

## PRIMARY CANCER PREVENTION AT SCHOOLS

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**Abstract:** *The article deals with cancer prevention education of children in a primary school setting. It outlines an educational preventive programme designed at Masaryk University Brno that focuses on promoting healthy life styles, especially on non-smoking, healthy diets, exercising, mental health, avoiding excessive sunlight exposure and developing life skills. It describes a survey of the programme's efficiency at primary school and compares children's perceptions of cancer before and after the targeted intervention.*

**Keywords:** *cancer prevention, school programmes, health education, children's concept of cancer*

### Introduction

It is generally accepted that health is of a hidden or latent value, and that even adults appreciate health better after they had some personal experience with a disease. Children and young people often do not regard health as their priority because their health is largely taken care of by their parents. Children only begin to learn to take responsibility, and the idea that they might fall ill when they grow up is too distant future. Oncology diseases afflict adult populations more than they afflict children. These all are obstacles educators may have to face when they implement cancer prevention education.

How do children perceive health risks, what do they know about cancer, what factual knowledge do they have and what do they really understand? Are they concerned about their health, and do they know how to, and wish to, care for their health? Researchers in other countries have been dealing with these questions for a long time. They study children's knowledge, attitudes and beliefs about cancer and their understanding of health and healthy behaviours for maintaining good health in the future (Oakley et al. 1995). They also map the **factual knowledge about the origin of cancer in primary school children** (Schonfeld et al. 1999, 2001) and they do **cancer prevention at schools**.

This is a topical issue also in the Czech Republic, primarily because cancer prevalence in Europe is on the increase. Emphasis is mainly placed on the analysis and recognition of risks and their prevention already at schools among the youngest children

because it is there that foundations of responsible attitudes to one's health are being laid. Childhood and adolescence are important stages of human life when every person undergoes important physical and mental development, acquires social and health habits and adopts patterns behaviour he will keep for life. Big influence in this period is wielded, besides the family, by the school.

Primary cancer prevention includes necessary instructions of how to behave to avoid cancer. What decisions to make for an appropriate behaviour. **Prevention is primarily focused on the reduction of smoking, healthy diets and abundance of exercise, i.e. on the three main risk factors.** The aim of education is to teach to make the right decisions that help to promote health, and to implement them in everyday life.

Based on research and surveys, the American Cancer Society **recommended that cancer prevention education be included in the school curriculum.** It is assumed that about two thirds of oncology diseases are attributable to the choice of a bad lifestyle. **One third is the result of tobacco use, and the other is the consequence of unhealthy dietary habits.** Cancer prevention in young children should include the main and the **most general risks** such as **smoking, unhealthy diet, excessive exposure to sunlight and lack of exercise.** Physical activity and physical education at schools play a major role in reducing cancer risks. Appropriate foods in combination with abundance of exercise are basic factors in cancer prevention. **It is important to understand that cancer can be prevented.**

The fundamental question in children health education that we may ask ourselves is: **“Why should we teach children at school about cancer?”** The reasons for including cancer prevention in school curriculum as mentioned above are very many. In spite of that there are still many parents and teachers who are afraid of the topic, considering it premature to discuss it with the very young children from primary schools. Teachers are overloaded fulfilling school curriculum's objectives. There are a number of programmes on the prevention of unhealthy lifestyles, and teachers can choose among them. In its outputs and key competences, the school educational programme includes competencies, attitudes and skills focused on health promotion, disease prevention, etc. Children receive general information on enhancing and maintaining health in the standard school curriculum. Why should we then discuss cancer issues in a special programme with the very young school children? There are quite a few reasons. It is possible to refer to research conducted abroad (Schonfeld et al. 2001, Chin et al. 1998, Oakley et al. 1995). Several reasons are listed in Schonfeld's programme (2001):

- 1) The majority of children does not understand correctly what cancer is. We come across misconceptions (fallacies) that cancer can be contracted through physical contact from someone with cancer. Few children know that specific types of behaviour, such as eating wrong foods or excessive sun exposure, may cause the disease. The three top risk factors are smoking, wrong foods and excessive sun exposure, especially for young schoolchildren. Cancer can be treated and it can also be prevented.
- 2) Cancer directly concerns schoolchildren's lives. Cancer affects both adults and children. Many children have met with cancer in their families. A better understanding of cancer at their age is associated with less fear of the disease and better acceptance of and interaction with cancer patients.

- 3) Behaviour that leads to cancer may be avoided by prevention, specifically by healthy diets, non-smoking, reducing excessive exposure to sunlight, abundant exercise, etc. It is a well-known fact that cigarette smoking and unhealthy eating habits enhance the development of about 70 per cent of all oncology diseases.
- 4) Patterns of behaviour that support healthy lifestyles develop during childhood and adolescence. Most smokers begin experimenting with tobacco at 10 to 14 years of age, 80 per cent of individual cumulative time of exposure to sunlight is spent in childhood and early adolescence, dietary habits of adults are influenced by childhood habits.
- 5) It is easier to establish healthy habits in childhood than to try change behaviour patterns later in life: to change dietary habits, to quit smoking, etc.

These are the main reasons why the National Cancer Institute and the American Cancer Society acknowledged the strategic role of schools in cancer prevention and education.

Drawing on these surveys, the **WHO has recommended to its member countries to introduce cancer prevention education to schools**. In 12001, the Czech Society for Oncology launched its “National Oncology Programme” for the Czech Republic, in which it focused on prevention at schools (available at <http://www.linkos.cz>).>. In the programme, it also mentions the strategic importance of cancer prevention education at schools.

## **Primary preventive oncology programmes for children**

Experts in many industrialized countries such as the UK, USA, Netherlands, Spain, Italy, Portugal, Norway, Sweden and Australia have come to understand that primary cancer prevention for children at schools is necessary and irreplaceable. They drew upon many surveys in their countries and in the world. It was established that a good primarily preventive educational programme must respond to practice requirements and existing situation findings. Before it is broadly applied and regularly used, such a programme must be evaluated in a pilot study. It is necessary to test a programme’s effectiveness before it is promulgated because we very often come across a discrepancy, an abyss, between research and implementation in practice. In this chapter, we are going to take a closer look at several cancer prevention programmes and research projects in different parts of the world.

In Europe (Rabier 1989), a survey of teachers from 12 EU member states (Belgium, Denmark, France, Germany, Greece, UK, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain) was conducted in which respondents expressed their opinions on cancer prevention education at schools. A total of 2,750 teachers were contacted, with about a third of them from primary schools and two thirds from secondary schools. Each of them was interviewed on topics including cancer, drugs, AIDS, methods of prevention, organisation of health education in schools. Who is responsible for health education at their school, the role of the teacher vs. physician and parent, smoking prevention for teachers and children. It was established that **cancer prevention was not sufficiently represented in schools, and that teachers would welcome more extensive cooperation with physicians and parents**.

In the USA (Chamberline 1999), an approach was developed to help children suffering from cancer cope with tumour chemotherapy side effects. Five psychologists with personal experience with the disease because they themselves had to have cancer treatment, joined the efforts to help other people cope with this very serious life situation. They wanted to prepare children with leukaemia and their parents for chemotherapy. They wrote a comic book called **Kemo Shark**. The shark swims around in the body and eats the bad cancer cells, but sometimes it eats the good ones by mistake, which creates the unintended “side effects”. Kemo Shark is a metaphorical description of what is taking place in my body during chemotherapy. The shark eats the diseased cells but it also eats the healthy ones, which make the treatment problematic. A comic book **Kemo Shark** and informational video **My Mom Has Breast Cancer** were developed to help children prepare for changes in the family function during the mother’s disease and communication in the hospital. Available at [http:// www.kidscope.org](http://www.kidscope.org).

