



## Children's university: University without Borders (UBH)

The [UNIVERSITY WITHOUT BORDERS](https://www.upjs.sk/en/information/public-relations/university-without-boarders/) children's university project is intended for students who have completed the 5th and 6th year of elementary school. Orphanages are traditionally also involved, whose children show great interest in participating in this event every year. University without borders is realized as a day camp with an interesting program, which is provided for young enthusiasts by the faculties and university workplaces of UPJŠ in Košice. The employees of the Department of Medical and Clinical Biochemistry UPJŠ FM have been participating in the preparation and implementation of this event for several years under the guidance of **doc. RNDr. Vladimíra Tomečková, PhD.** You can find more about the project on the website: <https://www.upjs.sk/en/information/public-relations/university-without-boarders/>



Until recently **9 projects** were carried out:

- In the world of crystals – 9. 7. 2024
- Chemical garden – 11. 7. 2023
- Mystery of fluorescence – 26. 7. 2022
- Magic of plant pigments – 13. 7. 2021
- Sweet glucose – medication or poison? – 28. 7. 2020
- Why are some body fluids coloured? – 9. 7. 2019
- Search for invisible inhabitants of tears – 11. 7. 2017
- Secret of body fluids – 7. 7. 2014
- Colours and human health – 9. 7. 2013

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### 2024 – In the world of crystals

We know many crystals in nature and their coloring is very aesthetic and brings us joy. Some may be surprised that we can also have various crystals in the human body, which combine with each other, accumulate and can form hard stones over time, e.g. gallstones, kidney stones, pancreatic stones and others. The stones cause pain and inflammation to the patient, and therefore they are removed from the body surgically, namely oxalate, urate and cystine stones. Phosphate stones (hydroxyapatite) in the human body are needed in bones and teeth. Questions:

1. What crystals are formed in the human body?
2. Which crystals cause inflammation and pain in the human body?
3. Which crystals are needed in the human body in bones and teeth?

**Task No. 1 Golden rain:** What is formed by cooling a supersaturated solution?

**Task No. 2 Rainbow:** Which solution is placed at the top, with the highest density or with the lowest density in the test tube?

**Task No. 3 Bubbles:** Why does a bubble burst? Have you observed the rainbow effect on the bubble?

**Task No. 4 Hot ice sculptures:** What causes the super-fast crystallization of sodium acetate trihydrate?

**Task No. 5 Observation of stones from the human body and nature:** What color of stones do we see with the naked eye and under UV light? Which stones fluoresce?

#### Gallery of this event:





## 2023 – Chemical Garden

The already 13th year of the University without Borders (UBH) was organized at UPJŠ in Košice and, traditionally, our workplace also participated. At the Department of Medical and Clinical Biochemistry of the UPJŠ FM, elementary school students under the title "Transition from the visible colored world to the invisible" enjoyed:

- Magical colored cups
- Crystal flowers
- Burning rainbow flowers
- Invisible Helium Flowers
- Bubble fun



Under the professional guidance of doc. RNDr. Vladimíra Tomečková, PhD, assisted by Mgr. Marcela Petrenková and Mgr. Anna Zimová participants created a beautiful colorful garden with different colored “chemical plants”, which is a periodic table, which contains many plants - chemical elements. Among those which were described and presented to them were: **sodium** from the first group, which is e.g. in the mineral sodalite, **calcium** from the second group, which is e.g. in school chalk, **boron** from the third group, which in boric acid helps in the reproduction of ants, **silicon** from the fourth group, which is e.g. in a crystal colored with cobalt, in borosilicate glass that does not crack even in fire, **oxygen** from the sixth group, which we need for breathing and without which no flame would burn, and finally **helium** from the eighth group, which does not make friends with anyone, and is an inert loner.







**Gallery of this event:**





## 2022 – Mystery of fluorescence

The program of the 12th year of the project was interesting and colorful. At the Department of Medical and Clinical Biochemistry of UPJŠ FM, children learned about light and illumination and bioluminescence during the "Mystery of Fluorescence". UBH participants practically observed what can "glow" even if sometimes we can't see it with the naked eye.

Organic and inorganic nature around us is full of surprises. Did you know that it was also able to create many interesting luminescent substances? Let's look into the mysterious world of fluorescence, discover the magic of luminescent molecules and find out what can be luminescent in the world that surrounds us, but also in our own organism...



### What is light?

Light is an electromagnetic wave. It is visible either with the naked eye or with the help of devices and can have different forms (according to different wavelengths) - from infrared, through visible light to ultraviolet color. Think of its range as the different colors of a rainbow.

**Lighting** represents the emission of cold light, while with luminescence the substance glows by itself and can be freely observed either in the dark or in the light, while fluorescence is seen under ultraviolet light and the luminescence lasts much shorter. Chemiluminescence is the luminescence released during a chemical reaction (e.g. phosphorescence).



**Bioluminescence** is the emission of visible faint green or faint red light by living organisms as a result of chemical reactions. We encounter it in some species of parrots, worms, insects, fungi and single-celled microorganisms (bacteria), while it serves for mutual search and understanding of animals, or deterring predators.





**Gallery of this event:**





## 2021 – Magic of plant pigments

The program of the 11th year of this project was interesting and compelling despite the situation surrounding the pandemic caused by the CORONA virus. At the Department of Medical and Clinical Biochemistry of UPJŠ FM, children learned about the existence and importance of plant pigments during "Magic of plant colors", e.g. chlorophylls, carotenoids, flavonoids. UBH participants practically observed that orange carotenoids and green chlorophylls are soluble in oil, while flavonoids (anthocyanin) are soluble in water. They learned that the purple dye (anthocyanin) present in red cabbage is sensitive to the surrounding environment and experimentally tried changing the color of this dye to create rainbow colors depending on the acidity of the environment. The materials needed for the implementation were published in the form of "miniscripts".

### Have you ever wondered what causes different plants to color?

Carotenoids, flavonoids and chlorophylls contribute to the coloring of carrots, sunflowers and other plants. They can create colors from green, yellow, orange, red to purple. Together they protect all living organisms. The human eye is attracted to the colors of nature. In the spring, the most chlorophyll - the green pigment - is formed in the leaves. In autumn, when there is less sunlight, chlorophyll decreases, yellow, orange, red colored leaves prevail.

Humans and animals cannot create these plant substances, so they must receive them in food. Flavonoids are also called molecules of life and youth. Chlorophylls clean the blood. In humans, vitamin A is formed from carotenoids is needed for proper vision. Carotenoids protect cells from inflammation and are more digestible for humans if they are heat-treated, so they should not be consumed only in their raw state, e.g. tomatoes, but also as ketchup, for example. In humans, a yellow to orange-brown coloration of the skin may appear after consuming large quantities or regular consumption of carrots and tomatoes.



These substances are also used in cosmetics. Flamingos have pink-red feathers. Goldfish and salmon have pinkish-orange flesh. Sea crayfish has a purple color, which turns orange-red after cooking.



## Events

*Department of Medical and Clinical Biochemistry*



### Gallery of this event:

