates since water fluoridation was introduced.

The group found no evidence for associations between fluoridation and other health effects so recommended no specific research, apart from keeping the issues under review.

Dr Harrison considered that the review of water fluoridation was part of a more general effort to involve the public more in policy making. "Scientists and policy makers have realised that communication with the public is important. Communities should be informed and involved in public health measures that affect them."

Estimación de la exposición a fluoruros en Los Altos de Jalisco, México. Roberto Hurtado-Jiménez, M en C; Jorge Gardea-Torresdey, PhD. Salud pública México vol.47 no.1 Cuernavaca Jan./ Feb. 2005

OBJETIVO: Estimar la exposición a fluoruros y riesgos potenciales a la salud humana en Los Altos de Jalisco, México.

MATERIAL Y MÉTODOS: Se midió electroquímicamente la concentración de fluoruros en 105 pozos y seis tomas de agua potable, en los Altos de Jalisco, de mayo a julio de

2002. Se estimó la dosis de exposición y la ingestión total de fluoruros para: bebés de 10 kg, niños de 20 kg y adultos de 70 kg.

RESULTADOS: La concentración de fluoruros en las muestras de agua varió entre 0.1 y 17.7 mg/l. El 45% de las muestras excede el límite permitido por la normatividad (1.5 mg/l). La ingestión total y dosis de exposición a fluoruros estimados están en los rangos de 0.5-18.4 mg/d y 0.04-1.8 mg/kg/d, respectivamente.

CONCLUSIONES: Una parte importante de la población está expuesta a fluorosis dental, fluorosis esquelética y fracturas óseas. Para reducir los riesgos se debe evitar el consumo de sal fluorada, pastas dentales con flúor y agua potable cuya concentración de fluoruros sea mayor de 0.7 mg/l. El texto completo en inglés de este artículo está disponible en: http://www.insp.mx/salud/47/eng

A History of Fluoridation. Fatal Error. The mistaken assumption that led to the misguided practice of water fluoridation.
http://www.saynotofluoridation.org.nz/history.html Nov. **2005**

The early observations which eventually led to fluoridation were made from 1901 in communities where inhabitants showed an unsightly brown staining on the teeth, known as "Colorado Brown Stain", now know as dental fluorosis. It was also observed that those parts of the teeth not affected by this condition seemed particularly resistant to decay. In fact later review of such communities showed that the improved dental health was related to calcium and phosphorus levels, not the fluoride level. (Tooth enamel is made of calcium and phosphorus, not fluoride).

It wasn't until 1931 that analytical techniques determined that all these communities had fluoride levels in drinking water of 2.5 ppm or more, some as high as 8ppm.

The understandable assumption was made that these phenomena were due to the ingestion of the water. After all, all nutrients were assimilated into the body by ingestion, digestion, uptake into the blood, and incorporation into the bodily tissue: there was no reason to believe that fluoride was any different.

Harvard Study Shows Fluoridation-Cancer Link New York -- April 7, **2006** -- Fluoridation is linked to bone cancer (osteosarcoma) in young boys reports the May 2006 Harvard peer-reviewed journal, "Cancer Causes and Control." http://www.americansdiscusshealth.org/node/594?PHPSESSID=71759e77008ea1ac49ae3be62c7ceb6c

This fluoridation-cancer study, by Elise Bassin, PhD and colleagues, follows on the heels of the National Academy of Sciences National Research Council's (NRC) report revealing the scientific evidence showing how fluoridation can harm subsets of the population.

"Monitor your own intake. [high water drinkers], the elderly and people with severe renal deficiency who have trouble excreting fluoride in their urine are likely to have increased bone-fluoride concentrations," reports the Chicago Tribune. High fluoride levels damage bones and teeth.(2)

Many studies link fluoride to cancer. Examples:

1954 Taylor reports more tumors and shorter lifespan in fluoride treated mice. (3)

1956 Landmark 10-year Newburgh/Kingston fluoridation study shows more cortical bone defects (a suspected precursor to osteosarcoma) in children drinking fluoridated water. (4)

1977 Burk-Yiamouyiannis show cancer death rates in the 10 largest fluoridated U.S. cities were higher and rose faster vs. the 10 largest nonfluoridated U.S. cities after corrections for age, race, and sex.. (5)

1977 National Academy of Sciences expresses concern about a possible water fluoridation/osteosarcoma link based on the Newburgh /Kingston cortical bone defect evidence. (6)

1977 Congressional hearings based on the Burk/Yiamouyiannis findings lead to fluoride cancer testing in rodents by the National Toxicology Program (NTP) (6)
1990 NTP reports fluoride is an "equivocal" (may or may not) cause of cancer. EPA drinking water senior toxicologist, William Marcus PhD, reports results were suspiciously downgraded in the final report.(7) Marcus was fired for stating the truth but rehired with back pay under the whistle-blower's act.