In his study, David Schonfeld (1999) from Yale University confirms that it is possible to discuss AIDS and cancer with children without causing them any harm. Children know very little about these diseases. Events that frighten adults did not have the same effect on children. Children were not afraid to discuss these health threats and the discussions did not have any negative impact on them. **Done properly, health education does not traumatize or scare children. It gives them a realistic and rational insight into the situation.** There is a feedback from the children to their parents, and the parents learn from their children. Cancer prevention education must start in early school age, because the basis of most risk behaviours impacting health later in life is formed at that age. Based on his study, he calls for a more effective health education to be included in the US school curricula. He is critical of school approach to health education. Teachers spend very little time on it but the expectations are extreme. He sees this field as a critical part of primary education. Researchers have only made the first steps along the road to develop a theory explaining how children understand key health-related concepts.

Jones, Saraiya, USA, (2006) deal with cancer prevention, more specifically with protection **against sunlight** that should become part and parcel of every school’s curriculum, particularly in summer months. It is particularly important to avoid excessive sunbathing in childhood **because sun exposure accumulation and sunburns in childhood are associated with skin cancer development at adulthood.** Sun’s rays may damage human cells and cause a healthy cell to become a cancer cell. UV irradiation of the cell genome triggers gene mutation and uncontrolled proliferation of cancer cells. A questionnaire survey showed that sun protection is more frequently observed by women than by men and by the young than the old. They are more frequent users of **creams, glasses, head covers, hats, caps, clothing, sunscreens with SPF of 15 or higher, protect themselves against the noon sun, seek the shade.** It is recommended to include sun radiation prevention into other prevention programmes. Children are at school during the sun’s peak intensity period, i.e. between 10 am and 2 pm, and therefore teachers have to look after their protection. ***Guidelines for school programs to prevent skin cancer, CDC 2002, published prevention guidelines to help school.***

Working with a group of 9-10 year-old children in the UK, Oakley, Bendelow, et al. (1995) investigated how **children understood the concepts of health, disease**

**and cancer.** The used a qualitative methodology with the “draw and write” and group discussion techniques. Under the “Healthy Things” heading, children most frequently listed healthy foods (fruit, vegetables, fish, cheese, eggs, cereals, milk, mineral water, vitamins). They also mentioned exercise and sports, hygiene, smoking abstention and abundant sleep. Listed under the “Unhealthy” category were smoking, unhealthy foods (fatty foods, meat, sweet foods, drinks, chocolate, salty foods, chips), polluted environment, violence, hygiene, etc. The authors also wanted to find out **what children knew about cancer.** Almost half of them knew that it is a fatal disease, and 40 % said that it is caused by smoking, 30 % said that people will loose their hair (there was a child with leukaemia in the class). In drawings, four main themes were identifiable: smoking as the cause of the disease, individual parts of body affected with cancer, cancer as a group of cells and cancer as an unpleasant face or a monster. Almost half of the children said that they knew somebody who has or had cancer. Personal contact significantly increased the volume of information in children. The types of cancer children were most familiar with included cancer of the lung, skin, blood (leukaemia), brain, head and breast. They mentioned also other internal and external organs. In their perception, cancer prevention consisted mainly in non-smoking, maintaining generally good health, eating healthy foods, avoiding excessive exposure to the sun, limiting alcohol and drug abuse, protecting oneself against passive smoking, etc. Children had adequate knowledge, the prevention they mentioned most frequently was healthy foods and non-smoking, which are generally well-known negative factors. Their main sources of information were the TV and the media.

In their study, David Schonfeld and his co-workers (1999) set out to find what children knew about cancer and they confirmed insufficient cancer prevention education at school. They developed a curriculum that meets these needs and evaluated a programme to find out whether the programme works. This **cancer prevention program and instructional curriculum for elementary school children** was developed in the Cancer Center of Yale University, New Haven, USA (1999) and has been tested in a pilot study. They called it “STAYING HEALTHY: WHAT I CAN DO. First steps to prevent cancer.” It has been designed for grades K-6 (from kindergarten to elementary school).

According to D. Schonfeld, most risk behaviours in adulthood, such as smoking, unhealthy dietary habits, lack of exercise and unscreened sun exposure, are formed and fixed in childhood and early adolescence. For that reason, effective tumour prevention must start already at that age. Rather than trying to frighten children with possible risks, the programme aims at fostering positive skills in children that will help them maintain health in the future. **Children are not threatened with cancer yet but it is necessary to start now to learn to maintain good health for the future.** In his study, the author interviewed 1,500 children. He asked open questions on the causes, transmission, treatment, prevention, symptoms and treatment of cancer. Twenty-four per cent of children knew that cancer is caused by smoking, 22 % that it is contagious. Other causes were improper foods, pollution of water and of air, excessive sun exposure, alcohol and old age. Half of the children were afraid of developing cancer. The programme was tested in a school and it was found that children were taught very little about the topic. Children’s knowledge on cancer was investigated. Based on this research, the author and his team of paediatricians designed a 7-unit cancer prevention curriculum for elementary school children.

D. Schonfeld's curriculum "**STAYING HEALTHY: WHAT I CAN DO**", **First Steps to Prevent Cancer**, consists of 7 interconnected units, each focusing on a specific theme suitable for and understandable to children of that age.

Unit 1: Differences among illnesses

Unit 2: What is cancer

Unit 3: What is risk behaviour

Unit 4: Cancer prevention: Avoid tobacco

Unit 5: Eat healthier foods

Unit 6: Protect yourself from the sun

Unit 7: Helping people stay healthy, summary

Class teachers are to present the entire programme by techniques appropriate to the age of the children (brainstorming, role playing, drawings) that will make it attractive for them. It was associated with positive feelings, activity in classes, it was led by understanding of the seemingly difficult and non-topical theme. Parental cooperation is an important aspect that significantly contributes to the programme's effectiveness. At home, children often eat unhealthy foods, are exposed to passive smoking and are unprotected by their parents from excessive exposure to the sun. Evaluation established that children generally understood the causes of the disease and its prevention, broadened their knowledge and accepted that cancer was not spread by physical contact. The programme was recommended to schools to be used in regular classes.

M.D.Anderson Cancer Center, Houston, USA, developed a computer programme for high-school students to enhance knowledge and awareness of cancer, nutrition, exercise, sun protection and tobacco. The interactive programme called "**Good Living Mall**" is an attractive and entertaining form of gaining knowledge for the students. A total of 957 students participated in the programme. Seventy-three percent of the students showed an increase in knowledge. The programme proved to be an excellent teaching tool for cancer prevention instruction and was well-received by both students, school staff and parents. Available at [http:// www.mdanderson.org/goodlivingmall](http://www.mdanderson.org/goodlivingmall).

"**Be smokeFree**" (Josendal 1998) – intervention programme for schools in Norway. It was designed by the Norwegian Cancer Society in cooperation with Bergen University for middle school students. The programme evaluation was conducted on a national sample of 99 schools with a total of 4,441 children. A change in smoking behaviour and the programme's effectiveness were confirmed. Schools were recommended to carefully plan intervention to reduce smoking among adolescents.

