

(2012 / 2/ 27 2011/ 12 /26)

(27.71±0.74 U/ml)

(19-70 year)

(38.95±1.01 U/ml)

(31-80 year)

(25) (8.865 U/mg)

Sephadex G-100

(151 ± 1.8 kDa)

(45 °C)

(0.1 M)

(5)

2.443) - (24.27 U/ml) (12 mM)
 -2 .(mM

Biochemical Study of Myeloperoxidase in Blood and it's Relation to Atherosclerosis

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ABSTRACT

The research included studying of myeloperoxidase in human serum, The normal value of myeloperoxidase activity was found (27.71 ± 0.74 U/ml) in control group for both sexes at (19-70 year), with no sex difference, while it was affected by age and smoking. The study also showed a significant increase in myeloperoxidase activity (38.95 ± 1.01 U/ml) in serum of atherosclerosis patients group for both sexes at (31-80 year) in comparison with control, on the other hand, myeloperoxidase activity in serum of patients group was affected by sex, age, smoking and the intake of statins.

The results also indicated a significant increase in the concentration of total cholesterol, low density lipoprotein -cholesterol, C-reactive protein and troponin. While a significant decrease in high density lipoprotein -cholesterol, total protein, albumin, globulin, chloride and arylesterease in serum of patients group in comparison with control. Correlation study was performed between the measured biochemical parameters and myeloperoxidase activity in serum by linear correlation coefficient, The results also showed that there was a significant positive correlation between myeloperoxidase activity and troponin in atherosclerosis patients.

Also, the research included the isolation of myeloperoxidase from normal human serum using different biochemical techniques, including: precipitation by ammonium sulfate, dialysis, gel filtration chromatography on sephadex G-100. The results predicted that spicific activity and the number of fold of purification were (8.865 U/ml) and (25) respectively for partially purified enzyme. Furthermore, the comparative molecular weight of the partially isolated myeloperoxidase was (151 ± 1.8 kDa) using gel filtration chromatography. The results were predicted also that myeloperoxidase containing heam group, zinc and calcium elements, which indicated that the enzyme is glycoproteins type.

The study showed that the optimum conditions of myeloperoxidase were obtained at the first minute using sodium citrate (0.1 M) as buffer at pH (5.0), at a temperature (45 °C)

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and (12 mM) of *o*-dianisidin as substrate. It was found that V_{max} and K_m have the values of (24.27 U/ml) and (2.443 mM) respectively.

Ethylene diamine tetraacetic acid, sodium azide, 2-mercaptoethanol and sodium chloride showed inhibition on the activity of myeloperoxidase, where sodium azide had more inhibition in the activity and in an irreversible non competitive inhibition type.

Keywords: Myeloperoxidase (MPO), Atherosclerosis, Troponin, Biochemical variables, purification.

(EC1.11.1.7) (MPO)

(Arnhold, 2004)

Anger 1941

.(Harrison *et al.*, 1977)

MPO (Winterbourne *et al.*, 2000)

(Tang *et al.*, 2009) (Meuwese *et al.*, 2007)

.(Green *et al.*, 2004) Microglia

: Hydrogen Peroxide



(Fiedler *et al.*, 2000 ; Murray *et al.*, 2003) SCN⁻, I⁻, Br⁻, Cl⁻ = (X⁻)

(MPO)

(HOCl)

.(Malle *et al.*, 2003)



(NO[•])

.(Schindhelm *et al.*, 2009)

(LDL) (MPO) (Malle *et al.*, 2007)
 (LDL)

(Hazen *et al.*, 1999)
 ()

Plaques
 ()

MPO (Eggers *et al.*, 2010) (Mallinson, 2010)

(Heslop *et al.*, 2010)

(47) (58) (105)

(61) (19-70 year)

(31-80 year) ()

(21) (40)

Biolabo (Kit)

(Henry, 1974) Biuret Method

(Doumas *et al.*, 1971)

(Richterich, 1969) (+ =)

Biolabo (Kit)

(Fossati and Prencipe, 1982) (Allain *et al.*, 1974)

