

# Silvia Balbo

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## Curriculum Vitae

### *Education:*

<b>INSTITUTION</b>	<b>DEGREE</b>	<b>YEAR</b>	<b>FIELD OF STUDY</b>
Masonic Cancer Center, University of Minnesota	Postdoc	2008-2010	Carcinogenesis and Chemoprevention
International Agency for Cancer Research, Lyon (France)	Postdoc	2006-2008	Molecular Cancer Epidemiology
University of Torino, Torino (Italy)	Ph.D	2006	Medicinal chemistry/ Genetic toxicology
University of Torino, Torino (Italy)	M.S.	2002	Medicinal chemistry

### *Current position:*

Silvia Balbo is an Assistant Professor of the School of Public Health at the University of Minnesota. She is part of the Division of Environmental Health Science and member of the Masonic Cancer Center. Her work focuses on studying mechanisms of chemical carcinogenesis, in particular those related to alcohol and tobacco exposures. She is developing more accurate methods to quantify the genotoxic effects deriving from these exposures and thus to measure the corresponding DNA damage. She is drawing upon her expertise in organic synthesis, analytical chemistry, cell culture and molecular epidemiology to develop integrated approaches aiming at quantifying DNA samples collected in clinical trials and molecular epidemiology studies.

***Areas of expertise:***

- Biomarkers for the investigation of chemical carcinogenesis, with particular emphasis on biomarkers of human exposure to be used in epidemiological studies
- Synthesis of compounds to be used as standards for analytical methods (Organic synthesis, NMR)
- Analytical biochemistry: development of analytical procedures for the analysis of trace levels of biomarkers in biological samples by HPLC, LC-MS-MS and high resolution LC-MS/MS and other analytical methods
- Animal models and cell culture techniques to investigate carcinogenic processes and metabolic pathways.
- Cytotoxicity, genotoxicity and mutagenicity assays (including COMET and micronuclei assays)
- Design and management of clinical trials and experience in obtaining Institutional Review Board approval for clinical protocols
- Cross-disciplinary collaborations with epidemiologists and clinicians.
- Management of a research team and supervision of multiple parallel projects

***Research Activity:***

**As a Research Associate at the Masonic Cancer Center:**

- Investigating carcinogenic mechanisms of two potent carcinogenic tobacco specific nitrosamines: NNN and NNK focusing on the specific action of NNN enantiomers and NNK metabolite NNAL enantiomers.
- Investigating relationship between alcohol exposure and formation of acetaldehyde-derived DNA adducts in Humans and in tissues obtained from monkeys exposed to alcohol.
- Investigating the effects of food on acetaldehyde-derived DNA adducts in order to assess the confounding role of diet in the investigation of alcohol-related acetaldehyde DNA adducts.
- Supervising a project focusing on the investigation of levels of acrolein-DNA adducts in oral cell samples from lung cancer patients
- Supervising the synthesis of standards to be used in the investigation of the Phenanthrol metabolic pathways
- Investigating mechanisms of carcinogenesis in Lung stem cells (Collaboration with Dr. Fekadu Kassie, University of Minnesota)
- Investigating effects of indol-3-carbinol on formation of NNK induced DNA adducts (Collaboration with Dr. Fekadu Kassie, University of Minnesota)
- Investigating effects of Kava extracts on formation of NNK induced DNA adducts (Collaboration with Dr. Xing, University of Minnesota)

- Investigating the application of a DNA adductomic method to measure known and unknown DNA adducts in DNA isolated from different samples utilizing constant neutral loss scanning and product scanning techniques in various human and animal samples.
- Investigating the application of the DNA adductomic approach on the identification of cytosine modifications as potential new leads in epigenetic studies. (Collaboration with Dr. Brooks and Dr. Shuebel, from NIAAA)

As a Post-doctoral Associate at the Masonic Cancer Center:

- Developed an accurate and sensitive method for the identification of potential biomarkers for the study of effects on DNA of ethylating agents present in tobacco smoke.
- Developed methods for the investigation of DNA adducts in specific cell types, isolating DNA from granulocytes and lymphocytes and investigating the implications on the adduct levels of analysis of DNA from cells with a short versus long life span.
- Worked on methods for the identification of metabolites of chemicals present in tobacco smoke and of metabolic pathways leading to the formation of acetaldehyde in human hepatocytes

As a Post-doctoral Associate at IARC:

- Investigated and developed biomarkers relevant for epidemiological studies on alcohol and nitrosamines exposures.
- Measured DNA-adducts in human subjects from large epidemiological studies
- Analyzed the relationship of adduct levels to lifestyle factors and genetic susceptibility in samples from large epidemiological studies focusing on head and neck cancer and bladder cancer.
- Managed training, fellowship and networking programs organized within the framework of IARC participation to the Environmental Cancer Risk, Nutrition and Individual Susceptibility Network of Excellence operating in the context of the 6th EU Framework.

