The Slovak Republic:

Monitoring activities in humans, using biomarkers, that focus on an environmental exposure, diseases and/or disorders and genetic susceptibility

| Participant                   | Name of project/study  | Funded by   | Date<br>enter-exit | Biomarker            | Matrix  | Specification according to groups and areas  |
|-------------------------------|--|---|--------------------|----------------------|---|--|
| Slovak Medical<br>University  | Xenobiotics as possible cause of allergy   | Ministry of Health<br>SR                                  | 1996-1999          | Pb, Cd, and total Hg | placenta                                      | 400 samples  |
| Contact:<br>Dr. Reichrtova E. |  |   |                    |                      |   | 8 areas of Slovakia  |
| Slovak Medical<br>University  | Risks of exposure and toxic effects in humans  | Ministry of Health<br>SR                                  | 1997- 2000         | Pb, Cd, and total Hg | cord blood, venous<br>blood, maternal<br>milk | maternal milk - 170 samples,<br>cord blood - 386 samples,<br>venous blood -263 samples of<br>children (age 1 year) |
| Contact:<br>Ursinyova M.      |  |   |                    |                      |   | 8 areas of Slovakia  |
| Slovak Medical<br>University  | Epidemic investigation of allergic<br>disease among children in the<br>Slovak Republic         | Project of Slovak-<br>American<br>cooperation<br>G/147/98 | 1998-2000          | Pb, Cd, Hg           | placenta                                      | 400 twinnings mothers and children   |
| Contact:<br>Reichrtova E.     |  |   |                    |                      |   | 8 areas of Slovakia  |
| Slovak Medical<br>University  | Neurobehavioral development of<br>children living in differently<br>polluted areas of Slovakia | Ministry of<br>Environment SR                             | 1995-1997          | Pb                   | venous blood                                  | 264 children   |
| Contact:<br>Sovcikova E.      |  |   |                    |                      |   | 3 areas of Slovakia  |
| Slovak Medical<br>University  | Long-term Lead exposure and its neurotoxic effects in children in the Slovak Republic          | Ministry of<br>Environment SR                             | 1997               | Pb                   | venous blood                                  | 200 children   |
| Contact:<br>Sovcikova E.      |  |   |                    |                      |   | 2 areas of Slovakia  |

| Slovak Medical<br>University | Biological monitoring of persistent<br>chemicals and their effect on the<br>health state of the selected groups<br>of inhabitants of Slovakia                | Ministry of Health<br>SR           | 1995   | Pb, Cd, Hg<br>Pb  | urine,<br>venous blood                           | 400 children (age 10 - 12 years)  |
|------------------------------|--|------------------------------------|--|---|--|---|
| Contact:<br>Uhnak J.         |  |                                    |  |   |  | 4 areas of Slovakia   |
| Slovak Medical<br>University | Alternative nutrition and metabolic<br>effects related to the risk factors<br>and protective nutritional factors   | Ministry of Health<br>SR           | 1997-1998  | Pb, Cd, Hg  | blood  | 250 volunteers, 2 nutritional<br>groups:<br>children (age 11- 14 years)<br>adolescents<br>adults              |
| Contact:<br>Kudlackova M.    |  |                                    |  |   |  |   |
| Slovak Medical<br>University | Seasonal dietary antioxidant levels<br>in relation to human health   | Project Copernicus<br>IC15CT961012 | 1997-2000  | Pb, Cd, Hg, Zn, Cu,<br>Se   | blood  | 120 volunteers (age over 50<br>years) after hearth attack and<br>control group                                |
| Contact:<br>Dusinska M.      |  |                                    |  |   |  |   |
| Slovak Medical<br>University | Placental uptake and transfer of<br>environmental chemicals relating<br>to allergy in childhood years.   | PLUTOCRACY                         | 2001-2005  | Pb, Cd<br>immunological<br>parameters   | placenta<br>cord blood                           | 200 samples of placenta per area<br>200 samples of cord blood per<br>area                                     |
| Contact:<br>Palkovicova L.   |  |                                    |  |   |  | 6 areas in Europe   |
