



Bilirubin & Alkaline Phosphatase

Liver enzymes are common tests for life insurance applicants. Liver enzyme tests were discussed in *Rx for Success* #3. In addition to those enzymes (*AST, ALT, GGTP*), common liver tests also include bilirubin and alkaline phosphatase. These are discussed below. Prothrombin time, platelet count and protein electrophoresis are additional tests that might be used in clinical medicine to provide clues to severity.

Bilirubin is considered a test of liver function but it is not specific to the liver. In fact, most bilirubin elevations are due to hemolysis of red blood cells or the benign genetic enzyme deficiency, Gilbert's syndrome. Bilirubin is formed primarily by the breakdown of a substance in red blood cells called "heme". Bilirubin is processed/conjugated in the liver and secreted into the bile. Bilirubin does not rise due to liver disease until 10-50% of the liver is non-functional. Yellow discoloration of the skin and eyes (*jaundice*) occurs when the bilirubin is ≥ 3 mg/dl.

Bilirubin elevation due to Gilbert's disease is usually < 3 mg/dl but values as high as 6 mg/dl have been reported. Fasting causes bilirubin to increase in Gilbert's syndrome. *AST, ALT* and *GGTP* are not elevated by Gilbert's syndrome.

If the obstruction to bile flow (*known as cholestasis*) is outside the liver (*e.g. stone or tumor in duct which carries bile from the liver*) or if there is diffuse disease of the bile ducts inside the liver, bilirubin increases along with *ALP* and *GGTP*.

Alkaline phosphatase is found mainly in liver and bone with some 20% derived from intestine or placenta. Cholestasis causes bile duct cells to increase synthesis of *ALP*. Isolated elevations of *ALP* $< 1.5X$ normal usually resolve spontaneously and are of no concern. Late in pregnancy, *ALP* may rise from placental origin up to $2X$ normal.

Normal values for alkaline phosphatase are age specific and are higher (*3-5X adult normal*) in children and adolescents due to bone growth. Adult values are expected after about age twenty years. Marked increase of bone *ALP* (*i.e. 6X-8X normal and GGTP normal*) is likely to be due to a destructive bone processes such as Paget's disease or metastatic cancer (*e.g. prostate*).

In general, liver disease causes elevation in more than one liver test. For example, cholestasis elevates bilirubin, alkaline phosphatase, *AST* and *ALT*. When only one test is elevated on a screening blood sample for life insurance, it is less likely to represent liver problems. The exception is *ALT*, which can be the sole elevation in hepatitis. For this reason, insurance companies add a hepatitis screen when the *ALT* is elevated.

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Ratings for Liver Test

- Rate for cause or see below

If the cause is unknown and there is significant elevation of only one test	
Bilirubin: <ul style="list-style-type: none"> ≤ 6.0 mg/dl > 6.0 mg/dl 	0 Decline
Alkaline phosphatase <ul style="list-style-type: none"> Age > 20 years = 3X laboratory reference range Age ≤ 20 years = 5X laboratory reference range Others 	0 0 Individual Consideration
AST: <ul style="list-style-type: none"> ≤ 5X normal > 5X normal 	0 Decline
ALT: <ul style="list-style-type: none"> ≤ 4X normal > 4X - 5X normal > 5X normal 	0 Table B Decline
GGTP: <ul style="list-style-type: none"> ≤ 4X normal > 4X - 5X normal > 5X normal 	0 Table B Decline

If the cause is unknown and there is elevation of two or more (AST, ALT, GGTP) with no significant elevation of bilirubin or ALP, rate for highest enzyme.	
<ul style="list-style-type: none"> ≤ 2X normal 	0
<ul style="list-style-type: none"> > 2X but ≤ 3X normal 	Table B
<ul style="list-style-type: none"> > 3X but ≤ 4X normal 	Table D
<ul style="list-style-type: none"> > 4X but ≤ 5X normal 	Table F
<ul style="list-style-type: none"> > 5X normal 	Individual Consideration

For entering the tables, the following values will be considered significant elevations:

<ul style="list-style-type: none"> AST, ALT, GGTP: 	> laboratory reference range
<ul style="list-style-type: none"> Bilirubin: 	> 2 mg/dl
<ul style="list-style-type: none"> ALP: <ul style="list-style-type: none"> 20 Years, non-pregnant ≤ 20 Years Pregnancy 	<ul style="list-style-type: none"> 1.5x adult laboratory reference range 5X adult laboratory reference range 3X adult laboratory reference range

To get an idea of how a client with a history of bilirubin & alkaline phosphatase would be viewed in the underwriting process, feel free to use the Ask "Rx" *per underwriter* for an informal quote.

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Bilirubin & Alkaline Phosphatase - Ask "Rx" perts underwriter (ask our experts)

Producer _____ Phone _____ FAX _____
Client _____ Age/DOB _____ Sex _____

If your client has elevated liver enzymes, please answer the following:

- ① How long has this abnormality been present? _____ (years)
- ② Please give the date and results of the most recent liver enzyme tests.
a) AST/SGOT _____
b) ALT/SGPT _____
c) GGTP _____
d) ALP _____
e) Bilirubin _____
- ③ Have these results been
 increasing fluctuating up and down
 decreasing unknown
 stable
- ④ Does your client drink alcohol? (answer all that apply)
 yes, please note amount and frequency _____
 no
 drinking pattern changed recently _____
- ⑤ Is your client on any medications (prescription and/or non-prescription)?
 yes, please give details _____
 no
- ⑥ Please check if your client has had any further studies for evaluation:
a) Hepatitis A, B, or C normal abnormal
b) iron studies normal abnormal
c) liver ultrasound, CT scan, or MRI normal abnormal
d) liver biopsy normal abnormal
e) no further evaluations
- ⑦ Does your client have any other major health problems (ex: heart disease, etc)?
 yes, please give details _____
 no

After reading the Rx for Success on bilirubin & alkaline phosphatase, please feel free to use this Ask "Rx" pert underwriter for an informal quote.

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