

## Newsletter Paris Appeal n°31- April 2010 – Toward a science-based recognition of the environmental origin of cancer

The hypothesis that two thirds to three quarters of cancers have an environmental origin implies that cancers are caused by carcinogenic agents outside the body, i.e. by some micro-organisms such as virus & bacteria, radiation, and exogenous chemicals. This environmental carcinogenesis hypothesis, put forward by Pr. D. Belpomme as early as 2004<sup>i</sup>, was the object of a Communication from the European Commission one year ago. In addition, being widely investigated by many scientists around the world, this new theory was accepted by the Environment, Public Health and Food Safety (ENVI) Committee of the European Parliament<sup>ii</sup>.

We must realize that there cannot be a cancer without mutations<sup>iii</sup>. Mutagenic agents are tumour initiators, therefore important to consider in theory of carcinogenesis. According to still-current theory, lifestyle-related risk factors, such as diet, alcoholism, sedentary, obesity and tobacco smoking would be responsible for the occurrence of many cancers. However, except for tobacco smoking, which is associated with carcinogenic chemical substances in smoke and tar, it has never been proved that these factors can cause mutations and therefore initiate cancer<sup>iv</sup>. In many countries, tobacco smoking is responsible for 20-25% of cancer cases.

Hence a pending question is what is the cause of the 75% of cancer cases not related to tobacco smoking. It was thought for a long time that hyper-caloric diets rich in animal fat and poor in fruit and vegetables could cause cancers; and that, following WHO's assertion, eating five fruits or vegetables portions per day could protect the organism from cancer. Unfortunately this has never been proven. Moreover, confirming the hypothesis of ARTAC, based on a careful analysis of the scientific literature<sup>v</sup>, this WHO<sup>vi</sup> claim is now disproved by the *European Prospective Investigation into Cancer and Nutrition (EPIC)*<sup>vii</sup>, since it has clearly established that a diet rich in fruits and vegetables does not protect from cancer, or at least they protect from cancer in a very limited number of cases.

The state of science therefore reinforces the ARTAC scientific research work that questions the classical carcinogenesis thesis according to which changes in lifestyle-related factors might be responsible for the present worldwide growing incidence of cancer. Rather, the state of science today strengthens its hypothesis that mutagenic agents present in the environment are a major contributor to cancer.

Many scientific studies have indeed shown the carcinogenic effect of numerous environmental agents<sup>viii</sup> and the hypothesis according to which these agents might cause cancer has recently been partially accepted by the *French Agency for Environmental and Occupational Health Safety* (AFSSET)<sup>ix</sup>. Moreover, for the first time, the *French National Cancer Institute* (INCa) mentioned that the increasing and prolonged exposition to environmental risk factors<sup>x</sup> could be one of the causes in the rise of the global cancer incidence. ARTAC had previously published an important paper in the journal *Carcinogenesis*, showing how exogenous chemicals could induce cancer and be responsible for the present growing incidence of cancer in all industrialized countries. In this paper it was shown that exogenous carcinogenic chemicals are not only coming from tobacco smoking but also from environmental exposure, suggesting that environmental chemical carcinogenesis may play a more important role than previously expected; and that carcinogenic, mutagenic and reprotoxic (CMR) substances may be involved in carcinogenesis; as much as oncogenic viruses and radiations are<sup>xi</sup>. Such environmental role was previously outlined in the Paris Appeal<sup>xii</sup>.

Moreover, as shown in studies conducted by the biochemist Philippe Irigaray, who coordinates ARTAC research studies, some chemical pollutants, in addition to their carcinogenic properties, could increase the adipose tissue mass, and therefore contribute to overweight and obesity. Consequently, contrary to what is still asserted, the causal link between obesity and cancer could not only result from the endocrine function of the adipose tissue, but also from its capacity to act as a reservoir for environmental organic pollutants which therefore bio-accumulate in the adipose tissue. As a consequence, this suggests that it is not obesity alone that induces cancer but the extra environmental chemicals that have been caused by pollutants accumulated in the body fat<sup>xiii</sup>.

