

# Contamination of Dietary Supplements in Sports

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# Contamination of Dietary Supplements in Sports

- The opinions:
  - of a Sports Physician and Exercise Physiologist,
  - of a (former) NADO member,
  - of an IF Medical and Antidoping Commission member

# Why is it so important ?

- Public Health Issue (General and Sports population):
  - Ephedrine (USA cases)
  - Liqiang 4 (Glyburide; FDA warning July 2005)
  - .....
- Sports Rules:
  - National Antidoping Agency (NADO)'s rules
  - World Antidoping Agency (WADA)

# Why is it so important ?

- WADA code:
  - Principle of strict liability:

*The athlete being responsible for whatever is in his or her body irrespective to how it got there.*

# High level athlete

In competition – Out of competition urine tests



Adverse analytical finding



Hearing



Sanction (warning to life ban) +/- national laws

# Why to worry ?

*Int. J. Sports Med. 2004; 25: 124 - 129*

Analysis of Non-Hormonal Nutritional  
Supplements for Anabolic-Androgenic Steroids –  
Results of an International Study

H. Geyer  
M. K. Parr  
U. Mareck  
U. Reinhart  
Y. Schrader  
W. Schänzer

Oct 2000 – Nov 2001:

- 634 non hormonal nutritional supplements
- 13 different countries
- 91.2%: stores, 8.2%: internet, 0.6%: telephone
- 46% of pro-hormone selling companies
- 54% of non prohormone selling companies
- Capsules, tablet, powder, fluids
- [C] > 0.01 µg/g

Table 1 Origin of the nutritional supplements (according to the label)

<i>Country</i>	<i>No. of companies</i>	<i>No. of samples</i>
<i>USA</i>	105	408
<i>Germany</i>	31	59
<i>UK</i>	5	37
<i>Netherlands</i>	12	27
<i>Italy</i>	15	22
<i>France</i>	13	19
<i>Switzerland</i>	6	14
<i>Norway</i>	7	12
<i>Belgium</i>	8	10
<i>Spain</i>	5	7
<i>Denmark</i>	4	6
<i>Sweden</i>	1	6
<i>Austria</i>	1	5
<i>Finland</i>	1	1
<i>Portugal</i>	1	1
<i>total</i>	215	634

Table 2 Main ingredients declared on the labels of positive samples

<i>amino acids/(hydrolysed) proteins</i>	<i>lysophosphatidylcholin</i>
<i>minerals</i>	<i>methylsulfonylmethane</i>
<i>herbal extracts</i>	<i>enzymes</i>
<i>vitamins</i>	<i>(N-acetyl) glucosamine (sulfate)</i>
<i>caritin/acetyl-L-carnitine</i>	<i>chrysin</i>
<i>creatine</i>	<i>melatonin</i>
<i>HMB</i>	<i>hemoglobin</i>
<i>pyruvate</i>	<i>inosine</i>
<i>ribose</i>	<i>NAC</i>
<i>fatty acids/oils</i>	<i>inositol</i>
<i>caffeine</i>	<i>lecithin</i>
<i>chondroitin (sulfate)</i>	<i>choline</i>

