

Climate Change Impact on Human Health Risks Associated with the Exposure to POPs

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Arctic Russia facts

- 2/3 of Russia's territory is represented by permafrost lands.
- About 11 million residents are reported to live there (about 7% of total population).
- Some 70,000 people are entitled to be the arctic indigenous minorities.
- Over 20% of Russia's GNP is provided by the economy of arctic regions enormous concentration of unique natural resources.


Arctic Russia: Climate Change Impact and Most Known Human Health Risks Involved.

- Increased risk of disasters, flooding, corrosion of permafrost lands,
- Увеличение риска разрушения зданий в зоне вечной мерзлоты, а также наводнений, штормов и других природных катастроф.


Vector-borne diseases, in particular those associated with blood-sucking arthropods

- Расширение ареала распространения на Север переносчиков некоторых «теплолюбивых» опасных инфекций, в частности клещевого энцефалита, а также увеличение заболеваемости гепатитами и кишечными инфекциями





Climate Change and Persistent Contaminants in the Arctic.

- Although the presence and the latitude-dependent increase of POP levels in the Arctic regions are confirmed by many international studies, the ecotoxicological and consequences especially that associated with climate change still remain largely unknown. High levels of persistent contaminants in the Arctic have already caused serious concern of health conditions of indigenous populations. Human reproduction appears to be especially vulnerable to the exposure to certain contaminants such as PCBs.
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Local sources of severe industrial pollution in Arctic Russia. A Satellite image.



Локальные антропогенные источники загрязнений в Российской части Арктики



Там, где раньше была вечная мерзлота.