The link between cancer and chemical pollutants led many researchers to underline the potential role of pesticides in the initiation of breast and prostate cancers<sup>xiv</sup>. A major rise of incidence of these two hormone-dependant cancers has been observed within the agricultural community, which is the leading and massive user of pesticides. Because results obtained from the ARTAC research group<sup>xv</sup> suggested a causal link between pesticide use and cancer, these results caused agitation in 2007 in France. The link between pesticides and cancer is however now widely accepted, including by some former detractors<sup>xvi</sup>. Indeed, ARTAC research carried out in the French Caribbean Islands and in Metropolis and published ever since, tend to prove that the causal origin of prostate cancers must be found in the environment, and that among the different possible environmental carcinogens,

pesticides are probably the main cause of the present rise of prostate cancer incidence in these islands. Moreover a similar conclusion has been drawn for breast cancer<sup>xvii</sup>.

One argument of scientists who are still denying the environmental origin of prostate and breast cancers is that the rise of incidence could be due to the improvement of screening techniques. This argument has recently been the object of an article published in the *Journal of the National Cancer Institute* (JNCI), to which the ARTAC team has responded to in a scientific note published in the same journal<sup>xviii</sup>. On the basis of an analysis of the European cancer registries, ARTAC has shown that in addition to screening, the rise of breast and prostate cancer incidence constitutes indeed a genuine public health problem--as the rise of incidence already existed much before the use of screening tests and therefore these two types of hormone dependant cancers are probably of environmental origin.

Another argument used by the opponents of the environmental origin of cancer is that the rise of incidence would be linked to the ageing of the population. However, since the incidence increase of cancer is observed for all age groups when it is expressed in age-specific standardised rates (which erase the effect of ageing and of demographic growth) this argument does not fit with epidemiological data. Moreover, it is important to note that children's overall cancer in Europe increases by 1.1% every year<sup>xix</sup>.

The hypothesis of the environmental origin of cancers is therefore in the process of being confirmed internationally, in particular thanks to the pioneering work of ARTAC.

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<sup>i</sup> Belpomme D. *Ces maladies créées par l'homme*. Edition Albin Michel, 2004 ; Belpomme D. *Guérir du cancer ou s'en protéger*. Edition Fayard, 2005.

<sup>ii</sup> According to the HEAL April Newsletter, available on: <http://www.env-health.org/a/3549>

<sup>iii</sup> Sjoblom T et al. *The consensus coding sequences of human breast and colorectal cancer*. Science. 2006, 314, 268-274 ; Greenman C et al. *Patterns of somatic mutation in human cancer genomes* Nature. 2007, 446, 153-158.

<sup>iv</sup> Belpomme D., et al. *The growing incidence of cancer: role of lifestyle and screening detection*. Int J Oncol. 2007, 30, 1037-1049 ; Irigaray P., et al. *Lifestyle-related factors and environmental agents causing cancer: An overview*. Biomed Pharmacother. 2007, 61, 640-658.

<sup>v</sup> Danaei G, et al. *Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors*. Lancet 2005; 366, 1784-1793.

<sup>vi</sup> World Health Organisation (WHO). <http://www.who.int/fr>

<sup>vii</sup> Boffetta P, et al. *Fruit and vegetable intake and overall cancer risk in the European Prospective Investigation into Cancer and Nutrition (EPIC)*. J Natl Cancer Inst. 2010, 102, 529-537.

