

THE SUPERIOR COUNCIL FOR PUBLIC HEALTH OF FRANCE
WATER SECTION
SEANCE OF NOVEMBER 7 2006
REQUEST FOR ADVICE ON THE RISKS ASSOCIATED WITH the USE OF
ULTRAVIOLET LAMPS FOR DECHLORINATION OF WATER IN PUBLIC
SWIMMING POOLS: PRODUCTION OF HALOFORMES IN THE SWIMMING
POOL WATER AND THE EVOLUTION OF THE PROCEDURES FOR
AUTHORISATION OF THESE PROCESSES

OPINION

The higher Council of public health of France and its extended circle of advisors have heard and after discussion, consider

- that the use of processes using ultraviolet radiation (UV) for dechlorination of water in public swimming pools (hereafter referred to as " UV déchlorinateurs ") is subject to authorisation by the minister in charge of health following advice from the Council for public health in France (CSHPF),
- that the CSHPF has already pronounced its views about four applications for authorisation of use of such processes and that four personal applications for authorisation are currently under consideration.
- that several documents emanating from the National Institute for Research were transmitted to the Directorate-General health (DGS), during 2005 concerning:
 - o the pertinence of use of techniques of UV irradiation for elimination of chloramines produced in water
 - o Their work relating to the study of the risks of formation of trihalométhanes (THM) in swimming pool water
- that in December 2005, the DGS transmitted two documents to the Water Section focussing on the influence of "UV dechlorinateurs" on the concentrations of chloroform and nitrogen trichloride (NCl₃) in the water of several public swimming pools:
 - o a publication by Cassan and Al in the 'Chemosphère' review, focussing on the effects dechlorinateurs using of medium pressure UV lamps on the quality of swimming pool water;
 - o a communication by Gerardin et al. in an internal review of the INRS on the monitoring of the evolution of the concentration of chloroform and nitrogen trichloride in bathing water in an aquatic centre;
- that the opinion of the CSHPF is requested initially on
 - o the impact of UV irradiation on the chemical characteristics of swimming pool water of treated by chlorination products at normal dosage rates, in particular the risk that this irradiation could lead to an increase in the content of THMs and of chloroform in particular both in the water and in the air:
 - o the eventual risk to the health of bathers or to personnel linked to the use of "UV dechlorinateurs ", in particular because of an increase in the content of THM's in the water or in the air;
- that in accordance with article D.1332-2 of the code of public health: "the water of the swimming pools must be in conformity with the following physical, chemical and microbiological standards (the norms) :

1. CASSAN D., DRAPER B, CASTEX F, RAMBAUD A., "Effects of medium -pressure UV lamp irradiation on water quality in chlorinated indoor swimming pool", 2006, Chemosphère, vol. 62, no9, pp. 1507-1513
2. GERARDIN F, HECHT G, HUBERT-PELLE G, SUBRA L, "UV Treatment: monitoring of the evolution of the concentrations of chloroform and of nitrogen trichloride in bathing water of an aquatic centre ", INRS, Hygiene and Occupational safety – file of documentary notes - n° 201 (December 2005).

- it does not contain substances of whose concentration would be likely to damage the health of bathers
- the pH lies between 6,9 and 8,2;
- the number of revivifiable aerobic bacteria at 37° C in one millilitre is lower than 100;
- the total number of coliforms in 100 millilitres is lower than 10 with absence of fecal coliforms in 100 millilitres;
- it does not contain pathogenic germs, in particular no pathogenic staphylococcus in 100 ml for 90 % of the samples "
- that in accordance with the decree modified on 7th April 1981 determining the applicable technical provisions for swimming pools, when chlorinated products are used " pool water [...] must have: [...] a total chlorine content not exceeding 0,6 milligram per litre above the free chlorine content ",
- that the current regulation does not set any standard in respect of total organic carbon (TOC), THM's, haloformes and chlorides in water of public swimming pools
- that the World Health Organization (WHO) recommends that the content of THM's in water of swimming pools should not exceed the value of 100 µg/L

