

Human Health Risk Assessment in Gyöngyösroszi

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Introduction of the site

- GyöngyöSOROSZI is situated in Toka-valley, in Mátra hill, north of Hungary.
- Abandoned lead-zinc mine with contamination of different origin associated with mining activities.
- Toka creek flows across the village and carries polluted sediment to the cultivated area.

Vegetable gardens

- Grounds next to Toka creek are used as vegetable gardens.
- Most popular vegetables are sorrel, parsley, carrot, cucumber and tomato.
- There is not any animal husbandry in these gardens.

Metal content of the vegetable gardens

mg/kg	As	Cd	Hg	Pb	Zn
mean value	78.63	2.05	0.95	145.56	568.08
SD	30.97	1.58	0.56	102.79	363.62
limit value	15.0	1.0	0.5	100	250

Exposure routes

- Inhalation of soil particles
- Ingestion of soil particles
- Dermal contact
- Ingestion of homegrown vegetables

Calculation of human health risk

Ingestion of homegrown vegetables

$$AWI_{ss} = C_p * AI * EF / BW$$
$$HQ = AWI / PTWI$$

C_p: concentration in plant

AWI: average weekly intake

AI: average intake

EF: event frequency

BW: bodyweight

PTWI: provisional tolerably weekly intake

Metal content of vegetable

K14 sorrel (mg/kg wet weight)



As	Cd	Hg	Pb	Zn
1.415	0.022	0.014	0.276	5.626

Results of manual calculation

- Ingestion of homegrown vegetables

Metals	AWI (mg/week/bwkg)	PTWI (mg/week/bwkg)	HQ
As	0.009096	0.015	0.61
Cd	0.000141	0.007	0.02
Hg	0.00009	0.005	0.02
Pb	0.001774	0.025	0.07
Zn	0.036167	7	0.005



Total HQ

0.725

BUT

only for homegrown vegetables!

Mortality in Gyöngyösroszi

- Women SMR (Standard Mortality Rate)
 - 15-64 years: 93.9%
 - 65- years: 177.1%
- Men SMR
 - 15-64 years: 92.7%
 - 65- years: 131.6%

Morbidity in GyöngyöSOROSZI

Higher prevalence of

- Loss of hearing
- TIA
- Osteoporosis
- Hyperuricaemia

Blood lead content in Gyöngyösoroszi ($\mu\text{g/l}$)

Gyöngyösoroszi		Controll village	
children	adult	children	adult
101	174.8	46	174

U.S. Centers for Disease Control:
children 100 $\mu\text{g/l}$
adults 250 $\mu\text{g/dl}$.

Conclusion

- Arsenic is responsible for most of the risk.
- Ingestion vegetable is the most hazardous exposure route.
- More epidemiological research should be made to clarify the effect.



Thank you for your attention!