

# Dim bez vatre, opasnost bez upozorenja



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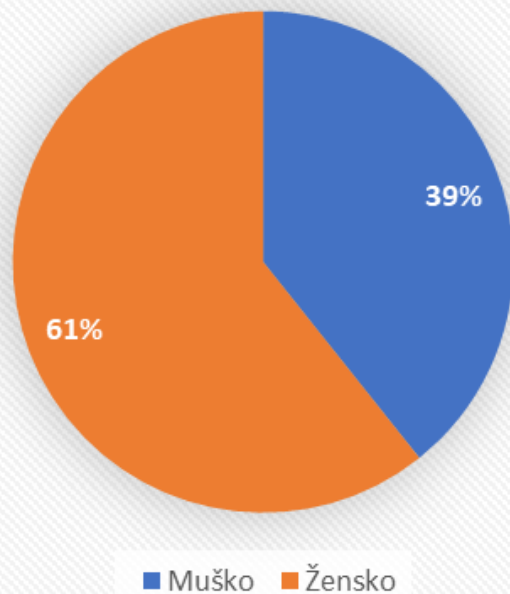
*Zagreb, 29.1.2026.*

# Uvod

- moderna alternativa
- Adolescenti
- istraživačko pitanje : „Imaju li e-cigarete manje štetni zdravstveni učinak nego klasične cigarete?”
- hipoteza : „E-cigarete su manje štetne nego klasične cigarete.”
- anketa

# Analiza ankete

Spolna struktura promatrane skupine



## Učeterostručio se broj djevojčica ovisnih o štetnom uređaju: 'Moramo im pomoći'

14. studenoga 2025. [Novosti](#)



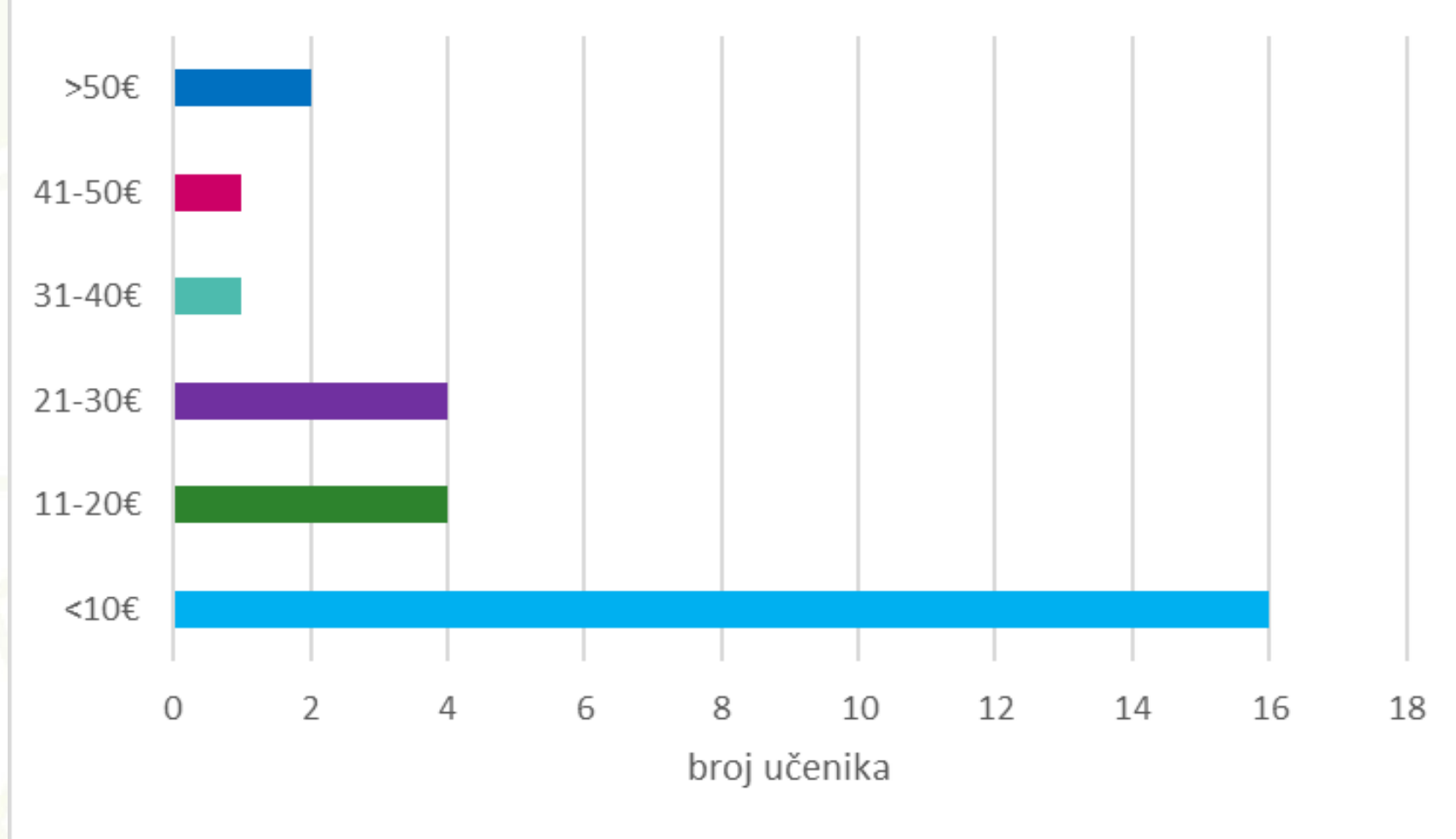
[Hrvoje Debeljak](#)