Ph. D. research :

- Studied the chemistry of NO prodrugs, such as nitric esters and furoxan moieties.
- Synthesized hybrid drugs in which the NO activity is associated with other activities to exploit synergic effects.
- Investigated the pharmacological activity of the newly synthesized structures as well as their potential cytotoxicity, genotoxicity and mutagenicity (the pharmacological study was performed in the laboratories of Cell Genetics at the VUB in Brussels, Belgium)
- Investigated the effects of some bisphosphonates NO donor hybrids on the induction of mineralization on bone marrow stromal cells and on the differentiation into osteoclasts of peripheral blood mononuclear cells.

***Teaching Experience:***

2010-present: Currently directing research projects conducted by 2 Senior Scientists Instructed; directed 13 Junior Scientists and rotation students.

- 2007-2008: Managing training, fellowship and networking programs for Ph.D and post-doctoral students within IARC activity in the Environmental Cancer Risk, Nutrition and Individual Susceptibility Network of Excellence.
- November 2006: Teaching assistant in the laboratory of “Synthetic preparation and extraction of natural active ingredients”, Faculty of Pharmacy, University of Torino.
- May 2001: Teaching assistant in the laboratory of “Chemistry of Cosmetic Products”, Faculty of Pharmacy, University of Torino.

***Other Professional Experiences:***

- Manuscript reviewer for: Cancer Epidemiology Biomarkers and Prevention (since 2008)  
Chemical research in Toxicology (since 2013)  
Analytical chemistry (since 2012)
- September 2007: Member of the organizing committee of the “IARC-EACR-AACR-ECNIS international symposium on Integrative Molecular Cancer Epidemiology that will be organized in Lyon, France, on the 3-5 July 2008.
- March 2007 - April 2007: Training in the laboratory directed by Prof. S. Hecht at the Cancer Center, University of Minnesota, Minneapolis, MN.
- February 2007: Participation as IARC member at the meeting of experts for the preparation of the 96th volume of the IARC monographs on the evaluation of carcinogenic risks to humans on: Alcoholic beverages consumption and ethyl carbamate
- July 2006 - September 2006 March 2007-April 2007: Training in the laboratory directed by Prof. S. Hecht at the Cancer Center, University of Minnesota, Minneapolis, MN.
- September 2005 - January 2006: Training on stromal cells isolation and cultivation in the laboratories of the CERMS (Centro di Ricerca in Medicina Sperimentale) at the "San Giovanni Battista" hospital in Turin.
- November 2004 - July 2005: Training in the laboratory of Cell Genetics directed by Prof. Micheline Kirsch-Volders at the Free University of Brussels, Belgium.
- October 2004: Participation as representative of the University of Turin to the kick-off meeting of the MedNatNet a network to create a European environment for theoretical education and practical training of graduate (Master) students in the field of Medical Natural sciences. MedNatNet was a Thematic Network Project funded by the European Commission in the Erasmus 3 action. Hosted by the Free University of Amsterdam, Amsterdam, Netherlands.
- July 2003 - September 2003: Training in the laboratory of synthesis of natural products directed by Dr. H. Olivo at the Medicinal Chemistry department, Faculty of Pharmacy, University of Iowa, Iowa City, IA.

**Presentations at National and International meetings:**

(work presented by the highlighted author)

**L. Zhao**; S. Balbo; M. Wang; P.W. Villalta; P. Upadhyaya and S.S. Hecht. *Liquid chromatography-tandem Mass Spectrometry Quantitation of DNA Adducts in tissues of rats treated chronically with enantiomers of the carcinogen N'-Nitrosornicotine*. 61<sup>st</sup> ASMS conference on Mass Spectrometry, Minneapolis, MN (2013)

**P.W. Villalta**; S. Balbo; P. Upadhyaya; S.S. Hecht. *DNA adductomics methodology utilizing a high resolution accurate mass MS approach for analysis of human DNA samples*. 61<sup>st</sup> ASMS conference on Mass Spectrometry, Minneapolis, MN (2013)