**Primary prevention of malign melanoma** in Stockholm, Sweden (Boldeman 1993). The aim of the Stockholm Cancer Prevention Program is to increase the awareness of excessive sun exposure risks because malign melanoma is the most rapidly increasing tumour in Sweden. The education programme focuses on changing behaviour with respect to exposure to UV rays.

"**SunWise school program**" Boston, USA (2003). Boston University evaluated a health education programme for elementary and middle school children designed to raise their sun awareness. Excessive UV exposure in childhood greatly increases the risk of skin cancer incidence in adulthood. For that reason, the SunWise programme has been included to the existing school curricula. It significantly increased the intention of children to play in shade and use sunglasses.

Preventive skin cancer programme called “**Sunshine at school**” was introduced in five cities in the **Orleans region (France)** (Esteve 2000). Children received instruction about risks associated with excessive sun exposure and protection against it by nurses and dermatologists during informal discussion meetings. Evaluation confirmed broadening of knowledge and the children’s intention to protect themselves against the sun. Available at WWW <<http://www.Eric.esteve@chr.-orleans.fr>>.

Lutte contre le Cancer (League Against Cancer) in **Montpellier (France)** provides cancer prevention education for schools in its **training centre Epidaure**. It has a long history and tradition with this education established by Professor of oncology Henri Pujol, the first to do so in France. At present, it is headed by Professor Helene Sancho-Garnier, MD. During my visited to the Centre in 2004 I had an opportunity to observe experts giving instruction on proper nutrition in cancer prevention. Teachers used activation methods involving group activities with the children based on original interactive educational tools right there in the Epidaure Centre. The children used a computer programme, models of foods, watched a story on the video, competed in groups. I was very captivated by computer programmes where children were able to follow and actively work on tasks related to the history of tobacco and smoking, the cultivation and use of cocoa beans and chocolate manufacture, history of alcohol and other lifestyle risk factors. Always, however, interactively. In 1989, they developed an **anti-smoking programme for children aged 9-12 years called “Pataclope”**. The programme addresses children through cartoons and offers a children’s magazine of the same name, takes advantage of children’s interest in sports and organizes sporting events, sets up miniclubs for non-smoking children, gives printed t-shirts to competition winners, supports football tournaments, participants in endurance runs, etc. **The Epidaure Centre also trains teachers in cancer prevention.** Available at <<http://www.epidaure@valdorel.fncfcc.fr>>.

The “**Sun and the Skin**” programme in Ontario (Canada) (Barankin et al. 2001) was designed to consist of two arms. One was aimed at parents and provided them with information on how to protect their children, the other at children in the school setting. There was an improvement in children’s attitudes to sun-tanning and to wearing of sun-protective clothing. Co-operation with parents helped reinforce behaviour aimed at reducing skin cancer risks.

The “**Sun Safe**” programme from Nottingham (UK) capitalizes on the attractiveness of a computer-based programme and workbooks for children to offer a broadening of knowledge about UV rays protection for 10-11 year olds. It focuses on attitudes and behaviour. The evaluation showed significant positive changes in knowledge, attitudes and behavioural intentions. It was introduced to schools before the summer holidays to increase its effectiveness and so that children could most usefully put their new knowledge into effect during the holidays.

The Carey study (Great Britain, 1995) evaluated the **level of cancer education** in primary school teachers. **Results identified a lack of materials on the topic that teachers have at their disposal. It is necessary to increase teachers’ awareness and to develop cancer prevention materials for them.**

The programme “**Sole Si Sole No GISED**” (2003) was launched in Italy to increase protection of primary school children against excessive sun exposure. The

effect of the intervention, particularly the attitudes and behavioural changes, were monitored. This is one of a very few programmes that were monitored in a controlled study. The programme's effectiveness was confirmed. Many skin cancer risk behaviours emerge in early childhood. It proved positive to introduce programmes of sun-protective practices before the summer holidays and to conduct a post-test after the holidays.

In Slovakia, a cancer prevention course was included into the curriculum in 1999. It was included among elective courses for secondary school students based on the authorization of the Ministry of Education of the Slovak Republic No. 130/99-4 of 28 Jan. 1999. The course is a project of the Slovak League against Cancer where it is taught by foremost Slovak experts in oncology. Selected teachers attended three one-day seminars. The teachers were given teaching texts, textbooks for students, promotional material, video cassettes and sets of booklets on the topic.

The **BRAVO** project (Barba 2001, Italy) is a survey of obesity prevalence among children. **Childhood obesity is a strong predictor of obesity in adulthood.** For that reason, it is important to start with obesity prevention in childhood. The aim of the study was to investigate dietary habits and anthropometric factors in a sample of 6-12 year old children from southern Italy. The results confirmed the trend of increasing childhood obesity prevalence that was also found in western European countries.

A smoking prevention programme was used in Spain (Barrueco et al. 1998). The programme was evaluated after three years. The first encounter of children with tobacco was found to occur at the age of 11. The reasons why children smoke are usually associated with curiosity, adventure, and peer pressure. They knew that smoking caused lung cancer and cardiovascular diseases. Fourteen per cent of 12-14-year old students were regular smokers.

University of Houston in Texas (Smith et al. 1998) conducted a survey with the aim of finding out how community agencies helped schools with cancer prevention education. It focused on the degree of implementation into the school curriculum. Smoking prevention and proper nutrition received most extensive coverage by school activities, protection against the sun was less extensively covered. School personnel had little training and the school had little community support. The author estimates that effective education programme might decrease the number of new smokers by up to 37 %, and reduce the use of alcohol and drugs. Prevention in schools may be of significant influence. He recommends that cooperation be developed between partner schools, the community and health personnel. There should be more cooperation between schools and the American Cancer Society. Teachers would like to get more of latest specialist information, specialist training, lessons, materials, literature of cancer prevention.

The **Expanded Food and Nutrition Education Program (EFNEP)** targeting dietary habits has been developed at the university in Minnesota (USA). It was recommended to eat less fat and cholesterol. The study confirmed **changes in participants' behaviour towards a greater focus on healthier diets and a greater interest in preventing cardiovascular and cancer diseases** (Hartman et al. 1997).

## Cancer prevention programme “it’s normal not to smoke” for children in the czech republic

The programme “It’s Normal not to Smoke” is a comprehensive primary prevention programme of support to and education towards non-smoking behaviour for young school children (aged 7-11 years). It draws on international research, experience and programmes already in existence and listed above, mainly from the USA (Shoenfeld et al. 1999) and France (Pataclope Programme, 1989). The programme was designed with a systematic approach to cancer and anti-drug prevention in mind, and with a follow-up in each subsequent grade of the primary school. The programme “It’s Normal not to Smoke” covers the entire primary school age period. It is divided into two sub-programmes, one for grades 1, 2 and 3 which is a follow-up of programmes for kindergartens, and the other for grades 4 and 5, which is connected with the programme “Smoking and I” intended for the second-level grades of primary schools. The programme was developed by the Medical Faculty of Masaryk University Brno on the initiative of the League against Cancer Praha.

Acting as a guide through the entire programme is a plush doll Věrka Squirrel, the symbol of a healthy lifestyle, and her opposite is Retka Cigarette symbolizing an unhealthy lifestyle. Motivational stories tell the children in an entertaining manner about healthy lifestyles, healthy foods, the risks they may encounter, harmfulness of smoking and effective prevention that will help them maintain good health also in adulthood. The programme’s main objective is a **child that has made a conscious decision to be a non-smoker**. It is a long-term objective and for that reason other short-term goals also need to be set. The programme’s content is **focused comprehensively on influencing children’s attitudes, behaviour and knowledge on a healthy lifestyle**. It emphasizes the main risk factors that may have up to 60 % influence on cancer development and which are completely preventable. They are the following two basic factors: a) smoking 30 %, b) healthy diets 30-35 %.

