EUROPEAN COMMISSION
HEALTH & CONSUMER PROTECTION DIRECTORATE-GENERAL

Directorate C - Scientific Opinions
C2 - Management of scientific committees; scientific co-operation and networks

Brussels, C2/VR/phosp/10032003D(03)

OPINION OF THE SCIENTIFIC COMMITTEE ON TOXICITY, ECOTOXICITY AND THE ENVIRONMENT (CSTEE) ON

"WRc report on the impact on the environment (reduction in eutrophication) that would result from substituting phosphates in household detergents"

WRc Ref: UC 4011
June 2002

Adopted by the CSTEE by written procedure on 10 March 2003

OPINION OF THE SCIENTIFIC COMMITTEE ON TOXICITY, ECOTOXICITY AND THE ENVIRONMENT (CSTEE) ON

"WRc report on the impact on the environment (reduction in eutrophication) that would result from substituting phosphates in household detergents"

WRc Ref: UC 4011
June 2002

Adopted by the CSTEE by written procedure on 10 March 2003

Terms of Reference

DG Enterprise and DG Environment have commissioned a study "Phosphates and alternative detergent builders" to evaluate the impact on the environment (reduction in eutrophication) that would result from substituting phosphate in household detergents.

DG Enterprise asked for the opinion of the CSTEE on this WRc report as follows:

Does the CSTEE agree with the conclusions of the WRc report?

INTRODUCTION

Eutrophication of lakes and marine coastal waters is one of the major environmental problems affecting water quality in developed and densely populated countries.
Besides oil pollution, the eutrophication of the Northern Adriatic Sea is the most important pollution problem of the Mediterranean.
Oxygen depletion extended over large areas in deep waters and sediments in the Baltic Sea is a clear symptom of marine eutrophication.

Since the 1970s it has been recognised that excess phosphorus is responsible for eutrophication in lakes and in some marine coastal waters (for example in the Adriatic Sea). In other marine environments, nitrogen may be the key element.

Phosphorus loads originate from point and non-point sources, in particular:

- urban sewage, in which two different components are present: phosphorus from human metabolism and phosphorus from synthetic detergents;
- animal farms;
- discharges of some specific industrial typologies;
- runoff and drainage from agricultural soils;
- runoff and drainage from natural soils.

Eutrophication in lakes was recognised to be a relevant pollution problem at international level in the 1960s. Synthetic detergents with sodium tripolyphosphate (STPP) as builders became a product used in large amounts in the middle 1950s.

In Italy it was estimated that, before the ban of phosphates in detergents, detergent phosphorus amounted for about 55% of the phosphorus content in urban sewage and about 33% of the total phosphorus load to surface waters (Chiaudani *et al*., 1978).

THE WRc REPORT

The WRc report gives an overview of the present European situation about the problem of phosphorus as detergent builder and surface water eutrophication. Major points treated are described below.

1. THE PRESENT USE OF PHOSPHORUS AS DETERGENT BUILDER IN EUROPE

The report provides an overview of the situation of phosphorus use as builders in Europe and in other developed countries. The description is sufficiently clear and complete.

Since the 1980s, in many developed countries the need for the reduction of STPP in detergents was recognised. In the European Union, different solutions were adopted in different countries.

In some countries regulations were implemented for an almost total (e.g. Italy, Belgium) or partial (e.g. Austria, Germany) ban of STPP. In other countries (e.g. Scandinavian countries, The Netherlands), even in absence of a precise regulation, voluntary agreements were reached which led to a substantial reduction of phosphorus quantities.

At present only in Greece, Luxembourg, Portugal and Spain no actions (legislative or voluntary) for phosphorus reduction in detergents have been taken.

It has been estimated that, as a consequence of these actions, phosphorus emissions from detergents in surface water have been reduced by about 77% from 1985 up to 2000.

Less information is available on the situation in new candidate member states of the European Union.

Outside the EU, ban of phosphorus in detergents is effective in Switzerland, Canada and in 27 States of the USA. In Japan the ban is effective only in sensitive areas but, in practice, no STPP based detergents are used.

2. THE CONSEQUENCES OF STPP REDUCTION IN EUROPE

It is the opinion of the CSTEE that the information and science presented is neither complete nor balanced to substantiate the conclusions drawn in this part of the report.

These shortcomings include:

- the quantitative evaluation, using the numerous case studies described in the literature, of the efficiency of STPP reduction on the significant reduction of eutrophication;
- the role of all phosphorus sources in determining eutrophication and the specific contribution of STPP.

In the report some examples, taken from different European countries, are described, showing the trophic trend of selected water bodies.
In some cases an improvement seems evident, while in others, precise conclusions are difficult to draw, due to the lack of systematic data describing the situation before phosphorus control actions.

