MINISTRY OF HEALTH OF UKRAINE
O.O. BOGOMOLETS NATIONAL MEDICAL UNIVERSITY

"Approved"
at the methodological conference of hygiene and ecology department
Head of the department
correspondent member of NAMS of Ukraine,
M.D. Bardov V.G._____

GUIDELINES
FOR STUDENTS

Subject	Hygiene and ecology
Module № 1	Assessment of the environment and its impact on the population health
Submodule №1	General questions of hygiene and ecology
Topic of the lesson	Hygienic assessment of the impact of natural and anthropogenic biospheres' constituents on human and health population.
Course	6
Faculty	medical
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Kiev

1. Learning objective

1.1. Master the fundamental methods of collection, processing and analysis of hydrometeorologic and other information for the hygienic assessment of climate and weather in the region. Master the scheme and methods of assessment of the weather and climate influence on human body and health. To elaborate hygienic recommendations for healthy and sick men for prevention of the heliometeorotropic reactions.

1.2. Acquire patterns of global biosphere pollution. Master the method os weather assessment through distortion of atmosphere polution dynamics and working out hygienic recomendations for toxic fog and photochemical smog influence prevention.

2. Basics

2.1. You should know:

2.1.1. Physiology of human thermoregulation and adaptation. Basics of the environmental hygiene. Medical classification of the weather conditions. Methods of medical and meteorological forecast. Methods of heliometeorotropic reactions prevention (permanent, seasonal, urgent) for healthy and sick men suffering from different diseases. General and applied medical classifications of climate. Structure and organization of the climate and the weather conditions inspection and forecast services.

2.1.2. The main ecological-depending diseases. Way of toxic fog, acid rains and photochemical smog forming. Metodology of prediction and prevention methods of ecological-depending diseases exacerbation.

2.2. You should have the following skills:

2.2.1. To determine the characterizing climate and weather conditions indices and state a hygienic value of results. To master statistical calculations including the usage of programmable calculator or computer. To present results of statistical calculations using tables, graphs, diagrams, schematic maps.

2.2.2. To make up plans of preventive measures of ecological-depending diseases.

3. Self-training questions

3.1. Biosphere and its structure.

3.2. Structure, the main properties and hygienic significance of atmosphere.

3.3. Structure, the main properties and hygienic significance of lytosphere.

3.4. Structure, the main properties and hygienic significance of hydrosphere.

3.5. . Environment and its components. The main mechanisms of environmental influence on human health.

3.6. General rules of environment influence.

3.7. Weather and its definition. The weather forming and characterizing factors.

3.8. Mechanism of the atmospheric motion. Formation of different weather types.

3.9. Main thermobaric processes: trade-winds, antitrades, cyclones, anticyclones, atmospheric fronts. Temperature inversion.

3.10. Weather influence on human health and emotional state. Heliometeorotropic reactions and their definition, mechanism of their development.

3.11. Medical classification of the weather conditions, the significance of their main characteristics.

3.12. Influence of meteorological conditions on atmospheric air pollution. Smog.

3.13. Medical weather forecast, principles and methods of helimeteorotropic reactions prevention. Influence of extreme weather conditions on human emotional state.

3.14. Climate and its definition. The climate forming and characterizing factors.

3.15. Classification and hygienic characteristics of different climatic zones. Climatic zones of Ukraine.

3.16. Climate features of different natural and geographical regions.

3.17. Acclimatization. Main hygienic aspects of acclimatization in the North, the South, in arid zone and mountains.

3.18. Hydrometeorology service, the processing methods and the significance of meteorological supervision data for medical-hygienic assessment of the climate and the weather conditions.

3.19. Usage of the climate factors for recovery and disease prevention, sanatorium-and-spa treatment in case of different diseases.

3.20. Climate health resorts of Ukraine.

3.21. Scientific and technical revolution, its positive and negative signs.

3.22. Global character of biosphere pollution.

3.23. Atmospheric air polution and its influence to human health.

3.24. Soil polution and its influence to human health.

3.25. Water polution and its influence to human health.

3.26. Environmental protection.

4. Self-training assignments

4.1. Solve the following situation tasks.

4.1.1. The stable anticyclon was present above Kyiv during 8 days from 15 till 22 March. This anticyclon caused the stable weather without precipitation. Meteorological data at 1 a.m. of 22 March:

Atmospheric pressure - 760 Hg mm.;

Daily pressure difference - 4 Hg mm.;

Air temperature - (+12°C);

Daily air temperature difference - (+3^0C);

Relative air humidity - 60%;

Air oxygen content - 325 mg/l;

Air movement speed – 2.0 m/sec.