A- A+

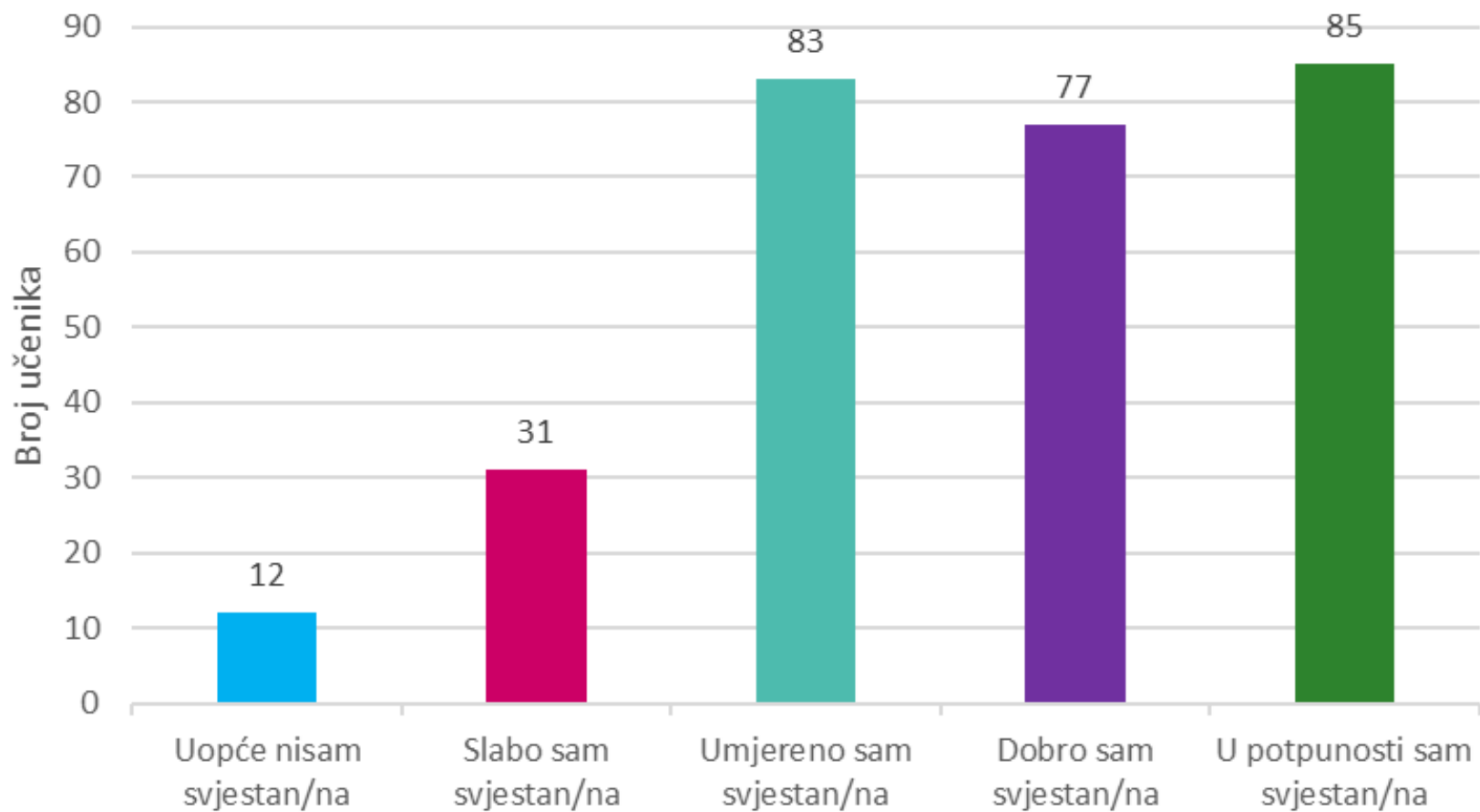
Dok je u 2019. godini devet posto naših učenica pušilo e-cigarete, lani je taj postotak porastao na čak 38 posto. Riječ je o rezultatima europskog istraživanja provedenog i u Hrvatskoj koje je pokazalo da ponašanje nekad tipično za mladiće sada postaje izraženiji problem kod djevojčica. Generalno, Hrvatska drži visoko treće mjesto od europskih zemalja po broju učenika koji konzumiraju e-cigarete.



