OPEN HOUSE

Department of Chemical Engineering

2014 IIT DELHI OPEN HOUSE

Cholesterol Analysis at the Cost of a Burger !!!

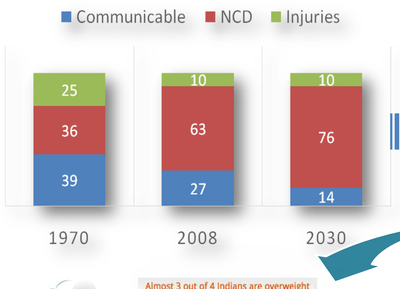
Developing a kit for Lipoprotein analysis

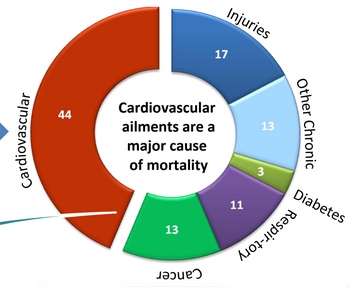


Prof. A. S. Rathore

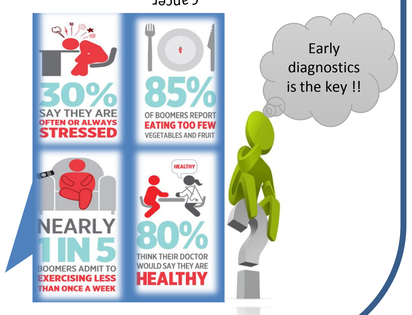
Mili Pathak

Cardiovascular Ailments are a Major Healthcare Threat for India and Abroad





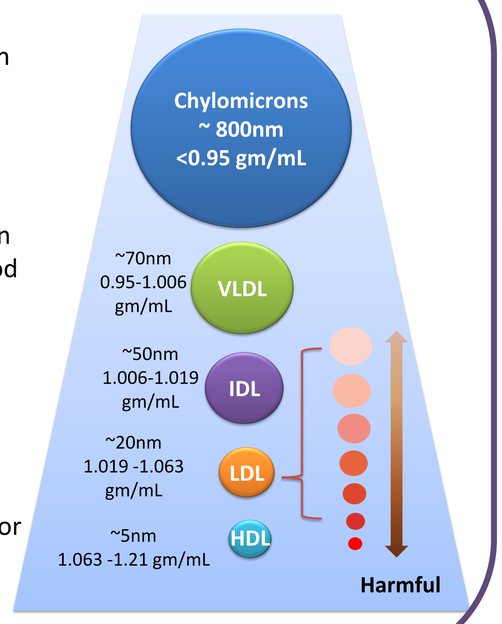




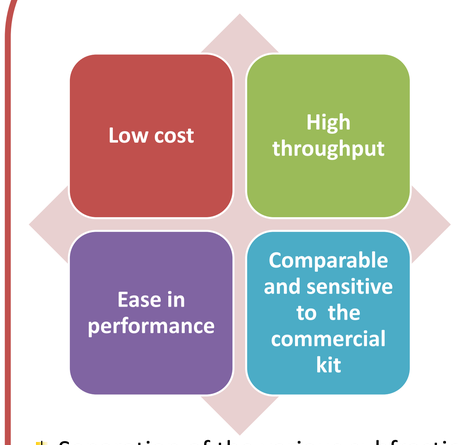
- 73% of urban Indians are overweight
- Avg. person goes from healthy at 26 to obese at 38
- Root cause for most heart related ailments is the suboptimal LDL: HDL ratio driven by our lifestyle

Early Detection of Cholesterol using Commercial Kits

- Cholesterol travels through the blood attached to a protein -- this cholesterol-protein package is called a lipoprotein.
- Basic analysis for detection of total cholesterol in blood costs ~800 INR/test today
- If a patient has high cholesterol, lipoprotein-cholesterol profiling is required and this costs ~5000 INR/test today
- The latter is out of reach for a majority of Indians