According to Ukrainian weather forecast, the weather has to change dramatically on Match 23 because of approaching of the cyclone with warm front. The rainy cloudy weather with such meteorological data is expected at 1 a.m. on 23 March:

Atmospheric pressure - 745 Hg mm.;

Air temperature - (+6°C);

Relative humidity - 100%;

Air oxygen content - 250 mg/l;

Air movement speed - 10 m/sec.

Determine the following parameters:

1. What is the weather type observed on March 22 in accordance to medical classification of the weather? What is the weather type expected for March 23?

2. What is the weather biotropicity during the first and second period?

3. The patients suffering from cardiovascular diseases are under regular medical check-up. Make recommendation to them about prevention of heliometeorotropic reactions because of the weather change.

4.1.2. As a member of building crew the physician of the Kyiv mechanical plant's medical department was sent into Middle Asia region rendering aid to the population having suffered from the earthquake. The doctor received the following climate and weather conditions from the climate description of this region and meteorological data:

Average air temperature of January - (+2°C);

Average air temperature of July - (+28°C);

Average relative air humidity of July - 24%;

Annual precipitation - 90 mm;

Prevailing wind direction – South-East;

Average air movement speed – 1.2 m/sec.

Answer the following questions:

1. What climate zone will the builders work in?

2. What climate and weather conditions are specific for this region? Define the hygienic characteristics of this region correctly.

3. What distinctive features of physiological reactions are typical during the stay and acclimatization of the builders in this region?

4. What hygienic recommendations in accordance to the climate and the weather conditions of the region will you make for:

a) planning and building of the apartment houses and patient care institutions;

b) water consumption;

c) dietary intake, dietary patterns;

d) selection of the clothes.

5. Structure and content of the lesson (duration of the lesson 160 min + 10 min break)

5.1. Preamble – 10 min.

5.2. Theoretical training – 60 min

5.2.1. Curriculum questions (see page 2)

5.2.2. Main theoretical aspects and normative documents.

5.2.3. The weather forming factors.

5.2.4. The weather characterizing factors.

5.2.5. The climate forming factors.

5.2.6. The climate characterizing factors.

5.2.7. Classifications of the weather and the climate.

5.3. Typical situational tasks "Krok-2" solution – 30 min.

5.4. State hygiene exams situational tasks solution – 40 min.

5.5. Test control for assessment of students' knowledge final level – 40 min.

5.6. Final part – 10 min.

Climate and weather as combination of environmental factors

Weather is the physical and chemical characteristics of the bottom layer during the short period of time (hours, days, weeks) (*Weather* is the day-to-day meteorological conditions experienced in a place or area).

Climate is long-term weather regime, repeating in the particular region systematically (*Climate* is the long-term prevailing weather conditions in an area).

So, weather is the changeable phenomenon, while climate is the statistically permanent phenomenon characterizing the particular region.

The weather forming factors:

1. Natural:

The solar radiation intensity (total and erythematous UV radiation, solar illumination duration) and the solar activity (solar spots, active regions, chromospheric bursts, radio-wave radiation);

The type of underlying surface (snow, water, soil etc.);

The atmospheric motion (cyclones, anticyclones, atmospheric fronts, trades, monsoon etc.).

2. Antropogenic:

The atmosphere pollution by industrial waste (smog);

The destruction of the woods, land reclamation (melioration), irrigation, formation of artificial reservoirs;

The weather type depends on region climate and time of the year.

The weather characterizing factors:

1. Heliophysical:

- the solar radiation intensity (total and erythematous UV radiation, the solar illumination duration);
- the solar activity (solar spots, active regions, chromospheric bursts, radio-wave radiation);

2. Geophysical:

- the planet and abnormal geomagnetic intensity, geomagnetic storms, impulses.

3. Atmospheric electricity:

- the atmospheric electric field intensity, atmospheric electroconductivity, air ionization, electromagnetic oscillation and discharges.