## Prosječna tjedna potrošnja



## Svjesnost o štetnosti e-cigareta



# Predavanje dr. Juga

- Juraj Jug, dr. sc. dr. med. spec. obit. med.
- Medicinske posljedice dugotrajnog pušenja na kardiovaskularni i dišni sustav
- Usporedba posljedica konzumiranja duhana i e-cigareta
- Objašnjavanje trenda e-cigareta



# Konzultacija s vanjskim izvorima

- US Surgeon General: biološki mehanizmi štetnosti duhana
- WHO: electronic nicotine delivery systems (ENDS)
- Romagna i sur. – *in vitro* citotoksičnost e-cigareta

# Eksperiment - Allium test

- Testiranje toksičnosti e-cigareta
- Usporedba s „običnim” cigaretama
- Zaključci o štetnosti za čovjeka
  
- Procjena genotoksičnosti, citotoksičnosti i fitotoksičnosti
- *Allium cepa*, L. kao verificirani testni organizam

# Allium test - metoda

- priprema testnih otopina e-cigareta i duhana
- 3 koncentracije - 3 razine učestalosti konzumacije
- priprema lukovica, postava pokusa
- mjerenja duljine korjenčića, svaka 24h, tijekom 72h
- faza oporavka



# Rezultati eksperimenta

Tablica 1: Rezultati Allium testa nakon 72h

$c/ \text{g/mL}$	$\bar{l}(\text{duhan})/ \text{mm}$	$\bar{l}(\text{e-cigarete})/ \text{mm}$	$\bar{l}(\text{voda})/ \text{mm}$	inhibicija rasta (duhan)/ %	inhibicija rasta (e-cigarete)/ %
0	/	/	11.6	/	/
0.005	5	3.7	/	56.9	68.1
0.025	2.2	0.6	/	81.0	94.8
0.05	1.1	0.3	/	90.5	97.4

