Cours 12

Medical prevention and athlete monitoring

Learning objectives of the course

Upon completion of this course, the student will be able to:

- Describe the components of the annual medical check-up for athletes.
- Identify the main biological markers to monitor (iron, vitamin D, etc.).
- Know the vaccination recommendations specific to athletes.
- Promote healthy lifestyle rules (sleep, nutrition, recovery) among athletes.
- Use simple tools for load monitoring and early detection of overtraining.
- Implement health education actions within their team.

Introduction: medical prevention, a pillar of sustainable performance

An athlete may have a perfectly planned training programme, flawless technique, adapted nutrition... but without regular medical monitoring and a rigorous healthy lifestyle, they remain vulnerable to injuries, infections, overtraining and deficiency pathologies.

Medical prevention is not limited to an annual medical certificate. It is a continuous process that combines:

- Regular check-ups (clinical, biological, cardiological).
- Monitoring of load and recovery.
- Vaccinations adapted to risks (tetanus, hepatitis B, influenza, etc.).
- Health education (sleep, hygiene, addictions).

The coach is the field actor who screens, raises awareness and refers to the physician.

1. Medical check-ups for athletes

1.1 Pre-participation check-up

Mandatory before the first competition or upon return after a long interruption. Content:

- **History**: personal history (cardiac, respiratory, neurological, infectious) and family history (sudden death <50 years, cardiomyopathies).
- **Clinical examination**: cardiopulmonary auscultation, blood pressure, search for signs of Marfan syndrome, osteoarticular examination.
- **ECG** systematic for high-level athletes.
- Fitness clearance (total or partial, with possible contraindications).

1.2 Annual medical check-up (follow-up)

Recommended for all athletes, even amateurs, and mandatory for licensed members in some federations.

Element	Detail
History	Search for warning signs (syncope, chest pain, abnormal dyspnoea, palpitations, excessive fatigue, recurrent infections).
Clinical examination	Weight, BMI, blood pressure, ENT examination, abdominal palpation, musculoskeletal examination (search for imbalances).
Resting ECG	Recommended every 2-3 years for athletes over 35, annually for high-level athletes.
Exercise test	Indicated for athletes >45 years, or earlier in the presence of cardiovascular risk factors.
Biological check-up	See section 2.

1.3 Specific check-ups according to discipline and age

Population	Additional examinations
Endurance athlete (running, cycling, triathlon)	Ferritin, haemoglobin, vitamin D, exercise test to measure VO_2max.
Strength athlete (weightlifting, rugby)	Muscle balance assessment, tendon ultrasound if painful, renal function (creatinine) if high protein intake.
Female athlete	Ferritin, vitamin D, hormonal assessment if amenorrhoea, bone densitometry if suspected RED-S.
Young athlete	Growth X-ray if pain (apophysitis).
Veteran (>50 years)	Exercise ECG, screening for cardiovascular diseases, osteoporosis screening.

1.4 Coach's role in the check-up

- Ensure the athlete has completed their annual check-up (medical certificate).
- Report any new symptoms to the physician between check-ups.
- Participate in multidisciplinary exchanges (interpret results from a functional perspective).

Note: The coach must never substitute for the physician in interpreting a blood test or ECG. They may simply draw attention to an obvious abnormality.

2. Biological monitoring (key indicators)

2.1 Markers to monitor regularly according to context

Marker	When?	Normal value (indicative)	Sign of deficiency / abnormality
Ferritin (iron stores)	Endurance, women, vegetarians	30-150 µg/L (athlete)	<30 µg/L: iron deficiency (fatigue, decreased VO_2max)
Haemoglobin (Hb)	Anaemia screening	Male >13 g/dL; Female >12 g/dL	Below threshold: anaemia (pallor, fatigue, breathlessness)
Vitamin D (25-OH D)	All athletes, especially winter, indoor sports	>30 ng/mL (75 nmol/L)	<20 ng/mL: deficiency (fatigue, stress fracture, decreased strength)
Creatine kinase (CPK)	Suspected muscle injury	<300 U/L (variable)	Elevated: ongoing muscle damage (caution: do not monitor in isolation)
Cortisol / Testosterone (ratio)	Overtraining screening (in specialised centre)	Varies	Low testosterone / high cortisol ratio = overtraining
Electrolytes (Na^+, K^+)	Dehydration, hyponatraemia	Na 135-145 mmol/L	Na <135: hyponatraemia (overhydration)

2.2 Recommended frequency

- **Basic annual check-up**: complete blood count (CBC), ferritin, vitamin D, creatinine.
- **Performance follow-up**: every 6 months in high-level athletes.
- In case of clinical signs (abnormal fatigue, decreased performance, repeated infections): targeted biological assessment.

2.3 What the coach should do based on results

Result	Action
Low ferritin	Refer to physician (iron supplementation). Temporarily reduce training intensity.
Vitamin D deficiency	Supplementation (by physician). Moderate sun exposure.
Low haemoglobin	Medical work-up, find cause. Reduce training volume until correction.
Very high CPK without acute cause	Suspect rhabdomyolysis or muscle injury. Rest, hydration, medical advice.