The aim is a better understanding of issues relating to healthy lifestyles, principles of healthy nutrition and cancer prevention in a fairy-tale-like story featuring the Heart, Lung, Tooth and Retka Cigarette. In five units, children learn about smoking, good dietary habits, the need for sufficient physical activity, appropriate daily routines and mental hygiene through a fairy tale-like story of a squirrel and several other forest animals. The programme is extended to include information on the history of smoking in the world, understanding one’s own body and its functions, formation of an adequate self-concept, self-knowledge, fire prevention, nature protection, relationship between man and nature, more information on healthy diet principles, daily routines and mental and personal hygiene.

The programme includes a section that focuses on children with worksheets, motivational stories and tasks. The teachers’ section focuses on methods to be used in individual five units. **The methodology is open to other broadening ideas, and it allows for creative additions according to local conditions of the schools and teachers’ creative inventiveness to tailor the programme to the needs of their classes, thus enriching the programme with their experience and making it their own.** It

also includes posters for parents because emphasis is placed on cooperation and positive relationships with parents, because the programme would be less effective without their assistance.

The programme's positive dimension is the evaluation of the programme's effectiveness, which is conducted in each successive grade. The programme and its evaluation are designed as a longitudinal investigation. The same children cohort is monitored over the entire programme implementation period, i.e. for five years between primary school Grades 1 and 5.

This programme's aspiration is to make a contribution to the formation of values, attitudes and behaviours prioritizing a healthy lifestyle. If a healthy lifestyle is successfully fixed in childhood, there is a greater probability that it will be automatically observed in adulthood. That is the main intent of long-term influence of comprehensive health education in school educational programmes and in the school official as well as hidden curriculum generally. It is important that no-smoking education be conducted systematically from kindergartens through primary to secondary schools and universities.

Cancer prevention in the programme is accomplished primarily through:

- 1) smoking prevention
- 2) principles of good nutrition and dietary habits
- 3) emphasis on enough physical exercise
- 4) protection against solar radiation
- 5) mental hygiene.

The programme was launched in 2005, and the first stage was completed in 2008 when the programme for grades 1, 2 and 3 was developed and tested, and received accreditation. The programme "It's normal not to smoke" is also presented at web pages [www.normalnijenekourit.cz](http://www.normalnijenekourit.cz), where the programme content is outlined together with materials for download, pages for teachers, parents and children, and practical experience.

## **Children's concepts of cancer and their changes after an intervention**

The issue investigated in this survey was children's understanding of the cancer phenomenon and its changes after an intervention using methodology that had been applied and tested abroad, and to do it in the social and cultural context of our location in the Czech Republic. The aim was also to test the effectiveness of the primary cancer prevention programme "It's normal not to smoke" for grade 3 of primary schools. We asked ourselves questions like: What do children know about cancer? What does that word bring to their minds? Do they know more about cancer after the intervention, i.e. after the implementation of the programme? Did they show a shift towards more healthy behaviours? Is the programme effective?

## Methods and research sample

Our research sample was neither a representative nor a random one. The selection of our sample was purpose-oriented. The sample is composed of third graders from public primary schools from Brno and its immediate environs that agreed to participate in the research and to implement the prevention programme. Two of the 10 participating schools also participated in the “Healthy School” programme. Their results were not evaluated separately.

**Children from grade 3 of primary schools** were selected on purpose because they seemed suitable for their relative independence compared with younger children from grades 1 and 2, but also because of their lower level of cognitive development compared with children from higher grades. The choice was also made in view of their curriculum content emphasis. The science trivia material on man in grades 1 and 2 is socially oriented, in grade 3 it already has a more biological focus, on the structure and function of internal organs. It should also be added that children from the experimental group had for three years participated in a long-term primary programme “It’s Normal not to Smoke” intended to promote healthy lifestyle and a no-smoking behaviour. No such intervention had been made in the control group, the group was not affected by the programme. The research sample consisted of 311 children in the pre-test and 373 in the post-test. The research sample consisted of an experimental and a control group to allow for a comparison of results and for programme evaluation. Both **the control and the experimental group** consisted of respondents of the same age, had approximately the same boys-to-girls ratio coming from the same environment and their sizes were about the same, i.e. **they were homogenous**.

**We drew from experience of foreign authors and their research into children’s beliefs and knowledge of cancer.** Oakley, Bendelow, et al. (1995) conducted a study in the UK using the “Draw-and-Write” technique to investigate subjective perceptions of the term cancer in a group of 9-10 year-old children. Pridmore, Bendelow et al. (1995) conducted a similar study with 100 children aged 9-10 in Botswana. The study of David Schonfeld et al. (2001), who developed and tested cancer education curriculum for children K-6 (kindergarten through grade 6) in the USA, helped understand the causes of some diseases and their subsequent comparison, specifically of common cold, AIDS and cancer. In their 1998 study, Chin, Schonfeld et al. (USA) investigated developmental causal reasoning for cancer and its prevention.

To evaluate the entire programme, we used a mixed design of quantitative and qualitative methods. For evaluation, the “draw-and write” technique, a semi-structured interview and a questionnaire design by us were used. The intervention was made in the experimental group only. The evaluation took the form of a pedagogic experiment. A pre-test was conducted before the intervention and a post-test followed four months after the intervention was completed in both the experimental and the control group. In this way, the medium-term effectiveness of the programme was tested. A comparison between the experimental and the control groups’ results was made both for the pre-test and the post-test, and the statistical significance of their differences was then evaluated in the EPI Info 6.09 programme by the *chi-square* test and its modification according to *Yates* and *Fischer*. After the pre-test in January 2007, the programme was implemented

in four weeks. Four months later in June 2007, the study was concluded with a post-test, verification of medium-term effectiveness and programme evaluation. The same procedure was applied in all schools and it was strictly observed.

## Results

To analyse, classify and categorize qualitative data, we used open coding and a system of categories that were defined based on the answers obtained. Based on the coding, the respondents' answers were gradually classified, organized and combined. Codes were thus set up that correspond to the aim of a thematic allocation of individual answers.

The data obtained were coded, categorized and evaluated in four thematic areas:

- A) Drawing
- B) Understanding the concept of cancer
- C) Causes of cancer
- D) Cancer prevention

### A) Analysis of children's drawings

In the first area, we analyzed drawings and written comments of children that had been told to **“Draw and write what you think cancer is, and how it can be prevented”**. Answers of any one child may have been included into more than one category. The drawings were coded and divided into nine categories.

The most numerous were drawings from the **“smoking”** category, which included drawings of, e.g., a smoker, cigarette, pipe, a man throwing a cigarette away. Children's perception of the concept of cancer was expressed in this manner by more than half of the respondents (65 %). Also numerous were drawings from the **“affected body organs”** category (up to 56 %). The most frequently depicted organs were the lungs, heart, brain, stomach, liver, skin, breasts, etc. Drawings by about a quarter of the children depicted a sick person lying in bed, physicians, a hospital, an ambulance. These were assigned to the **“sick person”** category. About 5-7 % drawings were assigned to the **“death”** category where a tomb, coffin or skeleton were used as symbols of dangers to life. This category was more frequent among boys than girls. The category **“tumour”** (lumps, spots, papulae, ulcers) was depicted in about 8 % of drawings, and approximately the same number of drawings was assigned to the **“micro-organisms”** category (viruses, bacteria, bacilli). Also represented, although only infrequently (in about 3% of cases) were drawings of a forest, polluted places with industrial zones, chimneys, drains, automobile exhaust fumes, air polluted with cigarette smoke (passive smoking). These drawing were assignend to the **“environmental factors”** category. The **“abstract monsters”** category fitted to drawings of about 4-8 % of respondents. Drawings depicted healthy foods (fruit and vegetables), alcohol, drugs, sports, persons without hair, injection syringes, etc., about 10 % of the drawings, were included in the **“other”** category.