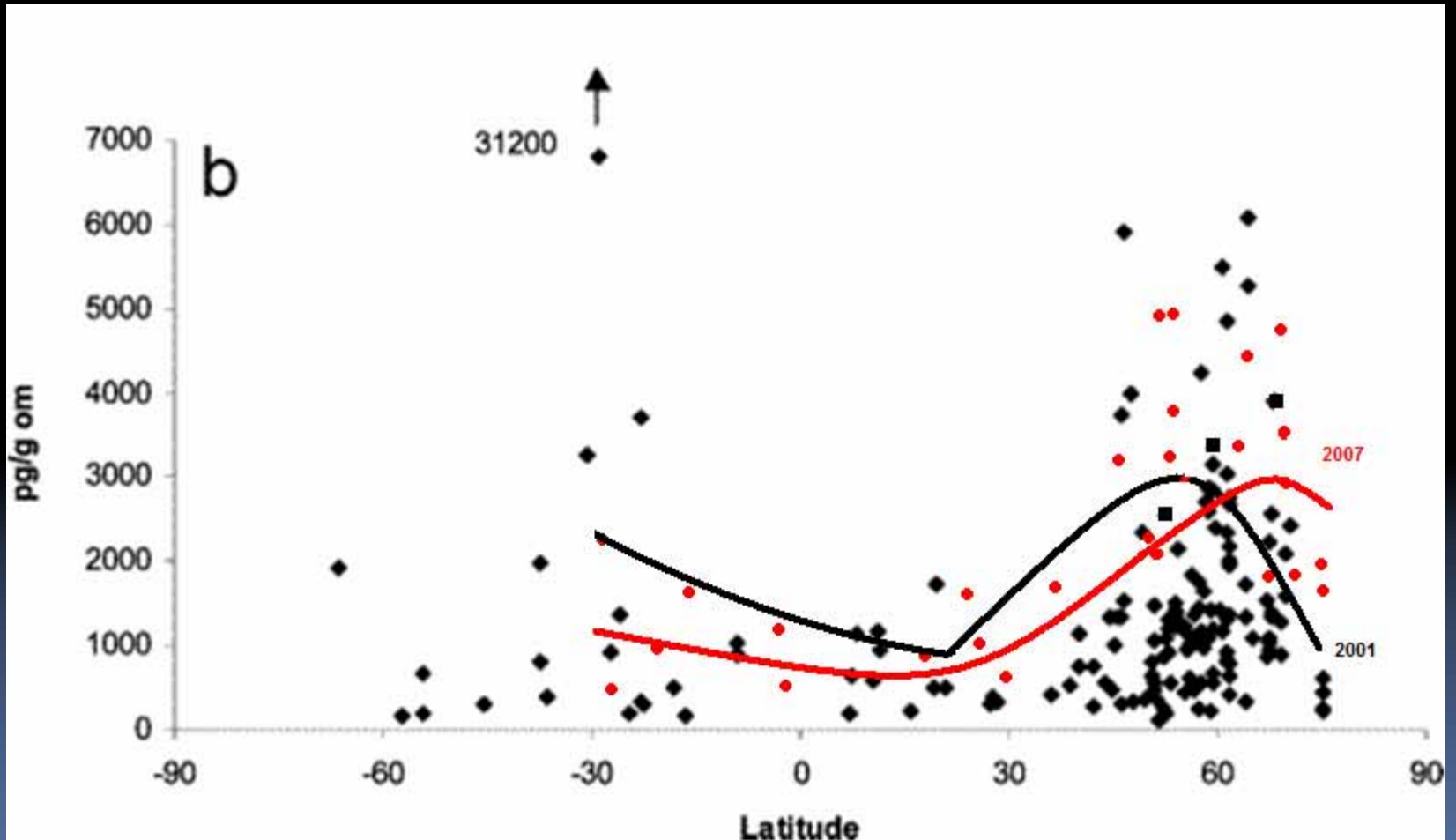




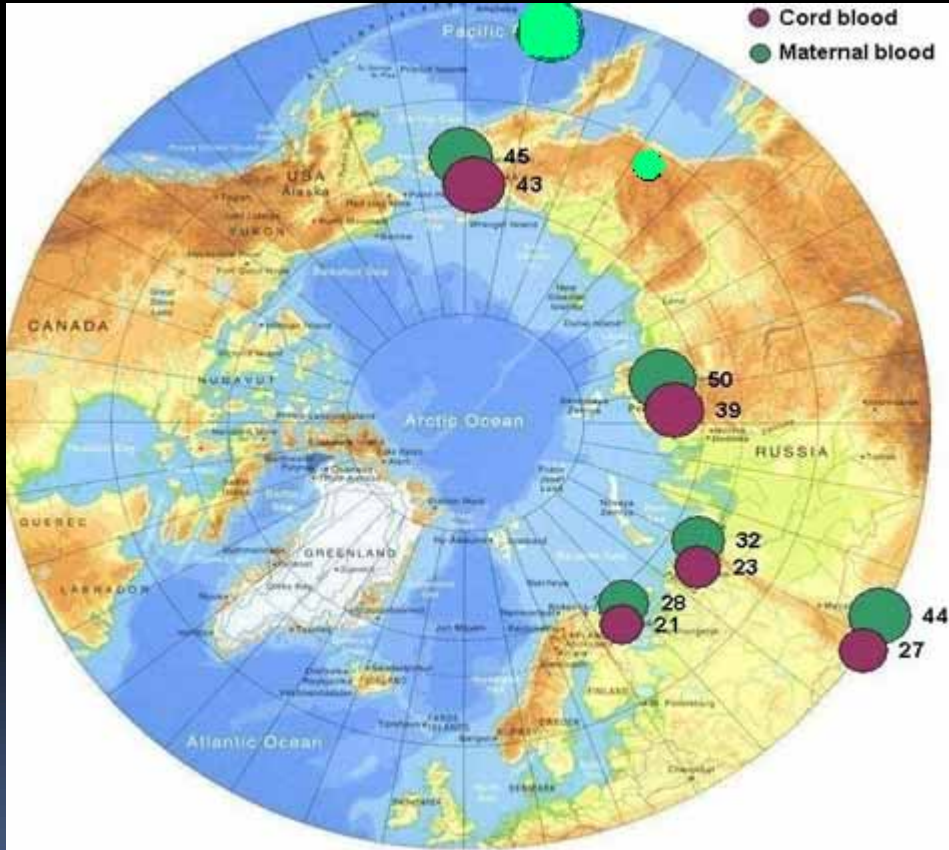
Climate Change and Persistent Contaminants in the Arctic.

- **Questions:**
- Is there any impact on global transfer, behavior, fate, distribution, exposure intensity and health effects of POPs?
- How significant such impact is?
- What should be done to reduce risks associated with the climatically modified human exposure to POPs?

