

Injuries and ilnesses prevention for the french national elite swimmers

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INTRODUCTION

Prevention in elite sport is today a real challenge.

Durations of training increased, many pressure of performance concern the athletes.

News injuries appear, that we never saw few years ago (hip prosthesis before 30 years old !).

What happens to ex-athletes when their career stopped ?

The health of our athletes is now an important aim, for today and tomorrow.



IOC WORLD CONFERENCE **PREVENTION OF INJURY & ILLNESS IN SPORT**



MONACO 16-18 MARCH 2017 **Final Programme**













INTRODUCTION

Original article



Injury and illness in aquatic sport: how high is the risk? A comparison of results from three FINA World Championships

Annika Prien,¹ Margo Mountjoy,^{2,3,4} Jim Miller,^{3,5} Kevin Boyd,³ Cees van den Hoogenband,³ David Gerrard,³ Mohamed Yahia Cherif,³ Yifan Lu,³ Kyriakos Nanousis,³ Edgar Ivan Ortiz Liscano,³ Farhad Moradi Shahpar,³ Astrid Junge^{1,6,7}

Injury risk in the FINA World Championships 2015 was significantly higher than in 2013 and 2009.

Of all athletes with complaints in the 4 weeks prior to the championships, 30% did not modify their training regime, 70% had overuse injuries, and 80% used at least one medication in this period.

The majority of athletes were interested in health education.







- \checkmark General presentation of INSEP
- ✓ The Medical Department
- ✓ The French Swimming Federation (FFN)
- \checkmark Swimming and Open Water National teams
- Swimming : what are the risks ? What we do?
- ✓ The Olympic Games in 2024









INSEP presentation

Created in 1945, INSEP is in charge of providing optimal sport training conditions and education tools to the elite French athletes and coaches





INSEP sport facilities













INSEP key figures



















	Total medals France	Total medals INSEP	
1988	16	8	50%
1992	29	17	58%
1996	37	19	51%
2000	38	21	55%
2004	33	19	57%
2008	41	21	51%
2012	34	19	56%
2016	42	21	50%

























INSEP key figures



Performance Optimisation Mission

Evaluation, coordination in link with the Olympic and paralympic federations

Great INSEP mission

Contributions to an organisation and labelisation of the different high level French centers (14 centers in 2017)





Terre de Champions



Medical unit





The medical service answers all emergencies concerning INSEP (athletes, coaches, personals, visitors). No appointment is necessary (from Monday to Friday from 8 AM to 8.30 PM, Saturday and national holydays from 9 AM to 1 PM). A permanent telephone is available Sunday and during the night.

The medical follow-up for training consists of setting up check-ups, examinations and fonctionnal tests for high level sportmen and women. These exams are legislated once a year.

The physiotherapy unit where prevention acts, health care, and recovery acts are realized

The health and dental center where the athlets are treated in different specialities











Medical Unit

ACTIVITES	
	ANNEE
	2016
Permanence médicale	8250
Actes infirmiers	584
Suivi de l'entraînement	
Bilans cliniques	1358
Biologie	1081
Epreuves énergétiques	545
Epreuves isocinétiques	1061
Cryothérapie Corps Entier	5049
Podologie	412
suivi psychologique	1992
Entretiens diététiques	507
Centre de Santé	
Consultations spécialisées Vacataires	3052
Consultations Médecins contractuels	11497
Pressions intra Musculaire (PIM)	12
Tests Hypoxie	41
Imagerie (radio. Echo, IRM)	6829
Kinésithérapie	18675
Activité dentaire	1198
Récupération (hydrojet, balnéo)	2253
TOTAL DES ACTES	64396

Statistics for the 2016 Year





Presentation video of INSEP





French Swimming Federation

FFN includes the 5 disciplines of FINA :

- Swimming
- Open water
- Synchronized swimming
- Diving
- Waterpolo



In Olympic Games Rio 2016, all the disciplines were present.

More 300 000 persons have sport license in 2017.

In World Championships of Budapest 2017, France wins 9 medals (6 Gold, 1 Silver, and 2 bronze) : 2 in swimming, 1 in diving, and 6 in Open water.



Open Water Team

In the last International championships :

- European Championships Berlin 2014 : Gold medal in 25 kms Men
- World Championship Kazan 2015 : Gold medal in 10 kms Women
- European Championships Horn 2016 : Gold medal in 25 kms Men Gold medal in 10 kms Women
- Olympic Games Rio 2016 (only 10kms) :
 Bronze medal in Men
- World Championship Budapest 2017 : 6 medals !!