# Results

**14.8% of T and Nandrolone prohormones not declared on the label**

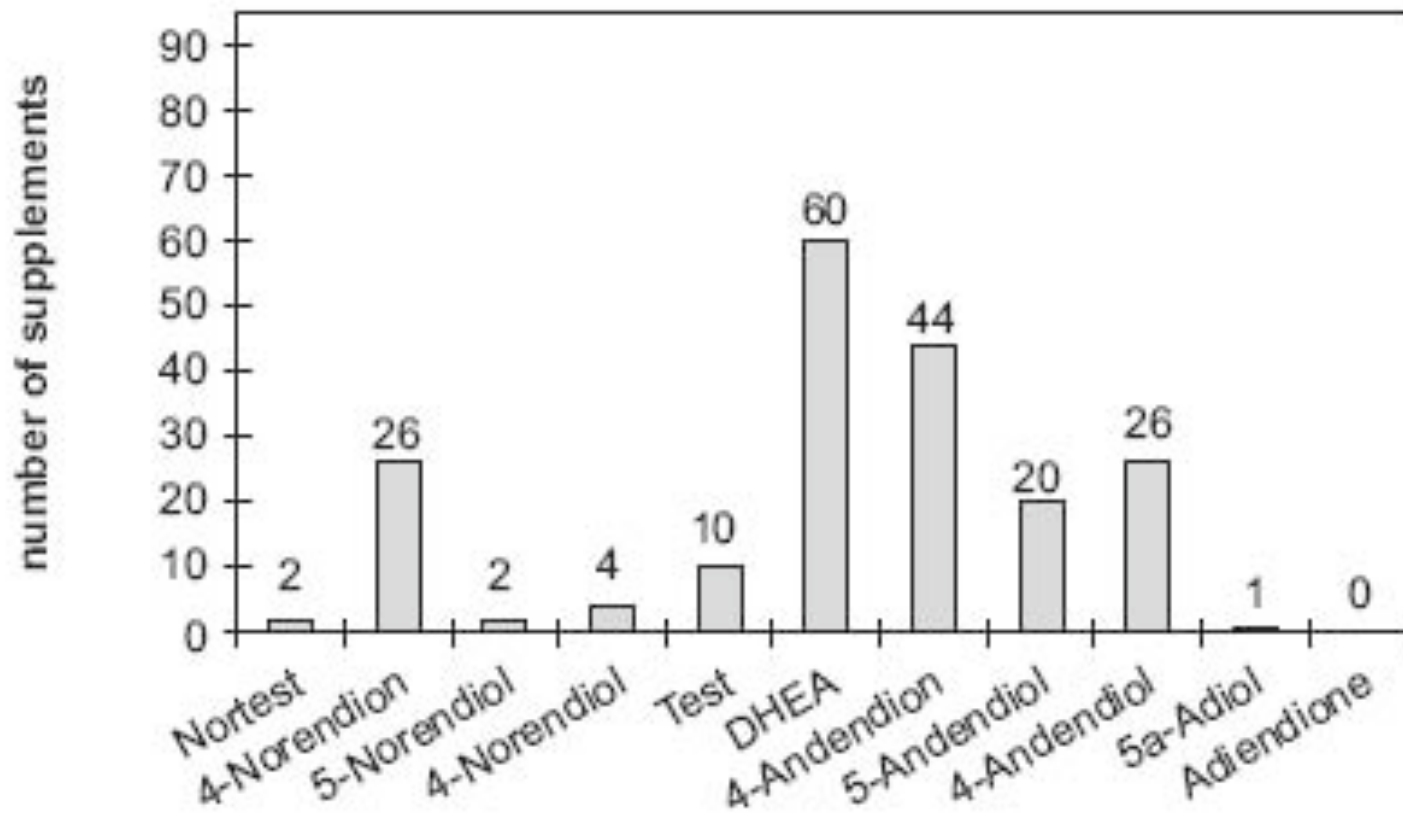


Fig. 5 Number of positive supplements containing specific prohormones.

# Results

Table 3 Nutritional supplements containing prohormones, in relation to the total number of supplements purchased in different countries

<i>Country</i>	<i>No. of products</i>	<i>No. of positives</i>	<i>Percentage of positives</i>
<i>Netherlands</i>	31	8	25.8%
<i>Austria</i>	22	5	22.7%
<i>UK</i>	37	7	18.9%
<i>USA</i>	240	45	18.8%
<i>Italy</i>	35	5	14.3%
<i>Spain</i>	29	4	13.8%
<i>Germany</i>	129	15	11.6%
<i>Belgium</i>	30	2	6.7%
<i>France</i>	30	2	6.7%
<i>Norway</i>	30	1	3.3%
<i>Switzerland</i>	13	–	–
<i>Sweden</i>	6	–	–
<i>Hungary</i>	2	–	–
<i>total</i>	634	94	14.8%