**A. Zarth**; S. Balbo; G. Cheng; S.S. Hecht. *Development of an LC-NSI-HRMS/MS-PRM method for quantification of attomole levels of 7-Phenyl-Guanine to determine the mechanism of Benzene-induced cancer*. 61<sup>st</sup> ASMS conference on Mass Spectrometry, Minneapolis, MN (2013)

**S. Balbo**, S. S. Hecht, E.J. Baker, J. B. Daunais, and K. A. Grant *Effects of alcohol consumption on levels of N<sup>2</sup>-ethylidenedeoxyguanosine in DNA from oral and esophageal tissues from Rhesus monkeys*. ACS National Meeting, Indianapolis, IN (2013)

**P. Upadhyaya**, S. Balbo, P.W. Villalta, X. Qian and F. Kassie. *DNA adducts in aldehyde-dehydrogenase ALDH-positive lung stem cells of A/J mice treated with the tobacco specific lung carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)*. ACS National Meeting, Indianapolis, IN (2013)

**S. Balbo**, L. Meng, R.L. Bliss, J.A. Jensen, D.K. Hatsukami and S.S. Hecht. *Kinetics of DNA adduct formation in the oral cavity and in peripheral blood granulocytes and lymphocytes after drinking alcohol*. 244th ACS National Meeting, Philadelphia, PA (2012) **The poster was selected for an oral presentation and included in the conference press release**

**P.W. Villalta**, S.S. Hecht, and S. Balbo. *Quantitation of DNA adducts using high resolution mass spectrometry: a case study*. 244th ACS National Meeting, Philadelphia, PA (2012) **The poster was selected for an oral presentation**

S.S. Hecht, S. James-Yi, M.G. O'Sullivan, I. Stepanov, M. Wang, S. Zhang, F. Kassie, S. Carmella, P. Upadhyaya, and **S. Balbo**. *DNA Binding of the Smokeless Tobacco Constituent (S)-N'-Nitrosornicotine [(S)-NNN] Predicts Its Oral Cavity Carcinogenicity in Rats*. 244th ACS National Meeting, Philadelphia, PA (2012). **The poster was selected for an oral presentation and included in the conference press release**

**S. Balbo**, S. James-Yi, M. Gerard O'Sullivan, I. Stepanov, M. Wang, S. Zhang, F. Kassie, S. Carmella, C. Wettlaufer, K. Hohol, A. Knezevich, P. Upadhyaya, S. S. Hecht. *(S)-N'-nitrosornicotine, a constituent of smokeless tobacco, is a potent oral tumorigen in rats*. AACR Annual Meeting, Chicago, IL (2012). **The poster was included in the conference press release**

**S. Balbo**, P.W. Villalta, S. S. Hecht. *Development of a high resolution mass spectrometry method for the observation and characterization of unknown adducts in human DNA*. AACR Annual Meeting, Chicago, IL (2012)

**S. Balbo**, L. Meng, J.A. Jensen, D. K. Hatsukami and S. S. Hecht. *Effects of defined amounts of alcohol consumption on levels of N<sup>2</sup>-ethylidene-dGuo in DNA from human buccal cells and peripheral blood nucleated cells*. AACR 102nd Annual Meeting, Orlando, FL (2011)

**S. Balbo**, J. B. Hochalter, P. W. Villalta, S. G. Carmella and S. S. Hecht. *Liquid chromatography-electrospray ionization tandem mass spectrometry analysis of 7-ethylguanine in human urine*. AACR annual meeting, Washington DC, (2010).

**S. Balbo**, P. W. Villalta, S. Zhang and S. S. Hecht. *Development of a sensitive method for the observation and characterization of unknown adducts in human peripheral blood leukocyte DNA*. 38th American Chemical Society National Meeting & Exposition, Washington, DC (2009)

**S. Balbo**, M. Wang, S. S. Hecht, C. Canova, L. Simonato, F. Merletti, L. Richiardi, A. Agudo, X. Castellsagué, A. Znaor, R. Talamini, V. Bencko, I. Holcátová, M. Hashibe P. Brennan and P. Boffetta. *Investigation of the role of alcohol-metabolizing genes and DNA repair genes in the increase of levels of N<sup>2</sup>-Ethylidenedeoxyguanosine*. AACR annual meeting, San Diego, CA (2008).