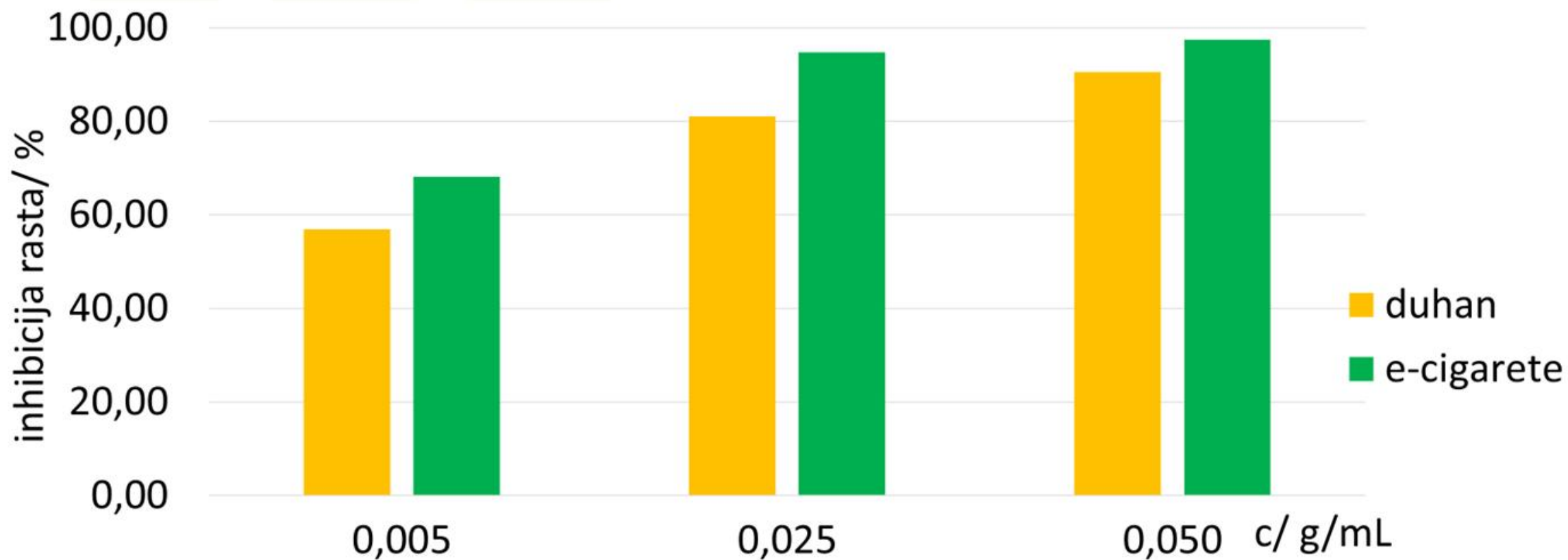
$$\text{inhibicija rasta} = \left(1 - \frac{\bar{l}(\text{izvor nikotina})}{\bar{l}(\text{voda})}\right) \cdot 100\%$$

Tablica 2: Rezultati Allium testa nakon faze oporavka

$c/ \text{g/mL}$	$\bar{l}(\text{duhan})/ \text{mm}$	$\bar{l}(\text{e-cigarete})/ \text{mm}$	$\bar{l}(\text{voda})/ \text{mm}$	indeks regeneracije (duhan)/ %	indeks regeneracije (e-cigarete)/ %
0,000	/	/	17,20	/	/
0,005	12,40	7,00	/	7,44	5,68
0,025	7,20	2,00	/	9,82	10,00
0,050	6,80	0,60	/	18,55	6,00

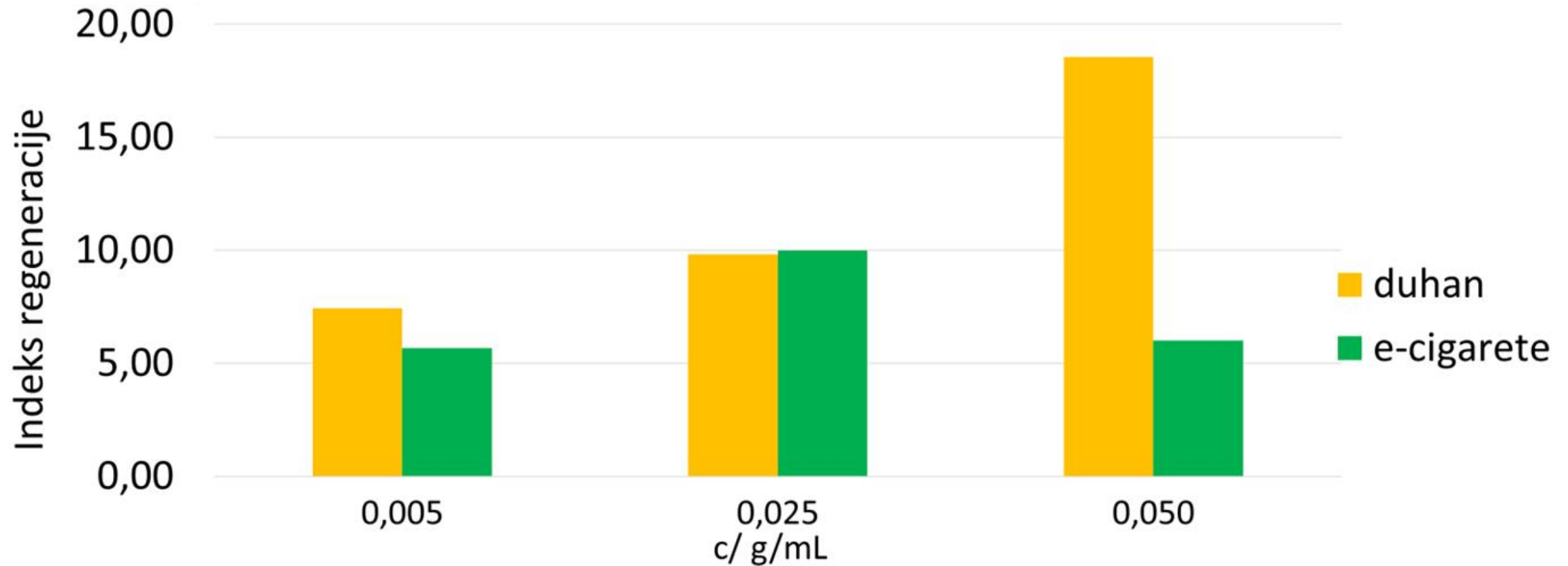
$$\text{indeks regeneracije} = \frac{\bar{l}(\text{nakon faze regeneracije})}{\bar{l}(\text{nakon 72h}) / 3}$$