PCB global deposition in soils by latitude as measured for 2001 and 2007

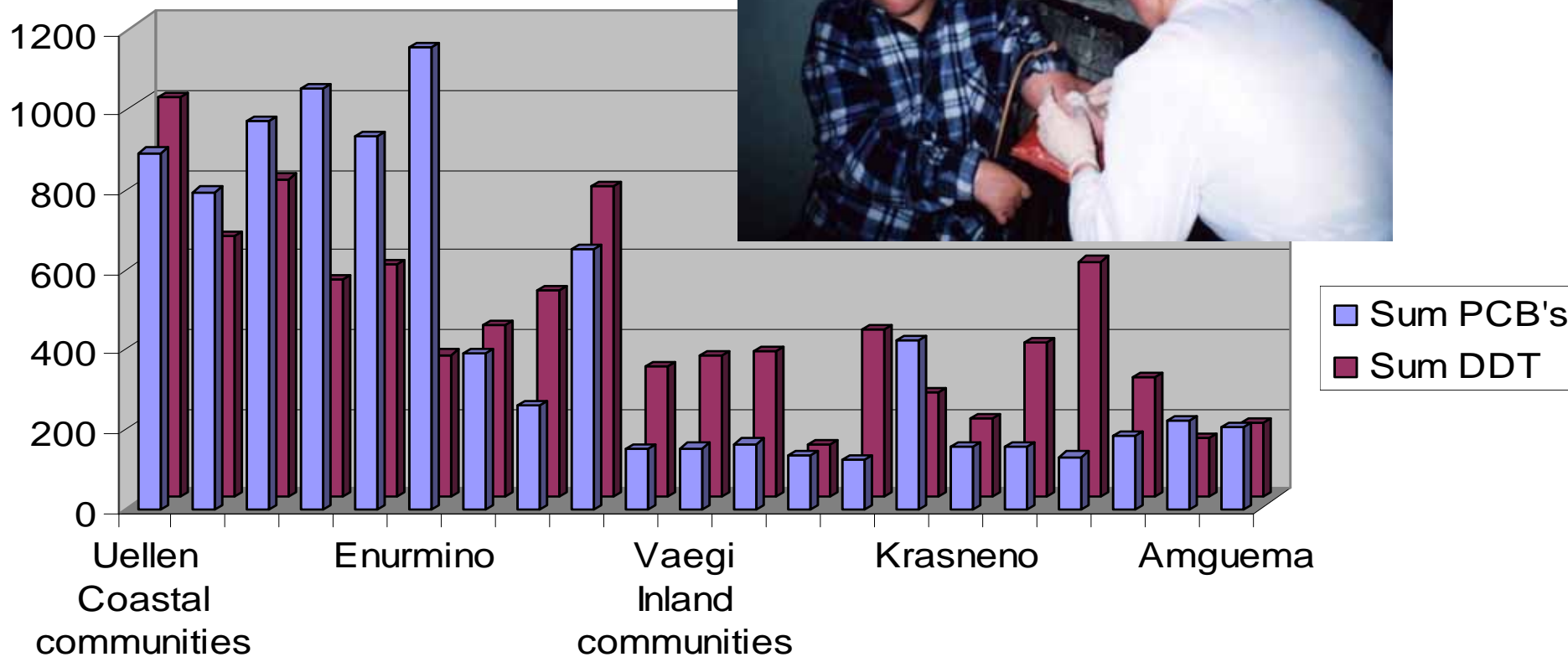


Russian PTS Surveys in the Arctic




- There were **118 native communities** in the selected study areas.
- The survey comprises **13 ethnical groups of 18 recognized by the Russian Legislation as indigenous minorities of the North** including some **407 mother-child pairs** and also **1514 adults**

Serum concentrations of total PCBs and total DDTs in maternal blood of pregnant indigenous women of Chukotka, ng/g in lipids (means)



General Conclusions from the Arctic Russia Study on Persistent Toxic Substances

- **Overexposure of indigenous people living in Murmansk, Nenets, Taimyr and Chukchi Districts from both long-range (5-20%) and local sources (80-95%) of POPs. Coastal populations are at highest risk of adverse effects related to the POP exposure**
- **Elevated level of infant mortality and the lowest life expectancy among natives heavily exposed to environmental contaminants**