# Results

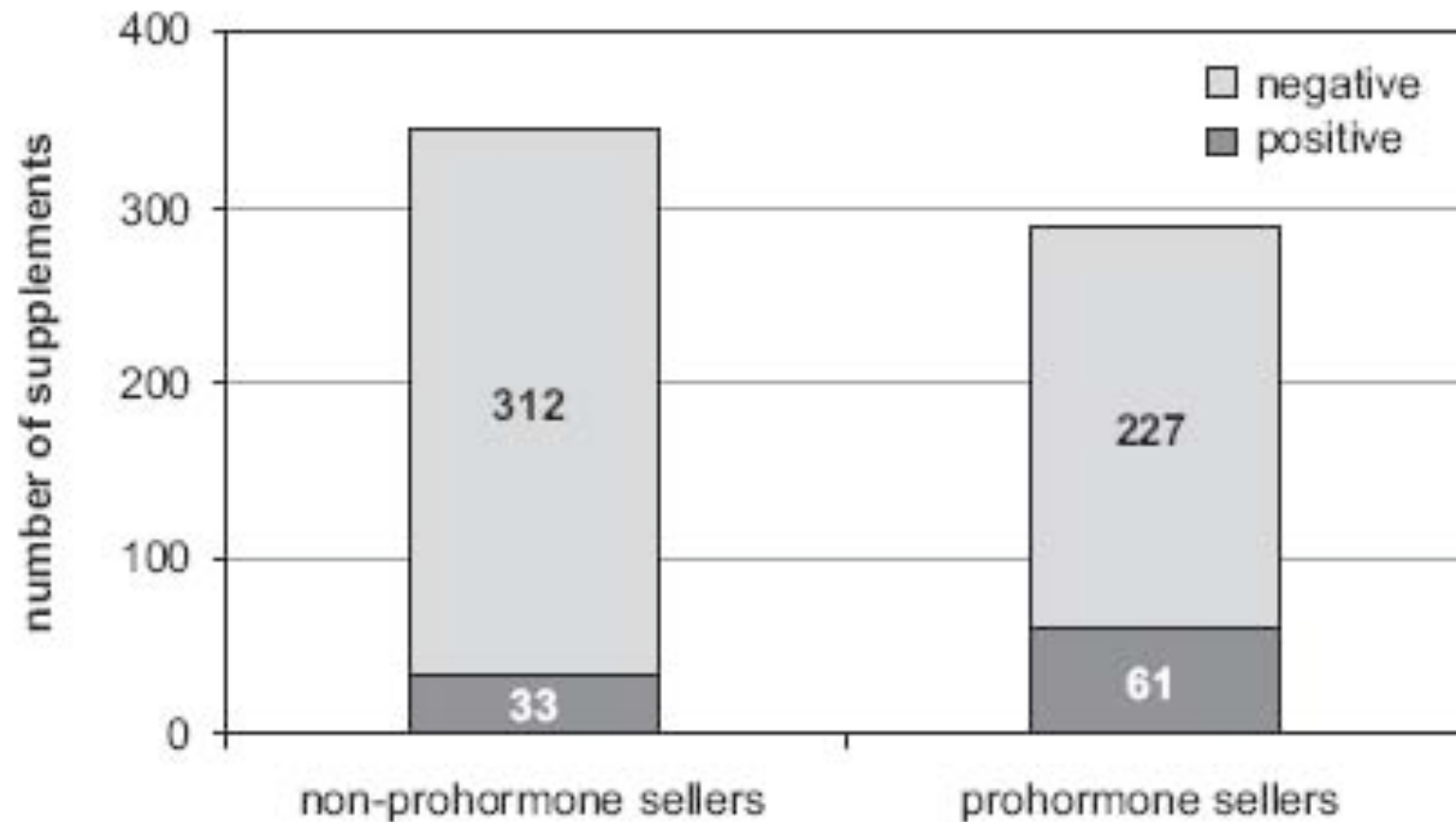


Fig. 7 Number of positive supplements among products from prohormone and non-prohormone sellers.