1. In response to the communication of the INRS and the publication of Cassan et Al

- a) In response to the communication of the INRS, note that:
 - the results seem to indicate a tendency to wards an increase in the concentration of THM's in water;
 - nevertheless these results having been the subject of no statistical processing, no significant statistical differences can be determined
 - the interpretation of the results obtained is rendered difficult because of the insufficient duration of the study and the operating conditions of "the UV dechlorinators " introducing a bias in the study
- b) In response to the publication of Cassan and Al, note that:
 - the results were analysed statistically and suggest an important increase in the concentration of chloroform in water;
 - measurements of free chlorine concentration show a good control of chlorination;
 - the results show a good reduction of combined chlorine under the UV irradiation
- c) note that these results are difficult to interpret because of the many factors influencing the concentration of THM's in water of swimming pools and, in the very first place, the attendance of the pools, the rate of renewal of water and the free chlorine level maintained in the water of the pools;
- d) observe that the increase in the chloroform concentrations (CHCl₃) in water seems to depend on the amount of UV irradiation (new lamps in the experiment by Cassan and Al and lampes presenting 60 à 70.% of output in the experiment by Gerardin et al..) but that the variable factors extend well beyond this data
- e) determine that UV irradiation is accelerating the decomposition of organic chloramines, the use of "UV dechlorinators" should lead to a temporary increase in the pool of the concentration of the precursors of haloformes;
- f) consider it regrettable that these studies do not provide comparative data over sufficiently long to be able to extend beyond the initial transitory periods following commissioning of the "UV dechlorinators";

- g) otherwise note that, at the time of the two experiments, the concentrations of THM's in the water were always lower than the value of 100 µg/L recommended by WHO for swimming pool water
- h) show that the results of these studies do not make it possible to conclude that the risk that UV irradiation of swimming pool water leads to an increase in the concentration of THM's and in particular of chloroform, in water and the air, beyond the limited period associated with commissioning

2. In respect of the follow-up to the aforementioned studies

- a) consider that the contents of THM can be explained in particular by the action of UV irradiation on the organic matter present in the water of the pools, emitted by certain "UV dechlorinators" using lamps whose spectrum is lower than 230 Nm;
- b) show that for this reason that it would be appropriate:
 - o to undertake complementary studies allowing to evaluate, according to the dose and the spectrum of the lamp, the influence of UV irradiations on the production of THM's and others by-products of disinfection by chlorination, by distinguishing the cases where the UV lamps used are of
 - either low pressure type or
 - medium pressure with or without control of wavelengths lower than 230 Nm;
- c) consider, in addition than it would be advisable to undertake these studies on the same site, in strictly controlled conditions and according to a protocol validated by acknowledged experts, for a minimum 2 months duration without lighting the lamp with radiation UV then 2 months with UV action in order that the greatest number of parameters are controlled;
- d) underline the need to have an evaluation of the risks undertaken by the different categories of users of the swimming pools in relation to the haloforms in the water of the swimming pools, in order to fix a maximum permissible concentration (CMA) for THM's

3. In respect of conditions for authorisation of use of processes using UV lamps for dechlorination of swimming pool water

- a) consider that if "UV dechlorinators" facilitate good reduction of the concentration combined chlorines, they should in no case to be used with an aim of reducing the water renewal rate that were in use before the installation of the déchlorinators;
- b) consider that the results of the aforementioned studies and the elements of data currently available do not justify withdrawal of the authorisations already granted by the ministry of Health for the use of certain "UV dechlorinators", taking into account the fact that:
 - o the link between UV irradiation of swimming pool water and an increase in the concentration of THM's in water is not yet established and that the concentration of THM in water depends on many other factors;
 - o the authorisations were granted with certain reserves relative in particular to

the water renewal rate that should make it possible to decrease the concentrations of certain substances such as the THM's

- concerning the nature of information required by the applicant in application for authorisation of use of these devices, requires: -
 - information on the extent of the spectrum emitted by the lamp and its photonic power;
 - information ensuring that the conditions of use recommended for the equipment are not susceptible to inducement of an uncontrolled increase in the water of the following parameters: total organic carbon (TOC), haloformes, chlorides;
 - test results carried out over two successive periods, including one of 2 months (minimum) with UV irradiation in situations of identical attendance and treatment. These tests will include in particular the monitoring, at a frequency at least twice-weekly:
 - TOC, chlorides and THM's in the pool water;
 - nitrogen trichloride and THM's in the air;
 - renewal rate of the water of the pools and air of the enclosures;
- c) In respect of the conditions of use which the managers of the swimming pools must observe for a process authorised by the ministry of health to use UV lamps for dechlorination of water in public swimming pools. We ask that, whilst waiting for complementary studies:
 - at the time of the use of "UN dechlorinators UV", of measurements are carried out of:
 - TOC, chlorides and THM's in the water of the pools on at least a monthly basis
 - nitrogen trichloride and THM's in the air, once per six-month period,
 - the concentration of THM's do not exceed a value of 100 µg/L recommended by WHO,
 - the water renewal rate is not lower than those existing before the use of the UV equipment and, in any event, never lower than the guiding value of 30L per bather per day,
 - the managers maintain or if necessary, increase the air renewal rate relative to that existing before the use of the UV equipment

4. Recommendation to the administrators:

- to require applicants having already received an approval for their apparatuses to provide results of measurement of THM's in water
- to specify by circular the conditions of use of these processes so that the managers of public swimming pools use these devices correctly.:

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