4. Meteorological factors:

- air temperature, surface radiation temperature;
- air humidity;
- direction and air movement speed;
- atmospheric pressure.

5. Synoptic phenomena:

- the cloudiness, precipitations and their characteristics (rain, snow etc.).

6. Chemical characteristics of the bottom layer:

- concentrations of oxygen, carbon dioxide, atmospheric pollutants.

The climate forming factors:

The geographical latitude of the region determinates the sun-raising above the horizon, the solar radiation intensity per earth surface;

The height above sea level and the relief (flat and undulating grounds, highlands);

The surface type (forests, forest-steppes, steppes, deserts, water reservoirs);

The closeness to seas, oceans, the type of the nearby sea currents (warm, e.g. Gulf Stream, cool, e.g. Labrador Current);

The air circulation types (cyclones, anticyclones, atmospheric fronts, trades, monsoon, wind strength and duration, that dominate in the region, for example phene, north, bora, sirocco ect.).

The climate characterizing factors:

1. Regional temperature conditions are characterized by the following parameters:
- the absolute minimum temperature;
- the absolute maximum temperature;
- the average annual temperature amplitude (range);
- the average temperature of January;
- the average temperature of July;
- the average annual temperature.

2. Air humidity is characterized by the following parameters:
- the minimum humidity;
- the maximum humidity;
- the average annual humidity;
- the annual amount and character of precipitations (rain, snow);
- the average mouth precipitations;
- the total days with precipitations;
- the average days with precipitations during the month;
- the total number of "dry-days" (without the precipitations) during the year;
- the total number of "moist-days" (rainy, snowy) during the year.

3. Atmospheric pressure is characterized by the following parameters:
- the minimum pressure;
- the maximum pressure;
- the average annual pressure;
- the amplitude of pressure difference.

4. Air movement direction and speed is characterized by the following parameters;
- the region "wind rose", the windy and calm days ratio during the year;
- the maximum air movement speed;
- the average annual wind speed.

5. The light climate is characterized by the following parameters:
- the monthly average minimum horizontal illumination;
- the monthly average maximum horizontal illumination;
- the average annual horizontal illumination;
- the total annual number of sunny days;
- the month with maximum sunny days;
- the month with minimum sunny days;
- the monthly average minimum intensity of the solar radiation;
- the monthly average maximum intensity of the solar radiation;

- the average annual intensity of the solar radiation.

6. The soil:
- soil types: dry, swamped soils;
- the frost zone of the soil;
- the duration of snow cover deposition;
- the duration of heating season.

Classifications of the weather and the climate

From the point of view of prevention of different types of diseases, the climate and the weather classifications, including medical are significant.

The climate conditions of the region are characterized by certain geographical particularities. The seven main climate zones are defined in accordance to the main geographical characteristics (temperature, pressure, air humidity, precipitations, light climate, wind parameters) and the geographical latitude of the region (see table 1).

Table 1

The Earth climate classification

Name of the climate zone	*Geographical latitude*	*Average annual temperature*	*Surface type**
1. Tropical	±13° latitude	+20-24°C	Evergreen forests, jungle
2. Hot	13-26° -"-	+16-20°C	Forests, steppe, desert
3. Warm	26-39° -"-	+12-16°C	Forests, steppe, desert
4. Moderate	39-52° -"-	+8-12°C	Forest-steppe
5. Cold	52-65° -"-	+4-18°C	Forests
6. Inclement	65-78° -"-	0-4°C	Forests, tundra
7. Arctic (polar)	69-90° -"-	-4° and below	Tundra

* The relief (flat and undulating grounds, highlands) and height above the see level are of great importance.

The five climate zones can be defined in the Ukraine: the marshy woodlands, forest-steppe, steppe, the Carpathian Mountains, the south coast of the Crimea (see table 2).

The climate zoning of the CIS (ex-USSR) territory (building climate classification) is presented in the table 3.

The zoning of the Ukraine territory is used for weather forecast in weather bureau: the north part (Zhytomyr, Kyiv, Chernihiv and Sumy regions), the west part (L'viv, Zakarpattya, Ivano-Frankivs'k, Ternopil, Khmelnytskyy and Chernivci regions), the central part (Vinnytsya, Cherkasy, Poltava, Kirovograd and Dnipropetrovsk regions), the east part (Kharkiv, Lugansk and Donetsk regions) and the south part (Odesa, Mykolayiv, Kherson and Zaporizhzhya regions) and the Crimea – the steppe part of the Ukraine. The south coast of the Crimea is considered as a separate climate zone.

