

# Summa Summarum of health-improving (?) skiing.

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All we want, that sport is associated with a sound and healthy lifestyle. Probably it is a major reason for existence of such sturdy resistance against performance-enhancing medical pre-mated. Most (or all) of these drugs are harmful.

All the more strange that there is a large group of performance-enhancing substances that are both harmful to health and the environment hostile, but no one will prohibit those substances. Even more surprising, that in the environmentally friendly (de jure) Sweden, are no discussion about this. No discussion regarding this paradoxical and absurd situation: ski preparation for a skiing trip or a skiing competition must include environmental and health risks.

## Health considerations

To glide wax skis are health-threatening activity. Even ordinary paraffin-based glide waxes cause a health hazard. From (Dahlqvist et al., 1992): "Transfer factor for the lung ("diffusion capacity") decreased among the ski waxers by 10-24 percent compared to the initial value", from (Hämeri et al., 1994): "Many of the harmful aspects of aerosol particles are connected to accumulation mode particles, which are produced during ski waxing. This particle size range is specially harmful when thinking of possible health effects due to inhalation", from (Knöpfli et al., 1992): "The subjects complained about burning eyes and tears, sore throat and coughing" and "In summary a reduction of the CO-diffusion capacity after inhalation hot wax exposure was observed for at least 24 hours".

In other words, after 1.5 hours of waxing you lose about 15% of lung efficiency, and even after 24 hours, the efficiency is 10% lower. How smart is to exercise strenuously for a long period, but then destroy everything because glide waxing? And (Dahlqvist et al., 1992, Knöpfli et al., 1992) conclusion corresponds well to the reality. For example, in a newspaper article from the Länstidningen in Östersund (December 2006) we read a story about an elite skiers who had the capacity to win tomorrow's race ("... which is now fully geared to be one of the Swedish World Championship squad for Japan 2007"), but after "Many hours of waxing for "saturation" of the skis ..." became only 14<sup>th</sup>.

Even greater health risks connected with so-called fluorine glide waxes, because ski technicians aggravate their health by the above impacts, plus they breathe in toxic perfluorinated substances – in (Bracco and Favre, 1998) in we read: "Inhalation of fluoride containing pyrolysis by-products can lead to systemic fluoride toxicity". In Norway, one ski preparation enthusiast found himself in resuscitation ambulance because of glide waxing

(Strøm and Alexandersen, 1990): "This article describes a man who was admitted to hospital with acute dyspnoea occurred, attack of polymer-fume fever and pulmonary edema". All this clearly shows that the glide waxing involves considerable health risks for anyone who prepared skis and also for those who stay in the wax cabin for a long time.

The ski technicians have made their own choice; it is their personal matter and has to be regulated by health and safety policy in specific sports (FIS, IBU). But what about the environment? Affect the use of fluorine glide waxes our environment or not?

## Environmental aspect

The Swedish Society for Nature Conservation ([www.naturskyddsforeningen.se](http://www.naturskyddsforeningen.se)) in its report (Naturskyddsföreningen, 2007) classifies perfluorinated substances in several groups, one of them is FTOH. From (Naturskyddsföreningen, 2007): "FTOH: Fluorotelomer alcohols, often called telomeres, fluorinated carbon, fluorine telomeres, fluoropolymers", this means that all fluorine glide waxes included in FTOH group.

In the same report: "In one of impregnant FTOH have been found in a concentration of 1 g/L. Concentration in air of FTOH in an area in the U.S. with the very large production of carpets treated with fluorotelomer alcohols averaged 148 pg/m<sup>3</sup>. This means that a content of the bottle we bought would be enough to pollute nearly 2 km<sup>3</sup> air at the same level. It is as much air as contained in more than 3000 buildings of the same size as the Stockholm Globe". Here we see how much damage can produce just one gram of perfluorocarbon, even worse such impurities accumulate in the environment. From (Kemikalieinspektionen, 2006): "...it is clear that perfluorinated substances are extremely persistent and that some of them are bioaccumulative and toxic".

All fluorine powder glide waxes is perfluorocarbon, and about 30 g goes to prepare only three pairs of skis. The powder is melted on the top ski base and then brushed off; there is only a microscopic film of perfluorocarbon left on the ski base. Brushed away particles by the window and the fan in the wax cabin come in to the outdoor environment. On the basis of (Kemikalieinspektionen, 2006), preparation of a single ski pair pollute about 20 km<sup>3</sup> air. In the Biathlon World Cup before each race technicians have prepared 200-300 ski pair with fluorine powder glide waxes. One can easily calculate the volume of the polluted air.

But probably, the greatest environmental and health impacts will be in huge amount of fluorine glide waxes burned in district heating plants (Waritz, 1975, Johnston et al., 1996, Lee et al., 1997). Even the producer (Swix, [www.swix.no](http://www.swix.no)) writes on Cera F pack: "Do not expose waxes to open flames such as from a waxing torch, heat guns, space heaters, fire places, etc. Do not smoke cigarettes while waxing with fluorocarbon or fluorinated hydrocarbon waxes. In fact, don't smoke at all! There is a chemical danger associated with fluorocarbon waxes when they are overheated. If fluorocarbon waxes are exposed to a heat source having a temperature higher than approximately 300°C (570°F), the fluorocarbon material disintegrates developing a poisonous gas."

Most of glide waxes applied scraped off the skis and end up in rubbish bins with everything else burnable. After such great events as the Olympics, World Championships, World Cup,

and also national championships will be more than one hundred kilograms of pure fluorine carbon in garbage bags (> 100 kg)! As early as 1977 (Arito and Soda, 1977), Japanese scientists warned of a great danger "...during treatment of solid waste containing fluorocarbon polymers in a community incinerator". In the same article we can read: the burning of FTOH emits gases that are **ten times more toxic than phosgene** (phosgene has been used in the First World War as a chemical weapon, Figure 1).



Figure 1 German soldier in World War One with dogs equipped with gas masks

In Sweden we have four municipalities hosting of the large international skiing competitions: Åre, Östersund and Falun. My E-mail inquiry revealed that all these municipalities are running waste from waxing cabins to combustion. In February 2008, during the Biathlon World Championships in Östersund red boxes for hazardous waste have been placed in each cabin, but it is difficult (perhaps impossible) to force technicians of all different nations to separate fluorine glide waxes from all other debris. I actually forgot about the largest ski event - Vasaloppet's Week. This arrangement additionally brings a several hundred kilograms of pure fluorine carbon to the outdoor environment and to the district heating plant.

Yes we can accept to a certain limit use of some health and environmental harmful technologies to produce the necessary things to maintain our current lifestyle (pending an alternative lifestyle). But we cannot accept that a basically very health-improving sport as skiing has such terrible side effects.

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