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OLD QUESTIONS, NEW APPROACHES
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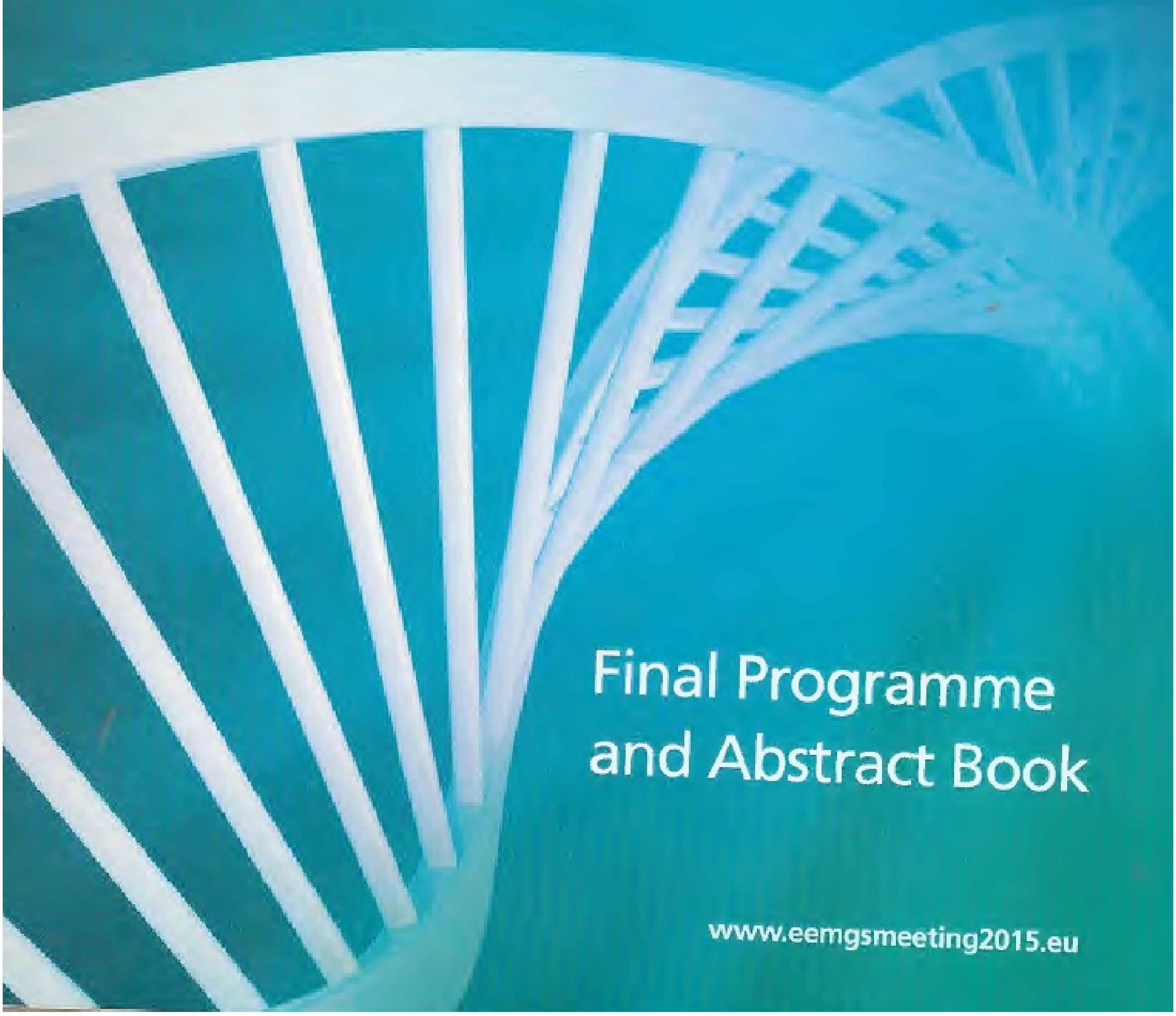

Final Programme and Abstract Book

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IL 40 - Characterization of harmful effects of potentially toxic agents by using cellular and molecular biomarkers