| Slovak Medical<br>University | Relationship between the levels of toxic and essential elements and allergic diseases in children  | project APVT-21-<br>025602         | 2002-2005  | Pb, Cd, Hg and trace<br>metals<br>immunological<br>parameters                               | blood  | 300 samples of blood from<br>children<br>This is the follow-up project of<br>the former project in volunteers |
| Contact:<br>Ursinyova M.     |  |                                    |  |   |  | 8 areas of Slovakia   |
| Slovak Medical<br>University | Prenatal a postnatal exposure to<br>xenobiotics and development of<br>allergy in preschool children  | project APVV-21-<br>016504         | 2005 - 2008  | Pb, Cd,Hg<br>immunological<br>parameters<br>genetical<br>polymorphism                       | placenta<br>cord blood<br>blood<br>maternal milk | 250 samples per matrix  |
| Contact:<br>Palkovicova L.   |  |                                    |  |   |  | 2 areas of Slovakia   |
| Slovak Medical<br>University | Study on the simultaneous impact<br>of selected toxic elements and PCBs<br>on hormonal levels of thyroid gland<br>and neurobehav. development in<br>children | Ministry of Health<br>SR           | 2005 - this<br>project was<br>given for<br>aproval | Pb, Cd, Hg<br>PCBs<br>parameters of<br>neurobeh.<br>development<br>thyroid gland<br>hormone | blood  | 150 twinnings mothers and children  |
| Contact:<br>Ursinyova M.     |  |                                    |  |   |  | 2 areas of Slovakia   |

| Slovak Medical<br>University   | Creutzfeldt-Jakob disease exogenic<br>risk factors study in the area with<br>higher prevalence of this disease | project APVT             | 2005-2008      | Mn, Cu<br>glycotype PrPsc tissue<br>polymorphism type<br>129 PRNP   | nervous tissue   |   |
|--|--|--------------------------|----------------|---|--|---|
| Contact:<br>Slivarichova D.  |  |                          |                |   |  | 2 areas of Slovakia   |
| National Authority<br>of Public Health<br>Bratislava<br>co-operators:<br>RAPH Banska<br>Bystrica<br>RAPH Kosice<br>RAPH Bratislava | Partial Monitoring System:<br>Population exposure to<br>environmental factors                                  | Ministry of Health<br>SR | 1996 -<br>2000 | Pb, Cd, Hg, Cr, Ni  | blood<br>hair<br>urine<br>adipose tissue<br>liver<br>kidney<br>maternal milk | 25 women and 25 men per area<br>30 children (age 10 years) per<br>area<br>30 adolescents (age 16 years)<br>per area |
|  |  |                          |                |   |  | 12 areas of Slovakia, 24 sampling points  |
| NAPH Bratislava<br>RAPH Bratislava<br>RAPH Prievidza<br>SGI Bratislava   | Health impact of geological factors<br>on population in Horna Nitra area                                       | SGI Bratislava           | 2004 - 2006    | As, Hg, Cd, Pb  | hair<br>nails<br>urine   | 200 school children   |
| RAPH Banska<br>Bystrica<br>gestor  | CINDI programe<br>Countrywide Integrated Non-<br>communicable Diseases<br>Intervention Programme               | Ministry of Health<br>SR | 1999 - 2005    | cholesterol<br>HDL<br>LDL<br>glucose<br>triglycerides   | blood  | 2000 people   |
| Contact:<br>Avdicova M.  |  |                          |                |   |  |   |
| RAPH Banska<br>Bystrica  | The overall evaluation of the exposure to formaldehyde in children   | Ministry of Health<br>SR | 1991 - 1992    | % Ab.b.,<br>ceruloplasmine<br>immunoglobulines<br>transferine index<br>orosomucoide<br>prealbumine<br>CSI, C3, C4, A1AT,<br>AFT | blood  | 19 pre-school children<br>21 pre-school children (control<br>group)   |
| Contact:<br>Slotova K.   |  |                          |                |   |  | 3 areas of Slovakia   |

| RAPH Banska<br>Bystrica<br>RAPH Prievidza                 | The health impact study of the polluted environment in the Novaky area                                  | PHARE project<br>EC/91/HEA/18 | 1992-1995              | Ni, Rb, Sc, Fe, Hf, Hg,<br>Ga, La, Na<br>Pt, Sb, Sn, Ta, W, K,<br>Ce, Co, Cs, Cd,<br>Cr, Eu, Ag, As, Au, Br,<br>Ba, Se, Zn,<br>In                           | hair                            | 39 children of 3 polluted areas<br>23 children of control group  |
|---|---|-------------------------------|------------------------|---|---------------------------------|--|
