

## **Alarming results of the scientific research on harmful effects to health of the emissions from laser printers**

In the framework of the research initiative for further clarification of harmful health effects caused by the emissions of laser printers, nano-Control has organized and mainly financed researches carried out by institutes in Hamburg, Freiburg and Essen.

Mainly from the beginning of autumn 2009 on and in the run-up to the urgently needed human exposure study, the research had been carried out by the working committee of chemical analysis regarding respirable dust (ARGE-Hamburg), the institute for environmental medicine and hospital hygiene at the University Hospital Freiburg (IUK) and the institute for pathology and neuropathology at the University Hospital Essen.

In detail had been examined:

- Seven toner and the emissions of four laser printers (3xKyocera, 2x Hewlett Packard, 1x Dell, color) by the ARGE Hamburg as well as five laser printers (2x Kyocera, 2x Hewlett Packard and 1x Ricoh fax) by the IUK Freiburg
- The impacts of the emissions of two "multi function" devices (Kyocera, Hewlett Packard) on human lung cells by the IUK Freiburg
- The impacts of the emissions of five laser printers (2x Kyocera, 2x Hewlett Packard and Ricoh fax) on six patients as part of a screening at the IUK Freiburg
- Tissue of four concerned persons to look for toner particles at the Institute for pathology in Essen.

**These examinations showed that**

- **Emissions from laser printers have a gene toxic impact on human lung cells and destroy them after only one hour of printing!**
- **With sensitized people the emissions, obviously, have an allergic impact after only 30 minutes and cause lasting health problems as well as dangerous oxidative stress.**
- **The particles can be detected in human tissue. They infiltrate into the cells.**

With that, the scientific indications for the harmfulness to health caused by the emissions of laser printers have dramatically increased! The detected damages to the genetic material can be a reason for the appearance of cancer. Oxidative stress has got cell damaging effects and is significant for serious diseases. The applied research methods are suitable to clarify the risks in a definite and fast way.

The research showed in detail:

1. The emissions of the two examined laser printers have got after only one hour of printing time a specific gene-toxic impact on human lung cells. This is a reason for the appearance of cancer diseases. Indeed, there had not been noted a primary cell-toxicity, but the gene-toxic damages indirectly lead to cell damage. The results of the research are an indication of the generally damaging impact of the emissions of laser printers.
2. Within the framework of a five days screening carried out on six patients with a reported sensibility towards emissions of certain laser printers the probates reacted with signs of inflammation of their respiratory system, partially also of their skin and their eyes as well as other unspecific aches after they had been exposed to a laser printer for only half an

hour. The symptoms had partially continued for weeks. Moreover, increased ECP-values as indication of an allergic reaction and significant increases of free oxygen radicals had been measured. This causes oxidative stress for the cells and the organism as well as cell damage. Oxidative stress bears a meaning for various ailments, e.g. cardiovascular diseases, burn out syndrome but also for neurodegenerative diseases such as Parkinson's or Alzheimer.

The proven oxidative stress corresponds to the results of cell experiments on human lung cells which had been carried out at the IUK and which showed gene-toxic effects.

3. The university hospital of Rostock proved the existence of toner particles in the lungs of a service technician who died of lung cancer. Further still ongoing examinations of tissue from patients in Essen seem to confirm this. There, corresponding particles were found in the lymph nodes of the lung and even in the abdominal cavity. The research is still lasting.
4. The seven toners that had been examined in Hamburg are burdened with heavy metal. Approximately one third of a toner is iron powder, which is determined with other metals, amongst others the allergens nickel and cobalt.
5. The seven toners of four producers that had been examined in Hamburg and Freiburg cause significant, printer specific emissions. Especially aerosol mixtures in the superfine fraction (<100 nanometers) are released. According to nowadays knowledge these mainly consist of volatile substances such as paraffin and silicon-organic compounds. Due to the printing process the release of these ultrafine particles increase from seven-times (after maintenance of the printer) up to 1.869-times with a color printer. Apart from that there are clear indications of releases of solid particles in all magnitudes: the proven existence of iron and other heavy metal compounds are evidence for toner dust emissions.

In the framework of testing the human exposition at the IUK Freiburg, the compartment air was examined with the help of ambient-monitoring. Very different immissions were measured on volatile organic compounds and for the first time on polycyclic aromatic hydrocarbon,

Per se, a harmful impact to the health could not directly be deduced from the results of the material and emission examination. However, it is a matter of highly different particular complex mixtures whose impact can hardly be estimated. Moreover, there is a lack of evaluation criterions for the stated emissions of ultrafine particles. The emission tests on human cells and concerned people have shown that the rather unremarkable appearing emissions cause significantly damaging effects after only a short period of time.

The disputable way of the Federal Government to have the particles assigned in behalf of the printing industry and the intention to appraise their impact afterwards shows to be a dead-end road and a dangerous "buying time attitude" in order to protect the printer industry at the expense of the population.

6. The methods of research proved to be suitable. Tests on human exposition are the sole way to control the impact of emissions on the health of human beings. This can happen in the short run. The qualification of the particles and volatile organics released from laser printers still has to be optimized.

The research reports and contact details of the engaged scientific institutes and other experts are available on request at: [research@nano-control.de](mailto:research@nano-control.de)