Swimming Team





Swimming Team



4 men and 5 women was in the team for the last World Championships Budapest 2017.

We win 2 medals :

- 1 Bronze medal with Mehdy METELLA (100m Freestyle)
- 1 Gold medal with Camille LACOURT (50m backstroke) The swimmers are training in differents swimming club during the year : Marseille, Nice, Amiens, Clermont,...

Some of them stopped their career recently (Yannick AGNEL, Florent MANAUDOU, Fabien GILOT, and now Camille LACOURT), and it's a new challenge for the team, with new young swimmers, and new technical management.

Before the international championships, or the Olympic Games, the terminal training period is usually in INSEP.













Technical aspect

4 strokes

- Freestyle
- Breaststroke
- Butterfly
- Backstroke

For each one, 5 phases :

- Input
- Carry
- Pull
- Push
- Recovery



Stresses on the joints are related to specificities of different techniques



- The leading cause of injury of swimmer
- Joint often injured, and more specifically with freestyle, backstroke, and butterfly
- Overuse injuries, by a repetition of movements in a maximum range of motion





Elite swimmer swims

- 8 to 15 kms per day
- 5 to 7 days per week



That is to say 10 000 to 17 000 strokes per week.....1 million strokes per arm per year !⁽¹⁾

40 to 80% of elite swimmers had affected by shoulder pain

(1) Matzkin E, Suslavich K, Wes D : Swimmer's shoulder : painful shoulder in the competitive swimmer. J Am Acad Orthop Surg 2016 Aug24(8):527-36



Many factors may be involved :

- Hyperlaxity
- Scapular dyskinesis
- Subacromial impingment
- Acromial bone spur
- Labral damage
- Subscapular nerve entrapment
- Glenohumeral rotational imbalances

An understanding of the mechanics of the swim stroke is essential to the comprehension and identification of the painful swimmer's shoulder





What about prevention ?

- Correction of technical defects Hand entry in water Crossing arm in propulsion Breathing
- Alternate the different stroke during training session
- Be watchful with swim paddles



• Strengthening exercises, especially scapular muscle endurance, and external rotator strength

Horizontal row with elastic band, push-up with variations,...

Low loading and small ROM, but many repetitions of movements.

 Stretching, : it's an integral part of elite swimmer training Anterior and posterior capsule, pectoralis minor, upper trapezius





Knee



- "Breaststroker's knee", results from the breaststroke kick (valgus load).
 34% of Olympic swimmers reported knee pain⁽¹⁾
- Breaststroke typically causes medial and anterior knee pain
- Many etiologies can be found : recurrent medial collateral ligament sprain, patellofemoral syndrome, patellar tendinopathy
- Many factors were involved : patellar instability / subluxation, hip abduction, ankle external rotation
- Be careful to excessive breaststroke kick training volume and intensity. Alternate with other strokes which less stress on the knee.
- Prevention and treatment require to establish an accurate diagnosis, and to identify contributing factors.

(1) Nichols AW. Medical care of the aquatics athletes. Curr Sports Med Rep 2015 Sep-Oct;14(5):389-96



Spine



Lumbar spine pain is common in swimmers, specially with butterfly and breaststroke.

Undalating, hyperextension, flip turn, and also the physical training, like squat exercises, can be responsible of an excessive posterior spine loads. And it may lead to spondylolisis, and spondylolisthesis.

So, a program of trunk strenghtening and stretching of lower limbs may be implemented to prevent this injuries. It's often done because it's also a performance factor. (*Example in video*)



Groin Pain

It's again often a breaststroker's injury, or individual medley swimmer.

Hip adductor injury, or abdominal muscle overwork can be found.

Most cases improve with correction of breaststroke kick technique errors, and implementation of strenghtening and stretching program.

2 cases in french open water team has been described, caused by a femoro-acetabular impigement. For one of them, arthroscopy has been necessary to treat labrum tear.







ENT diseases

- Otitis externa commonly affects all the aquatic athletes.

At the FINA World Championships 2015, otitis represents 13,7% of total of illnesses ⁽¹⁾.

Frequent cleaning of the ear canal furthers the risk. Use cotton must be avoided. Application of an oil product (like sweet almond oil) can be prescribed before to swim.

It's necessary to remind to dry meticulously the ear canal after the training.

- Chronic rhinitis is also common, furthered by chlorine byproducts. In prevention, use of nose clip, rinse of nasal cavities, and sometimes corticoids nasal spray can be necessary.