**S. Balbo**, S. Gundy, M. Wang, S. Hecht and P. Boffetta. *Relationship between acetaldehyde-related adducts in human leukocytes DNA and cytogenetic changes in alcoholics*. 2nd ECNIS annual meeting, Maastricht, The Netherlands (2007). **The poster was selected for an oral presentation.**

**S. Balbo**, P. Boffetta, S. Gundy, M. Wang and S. Hecht. *Quantitation of N<sup>2</sup>-ethylidenedeoxyguanosine in human DNA and its relationship with alcohol consumption*. AACR annual meeting Los Angeles CA (2007).

**S. Balbo**. *Synthesis and pharmacological evaluation of a new class of potential antiatherosclerotic drugs*. European school of Medicinal Chemistry of Urbino (Italy), XXV Advanced Course of Medicinal Chemistry and "E.Duranti" National Seminar for PhD Students, Urbino, Italy (2005). **The poster was chosen for an oral presentation.**

**L. Lazzarato**, M. L. Lolli, S. Balbo, G. Deleide, R. Fruttero. *A new class of NO-donors with bone selectivity*. Annual symposium of the Italian chemical society (Medicinal Chemistry division), Torino, Italy (2003).

#### **Invited Oral presentations:**

**S Balbo**. "Acetaldehyde from alcohol consumption induces DNA adduct formation in human oral cavity and peripheral blood cells". 2<sup>nd</sup> Alcohol and Cancer international conference. Breckenridge, CO (2013)

**S Balbo**. "Development of a high-resolution mass spectrometry method for the characterization of unknown adducts in human DNA" Departmental Seminars, Department of Medicinal Chemistry University of Minnesota. (February 14, 2012)

**S Balbo**. "DNA adducts of Acetaldehyde as biomarkers for the assessment of alcohol interaction with DNA" International Agency for Cancer Research, Lyon, France. (2007)

**S Balbo** and P Boffetta. "Biomarkers for the assessment of alcohol interaction with DNA" ECNIS WP6 Meeting, DKFZ, Heidelberg, Germany (2006).

**S Balbo**. "NO donors-antioxidants". Young scientists' symposium of the Belgian environmental mutagenic society, Brussels, Belgium (2004).

#### **Membership in professional organizations:**

American Association for Cancer research: 2007-present

American Chemical Society: 2009-present

American Society for Mass Spectrometry: 2012-present

#### **Peer-reviewed publications:**

Song JM, Kirtane AR, Upadhyaya P, Qian X, **Balbo S**, Teferi F, Panyam J, Kassie F. *Intranasal delivery of liposomal indole-3-carbinol improves its pulmonary bioavailability*. *Int J Pharm*. 2014 Oct 10. pii: S0378-

5173(14)00741-8. doi: 10.1016/j.ijpharm.2014.10.018. [Epub ahead of print] PMID: 25311179 [PubMed - as supplied by publisher]

**Balbo S**, Johnson CS, Kovi RC, James-Yi SA, O'Sullivan MG, Wang M, Le CT, Khariwala SS, Upadhyaya P, Hecht SS. *Carcinogenicity and DNA adduct formation of 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone and enantiomers of its metabolite 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol in F-344 rats*. *Carcinogenesis*. 2014 Sep 30. pii: bgu204. [Epub ahead of print]

Ma B, Villalta PW, **Balbo S**, Stepanov I. *Analysis of a malondialdehyde-deoxyguanosine adduct in human leukocyte DNA by liquid chromatography nanoelectrospray-high-resolution tandem mass spectrometry*. *Chem Res Toxicol*. 2014 Oct 20;27(10):1829-36. doi: 10.1021/tx5002699. Epub 2014 Sep 15.

Narayanapillai SC, **Balbo S**, Leitzman P, Grill AE, Upadhyaya P, Shaik AA, Zhou B, O'Sullivan MG, Peterson LA, Lu J, Hecht SS, Xing C. *Dihyromethysticin from kava blocks tobacco carcinogen 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone-induced lung tumorigenesis and differentially reduces DNA damage in A/J mice*. *Carcinogenesis*. 2014 Oct;35(10):2365-72. doi: 10.1093/carcin/bgu149. Epub 2014 Jul 22.