It follows from the results that children from the experimental group depicted various organs affected by cancer more frequently (heart, liver, brain, breast, blood, kidneys, etc) than children from the control group. A significant difference in favour of

children from the intervention group in the “**affected body organs**” was found in both pre-test and post-test ( $p<0.01$  and  $p<0.0001$ , respectively) The control group, on the other hand, remained unchanged. This proves a better awareness and understanding of the disease in the experimental group children following intervention (Fig. 1).

Categories “**smoking**” and “**sick person**” were significantly more frequent ( $p<0.05$ ) in the post-test of children from the control group. A significant difference ( $p<0.05$ ) in favour the intervention group was demonstrated in the post-test for the “**tumour**” category compared with the control group. In other categories, i.e. “micro-organisms”, “abstract monsters”, “environmental factors”, “death” and “other”, no major differences between the intervention and control groups were found (Tab. 15a).

Table 15b shows significant differences in the experimental group in the categories of drawings of affected organs ( $p<0.001$ ), “micro-organisms” ( $p<0.05$ ) and “other” ( $p<0.05$ ) in post-tests, i.e. after the intervention. In the post-test, children from the control group depicted a smoking person significantly more frequently ( $p<0.05$ ) than in the pre-test. In the intervention group, drawing assigned to the “tumour” category were also more frequent (up to 13 %), but the difference was not significant.

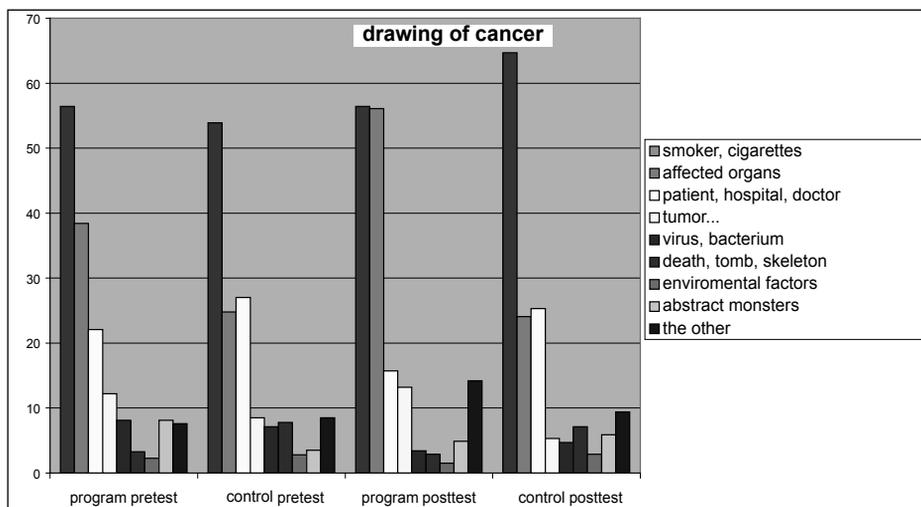


Fig. 1: Drawings of cancer

Lay concepts of cancer among the experimental group children were manifested more by images of affected body organs, and in images of smokers or cigarettes in the control group, i.e. images more congenit and appropriate for the topic were presented by the experimental group children. Children’s concepts are specific, unique, autonomous, lay and subjective, and variability in the drawings of cancer very broad, as demonstrated by the results.

## B) Understanding the concept of cancer

By analyzing the drawings and the interviews, we created a categorial system where we assigned children’s answers to questions “What is cancer? Can you explain it?”.

One and the same answer may have been assigned into several different categories, and the sum of all answers therefore exceeds 100 %. The answers were coded and placed into eight categories. Our results showed that children most frequently perceive cancer as an incurable and fatal disease. Cancer is incurable, a fatal disease, causes death were among the answers that we placed to the “**fatal disease**” category. Over half of the children (up to 62 %) gave that answer. Almost a third of the children from the control group and up to half of the experimental group gave answers that were placed to the “**lung disease**” category. The next category was that of a “**serious disease**” for answers like a dreaded disease, difficult to treat, dangerous disease. About 40 % of the children gave those answers. The “**infectious disease**” category included the children’s concepts that cancer is communicable, infectious disease, and children’s recommendations to avoid contact with cancer patients. This might be called a misconception although we know that some types of cancer are communicable and are of viral origin. Only 4 % of children made that statement. Some children said that their grandpa or grandma had died of cancer, and so they associate cancer with **elderly people’s ailments** (only 1% of answers). From time to time, we came across an answer that cancer is a **tumour**, but without any connections or understanding of that concept (1-4 % of children). Many children, more girls than boys, were unable say anything about the concept of cancer and stated they knew nothing about cancer. This was characteristic for the “**I do not know**” category (about 5-10 % of children). The category “**other**” (4-8 % of answers) included answers e.g. something that is harmful for people, inflammation of the intestines, painfulness and coughing.

Table 16a gives statistical differences in the pre-test and the post-test between the experimental and the control groups. It clearly shows the significantly higher frequency of answers that cancer is a lung disease among the children from the intervention group in both pre-test ( $p < 0.01$ ) and post-test ( $p < 0.0001$ ) compared with the control group.

It follows from Table 16b that more than half of all children of the entire group were aware that cancer is a fatal disease, a threat to life. This was mentioned by significantly more children from the intervention group ( $p < 0.01$ ) as well as the control group ( $p < 0.05$ ) in the post-test compared with the pre-test. The relative frequency of occurrence (62 %) in post-tests was the same in both groups. Following the intervention, the experimental group children described cancer as a lung disease significantly more frequently ( $p < 0.0001$ ). The number of answers in the “I do not know” category decreased in post-tests in both groups, the difference was not, however, significant. There were no differences between the groups in other categories. These results demonstrate a positive effect of the intervention and an increased amount of information among the experimental group children (Fig. 2).

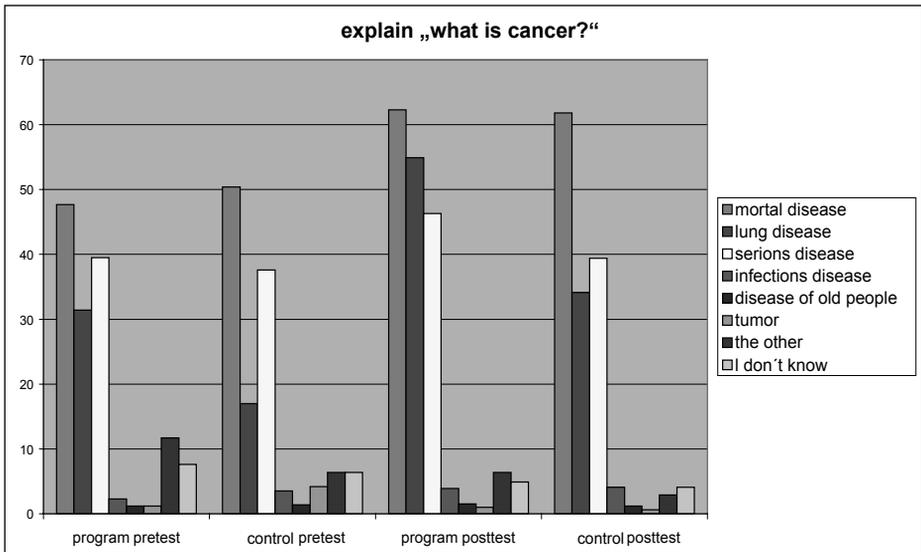


Fig. 2: Understanding the concept of cancer (%)

An exceptional answer was that cancer is a tumour, which is a cluster of cells that multiply. It is remarkable that so small children are able to come up with such an answer.