⁽¹⁾ Prien A, Mountjoy M, Miller J, Boyd K, Van den Hoogenband C, Gerrard D, Cherri MY, Lu Y, Nanousis K, Ortiz Liscano EI, Shahpar FM, Junge A. : Injury and illness in aquatic sport : how high is the risk A comparison of results from three FINA World Championships.Br J Sports Med 2017 Feb;51(4):277-282



Exercise-Induced Bronchoconstriction

Exercise-Induced bronchoconstriction (EIB) is a temporary narrowing of the respiratory airways, during or after exercise. This one is involved for the persons who have asthma, or recent upper respiratory infection.

In comparison of all other olympic sports, swimming, synchronized swimming, and open water are in the top 5 sports for asthma /EIB ⁽¹⁾.

The combined effects of repeated chlorine by-products exposure and chronic endurance training can lead to airway dysfunction.

(1) Mountjoy M, Fitch K, Boulet LP, Bougault V, Van Mechelen W, Verhagen E : Prevalence and characteristics of asthma in the aquatic disciplines. J Allergy Clin Immunol 2015 Sep;136(3)588--594



Exercise-Induced Bronchoconstriction

But what is the prevention ?

- Change the methods of swimming pool desinfection (without chlorine)
- Swim in outdoor swimming pool !! or ventilate wherever it's possible...
- Do a desensitization to other possible allergies
- But use of inhaled corticosteroids and bronchodilatator is unfortunately often necessary





Swimming and infections



The consultations for ENT diseases are higher (double) in the swimmers population than in general population.



Swimming and infections



Repartition of ENT consultations between the different disciplines of FFN Average age : 19,7 y.o. \pm 3,3 years ⁽¹⁾

Frequency of consultations for ENT and pneumological ilnesses was twice as aquatic athletes as other athletes. (ENT 24,4% vs 12,73% - Pulmonology 4,09% vs 1,98%)



Swimming and infections



Reasons of ENT consultations in swimmers population







Number of consultations by sport for french teams during Rio 2016 (« Swimming » included waterpolo (M&W), Synchronised swimming; diving, and swimming)



Finally, prevention is easy.....





To prevent against infection diseases :

- Reduce the risk of transmission disease
- Have a sleep of quality
- Have a quality feeding (carbohydrate, polyphenols, flavonoids)
- Be vaccinated
- Sometimes, take supplementations when it's necessary



Letter sent to the elite french swimmers before winter

Le mot des Doc



Evitons d'être malade...

Dr Sébastien LE GARREC Dr Stéphane LEFEBVRE FFN

L'hiver est une saison propice aux infections. L'activité physique intensive et prolongée altère l'immunité, et augmente donc ce risque infectieux. Si ces infections sont le plus souvent bénignes, elles peuvent néanmoins compromettre des périodes d'entraînement, plus ou moins courtes, ce qui peut être préjudiciable et pire, compromettre une compétition.

Voici donc quelques conseils utiles qu'il est bon de rappeler.

1. Eviter la contamination

La première mesure préventive utile est le lavage des mains. Pensez à vous les laver avant chaque repas, et évidemment après le passage aux toliettes. Qui dit lavage dit savon. Le rinçage sous l'eau est bien, mais le savonnage est mieux.



Ayez également avec vous une solution hydro-alcoolique lorsque le lavage n'est pas possible. Cela peut aussi être utilisé immédiatement au sortir de l'eau pour les mains, avant même de prendre votre douche. Vous pouvez aussi améliorer l'élimination des agents pathogènes

IIII

(microbes) et irritants présents dans les voies aériennes supérieures en procédant à des lavages nasopharyngès réguliers décongestionnant (sérum physiologique).

2. Respecter les temps de sommeil et de récupération



Notre système immunitaire (globules blancs, anticorps) assure notre défense contre les virus, bactéries, et autres parasites. Ses performances sont moindres lorsque nous sommes fatigués, et le risque d'être malade est donc accru. Ne négligez pas le repos, et soyez attentifs à avoir un sommeil suffisant en quantité et qualité, qui soit - réparateur -, Attention aux écrans (qui sont d'ailleurs à proscrire pendent les massages en kinésithérapie).

Si cela vous est possible, n'hésitez pas à faire la sieste.