(Burtis and Ashwood, 1982)

: FriedeWald

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$$\text{LDL- Conc.mg/100ml} = \text{Cholesterol Conc.} - \text{HDL- Conc.} - \frac{\text{TG Conc.}}{5}$$

(Burtis and Ashwood, 1982)

$$\text{VLDL- Conc. (mg/100 ml)} = \frac{\text{TG Conc.}}{5} \quad (\text{Fischbach, 2000})$$

plasmatic

(Young, 1995)

(Crockson *et al.*, 1966)

plasmatic

.(<6 mg/l)

(agglutination)

T

CTK

G

C

(Tomas *et al.*, 2000)

.(Tukel *et al.*, 1997)

Phenyl Acetate

.(270 nm)

:(U)

(1 ml)

.(25 °C)

(1 min)

(Phenol)

(1 μmol)

(Kumar *et al.*, 2002)

.(450 nm)

(20 year)

(19 ml)

(%75-0)

(60 min)

(4 °C)

(24 h)
(30 min) (13000 rpm)

(Plummer, 1978)

(2.5 L)
(4 °C) (0.1M) (NH₄HCO₃)
(24 h)

(Lyphilizer)

MPO

(93 × 2cm) (Anderws, 1965)
(2ml) (87cm) (Sephadex G-100)
(26ml/h) (2ml)
(5min)

(Mathy-Harter *et al.*, 1998) (430nm) (280nm)

MPO

(Lowry *et al.*, 1951)

(Schacterle and Pollack, 1973)

Blue dextran, Glucose) (2000-0.204 kDa)

(Oxidase, BSA, α-Amylase, Eggs Albumin, Papein , Tryptophan

:

.....

(Benzidine Test)
(Dean *et al.*, 1977)

(Plummer, 1978)
(Aneurin, 1952)

Mean

T- Standard Error

($P \leq 0.05$) P-

(Correlation Coefficient)

P

MPO

(19-70 year)

(1)

(27.71±0.74 U/ml)

MPO

(Hoy *et al.*, 2001)

(1)

MPO

($p \leq 0.001$)

(Lavi *et al.*, 2007; Rudolph *et al.*, 2008)

MPO

MPO :1

%	U/ml**		(year)
	(Mean±SE)	(Mean±SE)	
.....	(19.31±1.21)	≤25
15.58	(27.74±0.30)*	(24±0.68)	26-35
12.76	(31.45±0.88)	(27.89±1.0)	36-45
13.74	(36.82±1.34)*	(32.37±1.45)	46-55
13.44	(42.95±1.24)*	(37.86±1.27)	56≤
47.91	(40.84±1.26)***	(27.61±1.06)	Male
27.06	(35.35±1.44)***	(27.82±1.04)	Female
40.96	(36.85±0.9) ***	(26.14±0.82)	Non
42.01	(42.96±2.19) ***	(30.25±1.35) ***	Smoker
40.56	(38.95±1.01)***	(27.71±0.74)	

(P≤0.001)

*** (P≤0.05)

*

:(U)

**

MPO

(31-80 year)

(38.95±1.01U/ml)

(1)

(Heslop *et al.*, 2010)

(Hoy *et al.*, 2001)

(P≤0.001)

(Brennan *et al.*, 2003)

(p≤0.001)

(Lavi *et al.*, 2007 ; Rudolph *et al.*, 2008)

.....