Table 4

Medical weather classification by I.I. Grigor'ev

The weather types	*The weather characteristics*
The most comfortable	The stable weather is determined by anticyclone without considerable cloudiness and precipitations. The atmospheric pressure is higher that 760 Hg mm, an atmospheric difference is near 5 Hg mm, an air movement speed is to 3.0 m/sec, oxygen concentration above 315 mg/l.
Comfortable	Insignificant regional changes of the weather due to short-term precipitations and the variable cloudiness. An atmospheric pressure is 760-755 Hg mm, an atmospheric difference - 6-8 Hg mm, an air movement speed 4.0-7.0 m/sec, a temperature difference to - 5^0C, oxygen concentration - below 315 mg/l.
The weather requires intensified medical control (supervision)	A cloudy unstable weather with precipitations, frequently caused by moderate cyclones and local thunderstorms. An atmospheric pressure is 754-745 Hg mm, an atmospheric difference is 9.0 – 14.0 Hg mm, air movement speed is 8.0 – 10.0 m/sec, a temperature difference is 6 - 9^0C, oxygen concentration is 260 - 289 mg/l.
The weather requires severe medical control (supervision)	The weather is with storms and intensive precipitations, caused by deep cyclone. An atmospheric pressure is to 745 Hg mm, a pressure difference is above 14 Hg mm, a temperature difference above 10^0C, oxygen concentration - below 260 mg/l.

Table 2

Classification of the climate of the Ukraine

Name of the zone	*Zone limit*	*Temperatures, ^{0} C*					*Precipitations, mm*	*Total days with precipitations*	*Average air humidity*	*Duration of snow cover*
		Average in January	Average in July	Average annual	Minimum	Maximum				
1. Marshy woodlands	In the north: borders of the Ukraine. In the south: Lutsk, Shepetivka, Zhytomyr, Kyiv, Nizhyn, Konotop.	-4.5-7.8^{0}C	+17-18^{0}C +19-20^{0}C	5.5-7.0^{0}C	-32-35^{0}C	+35-36^{0}C	500-600	170-190	30-60%	100-110 days
2. Forest-steppe	In the north: Lutsk, etc.. In the south: Kotovsk, Kirovograd, Kremenchuh, Poltava, Kharkiv	-7-8^{0}C	+18-21^{0}C	+11-14^{0}C	-31^{0}C	+35-38^{0}C	500-700	150-170	30-60%	90-100 days
3. Steppe	In the north: Kotovsk, etc.. In the south: coasts of the Black and Azov seas (except the south coast of the Crimea)	-5-2^{0}C	+20-21^{0}C	+12-15^{0}C	-30^{0}C	+40^{0}C	250-300	120-150	Frequent hot winds	70-90 days
4. The Carpathian Mountains	The Carpathian Mountains and nearest hills	-7-8^{0}C	+18-21^{0}C	+14-15^{0}C	-26^{0}C	+31^{0}C	800-900	180-200	60-75%	60-70 days
5. The south coast of the Crimea	The south hills of the Crimean Mountains and seashore	+4^{0}C	+24^{0}C	+15-16^{0}C	-10^{0}C	+40^{0}C	400	130-160	60-64%	0-30 days

Classification of the climate of the CIS (ex-USSR) territory (building climate classification)