3. Vaccination of athletes

3.1 Universal vaccines (vaccination schedule)

- DT-Polio (diphtheria, tetanus, polio): booster every 20 years (in some countries, at 25, 45, 65 years) – tetanus is a risk in case of wound on the field (soiled ground).
- Pertussis (whooping cough): recommended for adults in contact with young people.
- MMR (measles, mumps, rubella): two doses in childhood, verify.
- Hepatitis B: mandatory for some professionals, recommended for athletes in group settings.

3.2 Vaccination and performance

- No negative impact of vaccination on performance (unfounded myths).
- **Timing**: prefer vaccination during rest periods or moderate load (avoid the day before a competition).
- **Coach's role**: ensure athletes (especially minors) have an up-to-date vaccination schedule, propose collective vaccination sessions with a physician.

4. Healthy lifestyle and health education

4.1 Sleep – the most powerful recovery factor

Recommendations for athletes:

- **Duration**: 7-9 h per night (some elite athletes need 9-10 h).
- **Regularity**: fixed bedtimes and wake-up times, even at weekends.
- **Environment**: dark, cool (18-20°C), quiet room.
- **Avoid**: screens (smartphone, tablet) 1-2 h before bedtime (blue light), caffeine after 4 pm, heavy late meals.
- **Nap**: 20-30 min in early afternoon, beneficial.

Consequences of sleep deprivation (coach alert):

Decreased strength, speed, accuracy.

Increased injury risk (×1.6 to 2).

Mood alteration, irritability.

Immune weakening.

Monitoring tools: sleep log (bedtime, wake-up time, quality), actimetry (connected watch).

4.2 Stress management and mental health

- Chronic stress (competitive pressure, overwork) promotes injuries, eating disorders, overtraining.
- Management techniques: relaxation, heart rate coherence, sports psychologist.

4.3 Addictions (tobacco, alcohol, cannabis, other substances)

Substance	Effect on performance	Management
Tobacco	↓ lung capacity, ↓ VO_2max, delayed healing	Refer for smoking cessation, ban on training premises
Alcohol (acute use)	Dehydration, hypoglycaemia, coordination problems, impaired judgment	Avoid before/after competition. Chronic use: ↓ testosterone, ↑ fat mass
Cannabis	Concentration problems, ↓ motivation, competition risk (prohibited)	Information on risks, report if problematic use
Other drugs (cocaine, amphetamines)	Doping, cardiac risks	Absolute prohibition, reporting

Coach's educational role:

- Set an example (do not smoke, do not drink in front of athletes).
- Discuss without judgement, refer to a physician or addiction specialist.
- Establish a collective lifestyle charter.

4.4 Health education – topics to address regularly

Topic	Key messages
Hydration	Drink before thirst, water + salt for long efforts. Avoid sugary drinks outside exercise.
Nutrition	Avoid restrictive diets without medical advice. Eat a balanced diet in appropriate quantities.
Injury	Do not "play with pain". Follow medical return-to-play instructions.
General hygiene	Shower after exercise, hand washing, avoid sharing towels/bottles (infection risk).
Sun protection	UV protection (cream, clothing) even during outdoor sports.

Tools: posters in changing rooms, dedicated meetings (15 min), provision of documents.

5. Load monitoring and prevention of overtraining

5.1 Simple tools for the coach

Tool	Frequency	Alert threshold
RPE (session-RPE)	After each session	Persistent discrepancy between perceived RPE and planned intensity
Morning heart rate	Every morning	↑ 5-10 bpm for several days
HRV (heart rate variability) (if watch)	Daily	Significant decrease relative to baseline
Recovery questionnaire (e.g., short REST-Q)	Weekly	Low score in "fatigue" or "stress" domains
Sleep (duration, quality)	Daily	<7 h or disturbed sleep for several nights
Mood (scale 0-10)	Daily	Progressive decrease

5.2 Educating the athlete in self-monitoring

- Keep a training log (feelings, sleep, any physical signs).
- Be able to recognise their own signs of overtraining (morning fatigue, loss of appetite, irritability).
- Alert the coach as soon as several signs appear.

5.3 Planning unloading weeks

- Every 4-6 weeks: reduction of training load (volume −30 to 50%, intensity occasionally maintained).
- Individual adaptation: some athletes need more frequent unloading.

6. Practical organisation for the coach (summary)

Action	Frequency	Detail
Verify medical certificate	Annual	Before return to sport, after long-term injury
Collect load and recovery data	Daily/weekly	RPE, sleep, any signs
Multidisciplinary meeting (physician, physio, coach)	Monthly or quarterly	Share information
Health education sessions	1-2 per season	Sleep, hydration, addictions, etc.
Biological check-up (with physician)	Annual or as needed	Ferritin, vitamin D, CBC
Vaccination (schedule)	Update as needed	Tetanus, influenza, hepatitis B

Key points to remember

- ✓ **Annual medical check-up**: mandatory. The coach ensures it has taken place.
- ✓ **Biological monitoring**: ferritin, vitamin D, haemoglobin are the most useful markers for prevention.
- ✓ **Healthy lifestyle**: sleep (7-9 h), no addictions (tobacco, alcohol, cannabis), continuous health education.
- ✓ **Load monitoring**: RPE, morning heart rate, recovery questionnaire. Alert on signs of overtraining.
- ✓ **Educational role**: the coach is a role model and educator. They must promote healthy behaviours.