# Results

10  $\mu\text{g}$  of prohormones produces adverse analytical finding

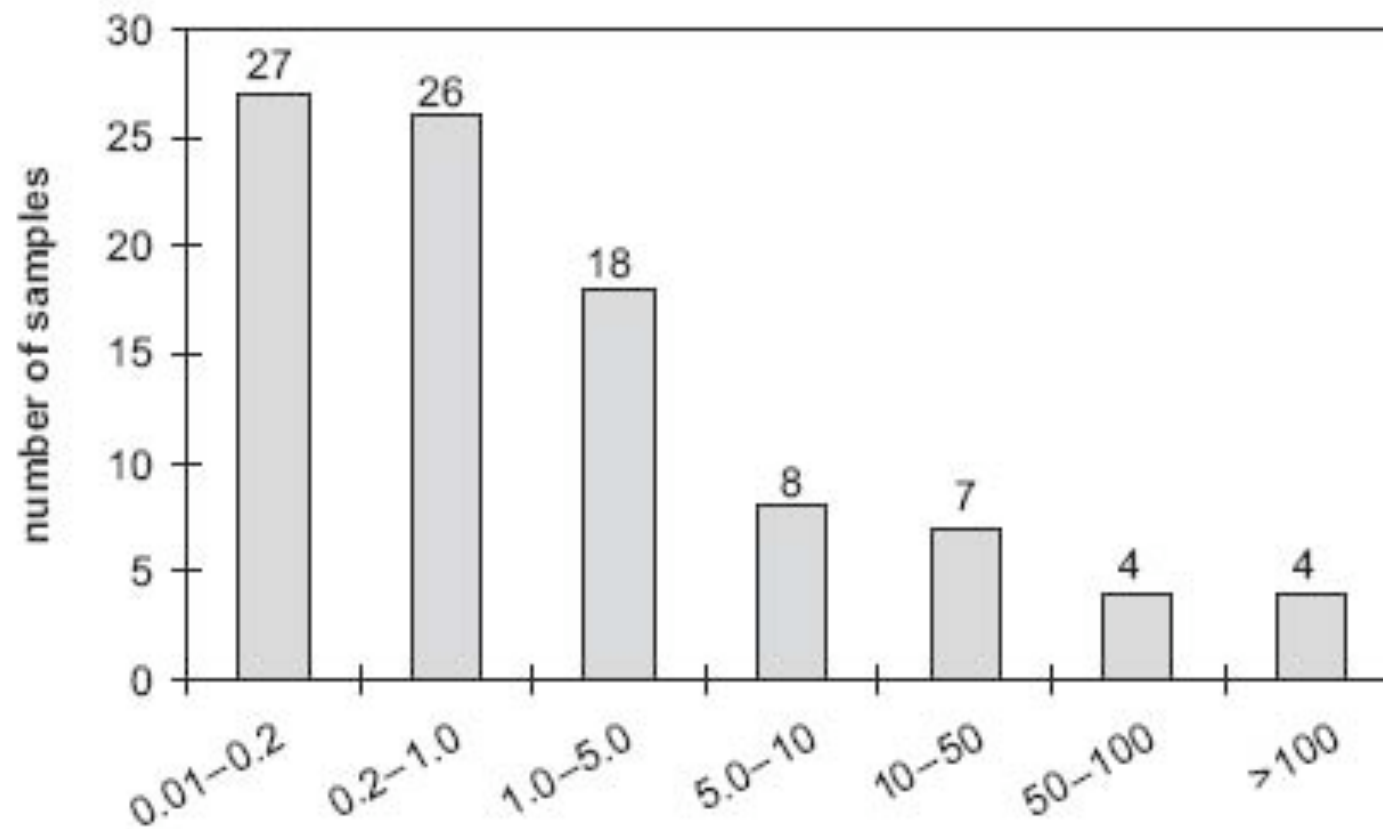
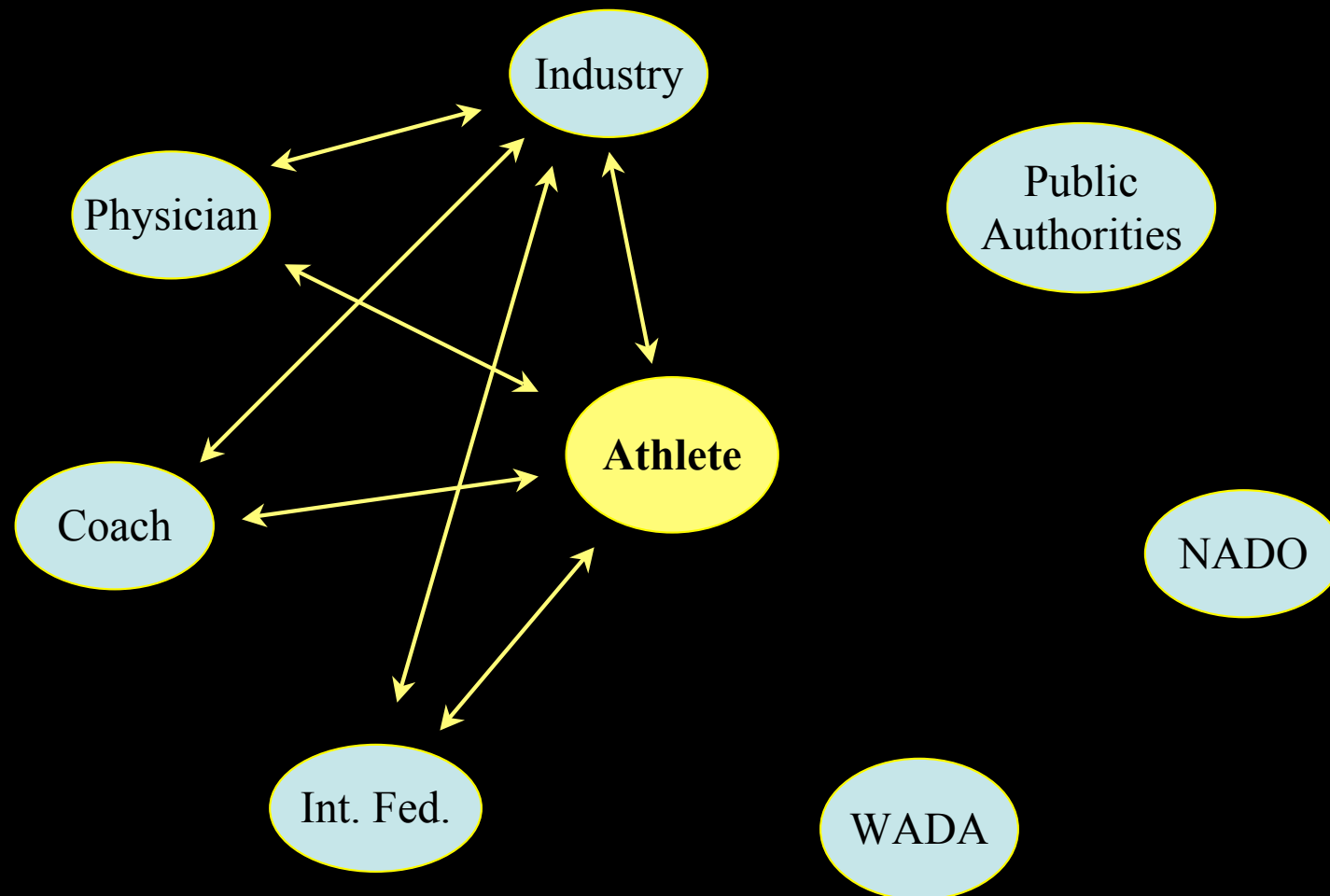


Fig.1 Distribution of the total prohormone concentrations ( $\mu\text{g/g}$ ) in positive samples (n = 94).