The climate		*Temperature and humidity characteristics of the subregions*					*Average wind speed, m/sec*
region	subregion	Average air temperature in January (^{0}C)	Average air temperature in July (^{0}C)	Average relative air humidity in July (%)	Precipitations (mm during the year)	Prevailing wind direction	
I	I A	-32 and below	4 till 19	ignor.	192	N-NE	ignor.
	I B	-28 till -32	0 till +13	above 75	206	N-NE	5 and above
	I C	-14 till -28	+12 till +21	ignor.	406	N-NE	ignor.
	I D	-14 till -28	0 till +14	above 75	456	E	5 and above
	I E	-28 till -32	+10 till +21	ignor.	496	E	ignor.
II	II A	-4 till -14	+8 till +12	above 75	582	NE	5 and above
	II B	-3 till -5	+12 till +21	above 75	605	W	5 and above
	II C	-4 till -14	+12 till +21	ignor.	494	N	ignor.
III	III A	-2 till -20	+21 till +25	ignor.	295	NE	ignor.
	III B	-5 till +2	+21 till +25	ignor.	310	W	ignor.
	III C	-5 till -14	+21 till +25	ignor.	318	NE	ignor.
IV	IV A	-10 till +2	+28 and above	ignor.	244	E	ignor.
	IV B	+2 till +6	+22 till +28	50 and above	100 3	E	ignor.
	IV C	0 till +2	+25 till +28	ignor.	4 - 98 3	NE	ignor.
	IV D	-15 till 0	+25 till +28	ignor.	4 - 98	NE	ignor.

Table 5

Medical weather classification by G.P. Fedorov

The weather type	*Meteorological characteristics*			
	Air temperature difference, ^{0}C	Relative air humidity, %	Air movement speed, m/sec	Air pressure difference, gPa
Optimal	до 2	40 - 70	до 3	до 3
Irritant	2 - 4	70 - 90	3 - 9	4 - 8
Acute	above 4	above 90	above 9	above 8

Recent researches (see tables 8-10) conducted at the propedeutic hygiene and military hygiene department of the National medical university named after A.A. Bogomolets, have proven the considerable adequacy of the weather classifications developed under the direction of V.F. Ovcharova in the Balneology and Physiotherapy Central Institute. This classification is used for the medical forecast of meteorotropic reactions in different climate zones of Ukraine (see table 6) and includes the dynamics and the intensity of circulating processes in the air, as well as many other meteorological elements (see table 7).

The tables 8, 9, 10 are used for the hygienic assessment of the weather troposity to the acute attacks of chronic cardiovascular diseases, bronchial asthma in different climate zones of the Ukraine.

Table 6

Medical weather classification by V.F. Ovcharova and others

The weather characteristics from the medical view	*The weather pattern characteristics*
Stable indifferent	The slow-moving anticyclone without atmospheric fronts
Unstable, passing from indifferent to "spastic" type	Destruction of the anticyclone. An approach of an inclination, a crest, a non-gradient region with increased pressure.
	An approach of a cold front or an occlusion front as a cold type.
"Spastic" type	An establishment of an inclination (ridge), a crest, a non-gradient region with increased pressure.
	A cold frontal passage or an occlusion frontal passage as a cold type.
Unstable „spastic" type with elements of „hypoxic" type	The retreat of a cold front or an occlusion front as a cold type
	An approach of a cyclone, a saddle, a dish, a non-gradient region with low pressure
	An approach of a warm front or an occlusion front as a warm type
"Hypoxic" type	The retreat of a cyclone, a saddle, a dish, a non-gradient region with decreased (reduced) pressure
	A warm front passage of an occlusion frontal passage as a warm type
Unstable „hypoxic" type with elements of „spastic" type of weather	An establishment of a cyclone, a saddle, a dish, a non-gradient region with decreased pressure
	The retreat of a warm front or an occlusion front as a warm type
	An approach of a inclination (ridge), a crest, a non-gradient region with increased pressure
"Spastic" type weather passing to stable indifferent	An establishment of an anticyclone after a cold front
	A formation of a local anticyclone

Table 7

The weather elements interdiurnal variability

The main meteorological elements tendency	*The intensity degree of the weather elements interdiurnal variability*				
	indifferent	weak	moderate	variable	very variable
P without particular changes	± 2.5 ± 2.5 ± 0.5				

The main meteorological elements tendency	*The intensity degree of the weather elements interdiurnal variability*				
	indifferent	weak	moderate	variable	very variable
T e R O_2	± 10 ± 2.5				
P ↑ Ta +- Tb -+ e +- R +- O_2 ↑	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0
P + Ta – Tb + e -+ R -+ O_2 +	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0
P ↓ Ta -+ Tb +- e + R + O_2 +	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0
P ↓ Ta – Tb + e – R + O_2 -	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0
P ↑ Ta – Tb + e +- R +_ O_2 +-	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0
P + Ta – Tb + e – R – O_2 +	<2.5 <2.5 <0.5 <10 <2.5	2.5-5.0 2.5-5.0 0.5-1.0 11-20 2.5-5.0	5.1-10.0 5.1-10.0 1.1-2.0 21-30 5.1-10.0	10.1-20.0 10.1-20.0 2.1-4.0 31-40 10.1-20.0	>20.0 >20.0 >4.0 >40 >20.0