# Rezultati eksperimenta



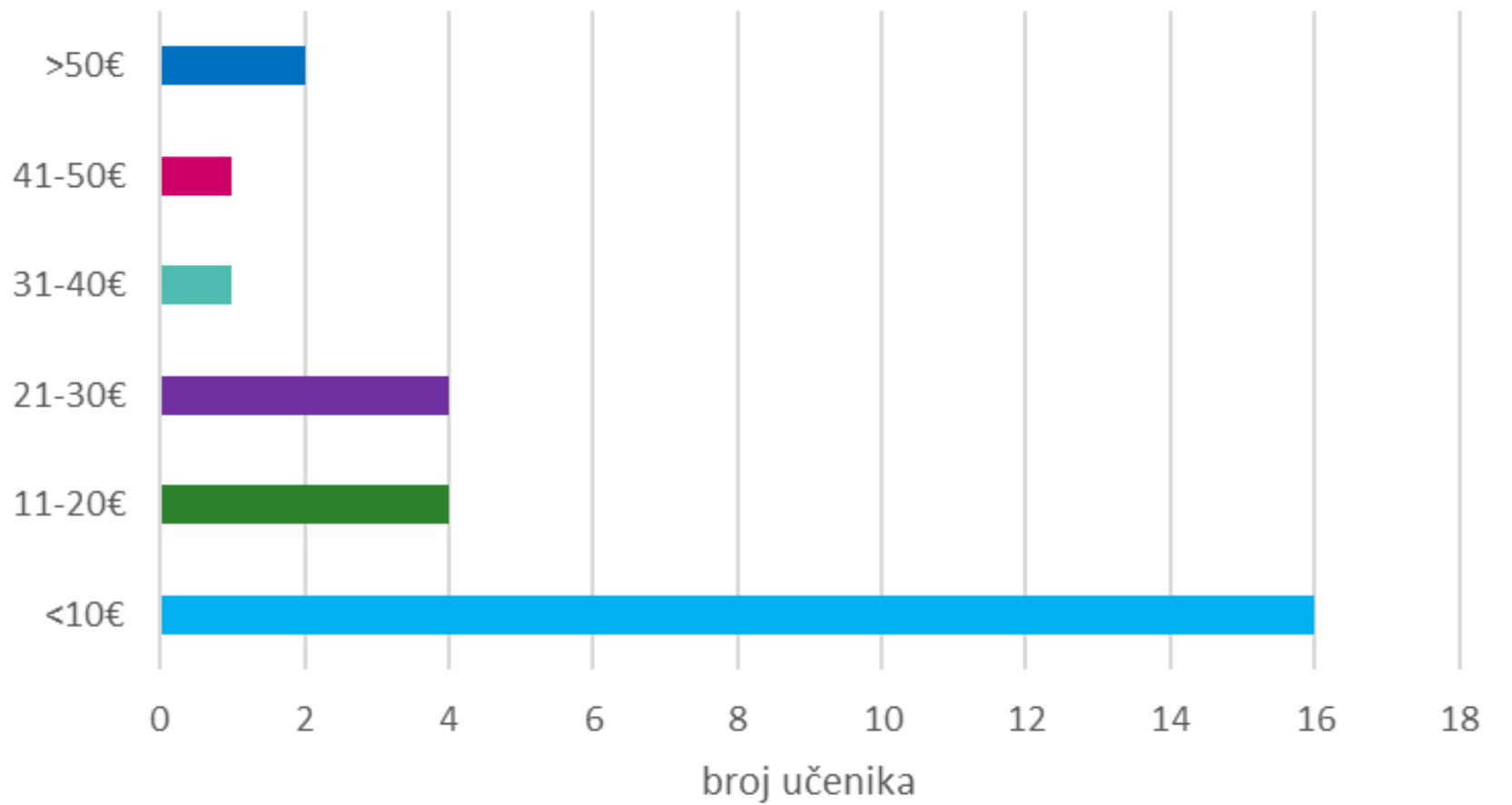
*Graf 1: Rezultati Allium-testa nakon 72h (ovisnost inhibicije rasta o koncentraciji otopine u kojoj su se držale)*

# Rezultati eksperimenta



*Graf 2: Rezultati Allium-testa nakon faze oporavka (ovisnost indeksa regeneracije o koncentraciji otopine u kojoj su se držale)*

## Prosječna tjedna potrošnja



# Mathematical Part of the Project

Investment made at the beginning of every month (instead of buying e-cigarettes),  
 $C_0 = €40$  (from the survey results)  
 accumulates for  $n$  years.