<sup>viii</sup> Clapp RW, et al. *Environmental and occupational causes of cancer: new evidence 2005-2007*. Rev Environ Health. 2008, 23, 1-37 ; Belpomme D., et al. *The multitude and diversity of exogenous carcinogens*. Environ. Research, 2007, 105, 414-429 ; Newby JA, Howard CV. *Environmental influences in cancer aetiology*. J Nutr Env Med 2006;15:56-114

<sup>ix</sup> AFSSET- Inserm. Expertise collective « Cancers-environnement » Éditions Inserm, octobre 2008, 907 pages, Collection Expertise collective. ISBN 978-2-85598-868-3

<sup>x</sup> INCa. *Survie attendue des patients atteints de cancers en France : état des lieux*. Avril 2010 Collection Rapports & Synthèses. Disponible à l'adresse suivante : <http://www.e-cancer.fr/les-soins/4211-survie-des-patients-atteints-de-cancers-en-france-linca-dresse-un-etat-des-lieux>

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- <sup>xi</sup> Irigaray P and Belpomme D. Basic properties and molecular mechanisms of exogenous chemical carcinogens. *Carcinogenesis*. 2010, 31, 135-148.
- <sup>xii</sup> [www.artac.info](http://www.artac.info)
- <sup>xiii</sup> Irigaray P, et al. *Ex vivo study of incorporation into adipocytes and lipolysis-inhibition effect of polycyclic aromatic hydrocarbons*. *Toxicol Lett*. 2009, 187, 35-39 ; Irigaray P., et al. *Overweight/obesity and cancer genesis: More than a biological link*. *Biomed Pharmacother*. 2007, 61, 665-678 ; Irigaray P, et al. *Benzo[a]pyrene impairs beta-adrenergic stimulation of adipose tissue lipolysis and causes weight gain in mice. A novel molecular mechanism of toxicity for a common food pollutant*. *FEBS J*. 2006, 273, 1362-1372.
- <sup>xiv</sup> Parent ME, et al. *Does Exposure to Agricultural Chemicals Increase the Risk of Prostate Cancer among Farmers?* *Mcgill J Med*. 2009, 12, 70-77 ; Fenichel P et al. *Environmental endocrine disruptors and breast cancer: new risk factors?* *Gynecol Obstet Fertil*. 2008 Oct;36(10):969-977.; Andre V, et al. *Evaluation of bulky DNA-adduct levels after pesticide use: comparison between open field farmers and fruit growers*. *Toxicol Environ chem*. 2007, 89, 125-139.
- <sup>xv</sup> Rapport d'expertise et d'audit externe concernant la pollution par les pesticides en Martinique. Available at : <http://www.artac.info/images/telechargement/Rapport%20Martinique.pdf>.
- <sup>xvi</sup> Communiqué de presse de la ligue contre le cancer du 04/02/2010 : Les pesticides à l'origine de certains cancers : des suppositions aux preuves. Disponible à l'adresse suivante : [http://www.ligue-cancer.net/newsletters/20100201/files/CP\\_Pesticides.pdf](http://www.ligue-cancer.net/newsletters/20100201/files/CP_Pesticides.pdf)
- <sup>xvii</sup> Belpomme D., et al. *Prostate cancer as an environmental disease: an ecological study in the French Caribbean islands, Martinique and Guadeloupe*. *Int J Oncol*. 2009, 34, 1037-1044 ; Landau-Ossondo M., et al. *Why pesticides could be a common cause of prostate and breast cancers in the French Caribbean Island, Martinique. An overview on key mechanisms of pesticide-induced cancer*. *Biomed Pharmacother*. 2009, 63, 383-395 ; Belpomme D, et al. *The growing incidence of prostate cancer in the French Caribbean islands, Martinique and Guadeloupe: A possible causal role of pesticides*. *Int J Oncol*. 2009, 35, 433.
- <sup>xviii</sup> Belpomme D and Irigaray P. *Re: Prostate Cancer Diagnosis and Treatment After the Introduction of Prostate-Specific Antigen Screening: 1986-2005*. *JNCI*. 2010, 102, 506-507.
- <sup>xix</sup> Kaatsch P. *Epidemiology of childhood cancer*. *Cancer Treat Rev*. 2010 Mar 13. doi:10.1013/j.ctrv.2010.02.003