Conventions:

+ a transfer from depression to increase;

+ a transfer from increase to depression, a tendency to an exaggerate;
↑ an increase;
↓ a depression;
a – winter (a cold period);
b – a summer (a warm period);
P – an atmospheric pressure (mb);
R – a relative humidity (%);
e – an absolute humidity (mb);
T – an air temperature (^{0}C);
O_2 – oxygen concentration in the air (g/m^3)

Table 8

Hygienic assessment of the weather biotroposity to the acute attacks of hypertension strokes (I), angina pectoris (II), myocardial infarctions (III), strokes (IV) in different climate zones of the Ukraine by V.G. Bardov (1985)

The main meteorological elements tendency	*The intensity degree of the weather elements interdiurnal variability*				
	indiffe-rent	weak	moderat e	variable	very variable
The stable indifferent	I-F П-F Ш-F V-F	I-F П-F Ш-F IV-F	I-F П-F Ш-F IV-F	I-F П-F Ш-F IV-F	I-F П-F Ш-F IV-F
The unstable with the transfer from the indifferent into “spastic” type	I-F П-F Ш-F IV-F	I-F П-F Ш-F IV-F	I-MB П-F Ш-F IV-MB	I-AT П-MB Ш-MB IV-AT	I-AT П-AT Ш-AT IV-AT
“Spastic” type	I-F П-F Ш-F IV-F	I-MB П-C Ш-C IV-MB	I-AT П-MB Ш-MB IV-AT	I-AT П-AT Ш-AT IV-AT	I-AT П-AT Ш-AT IV-AT
The unstable “spastic” type with “hypoxic” type weather elements	I-F П-F Ш-F IV-F	I-F П-F Ш-F IV-F	I-MB П-F Ш-F IV-MB	I-AT П-MB Ш-MB IV-AT	I-AT П-AT Ш-AT IV-AT
“Hypoxic” type	I-F П-MB Ш-MB IV-F	I-MB П-AT Ш-AT IV-MB	I-AT П-AT Ш-AT IV-AT	I-AT П-AT Ш-AT IV-AT	I-AT П-AT Ш-AT IV-AT
The unstable “hypoxic” type with “spastic” type weather elements	I-F П-F Ш-F IV-F	I-F П-MB Ш-MB IV-F	I-MB П-AT Ш-MB IV-MB	I-AT П-AT Ш-AT IV-AT	I-AT П-AT Ш-AT IV-AT
A transfer from a “spastic” type weather into a stable indifferent	I-F П-F	I-F П-F	I-MB П-MB	I-AT П-AT	I-AT П-AT

The main meteorological elements tendency	*The intensity degree of the weather elements interdiurnal variability*				
	indiffe-rent	weak	moderat e	variable	very variable
	III-F IV-F	III-F IV-F	III-MB IV-MB	III-AT IV-AT	III-AT IV-AT

Conventions:

F – favorable weather type for cardiovascular diseases prevention;
MB – moderate biotropical weather type;
AT – adverse weather type;
I – HS – hypertension strokes;
II – AP – angina pectoris;
III – MI – myocardial infarctions;
IV – S – strokes.

Table 9

Hygienic assessment of the weather biotroposity to acute attacks of bronchial asthma in different climate zones of the Ukraine by Ye.M. Anisimov (1998)

The main meteorological elements tendency	*The intensity degree of the weather elements interdiurnal variability*				
	indiffe-rent	weak	moderat e	variable	very variable
The stable indifferent	F	F	F	F	F
The unstable with the transfer from the indifferent into “spastic” type	F	F	F	AT	AT
“Spastic” type	F	MB	AT	AT	AT
The unstable “spastic” type with “hypoxic” type weather elements	MB	MB	AT	AT	AT
“Hypoxic” type	MB	AT	AT	AT	AT
The unstable “hypoxic” type with “spastic” type weather elements	MB	AT	AT	AT	AT
A transfer from a “spastic” type weather into a stable indifferent	F	F	F	MB	AT