### C) Causes of cancer

We analyzed and coded answers to the question of what causes cancer. The answers were assigned to 7 categories. The only significant difference between the groups in the pre-test was in the category “alcohol” ( $p < 0.05$ ). This factor was mentioned more frequently by children from the control group. In the post-test, significantly more children from the intervention group said that causes of cancer were in unhealthy foods ( $p < 0.01$ ) and in environmental factors ( $p < 0.001$ ).

The absolute majority (up to 90 %) of children gave **cigarette smoking** as the cause of the disease, their numbers being greater in the post-test (by up to 10 %) in both groups. **Smoking was unquestionably the most frequent cause of cancer given by the children.** Another relatively frequent category was “**unhealthy foods**”, where we included mainly lack of fruit and vegetables, fatty foods, smoked meat products, sweets, etc. Approximately one in every ten children identified unhealthy foods as the cause of cancer. Excessive consumption of **alcohol** was considered a greater risk by up to a quarter of the children in the pre-test. The children also referred to **drugs** as a cause of disease, but very sporadically: drugs were mentioned by only 5 % of the children. The reason may be that they consider drugs as a general risk factor for the development of a disease. To the category “**environmental factors**” we assigned car exhaust fumes, waste, air pollution, industrial pollutants, cigarette smoke, excessive exposure to the sun, passive smoking, etc. This category had the greatest difference in the number of answers between the pre-test and the post-test of up to 30 % in favour of the experimental group.

Very many (up to 20 %) respondents were unable to give any answer, and they were placed into the “**I don’t know**” category. The category “**other**” included answers, e.g., use of medicinal drugs, food additives, insufficient clothing, stress and sadness. **Some children mentioned several causes.**

The number of answers in the “**smoking**” category increased significantly in the post-tests in both the experimental group ( $p < 0.0001$ ) and the control group ( $p < 0.001$ ). This was not, however, attributable to the intervention because there was no difference between the groups with respect to the answers’ frequency. In the categories “unhealthy foods”, “alcohol” and “environmental factors”, however, significant differences in the post-test after the intervention were statistically demonstrated. This significant increase in the number of answers in the experimental group in the post-test compared with the pre-test was found in categories “**unhealthy foods**” ( $p < 0.001$ ), “**alcohol**” ( $p < 0.001$ ) and “**environmental factors**” ( $p < 0.0001$ ). At the same time, the **number of respondents who did not know the cause of the disease decreased significantly** ( $p < 0.0001$ ) in the group with intervention.

No such differences were found in the control group. There was a significant increase in response frequencies in the categories “**smoking**” ( $p < 0.001$ ) and “**environmental factors**” ( $p < 0.001$ ). At the same time, the post-test showed a significant ( $p < 0.01$ ) decrease in the number of those who did not know the answer, there was a decrease in the number of respondents in the “**I don’t know**” category. This proves that the intervention increased the amount of information for the children in the experimental group (Fig. 3).

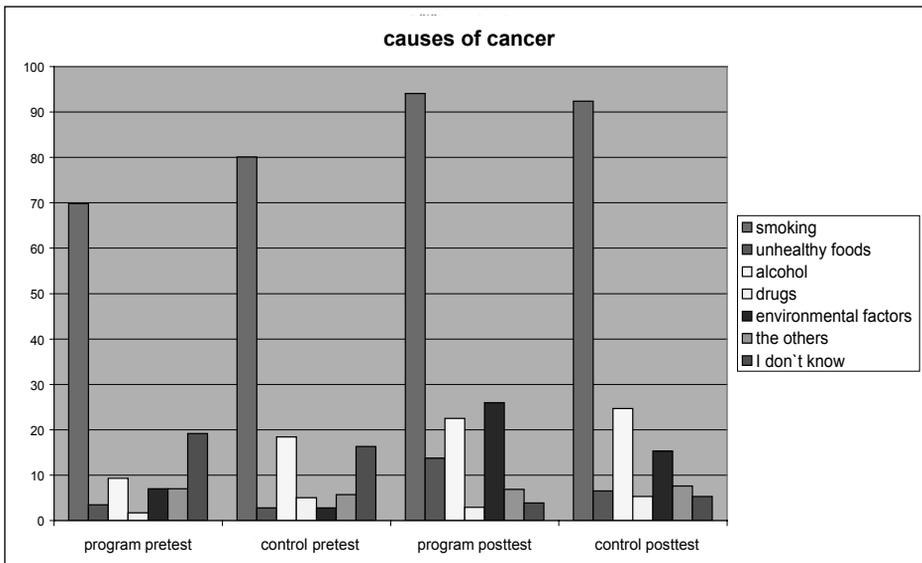


Fig. 3: Causes of cancer (%)

A change in the cognitive dimension of the concept of cancer causes was demonstrated.

## D) Cancer prevention

We also investigated children's beliefs about, and interpretations of, the concept of cancer prevention. Only few (less than 10 %) of children described cancer as a disease that cannot be prevented. A majority of them said that cancer is preventable, and 10 % of them were unable to give any answer and were included in the "I don't know" category. Over 96.1 % of respondents from the experimental group said that cancer can be prevented, which significantly differentiated ( $p < 0.0$ ) them from the control group's post-test results (87.6 %). Unambiguously negative answers were given by less than 10 % of children, most of them in the control group's pre-test. Only 1 % of intervention group children said in the post-test that cancer cannot be prevented. In this respect, there was a significant ( $p < 0.01$ ) difference between the experimental group (1 %) and the control group (7.1 %).

The frequency of the "I don't know" answer in the post-test decreased significantly in both the intervention group ( $p < 0.01$ ) and the control group ( $p < 0.05$ ). The experimental group differed significantly in the post-test increase in the frequency of positive answers ( $p < 0.01$ ) and a parallel decrease in negative answers ( $p < 0.05$ ). A significant increase ( $p < 0.05$ ) in positive answers was also recorded in the control, i.e. no intervention, group (Tab. 18b). **This was a statistical proof of an increase in the volume of information in the experimental group.**

Children from both groups saw cancer prevention mainly in abstention from smoking, almost 80% of them mentioned "**non-smoking**". Another frequently mentioned factor of cancer prevention was **healthy foods**, both in the intervention group (almost 38 %) and the control group (almost 20 %). Approximately the same numbers of answers referred to categories **limiting excessive consumption of alcohol (almost 17 %)** and **medical aid (10-16 %)**, and included children's answers like regular visits to the doctor, medical treatment, surgery, vaccination, etc. In the experimental group, **abundance of physical activity (almost 8 %)** was mentioned more frequently, while children from the control group focused more on **drug abuse (almost 5 %)**. **Environmental factors**, such as excessive exposure to sun radiation, suntanning, avoiding cigarette smoke, exhaust fumes, etc., were referred to in 8-23 % of answers, more frequently in the experimental group. A separate category was established for the **observation of hygienic rules (2-6 %)**. We used this category for answers referring to the avoidance of contacts with the patient, hand washing, etc., because children also mentioned it. The use of vitamins, reduction and management of stress, recommendation to lead a healthy life, take care of oneself, dress warmly, frolic, have fun, be careful, do everything the way it should be done, etc. were included to the category "**other**" (8-12 %).