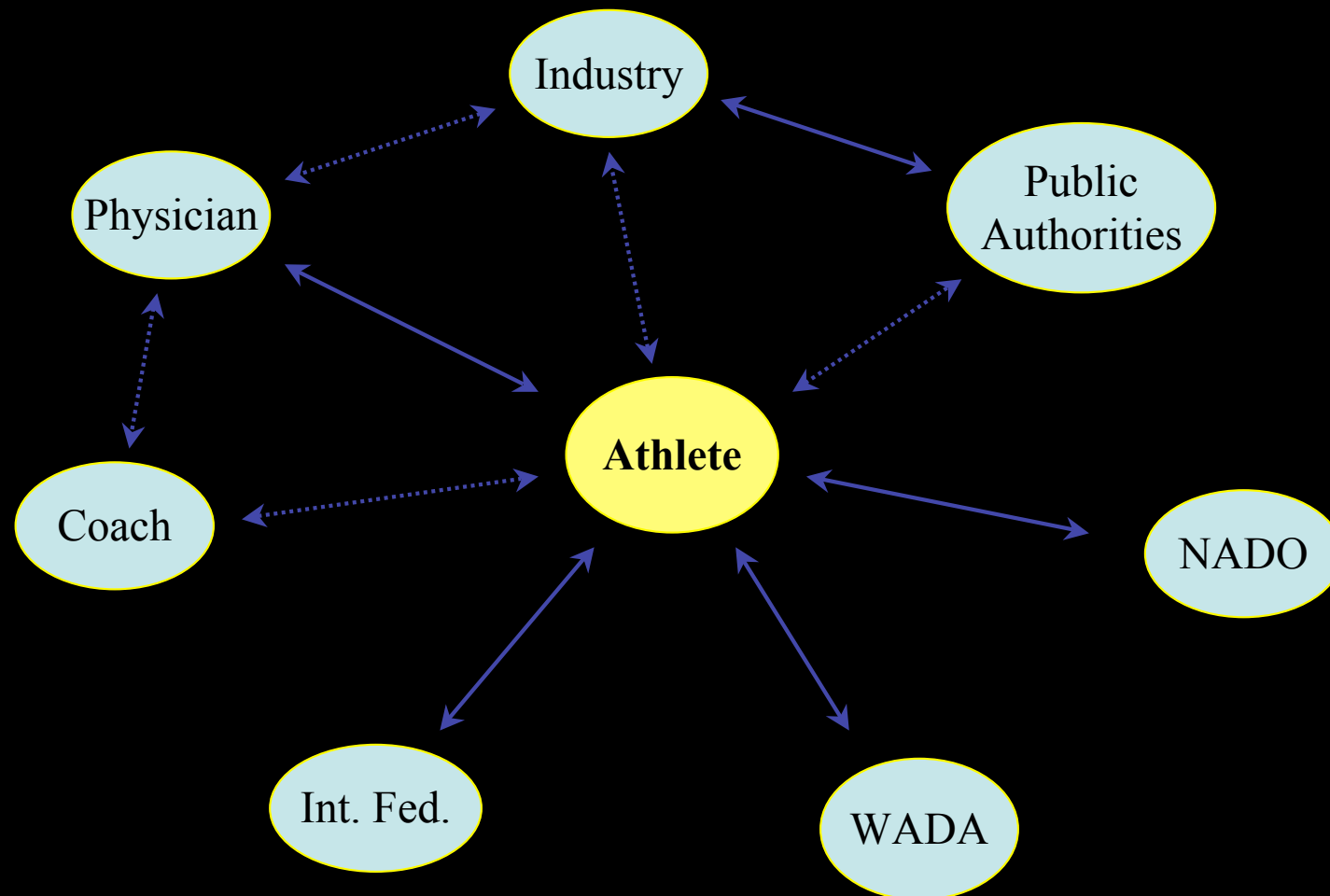
# An athlete-centered view of the problem