|   | Part II: Study in workers   |                               | 1992 - 1995            | total As, inorganic As<br>As metabolites -<br>MMA, DMA  | urine                           | workers of Power plant and<br>Novak Chemical Works   |
| Contact:<br>Fabianova E.                                  |   |                               |                        |   |                                 | 4 areas of Slovakia  |
| RAPH Banska<br>Bystrica<br>RAPH Prievidza                 | EPRI - Exposure to As and<br>bioavailability of Arsenic<br>metabolites<br>Part I.                       | EPRI, P. A.<br>California     | 1993 - 1996            | creatinine, urine<br>density<br>total As, inorganic As<br>As metabolites -<br>MMA, DMA<br>% Ab.b.,MN, SCE   | urine<br>hair<br>nails<br>blood | 20 volunteers<br>3 areas of Slovakia   |
|   | Part II.  |                               | 1997-1999              | creatinine, urine<br>density<br>total As, inorganic As<br>As metabolites -<br>MMA, DMA<br>% Ab.b.,MN, SCE   | urine<br>blood*<br>blood        | 20 volunteers<br>* done in USA<br>3 areas of Slovakia  |
| Contact:<br>Fabianova E.                                  |   |                               |                        |   |                                 |  |
| RAPH Banska<br>Bystrica<br>RAPH Zilina<br>RAPH Bratislava | CESAR<br>Central European Study on air<br>pollution and respiration<br>Part I.<br>Part II.<br>Part III. | EU                            | 1994 –<br>1997<br>1998 | total lymphocytes,<br>E196<br>Ly - CD markers,<br>IM index<br>lymphocytotransform.<br>test<br>deter. of antibodies to<br>tetanus, diphtheria<br>eosinofiles | blood<br>mucous smear           | 21 school - 3038 children (age 7<br>-11 years)<br>immunobiomarkers: 80 children<br>(age 9 -10 years)<br>validation study on atopy: 320<br>children ( 9 - 11 years) |
| Contact:<br>Fabianova E.                                  |   |                               |                        |   |                                 | 4 areas of Slovakia  |
| RAPH Banska<br>Bystrica<br>RAPH Levice<br>RAPH Nove Zamky | Determination of As metabolites in urine  | Ministry of Health<br>SR      | 1999                   | total As, inorganic As<br>As metabolites -<br>MMA, DMA<br>creatinine  | urine                           | 93 people  |
| Contact:<br>Koppova K.,<br>Miskovic P.                    |   |                               |                        |   |                                 | 8 areas of Slovakia  |

| RAPH Banska<br>Bystrica<br>RAPH Prievidza                                    | EXPASCAN - Exposure to Arsenic<br>and Cancer Risk in Central and<br>Eastern Europe                                     | EU<br>IC13CT980525               | 1999 -2001  | total As, inorganic As<br>As metabolites -<br>MMA, DMA<br>and genotype<br>determination  | urine<br>hair<br>bucous smear | 264 people and 286 controls   |
|--|--|----------------------------------|-------------|--|-------------------------------|---|
| Contact:<br>Fabianova E.,<br>Miskovic P.                                     |  |                                  |             |  |                               | area Novaky   |
| NAPH Bratislava<br>RAPH Banska<br>Bystrica<br>RAPH Kosice<br>RAPH Bratislava | CRB - Cancer risk Biomarkers   | EU                               | 2002 - 2004 | cytogenetic analyses<br>of lymphocytes<br>(% Ab.b.,MN, SCE)  | periph. blood                 | cohort: 3015 people - 1732 men<br>and 1262 women  |
| Contact:<br>Fabianova E.   |  |                                  |             |  |                               | 3 areas of Slovakia   |
| RAPH Banska<br>Bystrica  | ASHRAM<br>Arsenic Risk Assessment and<br>Molecular Epidemiology  | EU<br>QLRT-20001-<br>00264-EU    | 2002 - 2005 | total As, inorganic As<br>As metabolites -<br>MMA, DMA; Se<br>genotype of DNA<br>examination of<br>ceratosis occurrence<br>and pigment changes | urine<br>blood<br>skin        | 490 people -278 men, 212<br>women   |
| Contact:<br>Koppova K.   |  |                                  |             |  |                               | 6 areas of Slovakia   |
| RAPH Banska<br>Bystrica<br>RAPH Spisska Nova<br>Ves                          | PHIME<br>Public Health Impact of long-term,<br>low-level mixed element<br>exposure in susceptible population<br>strata | EU<br>6th Framework<br>Programme | 2006 - 2010 | Pb, Cd, Hg   | blood                         | 150 children (age 7 - 8 years)<br>120 women (age 20 -30, 50 -60<br>years)   |