In the pre-test, i.e. before the intervention, the experimental and the control groups differed significantly only in the category "healthy foods" ( $p < 0.001$ ) in favour of the former. After the intervention, a significant increase was demonstrated in the number of answers in the experimental group in categories "**healthy foods**" ( $p < 0.001$ ), "**physical activity**" ( $p < 0.05$ ) and "**environmental factors**" ( $p < 0.01$ ) compared with the controls.

An increase in the number of answers in the experimental group was recorded in categories "no smoking" ( $p < 0.001$ ), "environmental factors" ( $p < 0.001$ ), "healthy foods" ( $p < 0.01$ ) and "reducing alcohol consumption" ( $p < 0.01$ ). In the post-test, control group children mentioned "no smoking" and "healthy foods" categories significantly

more frequently ( $p < 0.01$  and  $p < 0.05$ , respectively). Differences in other categories were not statistically significant. It means that there was an increase in the number of children following the intervention who thought that cancer can be prevented by non-smoking, eating healthy foods, limiting alcohol intake and reducing harmful environmental influences. The greatest intervention effect was in the more frequent reference to healthy foods by the experimental group children. These results confirm the intervention effectiveness.

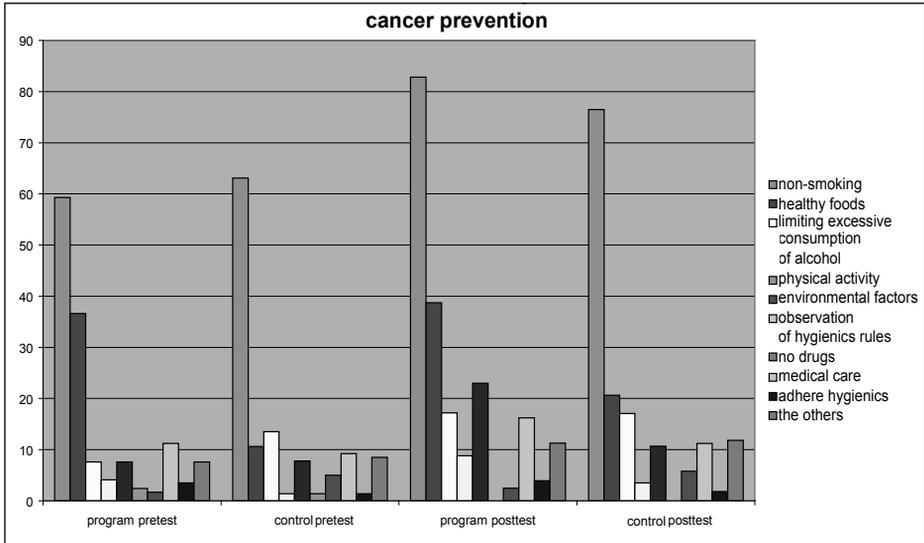


Fig. 4: Cancer prevention (%)

Several children’s concepts about cancer:

“Cancer may cause damage to the organism, for that reason there usually is a warning on cigarettes that smoking may kill.” (a girl, control group)

- “Cancer is a disease caused by cigarettes.” (a girl, control group)
- “Cancer can be transmitted from one man to other people.” (a girl, control group)
- “The person with cancer has difficulty breathing, coughs, his heart beats slowly.” (a boy, experimental group)
- “If somebody is a smoker, he will develop a tumour. Cancer is a disease that produces a tumour in a person’s body, it is caused by smoking, the person should get some treatment.” (a girl, experimental group)
- “Cancer is a disease that may appear if a person smokes too much. We can prevent it by refraining from smoking. Cancer causes heart and lung disease.” (a girl, experimental group)

In our drawings, more than half of all the children from both the experimental and the control groups, in the pre-test as well as in the post-test, associated cancer with a drawing of a person smoking or of cigarettes without any major distinction. The children perceived cancer in this way probably because they meet with this asso-

ciation between the terms smoking and cancer in their environments. They notice ads in the media, billboards in public places and warnings on cigarette boxes. A significant decrease in the number of drawings of micro-organisms and the increase in the number of drawings of affected parts of the body following the intervention underscores the intervention's effectiveness.

## Understanding the concept of cancer

Control group children perceived cancer as a dreaded disease, they associated it more often with death, threat to life, experimental group children were able to perceive cancer more realistically as an affliction of different parts of the body. Children know various types of cancer. In their answers, they mention cancer of the brain, blood, stomach, kidneys, breast, heart, etc., depending on what they have encountered in life, on their own experience. Some children told us that their grandfather, grandmother or uncle had died of cancer. This is one of the reasons why children associate cancer with the diseases of the old. The risk of cancer does increase with advancing age, as mentioned above. The increase in the number of answers that cancer is a disease of the lungs and of other parts of the body in the experimental group and a parallel decrease in the "I don't know" answers caused a positive change in the level of cognitive dimension of the concept about cancer in the experimental group.

This **demonstrates a greater volume of information among the intervention group children and the intervention's effectiveness.** The experimental group demonstrated a **greater volume of information and a stronger cognitive dimension of the concept of cancer.** The change in cancer concepts can be interpreted as a shift towards a more rational and less emotional (fear, anxiety, grief) concept of the disease in the experimental group children. We believe that the shift was consequential to a greater amount of information about the disease, mediated either by our intervention or a greater interest in the issue and to the adoption of influences from one's environment (information from the media, discussions with the family, peers, etc).

## Causes of cancer

Noteworthy and unique were the children's drawings showing their perceptions of **cancer as a battle of bacilli.** In various studies (including the survey of health and disease concepts presented here), children often identified the cause of various diseases as micro-organisms: viruses and bacilli. That perception of the disease is common among children in this period, as documented by some authors (Ellen et al. 1981) and also by our previous study of health and disease perceptions. Preschool children see the reasons for the disease in something magical, around the age of 10 they believe that the cause of diseases are bacteria, microbes. In children under 7, the level of cognitive processes according to Piaget is not at such a degree of development to make it possible for them to understand contagion and infection (Bibace, Walsh 1980). Recent studies have confirmed that these children are able to understand biological causes of diseases in the form of micro-organisms (Williams et al. 2002). Our respondents were 8-9 years old. About 10 per cent of children in our group conceived their drawings of cancer as micro-

organisms fighting the human body. However, it was interesting that children almost never mentioned micro-organisms in their explanations of the causes of the disease. **They saw the cause of cancer in smoking**, unhealthy food, excessive consumption of alcohol, in polluted atmosphere. In some of their drawings, children depicted cancer as a **fight of various viruses, bacteria and other micro-organisms against the body, but they believed that the causes of cancer were smoking, bad foods, drinking alcohol and taking drugs**. From this we might deduce that there are periods when they adopt **two contrary concepts about cancer at the same time**. Similarly conflicting or even contradictory concepts were manifest in the survey of children's concepts of the Earth (Vosniadou, 1992).