## Supplying nutritional supplements



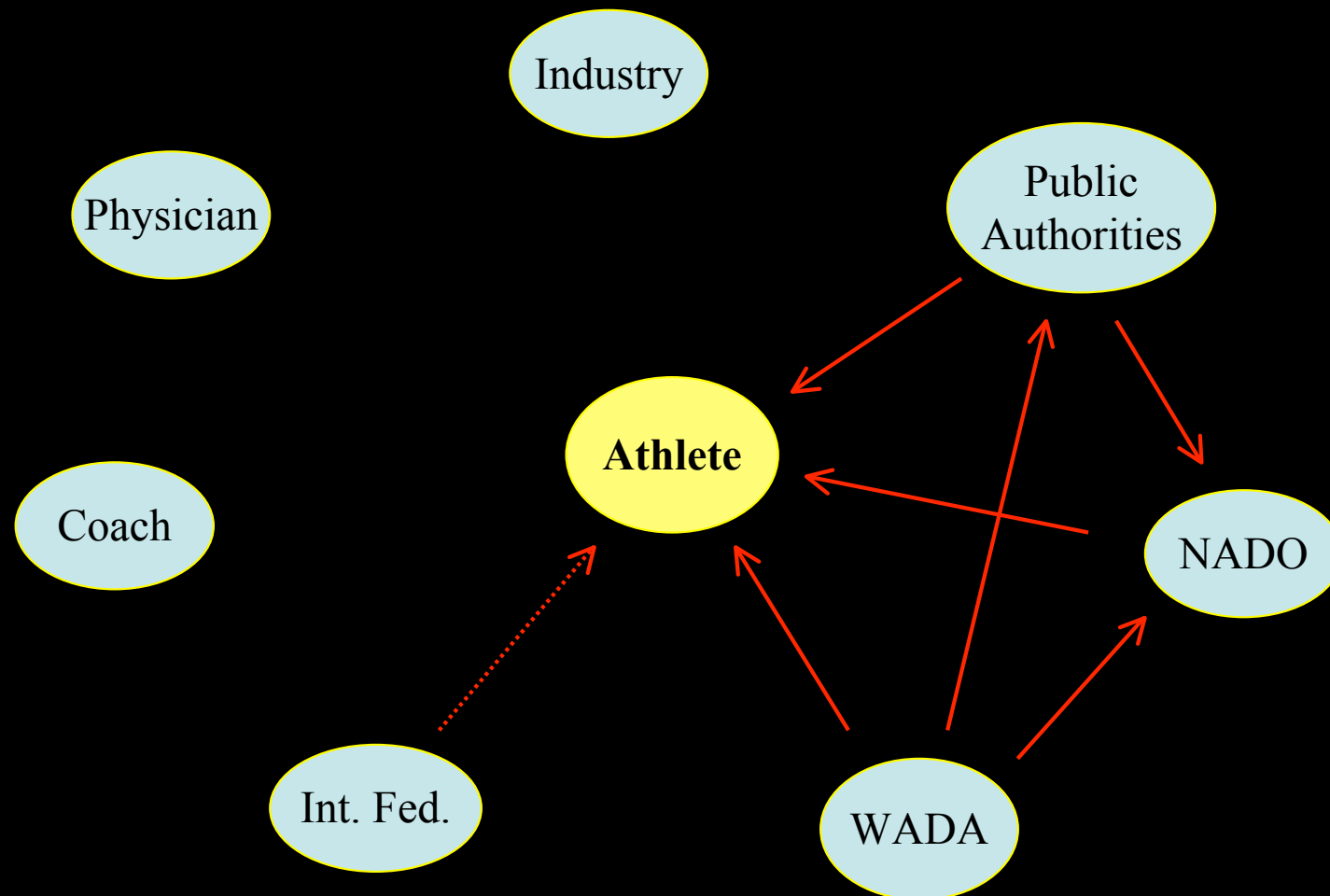
# An athlete-centered view of the problem

## Relevant Information / nutritional supplements



# An athlete-centered view of the problem

## Regulation



# Nutritional Supplements in Sports:

## the athlete perspective

- Commonly cited reasons for supplement use:
  - Compensation for an inadequate diet,
  - As an "insurance policy" against potential deficiencies
  - To meet abnormal demands of hard training or frequent competition

# One Athlete's day

JUNE 11<sup>TH</sup>

10.10am 3g L-lysine with 30mg Vit B6  
4 phosphate tablets  
2 scoops protein powder  
3 teaspoon acetylglutamine  
3g Vit C  
3 tablets detox  
50 mg zinc

Drank isotonic drink whilst training

1.45pm 3g L-lysine with 30mg Vit B6  
3g Vit C  
3 tablets detox  
50 mg zinc

11.00pm 3g L-lysine with 30mg Vit B6  
3g Vit C  
3 tablets detox  
1 scoop protein powder  
3 teaspoon acetylglutamine

Most athletes exceed the recommended doses of supplements.

This may be because:

"If one scoop is good, two scoops must be twice as good."

Opponents are using more than the recommended dose.

# Nutritional Supplements in Sports:

## the Athlete's perspective

- Commonly cited reasons for supplement use:
  - Compensation for an inadequate diet,
  - As an "insurance policy" against potential deficiencies
  - To meet abnormal demands of hard training or frequent competition
  - To produce a specific benefit on performance
  - To keep up with team mates and opponents



# The way to Victory



## Athènes 2004, Cycling, Kilometre Men

Rank	Name	NOC	Time 750-1000	Speed km/h
1	<a href="#">HOY Chris</a>	<a href="#">GBR</a> 	<b>1:00.711</b>	59.297 GOLD
2	<a href="#">TOURNANT Arnaud</a>	<a href="#">FRA</a> 	<b>1:00.896</b> <b>0.185 (0,3%)</b>	59.117
3	<a href="#">NIMKE Stefan</a>	<a href="#">GER</a> 	<b>1:01.186</b>	58.836

## Athènes 2004, Coxless four, 2000 m Men's Final

Rank	NOC	Name	2000m	
1	<a href="#">GBR</a> 	(b) <a href="#">WILLIAMS Steve</a> (2) <a href="#">CRACKNELL James</a> (3) <a href="#">COODE Ed</a> (s) <a href="#">PINSENT Matthew</a>	<b>6:06.98</b>	<b>(1)</b>
2	<a href="#">CAN</a> 	(b) <a href="#">BAERG Cameron</a> (2) <a href="#">HERSCHMILLER Thomas</a> (3) <a href="#">WETZEL Jake</a> (s) <a href="#">WILLIAMS Barney</a>	<b>6:07.06</b> <b>0.08</b> <b>(0,02%)</b>	<b>(2)</b>

# Nutritional Supplements in Sports:

## the athlete perspective

- **Commonly cited reasons for supplement use:**
  - Compensation for an inadequate diet,
  - As an "insurance policy" against potential deficiencies
  - To meet abnormal demands of hard training or frequent competition
  - To produce a specific benefit on performance
  - To keep up with team mates and opponents
  - Recommended by coaches, parent or other influential individual
  - To provide a practical alternative to everyday foods and drinks

# The power of advertising

- Supplement sellers often have large budgets and can use effective advertising.
- Athletes generally do not discriminate between scientific evidence and advertising hype
- This advertising works: if it did not, sellers would not spend money on it.