1990 National Cancer Institute finds more osteosarcoma in young males in fluoridated vs unfluoridated areas; but finds cause to dismiss the results.(6)
1990 Procter & Gamble (P&G) makes public a 1981-1983 study showing more bone tumors in fluoride-treated rats but claims they were not statistically significant. Another P&G study finds a significant increase in benign bone tumors in fluoride treated mice. (6)

1992 New Jersey Department of Health study shows osteosarcoma rates higher among young males in fluoridated vs unfluoridated regions of New Jersey (6). The report's title was changed to obscure connection to fluoridation.
1993 Yiamouyiannis' analysis of National Cancer Institute's cancer data confirms fluoridation/osteosarcoma link in males.(6)

2002-2005 Chester Douglass, Elise Bassin's Harvard dissertation advisor, issues a report to his research funders at the National Institutes of Health in 2003 in which he concludes there is no link between fluoridation and bone cancer. He references Bassin's thesis in support of his statement despite her conclusions which directly contradict his claim.(9) Douglass also makes the same misrepresentation in an earlier presentation to the British Fluoridation Society in 2002. In 2005, Douglass becomes the subject of a joint federal and Harvard ethics investigation. (10)

2006 NRC Panel finds cancer/fluoride link plausible.

2006 (May issue) Bassin's osteosarcoma/fluoridation study is published in "Cancer Causes and Control," along with a letter to the editor from Chester Douglass who cites unpublished, unfinished, non-peer-reviewed data in an attempt to downplay Bassin's peer-reviewed published findings of a significant link between osteosarcoma in boys and water fluoridation.

"EPA has more than enough evidence to shut down fluoridation, right now, with a special advisory," says retired EPA scientist, Robert Carton, PhD. "The safe drinking water act requires the EPA to act to protect all populations from known or anticipated harm (8)," says Carton.

Contact: Robert Carton, PhD., bcarton@verizon.net
SOURCE: NYS Coalition Opposed to Fluoridation, Inc
PO Box 263
Old Bethpage, NY 11804
http://www.orgsites.com/ny/nyscof
http://www.FluorideAction.Net nyscof@aol.com

References:

1) "Age-specific fluoride exposure in drinking water and osteosarcoma (United States), by Bassin et al, Cancer Causes Control, May 2006

2) "Researchers pour dose of worry in fluoridated water," Julie Deardorff, April 2, 2006, http://www.chicagotribune.com/features/lifestyle/health/chi-0604010266apr02,1,4385156.story?coll=chi-health-hed

3) Taylor, A: Sodium Fluoride in the Drinking Water of Mice. Dent. Digest, 60:170-172, 1954

4) Schlesinger E. R. et al.: "Newburgh - Kingston Caries - Fluorine Study. XIII. Pediatric findings after ten years", J. Am. Dent. Assoc. 52 (1956) 296;

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6) http://www.fluoridealert.org/health/cancer/osteosarcoma-timeline.html

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After reviewing health effects studies, EPA sets a Maximum Contaminant Level Goal (MCLG), the maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, and which allows an adequate margin of safety. MCLGs are non-enforceable public health goals. Since MCLGs consider only public health and not the limits of detection and treatment technology, sometimes they are set at a level which water systems cannot meet. When determining an MCLG, EPA considers the risk to sensitive subpopulations (infants, children, the elderly, and those with compromised immune systems) of experiencing a variety of adverse health effects.