.MPO

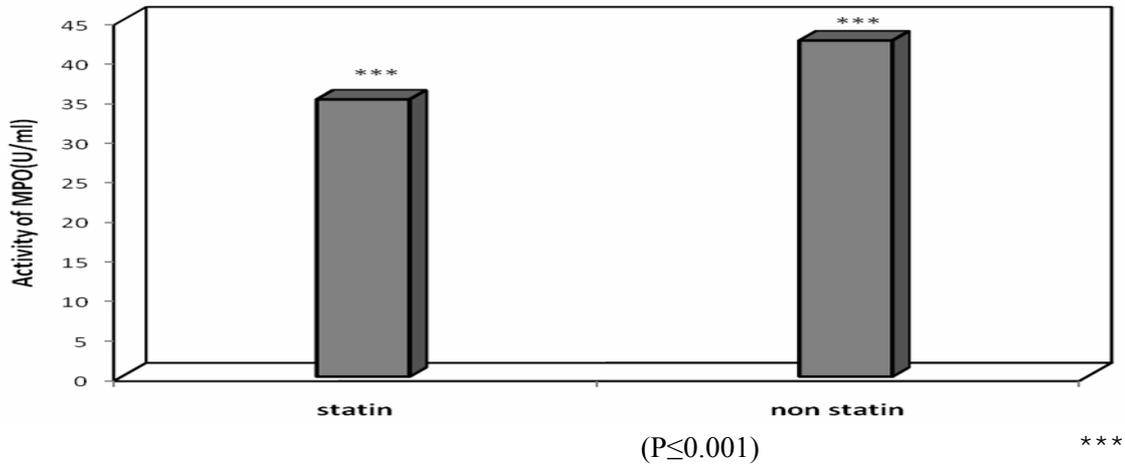
($p \leq 0.001$)

Zhou *et al.*

(1)

3-Hydroxy-3-Methylglutaryl Coenzyme A Reductase

(*al.*, 2006



:1

(Tang *et al.*, 2009 ; Eggers *et al.*, 2010)

(1)

LDL

MPO

HDL L DL

.(Schindhelm *et al.*, 2009)

.(2)

:2

Mean±SE	Mean±SE	
*6.10±0.36 mmol	5.37±0.14 mmol/l	Total Cholesterol
1.86±0.88 mmol/l	1.83±0.9 mmol/l	Triglyceride
***0.92±0.03 mmol/l	1.13±0.02 mmol/l	HDL-Cholesterol
**4.8±0.34 mmol/l	3.877±0.14 mmol/l	LDL-Cholesterol
0.37±0.017 mmol/l	0.36±0.018 mmol/l	VLDL-Cholesterol
***5.21±0.10 g/dl	7.21±0.089 g/dl	Total protein
***3.14±0.09 g/dl	4.39±0.04 g/dl	Albumin
***2.07±0.09 g/dl	2.82±0.08g/dl	Globulin
***81.64±0.84 mmol/l	100.75±1.80 mmol/l	Chloride
***66.0±2.081 U/ml	94.10±2.24 U/ml	Arylesterease
28.13±3.87 mg/l	<6mg/l	C-reactive protein
Positive(+)	Negative(-)	Troponin

.(P≤0.05)

* . (P≤0.01)

** .(P≤0.001)

(P≤0.05)

(Maharjan *et al.*, 2008)

LDL-Cholesterol

.LDL-Cholesterol

(2006 ; Maharjan *et al.*, 2008)

LDL

.(Ravnskov, 2002)

(p≤0.001)

HDL-Cholesterol

(Held *et al.*, 1997)

(P≤0.001)

.E C

(Olusi *et al.*, 1999 ;2006)

(P≤0.001)

(Schillinger *et al.*, 2004)(Bourdon *et al.*, 1999)

.....

(Hansson , 2005)

(P≤0.001)

(De Bacquer *et al.*, 1998)

MPO

(Dirican *et al.*, 2004 ; 2006)

.(Kabaroglu *et al.*, 2004)

(2008)

.(Eisenman, 2006)

Correlation)

(Coefficient "r"

MPO

.(2)

MPO

(P≤0.001)