Conventions:

F – favourable weather type;
MB – moderate biotropical weather type;
AT – adverse weather type;

Table 10

Hygienic assessment of the weather biotroposity to acute attacks of coronary heart diseases in different climate zones of the Ukraine by S.M. Tkachenko (1999)

The main meteorological elements tendency	*The intensity degree an interdiurnal variability of the weather elements*				
	indiffe-rent	weak	moderat e	variable	very variable
The stable indifferent	F	F	F	F	F
The unstable with the transfer from	F	F	F	F	AT

indifferent into “spastic” type					
“Spastic” type	F	MB	MB	AT	AT
The unstable “spastic” type with “hypoxic” type weather elements	MB	AT	AT	AT	AT
“Hypoxic” type	MB	MB	AT	AT	AT
The unstable “hypoxic” type with “spastic” type weather elements	MB	MB	AT	AT	AT
A transfer from a “spastic” type weather into a stable indifferent	MB	MB	AT	AT	AT

Conventions:

F – favourable weather type;

MB – moderate biotropical weather type;

AT – adverse weather type.

Acclimatization – is complete social and biological process of active adaptation to a new climate conditions.

Phases - initial (physiological reactions)

- dynamic stereotype transformation (favorable and un favorable)
- stable acclimatization

Heliometeotropic reaction – is reactionf of human organism to sharp weather transformation

Prevention of heliometeotropic reactions:

Improvement of nonspecific resistance of organism

Sparing of organism

Specific and nonspecific chemotherapy (season and emergency)

Situational tasks

1. There was anticyclone without atmospheric fronts and stable weather in Kyiv during 8 days (15-22 of May). The main meteorological indices at 13.00 were: atmospheric pressure - 1021 - 1223 Hg mm, air temperature - +22-24ºC, absolute humidity – 12,4 Hg mm, relative humidity – 40-50%, O_2 – 293,3 g/m^3.

22 of May deep cyclone with warm front and occlusion front of warm type start to approach to Ukraine fro Europe. Cyclone movement speed – 30 km/h. 22 of May the center of cyclone was situated over Lvov. The main meteorological indices at 13.00 were: atmospheric pressure - 960 Hg mm, air temperature - +11ºC, absolute humidity – 16,6 Hg mm, relative humidity – 98%, O_2 – 270,1 g/m^3. Front passing was accompanied by rain and hail, huge winds. Amount of precipitations for 1 day is 40 mm. distance between Lvov and Kyiv is 450 km.

Give answers to following questions:

1. What is medical characteristic of 22 of May weather in Kyiv and Lvov?
2. Give medical prognosis about type of weather changes, which will be in Kyiv andtheir biotropicity.
3. Work off recommendations for patients with cardiovascular diseases for meteopathological reactions prevention.

2. Graduating student of national medical university was assigned to Baykal-Amur Railroad. He was appointed a head physician of hospital in the center of Yakutija. The head physician received a right to choose individual project of hospital with consideration of local climate conditions.

Climate conditions of this region are characterized by:

TEMPERATURE

1. Absolute maximal temperature +22ºC
2. Absolute minimal temperature -48 ºC
3. Amplitude of temperature deviations 70 ºC
4. Average annual temperature -5,6 ºC
5. The hottest month July
6. Average monthly temperature in July +9 ºC
7. The coldest month January
8. Average monthly temperature in January -16 ºC

HUMIDITY

1. Maximum relative humidity 100%
2. Minimum relative humidity 38%
3. Average annual relative humidity 79%
4. Annual amount of precipitations 480 mm
5. Total number of days with precipitations 98

ATMOSPHERIC PRESSURE

1. Maximum atmospheric pressure 1056 Hg mm
2. Minimum atmospheric pressure 921 Hg mm
3. Average annual atmospheric pressure 982

WIND REGIME

1. Maximum wind speed 28,3 m/sec
2. Minimum wind speed 0,1 m/sec
3. Average wind speed 6,3 m/sec
4. Wind direction

Direction	Number of days	%	Direction	Number of days	%
N	39	9	S	21	17
NE	37	8	SW	54	4
E	67	22	W	39	16
SE	63	20	NW	46	5