| Contact:<br>Koppova K.   |  |                                  |             |  |                               | country, urban and polluted areas of Slovakia   |
| RAPH Rimavska<br>Sobota  | Longitudinal study on environment<br>and health in the area Hnusta -<br>Hacava   | Ministry of Health<br>SR         | 1986 - 1995 | CSI<br>Cd, Pb, Cr, Mn  | serum<br>hair                 | 60 children (age 10 years) living<br>in area min. 5 years<br>180 children (age 7-10 years)<br>living in area min. 5 years |
|  |  |                                  |             |  |                               | Hnusta-Hacava area  |
| RAPH Rimavska<br>Sobota  | Study on health state of children exposure to lead   | Ministry of Health<br>SR         | 1985        | Pb   | blood<br>hair<br>milk-teeth   | 60 children (age 10 years) living<br>in area min. 5 years<br>180 children (age 7-10 years)<br>living in area min. 5 years |
|  |  |                                  |             |  |                               | Banska Stiavnica area   |

| RAPH Banska<br>Bystrica<br>RAPH Rimavska<br>Sobota<br>RAPH Roznava                     | Magnesite Mine health impact<br>Assessment  | Ministry of Health<br>SR<br>Own budget    | 1977 -                             | cytogenetic analyses<br>of lymphocytes<br>mutagenity             | periph. blood<br>urine                       | 202 workers<br>107 workers   |
|--|---|---|------------------------------------|--|--|--|
|  |   |   |                                    |  |  | Jelsava area   |
| RAPH Roznava<br>RAPH Kosice<br>RHS Ostrava   | Cancer Risk Assessment in workers<br>of Metal Mines   | Ministry of Health<br>SR<br>Own budget    | 1987 - 1994                        | cytogenetic analyses<br>of lymphocytes<br>mutagenity             | periph. blood<br>urine                       | 103 workers  |
|  |   |   |                                    |  |  | Roznava area   |
| RAPH Velky Krtis<br>RAPH Banska<br>Bystrica<br>RAPH Liptovsky<br>Mikulas<br>RAPH Cadca | Exposure to PCBs via soil, water<br>and food chain  | Ministry of Health<br>SR                  | 1990<br>1986 - 1991<br>2001 - 2002 | PCBs<br>PCBs<br>PCBs, heavy metals                               | maternal milk                                | 52 women<br>5 women per year<br>9 women  |
|  |   |   |                                    |  |  | 3 areas of Slovakia  |
| RAPH Kosice  | Analysis of polluted factors impact<br>on workers health in U.S. Steel<br>Kosice - DZ coking plant  | NCI USA                                   | 2002 -2008                         | cytogenetic analyses<br>of lymphocytes<br>mutagenity             | periph. blood<br>urine                       | in subsample of 2814 workers<br>(age 15 - 74 years)                              |
|  |   |   |                                    |  |  | Kosice area  |
| RAPH Kosice  | Health impact Assessment from<br>exposure to As and Sb in Zlata Idka<br>area<br>Part I.<br>Part II. | Ministry of Health<br>SR                  | 2000 - 2003<br>2004 - 2006         | As, Sb   | blood, urine, hair,<br>nails<br>blood, urine | 117 inhabitants (age 10 - 100<br>years)<br>24 inhabitants (age 21 - 77<br>years) |
|  |   |   |                                    |  |  | 2 areas of Slovakia  |
| RAPH Kosice  | Health impact Assessment of garbage disposal plant/incinerator in Kosice                            | National Health<br>Promotion<br>Programme | 2004 - 2006                        | As, Sb, Hg, Cd, Pb,<br>Mn, Cu, PAU<br>NOx, CO, SO2, dust,<br>HCI | blood, urine, hair                           | 240 inhabitants (age 10 - 73<br>years)   |
|  |   |   |                                    |  |  | Kosice area  |
| RAPH Prievidza   | Vinylchlorid and Cancer Risk in<br>Novak Chemical Works   | Novak Chemical<br>works                   | 2003 -                             | VCM<br>cytogenetic analyses<br>of lymphocytes                    | blood  | 1200 workers and inhabitants of<br>Novaky and Zemlianske<br>Kostolany areas      |
| RAPH Prievidza   | Environmental Impact on children<br>Health  | Ministry of Health<br>SR                  | 1991 - 1999                        | Hg, As   | nails<br>hair                                | 400 children   |
|  |   |   |                                    |  |  | Prievidza area   |