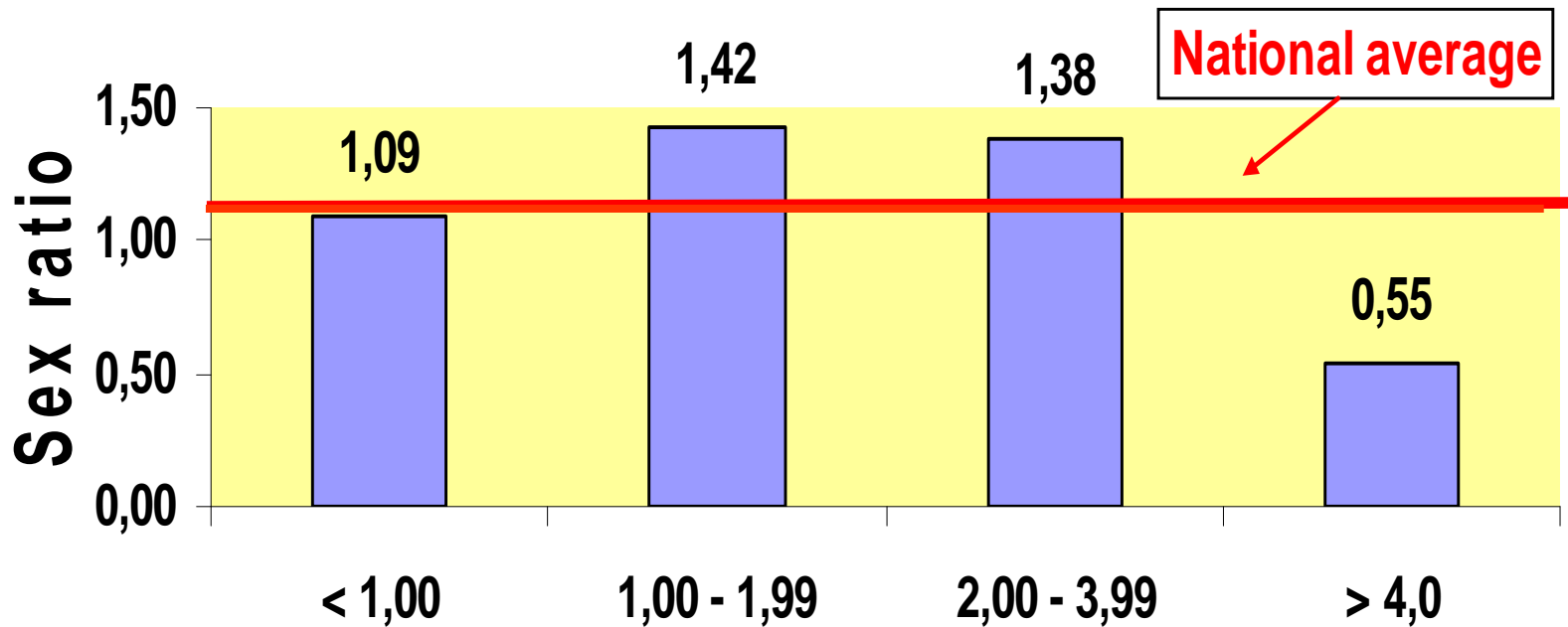
Major health effects associated with the exposure to PCBs

- Toxic, mutagenic, carcinogenic and estrogenic effects
- Disorders in immune system, behaviour and reproduction