$$C_n = C_0 r \frac{r^{12n} - 1}{r - 1}$$

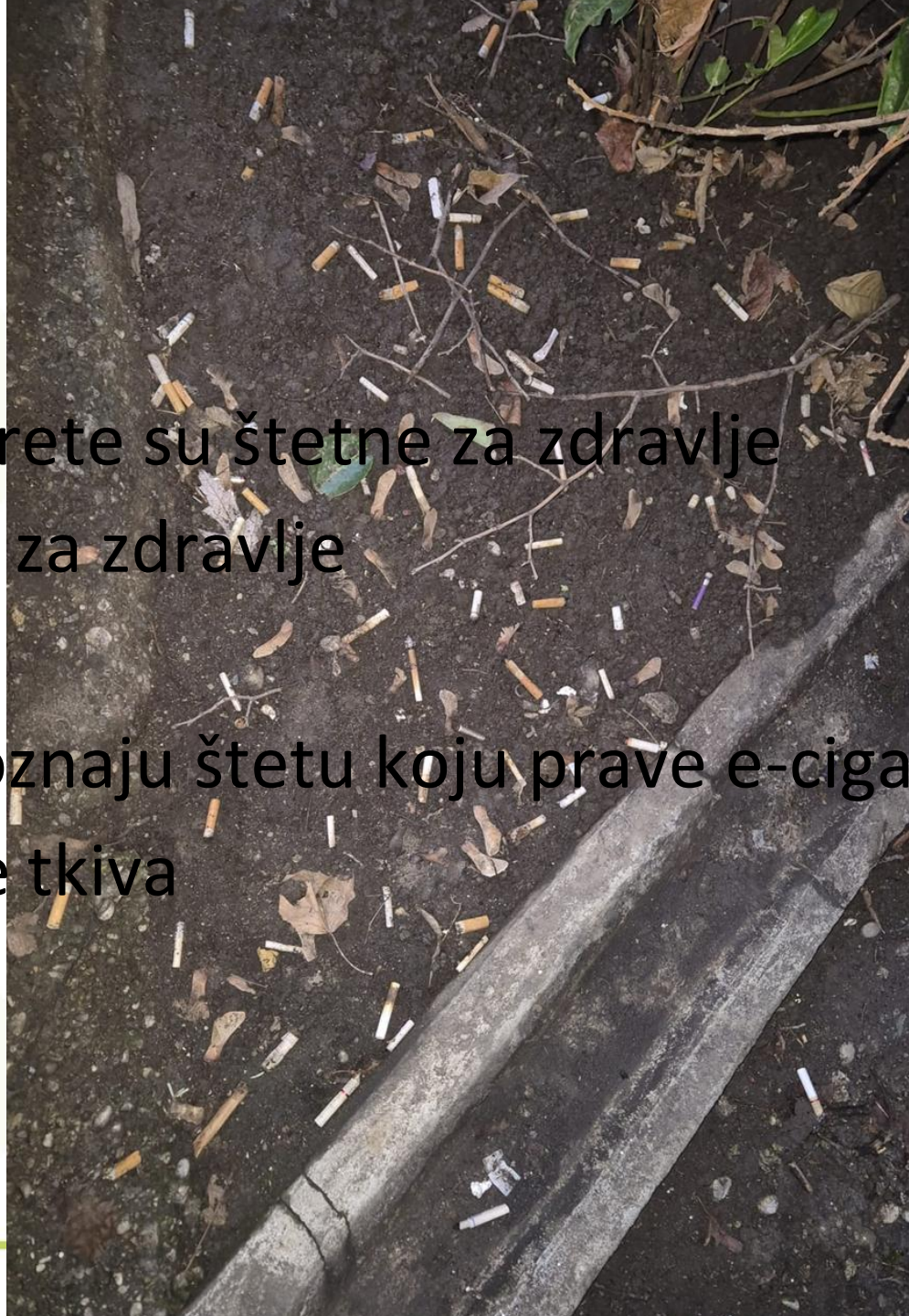
For  $r = 1 + p/12$

Annual interest rate of a bank in Croatia,  
 $p = 1.6\%$

Years investing	1 year	4 years	15 years
Money in the bank	€484	€1984	€8142
What you can buy	96 packets of Napolitanke 	a decent laptop, some left over 	a second-hand BMW (€7450) or rent an apartment in Zagreb for 8 months (€900/month)

# Zaključak

- E-cigarete i klasične cigarete su štetne za zdravlje
- E-cigarete nešto štetnije za zdravlje
- Hipoteza je pogrešna
- Većina učenika ne prepoznaju štetu koju prave e-cigarete
- Sposobnost regeneracije tkiva
- Ekološki učinak



# Izvori

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