

# OxiDates

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## TBARS and Body Fluids

TBARS is most often analyzed in plasma and serum samples to evaluate a patient's level of oxidative stress (OS). This test reflects a global response to OS, especially towards abnormal lipid peroxidation. To date, there are in excess of 2100 references measuring TBARS in plasma and 1298 in serum. However, OS has also been measured in other body fluid specimens with equally valuable results as a reproducible biomarker of OS. By comparison with blood, a July, 2009 PubMed search shows the relative occurrence for the following specimens: 230 for urine, 42 for seminal fluid, 20 for cerebrospinal fluid, 19 for saliva, 11 for breath condensate, 10 for synovial fluid and 5 for gingival crevicular fluid. Each of these references have documented an **increase** in TBARS. There are no citations for tears, or bile. The discussion described below summarizes examples of applications for the various samples and reaffirms the continued use of TBARS in diagnostic evaluations.

**Urine:** Chronic hyperglycemia of > 4 years duration results in an elevated value of TBARS due to OS, i.e; 3.73 micromol/mmol creatinine which correlated with HbA1c levels (1). Patients having type 1 and microalbuminemia or, type 2 diabetic nephropathy and macroalbuminemia show significantly elevated TBARS and also elevation in serum (2). In addition, experimental streptozotocin models with induced diabetic hypertension, urine TBARS was 9.9  $\mu\text{mol}$  compared to 8.1 in the controls which was significant at the  $p < 0.05$  level (3) and was reduced by vitamin C (4). The antioxidant activity of ginseng inhibits urinary TBARS formation in the streptozotocin model by inhibiting lipid peroxidation (5). Children with inflammatory and immunological active renal mesenchymal disease such as glomerulonephritis, have a 12-fold increase in TBARS values than children with no renal disorder (6). The increase of urinary TBARS in another study was 8 times higher than controls and was likewise lowered in this model by the antioxidants, onion and quercetin (7). Docosahexaenoic acid-induced lipid peroxidation in ODS rats increased TBARS dramatically in the urine and this effect was once more reduced by vitamin C (8).

Other examples of urine TBARS analysis is related to smoking. The elevation in smokers is significant at the  $p < 0.5$  level and was higher in females than males (9). A study from Scandinavia on long term use of cigarettes indicates that TBARS remains the most commonly reported index of OS in this context (10). Recently, an association was reported between smoking, infertility and high TBARS (11).

**Seminal Fluid:** Seminal fluid is receiving attention using TBARS as a biomarker for OS in male infertility which are elevated in this disorder (12).

In one study TBARS was 35.7 micromol/g protein in patients with obstructive azoospermia compared to 19.3 in controls (13). Interestingly, TBARS shows seasonal variation, with values being higher in summer than winter i.e; 728 mg/mL compared to 424 ng/mL in winter (14).

Specimens stored at 5 degrees C are stable for 24 hours so they can be analyzed within the same day of collection (15).

**Saliva:** Although a valuable source of fluid, salivary TBARS show high variability i.e; > 60% in both men and women (16). Individual variability is highest in men (73-46%). Nevertheless, salivary TBARS has been measured in periodontitis (17) and gingivitis (18). This reflects the TBARS level in gingival tissue removed from affected patients (19). In addition, time of sampling, effect of recent tooth-brushing and ascorbic acid pretreatment appears to influence TBARS (20).

**Exhaled Breath Condensate:** Exhaled breath condensate has been studied with TBARS. It can be detected in breath from healthy normals (21) and is abnormal in asthma (22), cystic fibrosis (23) chronic obstructive pulmonary disease (24), tuberculosis (25) and pneumonia (26).

**Cerebrospinal Fluid:** TBARS is markedly elevated in active and posttraumatic hydrocephalus i.e; 0.58 and 0.56 nmol/mg protein respectively, compared to a normal value of 0.28 (27). Antibiotics decreased TBARS levels (28). There is an increase in bacterial and aseptic meningitis (29). In acute ischemic stroke, elevated TBARS is decreased on day 3 following treatment with glycine (30). TBARS correlates with the severity of head injury i.e: the levels were highest in patients who died during the first week of trauma (31). Of interest is a report that TBARS is lower in patients with schizophrenia, even though it is high in plasma, suggesting that the phenomena is peripheral (32).

**Synovial Fluid:** TBARS obtained by arthrocentesis in patients with rheumatoid arthritis (33), or acute gouty arthritis (34) are markedly elevated and significant at  $p < 0.001$ . Aspirates from patients with facial arthromyalgia contain high levels of TBARS (35) and were decreased after hyaluronate treatment (36).

**Other Medical Situations:** Finally, TBARS is higher in the urine of women who are in the luteal phase of the menstrual cycle (37) and can be used in differentiating between transudates and exudates (38).



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## OXIDATIVE STRESS PRODUCTS



- TBARS Assay Kit      Cat. # 0801192
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