9) http://www.ewg.org/issues_content/fluoride/20050627/pdf/NIEHS_final_report.pdf

10) Environmental Reporting Group Harvard Study: Strong Link Between Fluoridated Water and Bone Cancer in Boys - Department Chair With Industry Ties Misrepresented Results to Federal Authorities, April 5, 2006

Metropolitan Water District of Southern California-USA. October 2007
In October 2007, the Metropolitan Water District of Southern California is scheduled to join a majority of the nation's public. Water suppliers in adding fluoride to drinking water in order to prevent tooth decay. In line with recommendations from the California Department of Public Health, as well as the U.S. Centers for Disease Control and Prevention, Metropolitan will adjust the natural fluoride level in the water, which ranges from 0.1 to 0.4 parts per million, to the optimal range for dental health of 0.7 to 0.8 parts per million. Fluoride levels in drinking water are limited under California state regulations at a maximum dosage of 2 parts per million. http://www.mwdh2o.com/fluoridation/ Resumen de Datos Preguntas Más Frecuentes

New York State may Waste Medicaid Dollars on Fluoridation/Pew Foundation (http://www.pewtrusts.org/) to Force Fluoridation in NYS?. Dec 7, 2011

New York – Dec 7, 2011 --The NYS Department of Health proposes to spend Medicaid funds on fluoridation equipment, supplies and staff (1) despite clear evidence that fluoridation fails to prevent tooth decay in NYS and can be health-harming. Many NYS cities and counties have already rejected fluoridation, reports the NYS Coalition Opposed to Fluoridation, Inc. (NYSCOF).

NY City spends $25 million on fluoridation annually (2). Yet, tooth decay is rampant in NYC's low-income population (3). Further NYS DofH statistics show that highly-fluoridated NYS counties don't have less tooth decay and fluoridation has not leveled out tooth decay between lower and higher income children (4).

Further, in 1990, the NYS DofH published a study, "Fluoride: Benefits and Risks of Exposure," alerting officials that fluoride can be harmful to kidney patients, diabetics and those with fluoride hypersensitivity even at "optimal" levels. (4a)

NY City Council Member Peter Vallone, Jr. co-sponsored legislation to stop fluoridation in NYC (5). And a NYC resolution is pending "calling on the NYS Department of Health to remove fluoride from NYS's water supply." (6)

A unique NYS law requires elected officials make fluoridation decisions to disallow mandates by a single non-elected entity e.g. Health Commissioner, as almost happened in Suffolk County in the 1990's until residents fought successfully to reject fluoridation.

However, it appears the multi-billion dollar Pew Charitable Trust wants to overturn that law so fluoridation can be forced on municipalities without citizen input, according to a Pew sponsored website, owned by a Public Relations company. (7)

Long Island (Nassau and Suffolk Counties) is the largest non- fluoridated area in otherwise 73% fluoridated NYS and tops the Pew's fluoridation "hit" list (8) even though the Suffolk County Water Authority "vehemently" opposes water fluoridation (9). And Long island Water Conference Chairman Karl Schweitzer says, "Studies have shown that adding fluoride provides limited or no benefit to dental health." (10)

Will Pew Bulldoze NY democracy as they have elsewhere?

Pew thwarted Arkansas democracy by paying lobbyists to convince novice state legislators to quickly pass a statewide fluoridation law, using incorrect information, without citizen input and over-riding citizen referenda in several Arkansas cities which rejected fluoridation repeatedly (11).

Despite government cautions to avoid mixing infant formula with fluoridated water (12) a Pew representative urged the Austin City Council to conceal this information (13).

"Pew decided to protect fluoride instead of babies," says attorney Paul Beeber, NYSCOF President.

Low-income New Yorkers aren't fluoride deficient but many are dentist deficient because fewer than 25% of NYS dentists accept Medicaid patients (14).

Further, in 1990, the NYS DofH published a study, "Fluoride: Benefits and Risks of Exposure," alerting officials that fluoride can be harmful to kidney patients, diabetics and those with fluoride hypersensitivity even at "optimal" levels. (15)

The Centers for Disease Control reports that over 41% of adolescents now suffer with fluoride damaged (discolored) teeth – 4% of it is moderate or severe. At the same time tooth decay rates are increasing in toddlers and untreated tooth decay has become epidemic.