**"I Lost 27 pounds with Hydroxycut!"\***

*"Before Hydroxycut, I'd tried just about every so-called fat burner known to man - with little or no success. None of them helped me get the results I was looking for. After hearing so much about Hydroxycut, I decided to give it a try. With the help of Hydroxycut in my fat-loss plan, I lost an incredible 27 pounds and trimmed 9 1/2 inches off my waist! Now I have the abs I've always wanted and feel more energetic than ever. My advice to you is simple: don't waste any more time. Use Hydroxycut and get into the best shape of your life - now!"\**

— Chris Musberg, California

**BEFORE AFTER**

**"I Lost 27 lbs!"**

*"I was shocked at how fast Hydroxycut worked. In just 8 weeks, I lost 27 pounds and 9 1/2 inches off my waist!"*

— Chris Musberg

Chris' results not typical\*

**BEFORE AFTER**

*"I lost so much fat from my waist! Hydroxycut helped me get the six-pack I've always wanted."*

Professional athletes, television stars, fashion models, and millions of men and women across America trust the most recognized name in weight loss - Hydroxycut - to help them lose weight. Chris achieved the body he always wanted and increased his energy level by adding the clinically proven Hydroxycut formula to his fat-loss plan. You can too. Try Hydroxycut for yourself today. You've got nothing but pounds and inches to lose!\*

**Advanced Weight Loss Formula**  
**MUSCLETECH**  
**LOSE FAT FAST!**  
Clinically Proven  
Increase Energy  
100% Natural  
140 Capsules

[www.hydroxycut.com](http://www.hydroxycut.com)

**Available at:** GNC Live Well, Walgreens, Target, Amazon.com

\*Results Not Typical and depend on your diet and training program. This product is not intended to diagnose, treat, cure, or prevent any disease. These statements have not been evaluated by the FDA. This product is not for use by individuals under the age of 18. Chris Musberg has been remunerated for his appearance. Chris lost 27 lbs. in 8 weeks by combining diet, exercise, and Hydroxycut. Average weight loss reported in 4 to 8 weeks is 8 pounds. \*This product contains caffeine and may cause nervous system health effects if used in excess. Read the label, take before and after, and carefully follow the labeled directions for use. © 2002 Muscle Tech, P.A., Inc. All rights reserved.

# Nutritional Supplements in Sports:

## the Physician's perspective

- Preserve athlete's health
- Transfer: from basic sciences to athletes knowledge
- Consider Benefit/Risk ratio (an EBMedicine approach):
  - **Risks:**
    - Adverse health effect
    - Adverse analytical finding
    - Financial
  - **Benefits:**
    - Short-term supplementation / Particular situations:
      - Food/caloric restriction
      - Iron supplementation
      - Travelling (alternative to everyday food)
    - Ergogenic effects

# The Ergogenic Compounds

A tennis player in a red Reebok tank top is celebrating a victory on a tennis court. She is holding her tennis racket high in her right hand and has her left arm raised in the air. She is looking upwards with a joyful expression. The background is a blurred crowd of spectators in a stadium.

- **Créatine**
- **Caféine**
- **Bicarbonate**
- **Sport Drinks (CHO +/- Proteins)**
- **Meal replacements**
- **Protein products**  
(specific situations)

# Nutritional Supplements in Sports:

## the NADO's perspective

- Preserve athlete's health
- Implement the WADA code
- Deal with positive cases!! (Olympics, WC,...)
- Provide general information to athletes regarding nutritional supplements
- Set national program (NECEDO, ASDA...) of nutritional supplement testings

# Phase II: Netherlands Security System Nutritional Supplements Elite Sports (NZVT)

**Aim:** “to develop a long term solution for the problems  
surrounding nutritional supplements and doping”

## Partners

National Olympic Committee (NOC\*NSF)

Branch association of health product manufacturers (NPN)

National Anti-Doping Organisation (NeCeDo)

## NZVT elements



1. Enriched HACCP system
2. Batchwise laboratory analyses
3. Security analyses
4. Communication

## Shared responsibilities

- Athletes remain responsible for the supplements that they take (strict liability)
- Producers must take action (self-regulation)
- Sport authorities ensure quality (independence)

## Current advice on supplements

1. Only use what's really necessary
2. Choose NZVT product/batch combinations



## Procedure

- Handed in by producers
- Analysed by knowledgeable lab
- Producers pay the analysis
- Independent review of results
- Communication through website

# Nutritional Supplements in Sports:

## the NADO's perspective

- But NZVT is an exception: poor countries
- Implementation of basic antidoping rules = 0
- Substitution role of:
  - WADA
  - IOC
  - International Federations