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Biomarkers can be employed in the assessment of toxic effects and mechanisms of potentially harmful substances. Genotoxicity biomarkers – such as micronucleus frequency, DNA strand breaks or phosphorylation of H2AX histone – provide information on the alterations in the genetic material, whereas cytotoxicity biomarkers – including viability rate, cell cycle alterations or cell death induction – reflect general toxic effects on the cell. The study of these biomarkers is highly relevant since they have been extensively associated with severe pathologies, including cancer. The following are examples of biomarker use to characterize the action mechanism of potentially harmful agents:

- Selenium (Se) is an essential element for the body. Nevertheless, depending on its concentration and chemical form, Se can also cause poisoning. The use of genotoxicity biomarkers in cultured human cells demonstrated that selenomethionine, an organic Se form, has not harmful but protective effects on DNA damage induction and repair, supporting its use as dietary supplemental Se form.
- Okadaic acid is the main marine toxin responsible for diarrheic shellfish poisoning. Its toxic effects at cellular and molecular levels were characterized in human target cells, namely hepatocytes, neurons and leukocytes. As a result, cytotoxic and genotoxic potential of OA were demonstrated, which should be considered in health protection of regular shellfish consumers.
- The rapidly growing use of nanomaterials has led to concerns on their toxicity, particularly on nervous system since they can cross the blood brain barrier. Potential harmful effects of some metal oxide nanoparticles (titanium dioxide, zinc oxide and iron oxide) on human neuronal cells were deeply characterized by a battery of biomarkers.

P 020 - Genotoxic potential of nanomaterials: in vitro evaluation of iron oxide nanoparticles

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The rapidly growing industrial and medical use of nanomaterials, particularly metal oxide nanoparticles, has led to growing concern about their toxicity. Moreover, human beings are commonly exposed to their potential harmful effects since these nanomaterials are frequently present in a number of industrial products of very regular use. Among them, iron oxide nanoparticles (ION) have been widely used in various biomedical applications, for both diagnosis and therapy, due to their unique magnetic properties. They are intensively explored in neuromedicine also because they have the ability to easily cross the blood brain barrier. Hence, their potential harmful effects on nervous system need to be carefully assessed. Accordingly, in this study the potential toxicity of different ION was evaluated in human neural cells by using a complete battery of in vitro techniques and a variety of experimental conditions which include different concentrations, exposure times and cell culture media. In this way, and after a proper assessment of their physico-chemical properties, a comprehensive characterization of ION toxicity was carried out at different levels, from genotoxicity and cytotoxicity to alterations in DNA repair processes and oxidative stress. Although further studies to deeply investigate the role of protein corona on ION toxicity are necessary, results obtained from this study provide a better understanding of the risks of exposure, both occupational and environmental, to these ION in terms of human health, in particular referring to neurological effects. These results could also be the basis for planning and developing subsequent epidemiological studies in which cellular, molecular and behavioural effects of ION on exposed subjects are evaluated.

P 025 - Micronucleus and H2AX phosphorylation assessment of silica-coated iron oxide nanoparticles in human neuronal cells

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As clinically approved metal oxide nanoparticles, iron oxide nanoparticles (ION) hold immense potential in a vast variety of applications in various fields of biomedicine and biotechnology. With the increase in ION usage, particularly in diagnostics and therapeutics, concerns regarding their interactions with cellular components and possible deleterious effects are also growing. ION surface may be coated with different materials thus minimizing hydrophobic interactions and enhancing their biocompatibility and desirable properties. Good biocompatibility was previously shown for silica-coated ION (S-ION) on the basis of viability assays, but to date knowledge on their toxicity at the genetic level, especially in neuronal cells, is very scarce. Hence, the main aim of this study was to evaluate aneugenicity and DNA double-strand break production by S-ION on human SHSY5Y neuronal cells by means of micronucleus (MN) test and H2AX histone phosphorylation assay. Four S-ION doses (10-200 µg/ml) and two exposure times (3 and 24 h) were tested, both in complete and serum-free culture media. S-ION were effectively internalized by the cells, as indicated by flow cytometry evaluation. Although previous comet assay assessments had shown that S-ION induced primary DNA damage in the same conditions, current results were always negative for the two endpoints tested, indicating that the nanoparticles analysed do not cause aneugenicity or DNA double strand breaks.

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