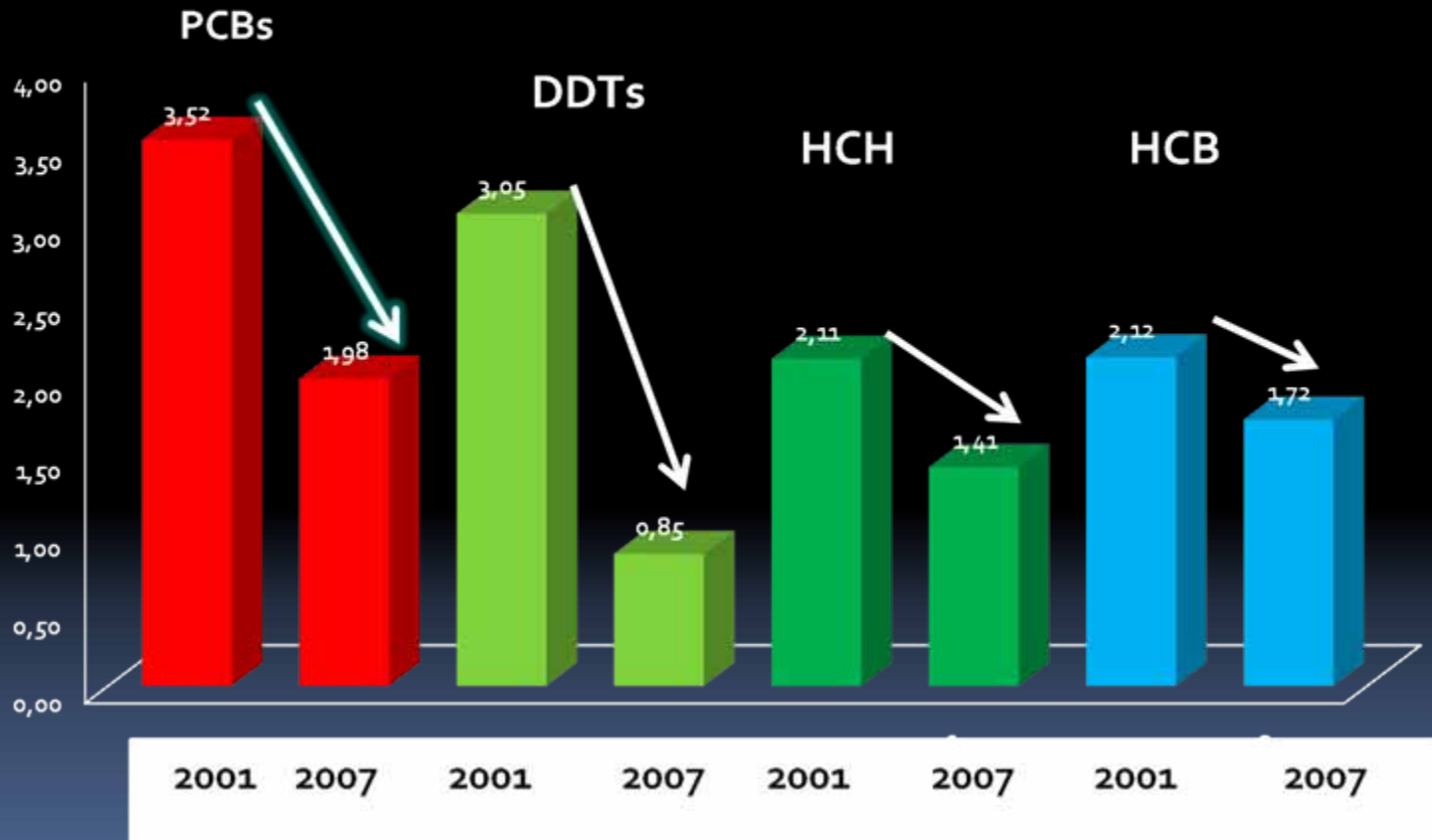
Prevalence of adverse outcomes of pregnancy by PCB concentrations in maternal serum, %

Total PCBs µg/L	Adverse outcomes (346 pregnancies)		
	Gestational age, less than 37 weeks	Stillbirth and birth defects	All lifetime fatal outcomes
< 0.800	7,1	1.2	9,5
0.800-1.299	11,0	3.3	12.1
1.300-2.499	13,4	6.2	17.5
>2.500	16,2	8.1	18.9

Sex ratio of newborns (boys/girls) by PCB concentrations measured in maternal blood, $\mu\text{g/L}$