| RAPH Galanta  | Health impact of environmental factors on population in Galanta area  | Ministry of Health<br>SR | 1996 - 1998 | Er, Hb, HTC, Fe, As,<br>Cd, Hg, Pb, F<br>total cholesterol, HDL,<br>Tg PCBs, γHCH | blood  | 30 children<br>30 adolescents   |
|---|---|--------------------------|-------------|---|--|---|
|   |   |                          | 2000 - 2001 | a+β+γHCH, DDT,<br>DDE, Pb, Cd, Cr,<br>Ni, Hg, As, F, NO3 <sup>-</sup>             | maternal milk, hair<br>urine, necrotic<br>mater. | 50 adults, primiparae   |
|   |   |                          |             |   |  | Galanta area  |
| RAPH Dolny Kubin  | Determination of Heavy metals in<br>children hair   | Ministry of Health<br>SR | 1977 - 1995 | Cd, Pb, Ni, Mn  | hair   | 334 school children   |
|   |   |                          |             |   |  | Dolny Kubin area  |
| RAPH Dolny Kubin  | Health impact of environmental<br>factors   | Ministry of Health<br>SR | 1995 - 1998 | Pb, Cd, Hg  | urine, blood                                     | 200 inhabitants   |
|   |   |                          |             |   |  | Tvrdosin and Namestovo areas  |
| RAPH Trebisov<br>Slovak Medical<br>University<br>RAPH Humenne | PCBs in humans in selected polluted areas in Slovakia   | Ministry of Health<br>SR | 1994        | PCBs  | adipose tissue                                   | patients  |
|   |   |                          | 1979-1999   |   | maternal milk                                    | primiparae  |
|   |   |                          | 1986-1993   |   | urine  | workers exposed to dinyl  |
|   |   |                          |             |   |  | 4 areas of Slovakia   |
| RAPH Spisska Nova<br>Ves                                      | Food contaminants study and health<br>impact of the polluted environment<br>on children                                   | Ministry of Health<br>SR | 1994-1997   | PCBs, HCB, HCH, DDT   | maternal milk                                    | 58 samples of maternal milk   |
|   |   |                          | 2000-2001   | Pb, Hg, Cd<br>heavy metals  | blood, hair, urine                               | 79 school children<br>40 workers  |
|   |   |                          |             |   |  | 2 areas of Slovakia   |
| Slovak Medical<br>University                                  | Exposure to Dioxins, PCBs, selected<br>Pesticides and PBDE in inhabitants<br>of Slovakia                                  | Ministry of Health<br>SR | 2006-2008   | PCCD/F, PBDE,<br>PCB, HCB,<br>p,p´-DDE, p,p´-DDT                                  | serum, maternal<br>milk                          | women: serum - 115 samples,<br>maternal milk - 70 samples<br>men: serum - 115 samples                           |
|   |   |                          |             |   |  | 5 areas of Slovakia   |
| Slovak Medical<br>University                                  | Health impact of exposure to PCBs<br>and Dioxins on neurobehavioral<br>and cognitive functions<br>development of children | Ministry of Health<br>SR | 2006-2008   | PCB, PCDD/F<br>PCB<br>PCB   | serum, maternal<br>milk<br>serum<br>serum        | 100 women and 100 children –<br>newborns<br>500 children (age 3 years)<br>200 twinnings mothers and<br>children |
|   |   |                          |             |   |  | Michalovce and Strazske areas   |

| Slovak Medical<br>University | Prenatal a postnatal exposure to<br>PCBs and immunity response   | Ministry of Health<br>SR   | 2006-2008              | РСВ                                     | serum, maternal<br>milk | 300 children (age 0 - 16 months)    |
|------------------------------|--|--|------------------------|---|-------------------------|-------------------------------------|
|                              |  |  |                        |   |                         | 3 areas of Slovakia                 |
| Slovak Medical<br>University | Exposure to PCBs and hearing<br>disturbance  | APVT-21-016804   | 2005-2007              | РСВ                                     | serum, maternal<br>milk | 800 children                        |
|                              |  |  |                        |   |                         | 3 areas of Slovakia                 |
| Slovak Medical<br>University | PCB Exposures and Early<br>Childhood Development in Slovakia<br>(PCB&ECDs)   | NCI/NIH project,<br>Grant # R01-<br>CA96525  | 2005-2007              | РСВ                                     | serum                   | 1000 twinnings mothers and children |
