Date of report 30 Jun 2022

Reported case interaction between **Ritonavir** and **Anabolic steroids/ Androgen agonists**

Drugs suspected to be involved in the DDI

Perpetrator

Ritonavir

Daily Dose
100 (mg)

Dose adjustment performed
No

Administration Route
Oral

Start date
Unknown

End date
Ongoing

Victim

Anabolic steroids/ Androgen agonists

Daily Dose
10 (mg)

Dose adjustment performed
No

Administration Route
Oral

Start date

End date

Unknown

Unknown

Complete list of drugs taken by the patient

Antiretroviral treatment

Darunavir (with Ritonavir or Cobicistat)
Emtricitabine/Tenofovir-DF

Complete list of all comedications taken by the patient, included that involved in the DDI

Ostarine

Clinical case description

Gender

Male

Age

32

eGFR (mL/min)

>60

Liver function impairment

No

Description

This is a case of relatively young and healthy male patient, MSM, 32 years old, Caucasian, with no liver and kidney impairment, high 189 cm, weight 88 kg, BMI=24,6 kg/m^2. HIV-1 infection was diagnosed in 2017 and soon after cART was initiated as follows: darunavir/ritonavir (800/100 mg QD) together with emtricitabine/tenofovir disoproxil fumarate (200/300 mg QD), achieving undetectable HIV-1 RNA and CD4+ T-cells count above 700 cells/mm^3. He had no other relevant medical history and he was not taking any other regular medication apart from cART. In 2019, his liver enzymes were elevated (ALT=1250 IU/L and AST=155 IU/L), when patient reported that his gym trainer recommended him Ostarine (10 mg QD) usage. Ostarine, also known as

Enobosarm or MK-2866, is an investigational selective androgen receptor modulator (SARM). Despite the fact it is not FDA approved, it is used for the treatment of conditions such as muscle wasting and osteoporosis, as well as for bodybuilding. Ostarine, is banned by the World Anti-Doping Agency (WADA) and the National Collegiate Athletic Association (NCAA). So, in this case, all other possible causes of transaminase elevation were excluded, including viral infection, other drugs as well as drug abuse. It was indicated to stop this supplement usage. Three months after Ostarine cessation, liver enzymes were normalised.

Clinical Outcome

Toxicity

Drug Interaction Probability Scale (DIPS)

Score

5 - Probable

Editorial Comment

Enobosarm, also known as Ostarine or MK-2866, is an investigational nonsteroidal selective androgen receptor modulator (SARM) developed for the treatment of conditions such as muscle wasting and osteoporosis. SARMs, including Enobosarm, can be used by athletes to aid in training and increase endurance and fitness, potentially producing effects similar to anabolic steroids. However, SARMs such as

enobosarm or ligandrol, have not been approved for therapeutic use by the FDA.
The interactions between CYP3A4 inhibitors, such as ritonavir or cobicistat, and anabolic steroids have been described, with an increase of the steroid concentrations. However, it has not been described with other gym supplements such as ostarine. Rare cases of ostarine liver toxicity have been previously described (Bedi H et al). No reliable information about the metabolic or toxicologic pathways of ostarine or other SARMs is available. Thus, it is impossible to conclude if ritonavir has increased ostarine toxicity in this case, although it is plausible given its high and well-known drug-drug interaction potential.

University of Liverpool Recommendation

N/A