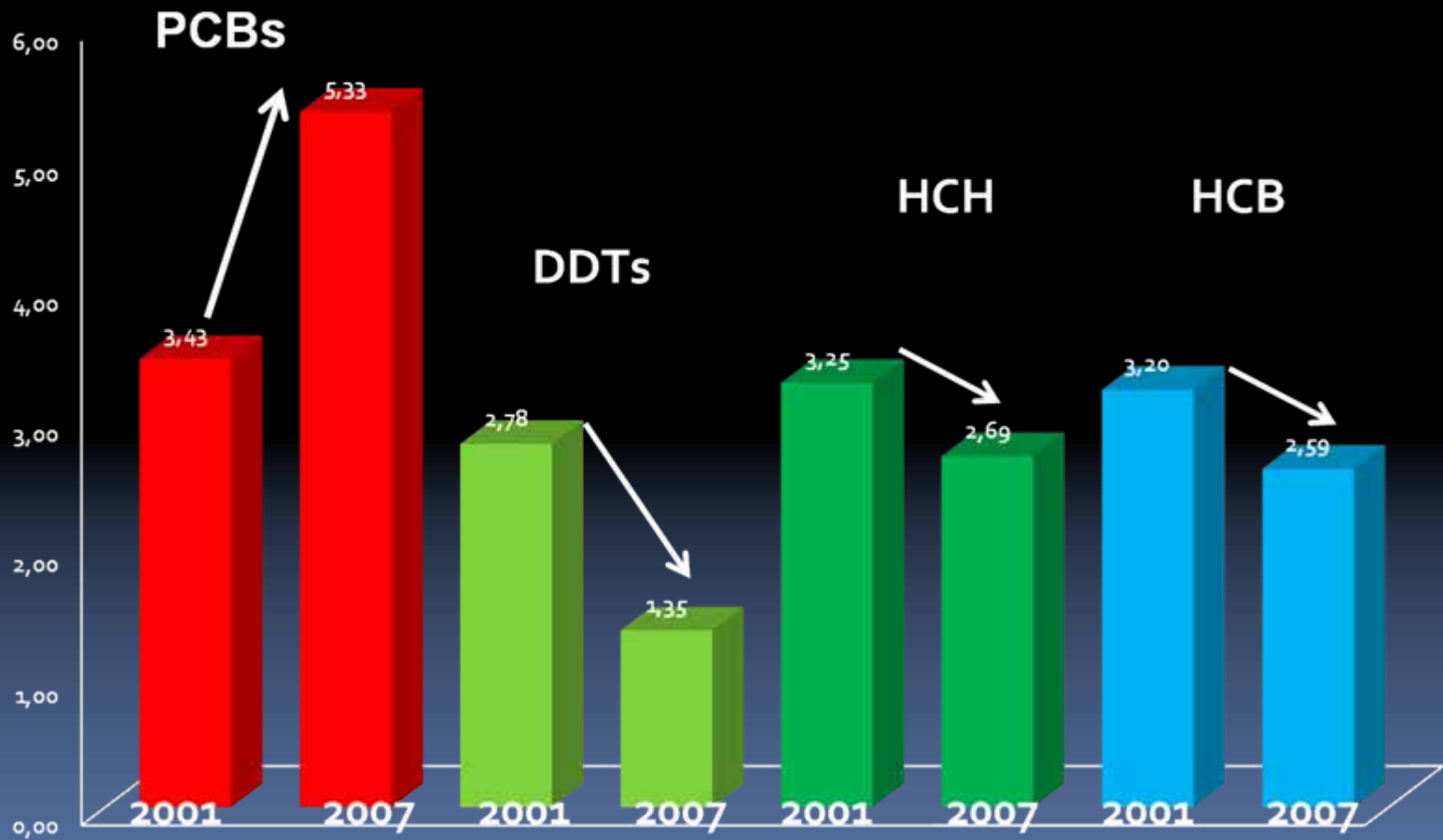


Temporal Trends in Human Exposure to POPs (as measured for serum concentrations, $\mu\text{g/L}$). A Cohort of Indigenous Adult Females of Arctic Russia

