

# Liver Function Tests

**Liver function tests** (LFTs) are blood tests that provide information about how well the liver is working, they help us diagnose and monitor liver disease and inform us about liver damage. When hepatocytes are damaged, various enzymes are released which are detectable in the blood. Liver function tests typically include 5 parameters - **serum concentration of 4 enzymes and bilirubin** (see table below). The tests help construct differential diagnosis and determine the affected area of the liver.

Parameters of hepatocellular damage	Normal range - men	Normal range - women
Alanine aminotransferase (ALT)	0.10–0.80 µkat/l	0.10–0.60 µkat/l
Aspartate aminotransferase (AST)	0.10–0.85 µkat/l	0.10–0.60 µkat/l
Parameters of cholestasis		
γ-Glutamyl transpeptidase (GGT, GMT, γ-GT)	0.10–0.85 µkat/l	0.10–0.70 µkat/l
Alkaline phosphatase (ALP)	0.10–2.20 µkat/l	0.10–2.20 µkat/l
Total bilirubin (bili, BILT, TBil)	2.0–17.0 µmol/l	2.0–17.0 µmol/l

Elevation in serum concentration of alanine aminotransferase (**ALT**) and aspartate aminotransferase (**AST**) suggests liver disease for which **damage to hepatocytes** is typical.

Elevation in γ-glutamyl transpeptidase (**GGT**) and alkaline phosphatase (**ALP**) indicates **cholestatic liver disease**, most commonly biliary obstruction that prevents bile secretion. Retention of bile salts can additionally lead to hepatocyte damage, resulting in secondary increase of parameters of hepatocellular damage.

## Specimen collection and requirements

Venous blood should be collected in the morning on an empty stomach. Fasting blood test requires fasting for at least 8 hours before the blood is drawn. It is also best to avoid strenuous physical activity on the day of the blood test. <sup>[1]</sup>

Blood for **AST**, **ALT**, **GGT** and **ALP** concentration is collected into a gold or green blood collection tubes type "Vacutainer" (gold - serum separating gel; green - lithium heparin). The concentration of liver enzymes is determined either from serum or plasma.

To determine the concentration of **bilirubin** in plasma, blood needs to be collected into a purple, gold or green blood collection tube type "Vacutainer" (purple - EDTA). The concentration of bilirubin may be determined either from serum or plasma.

## Reference range

Liver function tests reference range <sup>[2]</sup>

Age & Sex	ALT (µkat/l)	AST (µkat/l)	GGT (µkat/l)
0–6 weeks	0.10–0.73	0.38–1.21	0.37–3.0
6 weeks – 1 year	0.10–0.85	0.27–0.97	0.10–1.04
1–15 years	0.10–0.6	0.10–0.63	0.10–0.39
men > 15 years	<b>0.10–0.78</b>	<b>0.10–0.72</b>	<b>0.14–0.84</b>
women > 15 years	0.10–0.78	0.10–0.72	<b>0.14–0.68</b>

Age	BILT (µmol/l)
0–1 days	0.0–38.0
1–2 days	0.0–85.0
2–4 days	0.0–171.0
3 weeks – 1 year	0.0–29.0
> 1 year	<b>2.0–17.0</b>

## Interfering factors

### Total bilirubin (BILT)

Factors that decrease total bilirubin concentration: ascorbic acid (vitamin C), pregnancy, UV light exposure of both the patient and the collected specimen, phototherapy for neonatal jaundice in newborns

Factors that increase total bilirubin concentration: physical activity, fasting, arm strain during blood collection

### Alanine aminotransferase (ALT)

Factors that interfere with ALT concentration: hepatotoxic and cholestatic drugs, HCL, age, weight, physical activity, thrombolytic therapy, alcohol intake, smoking, prolonged compression of blood vessels, fasting, obesity, etc.

### Aspartate aminotransferase (AST)

Factors that interfere with AST concentration: hepatotoxic and cholestatic drugs, HCL, age, weight, physical activity, thrombolytic therapy, alcohol intake, smoking, prolonged compression of blood vessels, fasting, obesity, etc.

### $\gamma$ -Glutamyl transpeptidase (GGT)

Factors that interfere with GGT concentration: pregnancy, cholestasis, bile acids, long-term alcohol abuse, smoking, obesity, physical activity, vegetarian diet, obesity, drugs (extensive list below), improper specimen sample handling (higher temperature).

**Drugs** that affect GGT concentrations: phenobarbital, phenytoin, paracetamol (acetaminophen), anabolic steroids, aminopyrine, anticonvulsants, antithyroid drugs (methimazole, propylthiouracil), antirheumatic drugs, thiazide diuretics, etc.

## Biological half-lives

Enzyme	Biological half-life
<b>ALT</b>	47 hours
<b>AST</b>	17 hours
<b>GGT</b>	3-4 days

## References

### Related articles

- Liver failure
- Hepatitis
- Hepatoprotective agents
- Biochemical examinations of the liver

### References

1. Pears Health Cyber, s. r. o.. *Laboratorní hodnoty – Ordinace.cz* [online]. The last revision 2010-04-14, [cit. 2007-07-27]. <<http://www.ordinace.cz/laboratorni-hodnoty/>>.
2. MASOPUST, Jaroslav. *Klinická biochemie : požadování a hodnocení biochemických vyšetření*. 1. edition. Karolinum, 1998. ISBN 80-7184-650-3.