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ANSWER: LIPEMIC SERUM SECONDARY TO LOPINAVIR/RITONAVIR.

The blood sample shows a whitish layer of plasma consistent with lipemic serum secondary to lopinavir/ritonavir. Fasting lipid showed hypertriglyceridemia of more than 10. The patient was otherwise asymptomatic. The patient was continued on lopinavir/ritonavir and anti-lipid treatment (bezafibrate) was started. His blood sample was no longer lipemic the following day. After recovering from the COVID-19, a repeat fasting lipid done several weeks later reveal mixed hyperlipidemia.

Lipemic serum contains excessive fat globules in the blood especially in the form of chylomicron which mainly consists of triglycerides. Lipemic serum is mainly secondary to hypertriglyceridemia with levels typically more than 10mmol/L. Causes of hypertriglyceridemia can be categorized into primary or secondary causes.¹ Primary causes are genetic abnormalities that can present with chylomicronemia (rare), hypertriglyceridemia (relatively common) and genetic susceptibility (metabolic syndrome).¹ Secondary causes are more common which include poorly controlled

diabetes, obesity and hypothyroidism, and certain medications.¹ Medications that are associated with hypertriglyceridemia and highly active anti-retroviral (HAART) therapy are commonly associated with dyslipidemia.² Hypertriglyceridemia is more frequent with ritonavir, ritonavir-saquinavir and ritonavir/lopinavir.² Table I show the common secondary causes of hypertriglyceridemia.

Hypertriglyceridemia secondary to lopinavir/ritonavir or hypertriglyceridemia in general, may be asymptomatic as in our case, or may present with acute manifestations, such as acute pancreatitis.³ Other manifestations include xanthomatous eruptions and adverse cardiovascular events. A cloudy milky blood sample such in our case will need laboratory analysis for chylomicron content which will confirmed the diagnosis. Early diagnosis and treatment is necessary to prevent complications and to reduce the cardiovascular risks. Medical treatment is with lipid reducing medications with fibrate being favored over statins. It can be prevented or lowered by maintaining healthy weight, dietary fat and sugar restriction, increased physical activity, smoking cessation and alcohol abstinence.

Table I: Secondary causes of hypertriglyceridemia¹.

Diseases	Hypothyroidism, diabetes mellitus (poorly controlled, insulinopenic), central obesity, renal disease, nephrotic syndrome, pregnancy (third trimester), HIV associated hyperlipidemia, autoimmune disorders (Systemic lupus erythromatosus)
Medications	Beta-blockers (nonselective), diuretics (thiazides), corticosteroids, tamoxifen, raloxifene, oestrogens containing medications, protease inhibitors, retinoic acid, isotretinoin, sirolimus, L-asparaginase, bile acid resins, phenothiazines, anti-psychotics (second degeneration) and immunosuppressants
Diets	Alcohol excess, positive energy balanced diet, excess saturated fat

REFERENCES

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- 2: Calza L, Manfredi R, Chiodo F. [Dyslipidaemia associated with antiretroviral therapy in HIV-infected patients](#). *J Antimicrob Chemother.* 2004; 53:10-4.
- 3: Kim SJ, Kang H, Kim EJ, Kim YS, Cho JH. Clinical features and outcomes of hypertriglyceridemia-induced acute pancreatitis: Propensity score matching analysis from a prospective acute pancreatitis registry. *Pancreatology.* 2020 Mar 31. pii: S1424-3903(20)30104-6. doi: 10.1016/j.pan.2020.03.013.