Give answers:

2. What climate and weather conditions characterized this region? Hygienic pecularities of these conditions.
3. What hygienic recomendation could you give according climat and weather conditions of this place to
   - hospital progect selection
   - hospital buildings prientation
   - hospital location regard to indastrial objects
   - water supplying
   - nutrition and regime of nutrition peqularities
   - soloral radiation insufficiency prevention
   - selection of clothe and shoes
   - treatment process in hospital

7.3. Patient with "Hypertension disease II B. Aterosclerotic cardiosclerosis II-III" with severe vascular attacks ask factory's doctor to give him ticket for a tour to sanatorium in july. There are variants: Bukhara, Samarkand, Gagry and Jurmala.

Questions:

1. Where can go patient?
2. What regime is prescribed for him in time of vacation?

7. Literature

6.1. Principal:

6.1.1. Загальна гігієна. Пропедевтика гігієни. : Підручник / Є.Г.Гончарук, Ю.І.Кундієв, В.Г.Бардов та ін./ За редакцією Є.Г.Гончарука. - К.: Вища школа, 1995. - С. 143-192.

6.1.2. Общая гигиена. Пропедевтика гигиены /Е.И.Гончарук, Ю.И.Кундиев, В.Г.Бардов и др. - 2-е изд. Перераб. и доп. - К.: Вища шк., 2000. - С. 177-217.

6.1.3. Бардов В.Г. Гигиена климата. - Учебное пособие по общей гигиене. - К, 1990. - 136 с.

6.1.4. Даценко І.І., Габович Р.Д.. Профілактична медицина. Загальна гігієна з основами екології. - 2-ге вид.: К.: Здоров'я, 2004. – С. 124-140.

6.1.5. Загальна гігієна. Посібник для практичних занять. / І.І.Даценко, О.Б.Денисюк, С.Л.Долошицький та ін. /За ред. І.І.Даценко - 2-ге вид. – Львів: „Світ", 2001. – С. 40-48.

6.1.6. Габович Р.Д., Познанский С.С., Шахбазян Г.Х. Гигиена. - К.: Вища школа, 1983. - С.47-57.

6.1.7. Lecture materials.

6.2. Additional:

6.2.1. Никберг И.И., Ревуцкий Е.Л., Сакали Л.И.. Гелиометеотропные реакции человека. - К.: Здоров'я, 1986. - 144 с.

6.2.2. Оранский. И.Е. Природные лечебные факторы и биологические ритмы. - М.: Медицина, 1988. - 288с.

6.2.3. Бокша В.Г. Справочник по климатерапии. - К.: Здоров'я, 1989. – 208 с.

6.2.4. Медведев В.И. Устойчивость физиологических и психологических функций человека при действии экстремальных факторов. – Л.: «Наука», 1982. – 104 с.

NEW REFERENCES

1. Hygiene and ecology: textbook for students of higher medical educational establishments / under the editorship of corresponding member of NAMS of Ukraine, prof. Bardov V.G. – Vinnytsia: Nova Knyha, 2009. – 688 p.

2. Hygiene and ecology / V.A. Korobchanskiy, M.P. Vorontsov, A.A. Musulbas. – Kharkov, 2006. – 207 p.

3. Medicine of emergency situations: textbook for students of higher medical institutions / V.V. Chaplyk, P.V. Oliynyk, S.T. Omelchuk, V.V. Humenyuk. – Vinnytsia: Nova Knyha, 2012. – 344 p.

4. General nutrition: Study guide for the 4th accreditation level Medical School Students / edited by S.T. Omelchuk, O.V. Kuzminska. – Kyiv, 2016. – 146 p.

5. Гигиена и экология: учебник для студентов высших медицинских учебных заведений. – Винница: НОВА КНИГА, 2008ю – 720 с.

7. Equipment required for the lesson

1. Tables: Climate zones of the earth and climate zones of Ukraine.
2. Tables: Medical classification of weather by Grigorev, Fedorov, Ovcharova.
3. Tables: Daily variability of the weather elements.
4. Tables: Hygienic assessment of the weather tropicity to develop hypertension strokes, cardiac infarctions, the strokes.
5. Tables: Hygienic estimation of the weather tropicity to exacerbation of ischemic heart disease, bronchial asthma.