It is opinion of the CSTEE that the information reported is not exhaustive. Much additional information could be found on eutrophication trends in Europe in the last two decades.

In Italy for example, the trophic condition in Northern Adriatic is regularly monitored since approximately 20 years. Even if the eutrophication of the Adriatic Sea is not yet solved, after the phosphorus ban the process of rapid increase of eutrophication has been stopped and a slow but continuous improvement is observed. This information can be documented by annual reports of the Emilia Romagna Region (1984-2002).

Reasonably, this result is largely due to the control of detergent phosphorus, because other actions are, at present, poorly effective. In particular, the limit of phosphorus in sewage treatment plant is 10 mg/L, and this would produce a moderate reduction of phosphorus in urban sewage. A lower limit is effective on effluents discharged in lakes that represent a minor percentage of loads in the Po valley, major tributary of Northern Adriatic.

Probably additional relevant information on other water bodies could be found in the literature.

On the other hand, the control of detergent phosphorus may give extremely different results in function of different environmental conditions and, in particular, in function of the role of other phosphorus sources. In alpine lakes for example, where agricultural contribution is irrelevant, the effect of detergent phosphorus control can be determinant, while, in other conditions, the role of agriculture or animal breeding is more important.
This point has not been addressed by the report.

It is also recognised that more effective control of eutrophication can be realistically achieved with interventions on point sources of emissions. Diffuse sources (e.g. emissions from agricultural fertilizers) are more difficult to control in the short and medium term, and the reduction can be only partial, in function of the changes in agricultural practices.

Moreover, sewage treatment plants are not enough effective in reducing phosphorus, unless an additional chemical treatment is applied. A more advanced treatment is usually required only for highly sensitive areas, and this is not sufficient to reduce the phosphorus load in endangered marine waters (Adriatic, Baltic). Phosphorus reduction in treatment plants up to levels really effective for eutrophication control would be expensive.

A cost-benefit analysis of different possible control interventions has not been made in the report.

3. PRODUCTION OF BUILDERS AND ALTERNATIVES TO PHOSPHATES

It is the opinion of the CSTEE that, regarding this item too, the information is not sufficient to allow scientifically based conclusions on the appropriateness of the alternatives. In particular:

- the characteristics of various possible alternatives to STPP are not clearly described;

- there is no quantitative evaluation of the environmental effects of the alternatives.

Therefore a proper assessment of the environmental risk of the alternatives cannot be performed.

The report describes alternatives in a qualitative manner.
Apart from STPP, the most important substances used as detergent builders are zeolites, polycarboxilic acids (PCAs), citrates and nitrilotriacetic acid (NTA).
All these substances may have advantages and disadvantages in terms of efficacy and environmental impact.

Zeolite is an inert, insoluble alumino-silicate. Its major environmental impact is the increase of suspended solid concentration and, as a consequence, of sedimentation in water bodies. Systematic studies assessing the effect of increased sedimentation on benthic communities are not quoted in the report.
Zeolite has an affinity for heavy metals. The effect of zeolite on metals is not clearly explained in the report. It is likely that it would reduce bioavailability of metals.

In addition, an increase in the production of sludge may be expected. Key issues, such as the consequences of the presence of zeolite in sludge for its valorisation as agricultural fertilizer or for the disposal of these wastes, should be considered.

PCAs are a family of synthetic polymers generally used in combination with zeolites. They are only partially degraded in biological treatment plants. Systematic studies on the environmental fate and effects of PCAs are not quoted in the report.

Citrates may contribute to the BOD load, but are degraded in sewage treatment plants.

NTA may act as a chelator of heavy metals.

OPINION OF THE CSTEE

Given the weaknesses identified above, the CSTEE is of the opinion that the conclusions of the WRc report are not adequately substantiated. Hence they cannot be endorsed on the basis of the information provided. In particular some quantitative statements cannot be supported without accounting for the different role of phosphorus sources in different environmental and land use conditions.

The CSTEE strongly stresses the need for a more complete literature review addressing the weaknesses underlined in this opinion. Although the reduction of phosphorus in detergents may contribute to decrease the occurrence of eutrophication in Europe, it may not be sufficient to solve the problem of eutrophication. Further information to that which is provided in the WRc report should be collected and analysed to be able to respond to such a question.

References:

Chiaudani G., Gerletti M., Marchetti R., Provini A., Vighi M. (1978): *Il problema dell'eutrofizzazione in Italia*. Reports of the Institute of Water Research, Quaderni IRSA N° 42, 93 pp.

Regione Emilia Romagna (1984-2002): *Eutrofizzazione delle acque costiere dell'Emilia-Romagna. Rapporto annuale.* Regione Emilia Romagna. Assessorato Programmazione, Pianificazione e Ambiente. Studi e documentazioni. Bologna.