MPO

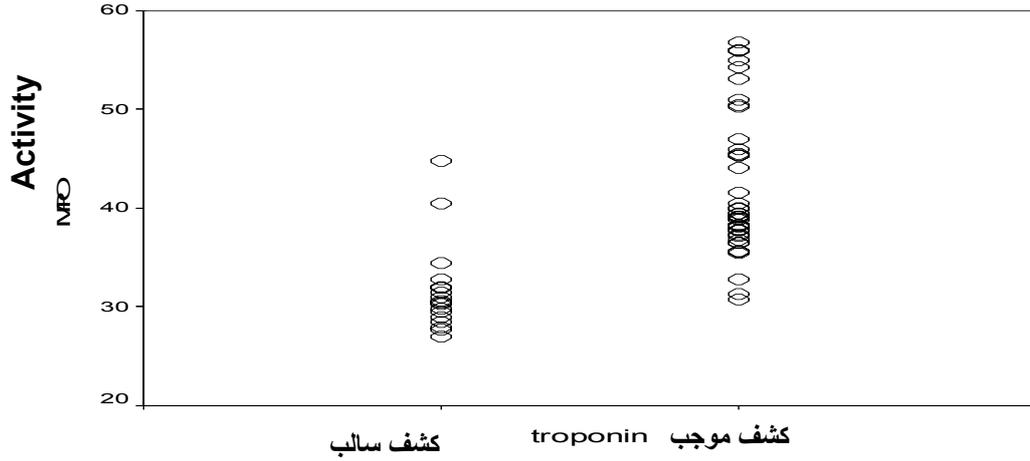
(42.026±1.075U/ml)

.(3)

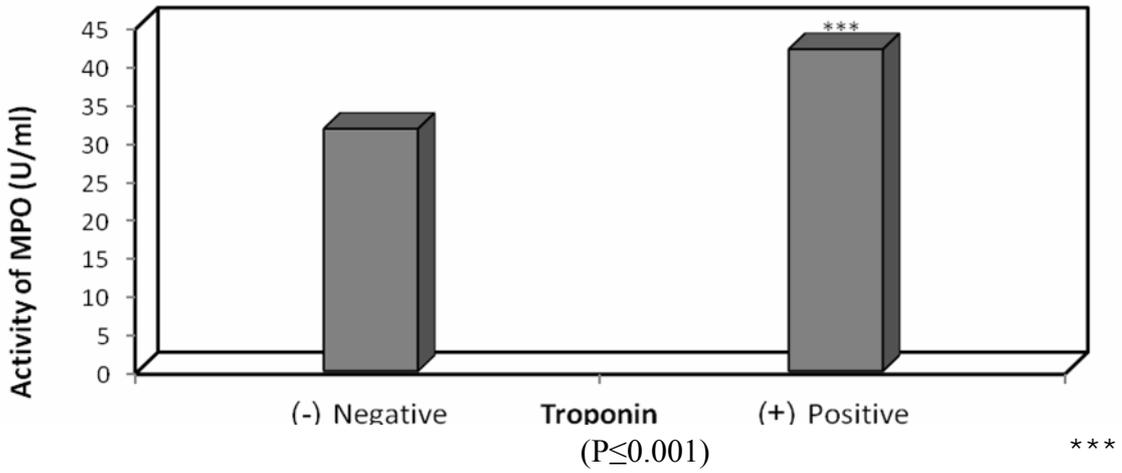
(31.625±1.057 U/ml)

MPO

(Goldmann *et al.*, 2009)



MPO :2



MPO :3

0.354)

MPO

(75%)
(1.063 U/mg)

(U/mg)
(0.616 U/mg)

(4)

253 ml 167 ml 99.5 ml

(C) (B) (A)
(430 nm) (280 nm)

(430 nm)