This may prove the existence of a double concept of cancer in children from our group. As mentioned earlier, almost 90% of children from our sample identified smoking as a cause of cancer. This is more than reported in foreign studies. For instance Bibace, Walsh, (1980) found that almost half of children knew that it was a fatal disease and 40% said that it was caused by smoking. Chin, Schonfeld et al. (1999), Oakley et al, (1995) also noticed that children aged 8 to 9 years give smoking as the main risk factor of cancer. We believe that the higher incidence in our group is the effect of two years' intervention in the experimental group with the programme "It's normal not to smoke" Unexpectedly higher results in the category **smoking** were also found in the control group. The children may have been influenced by the advertisement on cigarette boxes, or we may speculate about the effect that control tests focusing on smoking had on the control group. Other findings indicate that children apparently consider the heart as the main, the most important, organ in the body, and they associate its proper function with life. For that reason cancer of the heart is also frequently mentioned, and all that in connection with smoking.

According to the children, cancer prevention consisted mainly of non-smoking, maintaining generally good health, healthy foods, limiting excessive alcohol consumption, protecting oneself against passive smoking and polluted air, etc. Children had adequate knowledge, they most frequently suggested healthy foods and non-smoking as cancer prevention, which corresponds with foreign results (Chin, Schonfeld et al. 1998, Oakley et al, 1995). In his study, Schonfeld (1999) claimed that the majority of children does not understand correctly what cancer is. Some children mistakenly believe that cancer can be contracted through physical contact with a patient or by getting very cold, and the same situation existed in our group. Few children know that, e.g., eating wrong foods or excessive sun exposure, may cause the disease. The three top risk factors are smoking, wrong foods together with lack of exercise and excessive sun exposure, especially in young schoolchildren. Cancer can be treated and it can also be prevented, and so said also the majority of the children from our group. Personal contact markedly increased the volume of information the children had.

Children in our sample saw prevention also in the observance of hygienic rules. They draw on their own experience with diseases like flu, tonsillitis, etc. In the pre-test, they also expressed an opinion that preventive measures should also include the limiting of contacts with cancer patients to rule out the risk of contagion. They see the cause of the disease in the physical contact with the disease, with the patient, or in engaging in high-risk behaviour (Bibace, Walsh 1980). In their beliefs about cancer prevention, chil-

dren sometimes confused cancer causes with diseases as aftereffects of getting chilled, e.g. to dress warmly. We may call that a misconception regarding the causes of cancer, just as the use of drugs, which was more often mentioned by the control group children. Another misconception is the belief that cancer can be prevented by limiting contacts with cancer patients. Some children listed very correctly several prevention options, e.g. to refrain from smoking, to eat healthy foods, to engage in sports, to keep one's distance from smokers. It means that there was an increase in the number of children following the intervention who listed non-smoking, eating healthy foods, limiting alcohol intake and reducing harmful environmental influences among cancer prevention measures. The greatest intervention effect was in the more frequent reference to healthy foods by the experimental group children. These results confirm the intervention effectiveness.

## Summary

### Concepts of cancer

Children's concepts of cancer as a disease are absolutely unique beliefs, subjective interpretations, as documented in this paper. They are often mixed beliefs about the effects of micro-organisms combined with the effects of smoking, which often affects the lungs and the heart. Children often consider the heart as the principal organ of the body on which life and death depends. They perceive cancer as a dreaded disease, they associated it more often with death, serious threat to health, as well as a disease affecting multiple organs, most frequently the lungs, heart and brain. They view cancer as a serious, difficult-to-treat and often incurable, fatal disease. Some also believe that cancer is contagious, an infectious disease, and recommend to avoid contacts with cancer patients. Smoking was cited by the children as by far the most frequent cause of cancer followed by alcohol, drugs, bad foods and environmental factors. Among prevention options they most frequently mentioned non-smoking, healthy foods, restricting alcohol intake, limiting negative environmental factors, abundance of exercise, but also cutting down on contacts with the patient. Only a minority of the children did not know possible prevention measures or thought that cancer cannot be prevented.

### Changes in the post-intervention concept of cancer

Changes in the post-intervention concept of cancer were demonstrated in *an increase in the number of drawings* depicting affected organs (mainly the lungs and the heart). Children were more likely to list various types of organs affected by cancer. *A change in the level of cognitive dimension* of the concept of cancer also occurred in the children's belief that cancer was a disease *of the lungs and other organs*, and, at the same time there was a decrease in the number of those who did not know the answer. There also was an increase in the number of children who understood the cause of cancer in smoking, unhealthy food and environmental factors. There was an increase in the number of children following the intervention who listed non-smoking, eating healthy foods, limiting alcohol intake and reducing harmful environmental influences as cancer prevention measures. The greatest intervention effect was in the more frequent reference to healthy foods by the experimental group children. These results confirm the intervention effectiveness.

It follows from the above that children from the experimental group gained more information on cancer. **This demonstrates a greater volume of information among the intervention group children and the intervention's effectiveness. A shift in the concept of cancer in this group due to targeted intervention was demonstrated.**

**There was a change in the concept of cancer following the intervention, an increase in the level of cognitive dimension of the concept of cancer.** The increase is gradual, and it is not possible to unequivocally decide whether it is the result of purposeful instruction, the intervention, or whether also out-of-school influences have a role in it - and to what extent. The strengthening of the cognitive dimension may have been caused by personal experience, out-of-school influences, unintentional learning. The “*attractiveness*” of a topic also seems to play a role in the cognitive dimension formation. Because there was a considerable period of time between the intervention and the post-test (4 months), there is no doubt that **out-of-school influences and other information in the school curriculum newly played a role in the formation of the concept of cancer in the group surveyed.** Our objective, however, was to change that dimension.

We consider it important to state here that the study results are valid only for this group surveyed. It provides a greater insight into the phenomenon studied. The results are only locally valid, they could be further applied to a broader age category of children from 5 to 14, 16 years of age. It would be desirable to extend the study and conduct it as a longitudinal study in which the development of the children's concept of cancer would be monitored over time in connection with their age.

## Use in school practice

There is no doubt that cancer prevention should be given systematic, methodologically well thought-out and uniform (rather than only random) attention at schools. The content of instruction should truly be governed by an analysis of information already known to the cohort and identification of that which is unclear, misinterpreted or completely insufficient. An important prerequisite is also the preparation of teachers for instruction, which can be provided for by their on-the-job training of teachers and specialist training of undergraduates in teacher's training colleges. Issues relating to cancer are some of the major health themes that certainly deserve attention of teachers and their students. **And it is the programme “It's Normal not to Smoke” that offers such systematic cancer prevention education at schools.** Results have confirmed the effectiveness of the primary prevention programme It's Normal not to Smoke. We can recommend it for implementation in the school curriculum across the Czech Republic.

## PRIMÁRNÍ ONKOLOGICKÁ PREVENCE VE ŠKOLE

**Abstrakt:** Článek se zabývá možností výchovy a vzdělávání dětí k onkologické prevenci ve škole již na primárním stupni. Nabízí edukační preventivní program vytvořený na MU Brno, který se zaměřuje na podporu zdravého životního stylu zejména na nekouření, zdravou výživu, pohybovou aktivitu, duševní zdraví, omezování slunění

a rozvíjení dovedností potřebných pro život. Výzkumným šetřením ověřuje efektivitu programu na primárním stupni ZŠ. Zjišťuje dětské prekoncepce pojmu rakovina a jejich změny po cílené intervenci.

**Klíčová slova:** onkologická prevence, školní programy, výchova ke zdraví, dětské pojetí rakoviny