A recent San Antonio, TX, news report revealed "After 9 years and $3 million of adding fluoride, research shows tooth decay hasn't dropped among the poorest of Bexar County's children. It has only increased—up 13% in 2010."(16) Tooth decay hasn't declined in fluoridated Gainsville, Florida (17) or fluoridation state-mandated Kentucky (18) Actually tooth decay crises are occurring in all fluoridated cities, states and countries (18)

"Fluoridation should be terminated; not funded and promoted," says Beeber. "To propose that Medicaid funds be wasted on fluoridation, placing more New Yorkers in harm's way, is unconscionable, unethical and should be illegal," says Beeber "Further, Pew should be embarrassed to sully its name and reputation by associating with over-zealous and misinformed fluoridationists," says Beeber.

Fluoride's Adverse Health Effects Database: http://www.FluorideAction.Net/health
SOURCE: New York State Coalition Opposed to Fluoridation, Inc.

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http://www.gainesville.com/article/20111203/ARTICLES/111209857/-1/ent...

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18) http://www.FluorideNews.Blogspot.com

Heated debate over fluoride meeting; public meeting Jan. 25
By Sean Meyer/London Community News Friday, January, 13, 2012 - 7:07:04 AM (http://www.londoncommunitynews.com/2012/01/heated-debate-over-fluoride-meeting-public-meeting-set-for-jan-25/)

If the upcoming public participation meeting on fluoride becomes as heated as debate over its format, there could be fireworks inside Centennial Hall on Jan. 25.

During the council meeting on Jan. 10, councillors were passing the minutes of the most recent Civic Works Committee, when Ward 4 Councillor Stephen Orser brought the subject of the public participation meeting to the floor.

Orser, who stated he is taking an anti-fluoridation position on the subject, put forward a motion to allow more time to speakers than the five minutes chairman and Ward 12 Councillor Harold Usher has previously said he was going to allow. Orser wanted to extend that time for individuals, giving experts up to 20 minutes, and also opening up the meeting to questions.

Although council would eventually vote down Orser's amendments, he first stated his position by suggesting five minutes would be insufficient time given the complexity of the subject.

"My concern is apparently there are going to be experts brought in from Calgary that are against the fluoridation of water. Five minutes of time is not appropriate," Orser said. "I would also like to have the ability as a member of council, at this public participation meeting, to question experts while it is fresh, not after the whole thing is over."

Ward 10 Councillor Paul Van Meerbergen, who presided over the meeting after Mayor Joe Fontana left, cut off Orser from further discussion on the fluoride issue.

"We are getting into the whole fluoride debate now," Van Meerbergen said. "I think we can all appreciate why you might want to hear more from experts, but to get into he debate now is not in order."

Ward 8 Councillor Paul Hubert said he was sympathetic about Usher's position in dealing with what will likely be a large crowd. However, he was far more concerned with just who, besides London residents, may be showing up to speak at the meeting.

"In a public participation meeting, who is the public? When I hear about flying people in from Calgary. . . that is not the public I expect to be speaking," Hubert said. "When does the public become a lobbyist? Let's have a public participation meeting, but I want to hear from the public in London."

City clerk Cathy Saunders clarified the situation by saying a member of the public is essentially anyone who comes to the meeting, regardless of where they might live. Saunders also pointed out it is up to the chair of a committee to make the rules on how a meeting is to be run — although the rest of the committee could still challenge the decision.

Although the procedural question was answered, Hubert also spoke as to whether it was appropriate for a member of council to be stating their position before the public participation meeting even took place.

"Councillor Orser made the comment that he has made a decision. We have to be — it is our obligation to be — open to persuasion," Hubert said. "I am just reminding council we have to be open minded about these things."

Orser took offence to the question, seeing it as a suggestion he was working with a lobby group. In fact, he became so upset, Van Meerbergen had to repeatedly tell him he was out of order.

Still upset, Orser said he was simply trying to find out as much information as possible, something he suggested wasn't the case with all of his fellow councillors.

"I was speaking honestly to council that I have concerns with what I have been finding out," Orser said. "And I will be honest, a number of members around this horseshoe have been ducking the information that has been coming forward. Not everybody, but a few."

After getting back control of the meeting, Van Meerbergen asked city solicitor James Barber to clarify what the responsibilities of councillors are heading into a public meeting.

"Council, in relation to its bylaws, is exercising a legislative function. When it holds a public participation meeting . . . it is entitled to get whatever information comes forward at that meeting," Barber said. "The general law with respect to council is that members cannot be biased. They are biased when they indicate, that with respect to a particular matter, they are not amendable to persuading."