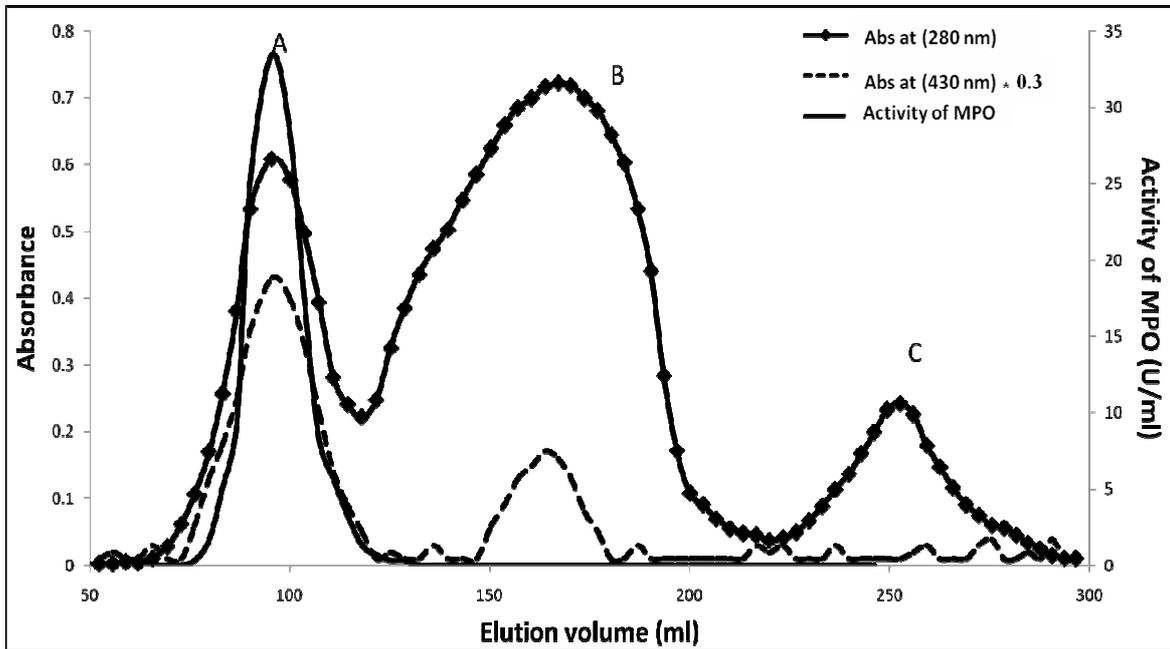
(A)

(B)

(A)

(C)

(3)



:4

(87cm)

(Sephadex G-100)

(95×2cm)

(A,B,C)

(26 ml/h)

:3

ml	mg/ml	mg	** U/ml	U	*** U/mg	%		
19	74.04	1406.7	26.22	498.18	0.354133	100.0	1.00	
15	51.1	766.5	31.49	472.35	0.616243	94.8	1.75	
17	25.3	430.1	26.9	457.3	1.063241	91.8	3.00	
9	46.9	422.1	48.88	439.92	1.042217	88.3	2.95	
468	0.097	45.396	0.86	402.48	8.865979	80.8	25.04	\

:(U)

(1 ml)

:

**

(1 mg)

:

(Anderws, 1965)

(A)

.(5)

(151 ± 1.8 kDa) (A)

MPO

(Andrews and Krinsky, 1981)

146) MPO

(Hansson *et al.*, 2006)

(150 kDa)

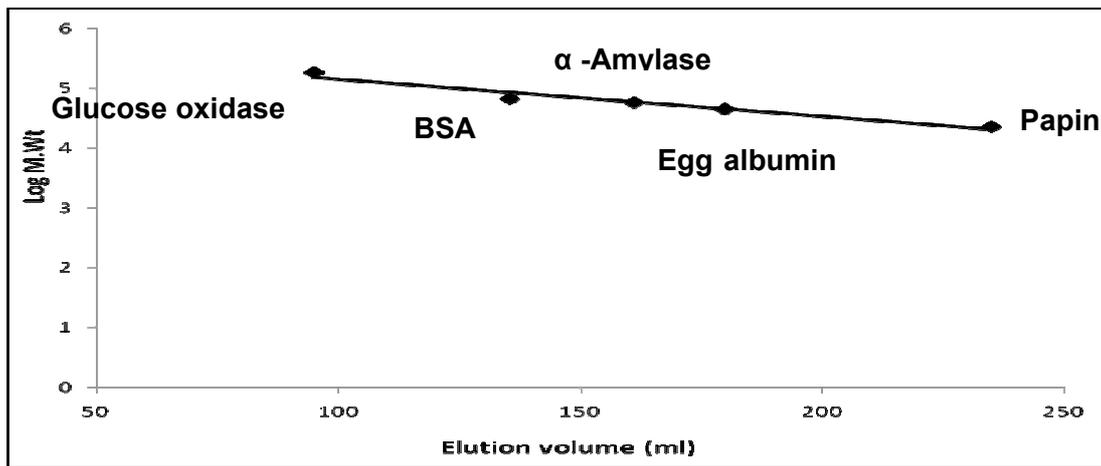
.(kDa

(A)