3. Avoir une alimentation adaptée à cette période

Ce même système immunitaire répond à des besoins nutritionnels indispensables. En voici les 2 grands principes :

a. Hydrates de carbone (glucides) : en maintenant la glycèmie pendant l'exercice, le stress métabolique lié à l'effort est diminuée, contrant ainsi les changements immunitaires négatifs après l'exercice. Une boisson de l'effort est vivement recommandée pendant l'entraînement à cette période, en complément de l'eau habituelle. C'est une mesure alimentaire prioritaire.





b. Fruits et légumes : Ils sont extrêmement importants, car riches en polyphénois et flavonoides. Ces éléments réduisent l'inflammation induite par l'exercice, et diminue le stress oxydatif. D'autres contiennent également de la quercétine (la pastéque en tête), qui diminue également l'inflammation, et peuvent aussi augmenter la biogénèse mitochondriale et la performance en endurance. C'est le cas par exemple des oignons rouges, des câpres, des pommes rouges (surtout la peau), des piments, ou encore du thé vert. (A noter que le chocolat en contient également, à consommer cependant avec modération car riche en graisses).

Crudités ou cuidités, fruits crus ou cuits, compotes, jus... tout est bon. Favorisez les produits de saison, et privilégiez les produits frais aux produits préparés ou pré-cuisinés.

Varier les couleurs est un moyen simple de diversifier au maximum les apports (fruits rouges, légumes verts, agrumes, légumes blancs, bananes,). Pensez à en prendre à chacun des repas.

4. La vaccination anti-grippale

C'est la meilleure mesure de prévention de l'infection grippale. Pour limiter le risque, il est donc recommandé de la faire.



5. Et les vitamines et compléments alimentaires ?

Voltà un sujet qui divise, y compris les médecins. Ils sont nombreux et variés. Selon l'excellent ouvrage - Nutrition et Performance en Sport - la science au bout de la fourchette - de Christophe HAUSSWIRTH, du service Recherche de l'INSEP, on peut retenir que seuis les probiotiques et le beta-glucane retiennent un éventuel intérêt. On peut conseiller par exemple la prise de Bion 3, à raison de 1 comprimé par jour. Si vous partez à l'étranger, la prise peut débuter 1 semaine avant, et se poursuivre durant tout le séjour, ce qui ne remet absolument pas en cause l'importance capitale du bon équilibre alimentaire qui est irremplaçable et non substituable.

La consommation tabagique ou alcoolique est un facteur immunosuppressif, augmentant le risque et la gravité potentiels d'infections. Soyez vigilants même en période festive car votre préparation ne s'arrête jamais.

En conclusion, ce qu'il faut retenir :

- Je me lave régulièrement les mains, et j'utilise si besoin le gel hydro-alcoolique qui est dans mon sac.
- Je ne me couche pas trop tard, et guand je peux, je fais une sieste. Attention aux écrans l
- J'ai toujours une boisson de l'effort à l'entrainement, ou à défaut un jus de fruit, une barre énergétique.
- Fruits et légumes sont présents à chacun de mes repas. Je mange des produits de saison, et je diversifie autant que possible.
- Il est recommandé que je me fasse vacciner contre la grippe chaque année.
- La prise de probiotiques, type BION 3, peut éventuellement être une aide complémentaire.

Au plaisir de vous retrouver tous en pleine forme. Sébastien et Stéphane



Recovery protocol for the athlets







Whole body cryotherapy -110°: 3 min

Water bed :15 min

Contrast bath 15min (6 x 1min C&H)



The cryotherapy center of INSEP

- Established at the beginning 2009
- Initially intended only for Elite athletes
- Beginning 2009 May, it was open for the patients with pathologies
- More than 30 000 sessions over 8 years
- The Whole body cryotherapy is integrated in the medical service
- The sessions are supervised by medical professionnals
- A medical check is done before the first session







Med Sci Sports Exerc. 2015 Jul;47(7):1416-25. doi: 10.1249/MSS.000000000000546.

Whole-Body Cryostimulation Limits Overreaching in Elite Synchronized Swimmers.

Schaal K1, LE Meur Y, Louis J, Filliard JR, Hellard P, Casazza G, Hausswirth C.

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When WBC is done at the end of the training :

- improve the quality of sleep during the night

- decrease the body temperature and facilitate the failing asleep.



- Injuries and ilnesses in swimming are various, related to technical aspect, repetitions of movements, and aquatic environment.
- Prevention is based on good physical training, technical adaptations, and recovery protocols.
- Rhythm of life, and life style, are also essential for a good health.





Olympic games in 2024





Olympic games in 2024

We hope, we want the Olympic Games in 2024





Thank you for your attention





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