Prior to the vote being held on Orser's proposed amendments, Usher said he wanted to limit speakers to five minutes to prevent the meeting — which is expected to draw a large crowd — from running any longer than necessary.

In addition, Usher also said a public participation meeting is not a debate, but rather a venue for the public to make presentations and provide information.

"On occasions like this, we will have a multitude of people. We cannot afford to have everybody asking questions or we will never get finished," Usher said. "There have to be rules and I, as chair, set the rules for my public participation meeting."

DEBATE CIENTÍFICO SOCIAL EN LOS 90S

Statistical analysis

Consider the following example of a social-scientific debate: During the 1990s, there was a precipitous decline in violent crime in the United States. Many social scientists naturally began to apply themselves to the question of why this had occurred, i.e., they set out to explain the phenomenon. A number of different hypotheses were advanced: the hiring of more police, changes in community policing practices, more severe sentencing guidelines for offenders, decreased tolerance for minor infractions, an increase in religiosity, a decline in the popularity of crack, changes in the demographic profile of the population, etc. Since the decline in crime occurred in many different jurisdictions, each using some different combination of strategies under different circumstances, it is possible to build support for different hypotheses through purely statistical analysis. For example, the idea that policing strategies play an important role is contradicted by the fact that New York City and San Francisco adopted very different approaches to policing, and yet experienced a similar decline in the crime rate. Thus a very sophisticated debate broke out, with different social scientists producing different data sets, and crunching the numbers in different ways, in support of their rival hypotheses.

This debate, like almost every debate in criminology, lacks microfoundations. It would certainly be nice to know what is going through people's mind when they commit crimes, and thus how likely various measures are to change their behavior, but the fact is we do not know. Indeed, there is considerable skepticism among criminologists that a "general theory" of crime is possible. Nevertheless, we can easily imagine criminologists deciding that one particular factor, such as a demographic shift in the population (i.e., fewer young men), is the explanation for the late-20th century decline in violent crime in the United States, and ruling out the other hypotheses. And even though this may be a "half-way" explanation, there is no question that it would represent a genuine discovery, one that we could learn something important from.

Furthermore, it is not obvious that the "rock-bottom" explanation – the one that satisfies the precepts of methodological individualism – is going to add anything very interesting to the "half-way" explanation provided by the statistical analysis. In many cases it will even be derived from it. Suppose that we discovered, through statistical analysis, that the crime rate varied as a function of the severity of punishment multiplied by the probability of apprehension. We would then infer from this that criminals were rational utility-maximizers. On the other hand, if

studies showed that crime rates were completely unaffected by changes in the severity of punishments or the probability of apprehension, we would infer that something else must be going on at the action-theoretic level.

Results at the action-theoretic level might also prove to be random or uninteresting, from the standpoint of the explanatory variables. Suppose it turns out that the decline in crime can be explained entirely by demographic change. Then it doesn't really matter what the criminals were thinking – what matters is simply that a certain percentage of any given demographic group has the thoughts that lead to criminal behavior, so fewer of those people translates into less crime. The motives remain inside the "black box" – and while it might to nice to know what those motives are, they may not contribute anything to this particular explanation. In the end, it may turn out that each crime is as unique as the criminal. So while there is a concrete explanation in terms of actual people's intentional states, there is nothing that can be said at the level of a general "model" of rational action. (In this context, it is important to remember that methodological individualism in the Weberian sense explains actions in terms of a model of the agent, not the actual motivations of the real people.)

Fuente: Heath, Joseph. Methodological individualism.The Stanford Encyclopedia of Philosophy (Winter 2009 Edition), In In Zalta, E. N. Ed. http://plato.stanford.edu/entries/methodological-individualism/. *First published Thu Feb 3, 2005; substantive revision Tue Nov 16, 2010.*

CIENCIA Y LIBERTAD DE EXPRESIÓN

Is Science Censored? Ideology may influence what studies get published. Sept. 1992 issue Newsweek. Sharon Begley. Disponible en:
http://www.nofluoride.com/newsweek_censored.htm

This is how science works? Despite its objective face, science is as shot through with ideology as any political campaign, and now that dirty secret is coming out. The party line is that papers submitted to journals are rejected only for reason s of substance-the methodology is suspect, the data don't support the conclusions, the journal has better papers to use. But lately scientists have been privately fuming over rejections they blame on censorship. And this summer, the issue exploded in public.