.(4)

(8.98%) (Zn/Ca)

(Fiedler *et al.*, 2000)



:5

(A)

.(Hansson *et al.*, 2006; Malle *et al.*, 2007)

.(Arnhold, 2004)

.....

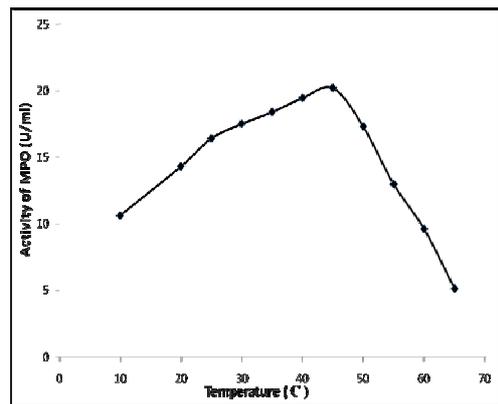
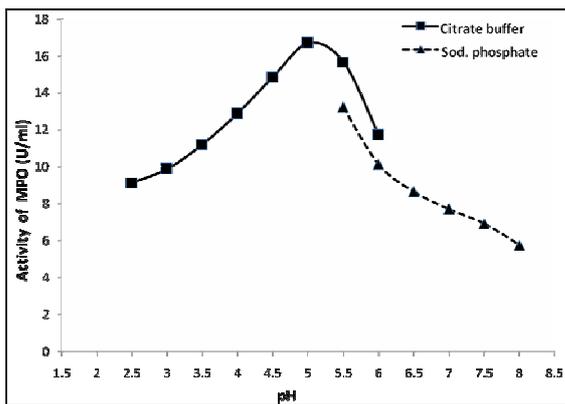
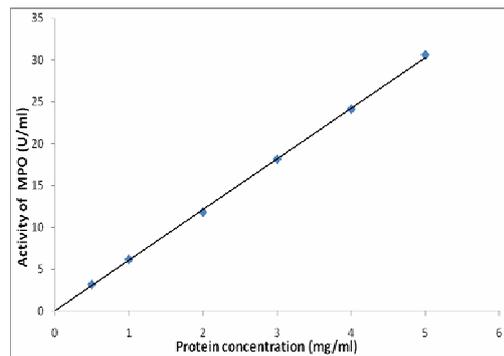
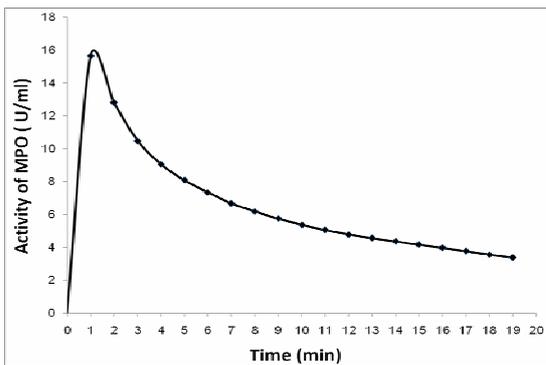
:4

/	/	/	%		
U/mg	U	mg	MPO	(mg/ml)	
1.2455	0.02310	0.167	% 8.98	0.001637	Zn
				0.018214	Ca

(5)

.(Kumar *et al.*, 2002)

(A)



:5

U/ml	(mM)	(°C)	(0.1M) Citrate buffer	(Min)	(mg/ml)	MPO (A)
26.286	12	45	5	1	2.5	
20.796	20.46	25	5.5	1	2.5	

(V_{max})