|                              |  |  |                        |   |                         | 3 areas of Slovakia                 |
| Slovak Medical<br>University | Fourth WHO-Coordinated Survey on POP in Human Milk   | WHO/ECEH   | 2005-2006              | PCB, OCP<br>PCDD/F, PBDE                | maternal milk           | primiparae                          |
|                              |  |  |                        |   |                         | territory of Slovakia               |
| Slovak Medical<br>University | Evaluating Human Health Risk from<br>Low-dose and Long-term PCB<br>Exposure (PCBRISK)  | EU project QLK4-<br>2000-00488   | 2001-2004              | PCB, OCP<br>PCDD/F                      | serum                   | 2000 women and men<br>400 children  |
|                              |  |  |                        |   |                         | 3 areas of Slovakia                 |
| Slovak Medical<br>University | 2nd Round Exposure Study on<br>Levels of PCBs, PCDDs and PCDFs in<br>Human Milk 3rd Round Exposure<br>Study on Levels of PCBs, PCDDs and<br>PCDFs in Human Milk                  | WHO/ECEH   | 1192-1994<br>2000-2002 | PCB, PCDD/F                             | maternal milk           | primiparae                          |
|                              |  |  |                        |   |                         | 4 areas of Slovakia                 |
| Slovak Medical<br>University | Case Control Study on<br>Environmental Exposure to PCBs<br>and Cancer Risk in Eastern Slovakia   | EHSRC<br>International Pilot<br>Grant of University<br>of Iowa and NIH<br>Fogarty<br>International Grant | 1999 - 2000            | РСВ                                     | serum                   | 70 women and men                    |
|                              |  |  |                        |   |                         | Michalovce area                     |
| Slovak Medical<br>University | Polychlorinated dibenzo-p-dioxins,<br>dibenzofurans, biphenyls and dioxin<br>like PCBs in the human population<br>of the Slovak Republic: Analysis and<br>health risk assessment | U.S Slovak<br>Science and<br>Technology<br>Programme   | 1994-1998              | PCDD/F, PCB, HCB,<br>p,p´-DDE, p,p´-DDT | serum                   | 40 women and 37 men                 |
|                              |  |  |                        |   |                         |                                     |
|                              |  |  |                        |   |                         | 6 areas of Slovakia                 |

| Slovak Medical<br>University | Polychlorinated aromatic<br>compounds in the human<br>population of the Slovak Republic         | Ministry of<br>Environment SR          | 1998-2000 | РСВ               | serum                                     | 300 twinnings mothers and children (age 6 months)     |
|------------------------------|---|--|-----------|-------------------|---|---|
|                              |   |  |           |                   |   | 2 areas of Slovakia                                   |
|                              |   | Ministry of Health<br>SR               | 1997-1999 | РСВ               | serum                                     | 459 women and men ( age over 18 years)                |
|                              |   |  |           |                   |   | 2 areas of Slovakia                                   |
|                              |   |  | 1993-1995 | PCDD/F, PCB, HCB, | serum, adipose<br>tissue<br>maternal milk | 90 women and 169 men                                  |
|                              |   |  |           |                   |   | 6 areas of Slovakia                                   |
| Slovak Medical<br>University | Heavy metals (Pb, Cu, Zn, Se) in<br>pathogenesis of Attention deficit<br>Hyperactivity Disorder | NIH Fogarty<br>International<br>Center | 2004-2006 | Cu, Zn, se, Pb    | serum<br>blood                            | 30 children with ADHD<br>30 children of control group |
| Slovak Medical<br>University | Crohn disease: Nutrition,<br>immunopathological changes<br>and oxidative stress                 | APVT-21-009502                         | 2002-2005 | Se                | serum                                     | 100 patients with Crohn disease                       |