Kennedy G., Nukaya M., Moran S., Glover E., Weinberg S., **Balbo S.**, Hecht S.S., Pitot H.C., Drinkwater N R. and Bradfield C.A. "Liver Tumor Promotion by 2,3,7,8-Tetrachlorodibenzo-p-dioxin is dependent on the Aryl Hydrocarbon Receptor and Tumor Necrosis Factor/Interleuchin-1 receptors" *Toxicol Sci*. 2014 Jul;140(1):135-43. doi: 10.1093/toxsci/kfu065. Epub 2014 Apr 9

Ronnekleiv-Kelly S.M., Nukaya M., Geiger P.G., Diaz-Diaz C.J., **Balbo S.**, Hecht S.S., Bradfield C.A. and Kennedy G.D. "The role of the Aryl Hydrocarbon Receptor in inflammation-associated colorectal carcinogenesis by Azoxymethane and Dextrane Sodium Sulfate" Submitted to *Carcinogenesis*

Zarth A., Cheng G., Zhang Z., Wang M., Villalta P.W., Balbo S., and Hecht SS "Analysis of the Benzene Oxide-DNA adduct 7-Phenylguanine by Liquid Chromatography-Nanoelectrospray Ionization-High Resolution-Tandem Mass Spectrometry-Parallel Reaction Monitoring: Application to DNA from Exposed Mice and Humans". Submitted to *Chemico-Biological Interactions*

**Balbo S.**, Turesky R.J., Villalta P.W. "DNA adductomics" review published on *Chem Res Toxicol*. 2014 Jan 17. DOI: 10.1021/tx4004352

**Balbo S.**, Hecht S.S., Upadhyaya P., Villalta P.W. "Application of a high-resolution mass-spectrometry-based DNA adductomics approach for identification of DNA adducts in complex mixtures". *Anal Chem*. 2014 Jan 21. DOI: 10.1021/ac403565m

Leitzman P., Narayanapillai SC, **Balbo S**, Zhou B, Upadhyaya P, Shaik A, Lu J, Stephen S. Hecht SS, O'Sullivan MG, and Xing C. "Kava Blocks 4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone-induced Lung Tumorigenesis in Association with Reducing O<sup>6</sup>-methylguanine DNA Adduct in A/J Mice". *Cancer Prev Res*. 2014 Jan;7(1):86-96.

Zhao L, **Balbo S**, Wang M, Upadhyaya P, Khariwala S, Villalta PW, Hecht SS. "Quantitation of pyridyloxobutyl-DNA adducts in tissues of rats treated chronically with (R)- or (S)-N'-nitrosornicotine (NNN) in a carcinogenicity study". *Chem Res Toxicol*. 2013 Sep 3

**Balbo S**, James-Yi S, Johnson CS, O'Sullivan MG, Stepanov I, Wang M, Bandyopadhyay D, Kassie F, Carmella S, Upadhyaya P, Hecht SS. "(S)-N'-Nitrosornicotine, a constituent of smokeless tobacco, is a powerful oral cavity carcinogen in rats". *Carcinogenesis*. 2013 Sep; 34(9):2178-83

Wang M, Cheng G, Khariwala SS, Bandyopadhyay D, Villalta PW, **Balbo S**, Hecht SS. "Evidence for endogenous formation of the hepatocarcinogen N-nitrosodihydrouracil in rats treated with dihydrouracil

and sodium nitrite: A potential source of human hepatic DNA carboxyethylation". *Chem Biol Interact.* 2013 Jul 30.

**Balbo S**, Upadhyaya P, Villalta PW, Qian X, Kassie F. "DNA Adducts in Aldehyde Dehydrogenase-Positive Lung Stem Cells of A/J Mice Treated with the Tobacco Specific Lung Carcinogen 4-(Methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK)". *Chem Res Toxicol.* 2013 Mar 15.

Fowler AK, Hewetson A, Agrawal RG, Dagda M, Dagda R, Moaddel R, **Balbo S**, Sanghvi M, Chen Y, Hogue RJ, Bergeson SE, Henderson GI, Kruman II. "Alcohol-induced one-carbon metabolism impairment promotes dysfunction of DNA base excision repair in adult brain". *J Biol Chem.* 2012 Dec 21;287(52):43533-42.

**Balbo S**, Meng L, Bliss RL, Jensen JA, Hatsukami DK, Hecht SS. "Time course of DNA adduct formation in peripheral blood granulocytes and lymphocytes after drinking alcohol". *Mutagenesis.* 2012 Jul; 27(4):485-90.

**Balbo S**, Meng L, Bliss RL, Jensen JA, Hatsukami DK, Hecht SS. "Kinetics of DNA adduct formation in the oral cavity after drinking alcohol". *Cancer Epidemiol. Biomarkers Prev.* 2012 Apr; 21(4):601-8.

Abraham J., **Balbo S.**, Crabb D., Brooks P.J. "Alcohol Metabolism in Human Cells Causes DNA Damage and Activates the Fanconi Anemia-Breast Cancer Susceptibility (FA-BRCA) DNA Damage Response Network". *Alcohol Clin Exp Res.* 2011 Dec 35(12): 2113-20.