(Lineweaver-Burk plot)

.(6)

(2.443 mM)

(K_m)

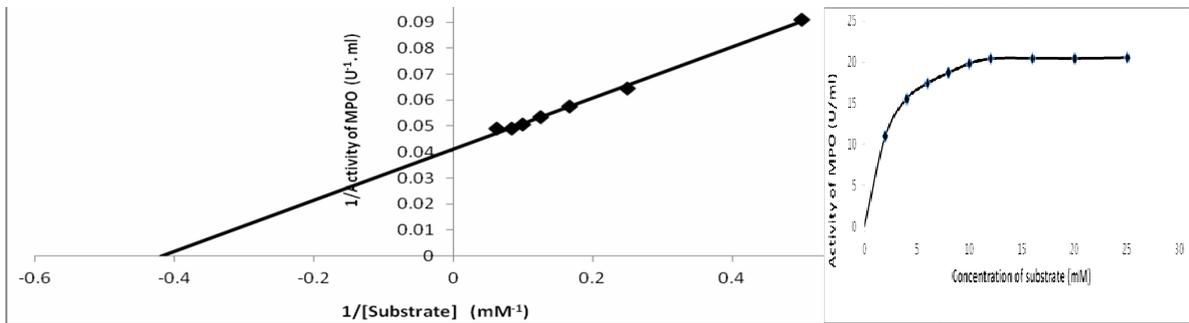
(24.27 U/ml)

MPO

(6)

(A)

NaN₃ > 2-Mercaptoethanol > EDTA > NaCl :



: 6

(A)

(Gaut *et al.*, 2002)

(2.5mM)

(2 - 25mM)

K_m

.(7)

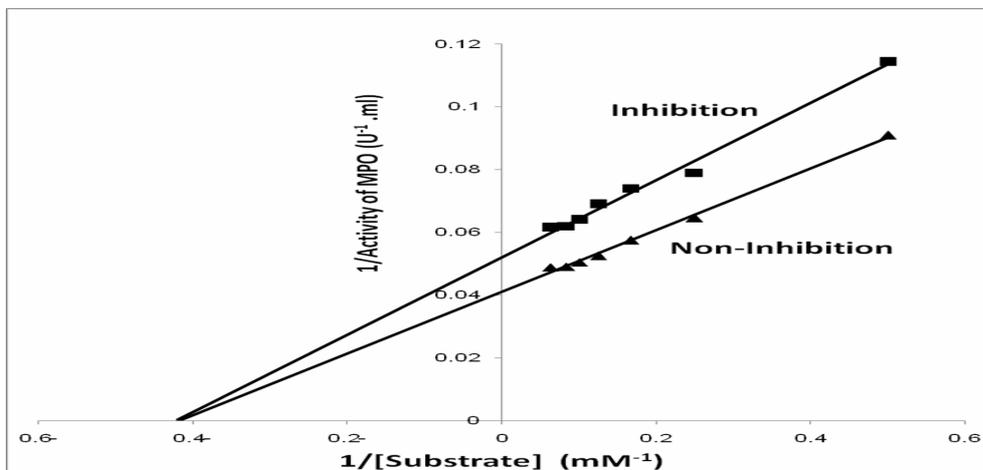
.....

% **	* U/ml	mM	
86.95	9.98	0.5	EDTA
81.15	9.31	1	
81.15	9.31	5	
56.52	6.48	8.7	
53.62	6.15	21	
53.52	6.32	0.1	NaN ₃
46.47	5.49	0.25	
39.43	4.65	0.5	
23.94	2.82	1	
18.30	2.16	3	
11.26	1.33	20	
11.26	1.33	30	-2 HOCH ₂ CH ₂ SH
55.17	5.323	0.05	
37.93	3.66	0.1	
27.58	2.66	0.25	NaCl
92.98	8.818	0.5	
89.65	8.651	1	
87.93	8.485	3	
79.31	7.653	20	

.(%100)

%**.

*



(2.5 mM)

-

:7

(A)

" .(2006)

"

" .(2008)

"

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