One leading cancer journal, for instance, recently published an industry study concluding that the fluoride added to drinking water does not increase the risk of cancer in lab animals. That same journal rejected a government study, by researchers at the National Institute of Environmental Health Sciences, that reported an increase in rare bone cancers among male rats fed fluoride. The journal explained that it does not publish lab-animal studies anymore. "No one wants to touch this," says toxicologist James Huff of NIEHS about the persistent evidence that fluoride poses some hazard.

Chalmers hasn't made many friends at science journals by opening this debate, but some researchers applaud him. "He's made statements about something that is very, very disturbing," said toxicologist Ellen Silbergeld of the University of Maryland. "[Suppression of studies] is particularly vicious when they concern public-health issues." But the risk that censorship poses to public health may be the least of it. If science loses its reputation for probity, its conclusions will carry no more weight than any interest group's.

The Bush Administration's Censoring of Science. Si lo desea puede ver y escuchar los siguientes videos sobre cambio climático y la posición de James Hansen-NASA. (Tema cambio climático y censura de gobierno de USA).
http://www.youtube.com/watch?v=s8F6OSCcB8o
http://www.youtube.com/watch?v=lJgoeXDhdLQ&feature=BFa&list=PLE1D022472C02AF34&lf=PlayList
http://www.youtube.com/watch?v=LPbYFb8O4ag&feature=BFa&list=PLE1D022472C02AF34&lf=PlayList
http://www.youtube.com/watch?v=lZH7S4gxxro&feature=BFa&list=PLE1D022472C02AF34&lf=PlayList

American Association for the Advancement of Science (AAAS-Boad of Directors). *Statement of the Board of Directors of the American Association for the Advancement of Science Regarding Personal Attacks on Climate Scientists.* AAAS Board of Directors 28 June 2011. Disponible en http://www.aaas.org/news/releases/2011/media/0629board_statement.pdf

We are deeply concerned by the extent and nature of personal attacks on climate scientists. Reports of harassment, death threats, and legal challenges have created a hostile environment that inhibits the free exchange of scientific findings and ideas and makes it difficult for factual information and scientific analyses to reach policymakers and the public. This both impedes the progress of science and interferes with the application of science to the solution of global problems. AAAS vigorously opposes attacks on researchers that question their personal and professional integrity or threaten their safety based on displeasure with their scientific conclusions. The progress of science and protection of its integrity depend on both full transparency about the details of scientific methodology and the freedom to follow the pursuit of knowledge. The sharing of research data is vastly different from unreasonable, excessive Freedom of Information Act requests for personal information and voluminous data that are then used to harass and intimidate scientists. The latter serve only as a distraction and make no constructive contribution to the public discourse.

Scientists and policymakers may disagree over the scientific conclusions on climate change and other policy-relevant topics. But the scientific community has proven and well-established methods for resolving disagreements about research results. Science advances through a self-correcting system in which research results are shared and critically evaluated by peers and experiments are repeated when necessary. Disagreements about the interpretation of data, the methodology, and findings are part of daily scientific discourse. Scientists should not be subjected to fraud investigations or harassment simply for providing scientific results that are controversial. Most scientific disagreements are unrelated to any kind of fraud and are considered a legitimate and normal part of the scientific process. The scientific community takes seriously its responsibility for policing research misconduct, and extensive procedures exist to protect the rigor of the scientific method and to ensure the credibility of the research enterprise.

While we fully understand that policymakers must integrate the best available scientific data with other factors when developing policies, we think it would be unfortunate if policymakers became the arbiters of scientific information and circumvented the peer-review process. Moreover, we are concerned that

establishing a practice of aggressive inquiry into the professional histories of scientists whose findings may bear on policy in ways that some find unpalatable could well have a chilling effect on the willingness of scientists to conduct research that intersects with policy-relevant scientific questions.

PREGUNTAS ORIENTADORAS PARA EL FORO

Utilizando como referencia las publicaciones compiladas en el presente docuemento el grupo responderá y debatirá sobre las siguientes preguntas.