**Balbo, S.**, Villalta, P.W., and Hecht, S.S. "Quantitation of 7-ethylguanine in leukocyte DNA from smokers and nonsmokers by liquid chromatography-nanoelectrospray-high resolution tandem mass spectrometry". *Chem. Res. Toxicol.*, 2011 Oct 17; 24(10): 1729-34.

Thomas JL, Guo H, Carmella SG, **Balbo S**, Han S, Davis AB, Yoder AR, Murphy SE, An LC, Ahluwalia JS, Hecht SS. *Metabolites of a Tobacco-Specific Lung Carcinogen in Children Exposed to Secondhand or Thirdhand Tobacco Smoke in Their Homes.* *Cancer Epidemiol Biomarkers Prev.* 2011 Jun 20(6): 1213-21.

Zhang S, **Balbo S**, Wang M, Hecht SS. "Analysis of acrolein-derived 1,n(2)-propanodeoxyguanosine adducts in human leukocyte DNA from smokers and nonsmokers." *Chem Res Toxicol.* 2011 Jan 14;24(1):119-24.

Zhong Y, Carmella SG, Hochalter JB, **Balbo S**, Hecht SS. "Analysis of r-7,t-8,9,c-10-Tetrahydroxy-7,8,9,10-tetrahydrobenzo[a]pyrene in Human Urine: A Biomarker for Directly Assessing Carcinogenic Polycyclic Aromatic Hydrocarbon Exposure Plus Metabolic Activation." *Chem Res Toxicol.* 2011 Jan 14;24(1):73-80.

Upadhyaya P, Hochalter JB, **Balbo S**, McIntee EJ, Hecht SS. "Preferential Glutathione Conjugation of a Reverse Diol Epoxide Compared with a Bay Region Diol Epoxide of Benzo[a]pyrene in Human Hepatocytes." *Drug Metab Dispos.* 2010 Sep; 38(9):1397-402.

Wang M., Cheng G, **Balbo S**, Carmella SG, Villalta PW and Hecht SS. "Clear differences in levels of a formaldehyde-DNA adduct in leukocytes of smokers and nonsmokers." *Cancer Res.* 2009 Sep 15;69(18):7170-4.

**Balbo S.**, Hashibe M., Gundy S., Brennan P., Canova C., Simonato L., Merletti F., Richiardi L., Agudo A., Castellsagué X., Znaor A., Talamini R., Bencko V., Holcátová I., Wang M., Hecht S. and Boffetta P. "N<sup>2</sup>-Ethyldeoxyguanosine as potential biomarker for the assessment of effects on DNA of alcohol consumption" *Cancer Epidemiol Biomarkers Prev.* 2008 Nov; 17 (11): 3026-32.

**Balbo S.**, Lazzarato L., Di Stilo A., Fruttero R., Lombaert N. and Kirsch-Volders M. "Studies of the potential genotoxic effects of furoxans: the case of CAS 1609 and of the water soluble analogue of CHF 2363" *Toxicol Lett.* 2008 Apr 21; 178(1): 44-51.

Cena C., Chegaev K, **Balbo S**, Lazzarato L., Rolando B., Giorgis M., Marini E, Fruttero R, Gasco A. “*Novel Antioxidant Agents Deriving From Molecular Combination of Vitamin C and NO-donor moieties*” Bioorg Med Chem. 2008 Mar 6.

***Contributions to book chapters:***

M. Hashibe, **S. Balbo**, P. Boffetta. “*Alcohol biomarkers*”. In: State of validation of biomarkers of carcinogen exposure and early effects and their applicability to molecular epidemiology. P. Farmer, S. Kyrtopoulos and J. Emery Eds. ECNIS ISBN 978-83-60818-06-0

F. de Vocht, J. Vlaanderen, A. Povey, **S. Balbo** and R. Vermeulen *Chapter 9: “Use of Biological Markers to Assess Exogenous Exposures”* in Molecular Epidemiology, Unit III: Assessing Exposure to the Environment. P. Boffetta et al. Eds. IARC Sci Publ. 2011;(163):163-74.

**S. Balbo** and S.S. Hecht “*Quantitation of Acetaldehyde-DNA Adducts, Biomarkers of Alcohol Consumption*” In: Cancer prevention: dietary factors and pharmacology. Z. Dong and A.M. Bode Eds. Springer Humana Press; 2013; (11): 237-248.