# Nutritional Supplements in Sports:

## the IF's perspective

- Preserve athletes health (MADC)
- Frequently asked to “Give a list”
- Avoid having adverse findings and positive cases because of supplement contamination:
  - Time
  - Money
  - Human resources
- Substitution to some NADO

# Nutritional Supplements in Sports:

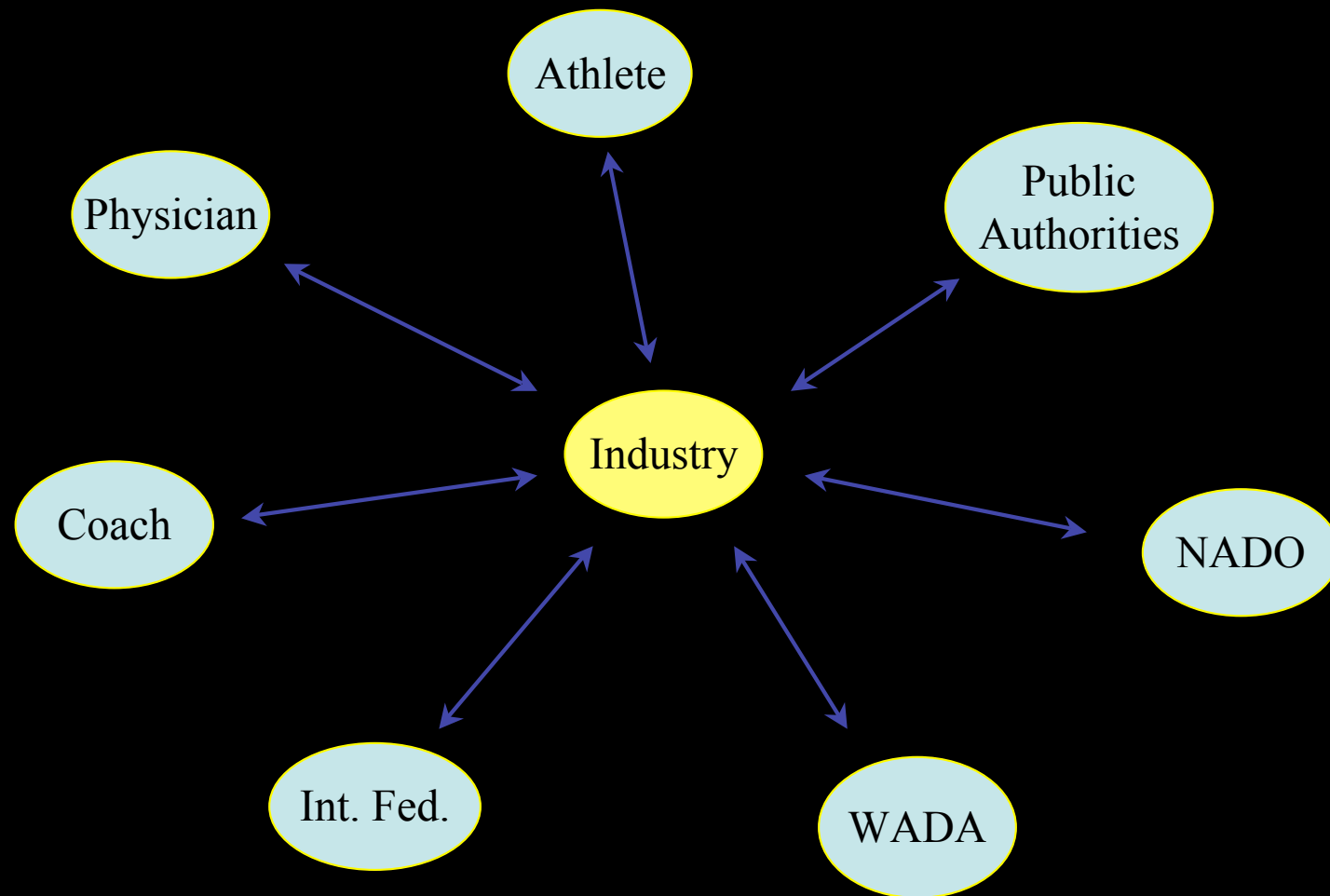
## the IF's perspective

- Communication - Education to athletes:
  - Recreational (national federations)
  - Top athletes:
    - antidoping program (IC & OOC)
    - Whereabout system
    - Competition and meetings
    - Athlete's staff (coach, physicians, physio...)
    - Publication and website

# Conclusions



# An industry-centered view of the problem



# Second International Symposium on Supplements in Sports

- **Main outcomes:**
  - Inadvertent doping offence is of importance!
  - The dietary supplement industry is best positioned to assume a leadership role in developing solutions
  - Self regulatory scheme – nutrition products:
    - without risk for health
    - no risk of producing a positive doping test
  - Key elements:
    - Logo
    - Risk analysis and accreditation
    - Independent auditing, GMP
    - Laboratory methods
  - Continuation of national or regional solution until adoption of the scheme