Datos, métodos y análisis estadístico

1. ¿Cuál es la problemática en discusión? ¿Cómo llegó a esa conclusión?
2. ¿Es el tema central de la discusión académica, política, económico, una mezcla de las tres?
3. ¿Desde cuándo se está discutiendo sobre el tema?
4. ¿Por qué existen múltiples puntos de vista?
5. ¿Es un problema de datos, de métodos, de tecnología?
6. ¿Existe interés de alguna de las partes en cuanto a que alguno de los escenarios prevalezca?
7. ¿Cuáles son los argumentos científicos, estadísticos?
8. Después de leer todas las publicaciones; ¿Cómo reformularía usted la pregunta inicial? "¿Cuál es la problemática en discusión?)"
9. ¿Cuál es su posición con respecto a la siguiente afirmación?: "Lo que consideramos conocimiento depende de lograr un acuerdo con otros científicos, y esto, puede estar asociado a aspectos no científicos como la financiación, el estatus o la capacidad de persuasión".

Aplicaciones de política:

1. ¿Cuál sería su recomendación al ministro de Salud de su país sobre fluorar o no agua basado en la evidencia del material leído? ¿Se aplica flúor al agua en su país?
2. ¿Cuál sería la recomendación sobre fluorar o no agua basado en la evidencia más antigua?
3. ¿Cuál sería la recomendación sobre fluorar o no agua basado en la evidencia más reciente? ¿Qué pasaría si la publicación más reciente fuese patrocinada por una empresa que vende equipo para fluorar agua?

CASO DEBATE CIENTÍFICO SOCIAL EN LOS 90S

¿Qué similitudes se observan entre el caso del "flúor" y lo expuesto en la sección "Debate científico social en los 90s"?

Informe

Considerando lo expuesto en las siguientes dos páginas sobre "**Lecciones aprendidas**", cada estudiante o grupo de dos estudiantes preparará un informe sobre sus lecciones aprendidas.

Lecciones aprendidas

No existe una definición simple y única del concepto de lección aprendida. Sin embargo, podemos entenderla como el conocimiento que surge de una experiencia concreta y que la persona/institución/organización considera valiosa y útil como guía o información para futuros proyectos o acciones. El objetivo es "aprender de la experiencia", transformando el aprendizaje en mejoras concretas que serán puesta en práctica en actividades en curso o futuras. Por ejemplo, al referirnos a una experiencia exitosa, se deben documentar tanto los elementos que conllevaron al éxito como las dificultades y obstáculos encontrados y, especialemente, cómo se resolvieron los mismos.

Para el Banco Asiático de Desarrollo (ADB) las lecciones aprendidas son "descripciones concisas de conocimiento derivado de la experiencia que pueden ser comunicadas a través de métodos y técnicas tales como la narración de historias, reportes breves o sistematizadas en bases de datos. Estas lecciones frecuentemente reflejan qué fue hecho bien, qué debería haber sido hecho de otra manera, y cómo debería ser mejorado el proceso para ser más efectivo en el futuro." (Asian Development Bank 2007)

Según la OECD/DAC, se trata de "generalizaciones basadas en las experiencias de evaluación de proyectos, programas o políticas en circunstancias específicas, que se aplican a situaciones más amplias. Con frecuencia, las enseñanzas destacan los puntos fuertes o débiles en la preparación, el diseño y la puesta en práctica que afectan al desempeño, los resultados y el impacto de los proyectos, programas o políticas." (OECD-DAC 2002).

Para que las lecciones aprendidas sean pertinentes y útiles, éstas deben poseer las siguientes características (BID 2008):

1. **Aplicables**: Deben tener un impacto positivo real o potencial en la persona, empresa, institución o grupo social que las uitilice.
2. **Válidas:** Deben estar sustentantadas en hechos verdaderos y por ende verificables por otros.
3. **Significativas:** Las lecciones aprendidas se dan un contexto temporal, social, cultural, organizacional y por lo tanto deben comunicar con claridad, precisión y sencillez el mensaje central utilizando términos o conceptos que el interlocutor considere importantes, de valor o relevantes; o sea debe ser un aprendizaje con sentido. Esto significa que las lecciones aprendidas no son necesariamente universales.

4. **Direccionalidad o propósito**: Las lecciones aprendidas tienen como fin o propósito compartir nuestras experiencias con la convicción de que esto ayudará a otros a no cometer los mismos errores; aumentando de esta manera nuestro aservo de conocimiento practico con la esperanza de que deriven en "mejores prácticas".

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