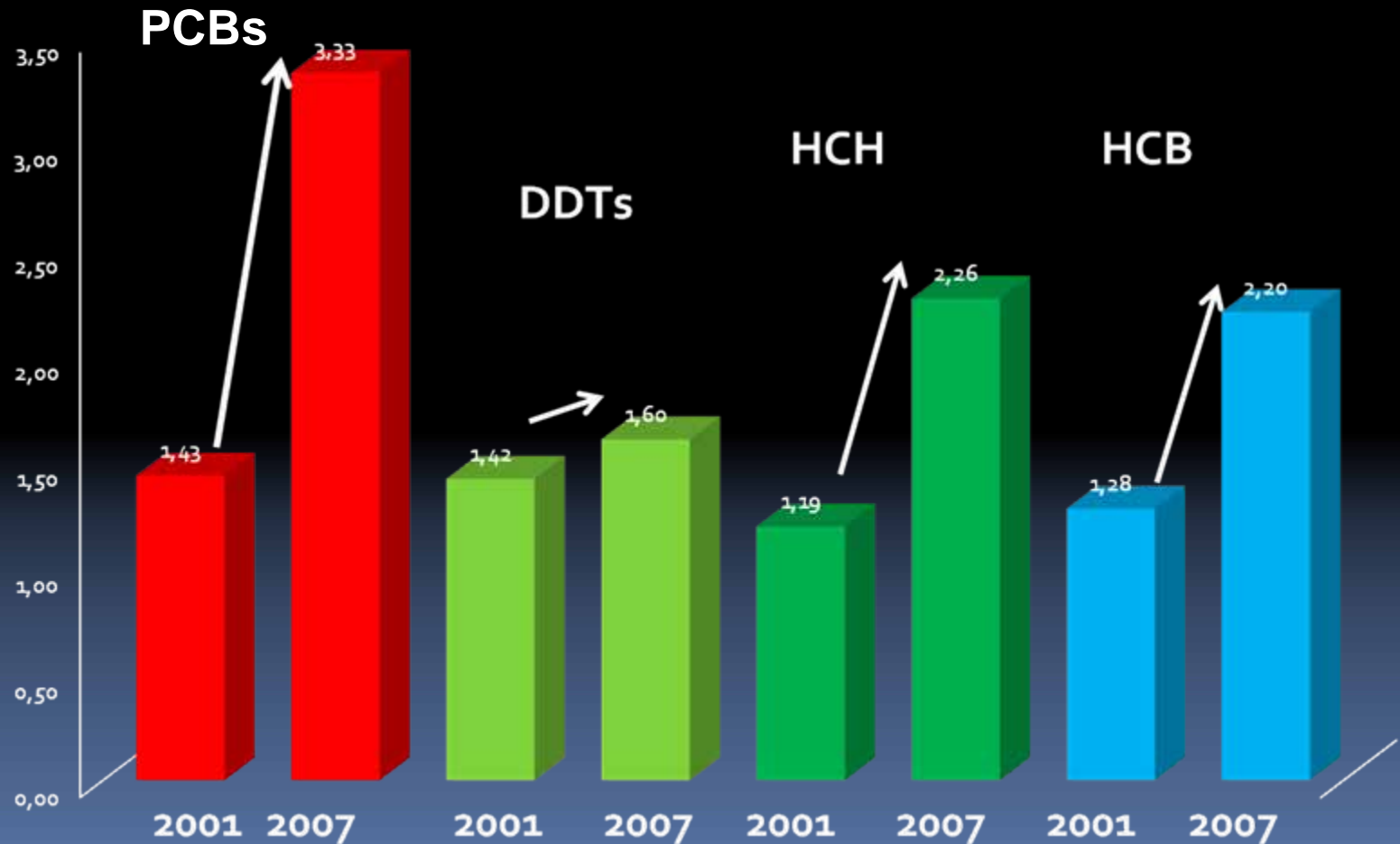


Temporal Trends in Human Exposure to POPs (as measured for serum concentrations, $\mu\text{g/L}$).

A Cohort of Indigenous Adult Males of Arctic Russia



Temporal Trends in Human Exposure to POPs (as measured for serum concentrations, $\mu\text{g/L}$). **A Cohort of Indigenous Children 6 yrs old of Arctic Russia**




Lead Blood Concentrations in The Followed Cohort of Indigenous People in Arctic Russia, $\mu\text{g/L}$





Summary Findings: Global Distribution and Fractionation of POPs

1. OCs Have an Affinity for Soils with High Soil Organic Carbon Content (SOCC) (forests, peat bogs, grasslands).
 2. Vegetation Canopies Appear to Enhance Scavenging and Promote Persistence.
 3. Contaminant Hopping (repeated air/surface exchange) Seems to Occur.
 4. Condensation (removal from air) Occurs in Cold Climates
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What will be the Effect of Global Warming on Human Exposure to POPs in the Arctic?

Increase in environmental temperature may well be resulted in:

- Enhancement of surface/air exchange;
 - Altered contaminant fractionation;
 - Increase in slopes of latitudinal plots – more transport to higher latitudes due to move of condensation area;
 - Accelerated corrosion of metallic containers/drums/tanks leading to mobilization of contaminants from wastes buried in permafrost lands
- Increase in organic matter productivity and greater OCs scavenging;
- Increase in human exposure/susceptibility to air-borne and water-borne hazards
- Formation of photochemical smog and ozone



Recommendations

- Develop new strategies and methods for monitoring and reduction of the exposure to PTS, to enhance the accessibility of decontamination services at community level;
- Improve dissemination of information, experience transfer and professional training to facilitate the development and implementation of both national and local action plans for improvement of the environment and health care systems as main components of adaptation to climate change in the Arctic..



Recommendations

- Develop an inventory of local sources of persistent toxic substances (PTS) in selected indigenous communities from the identified geographical locations in the Russian Federation.
 - Develop and implement a model demonstration project to identify, stabilize and/or remove the above-referenced local sources of contaminants in selected indigenous communities.
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