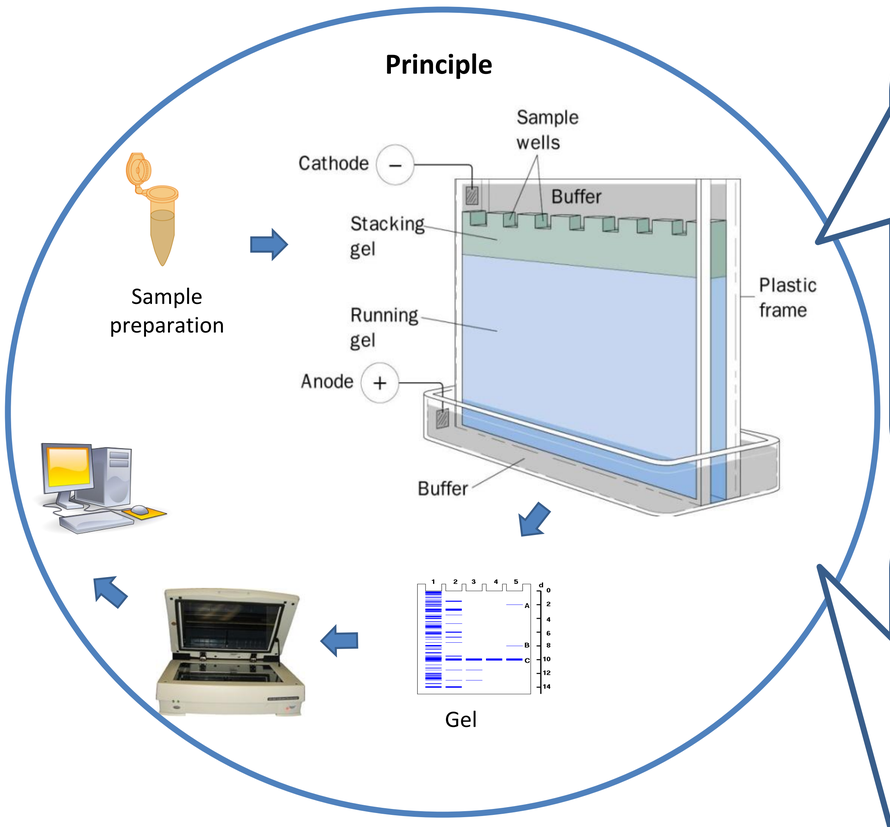


Aim and Approach



- Separation of the various subfractions is performed by Native Polyacrylamide Gel Electrophoresis and is non-trivial
- Separation is based on charge and size of molecules without affecting the conformation and biological activity

Principle



Parameters studied

- Dye formulation
- Sample preparation
- Running buffer
- Gel percentage
- Reaction chemistry
- Temperature
- Analysis

Instrument



Mini-Protean Tetra cell unit



Hand casting accessories



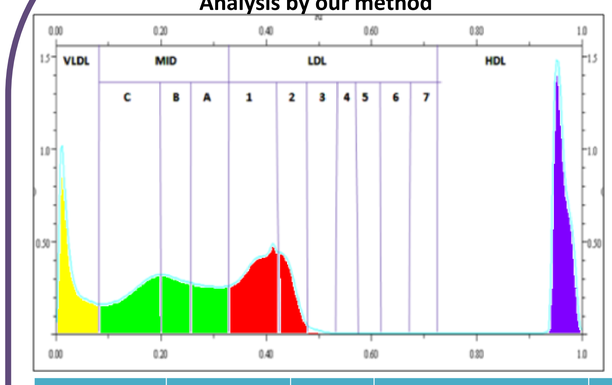
Universal power-pack unit



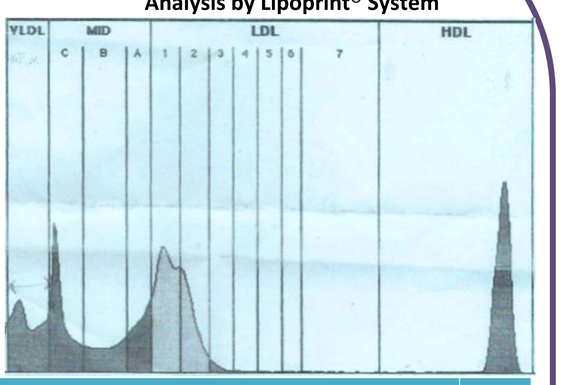
GS-800 scanner

Our Protocol performs at par with the Quantimetrix Lipoprint® System

Analysis by our method



Analysis by Lipoprint® System



		VLDL	MID			LDL							HDL
			C	B	A	1	2	3	4	5	6	7	
Cholesterol (mg/ml)	IITD	22	20	11	11	27	14	1	0	0	0	0	34
	Lipoprint®	21	19	11	12	31	16	1	0	0	0	0	31

No. of samples	Values calculated by optimized protocol					Mean	SD
	Run 1	Run2	Run 3	Run 4	Run 5		
VLDL							
Sample 1	22	20	23,5	–	–	21,83	1,76
Sample 2	14	12	15	–	–	13,67	1,53
Sample 3	45,6	43	58,6	55	–	50,55	7,44
Sample 4	9,01	14,37	10,82	13,9	9,55	11,53	2,47
Sample 5	35	35	31	33	33,4	33,48	1,66
LDL							
Sample 1	84	86	89	–	–	86,33	2,52
Sample 2	54	51	53	–	–	52,67	1,53
Sample 3	121	121	112	111	–	116,25	5,50
Sample 4	40,76	38,9	42,13	39,5	48,23	41,90	3,75
Sample 5	41,67	37,5	38,4	37,7	33,4	37,73	2,95
HDL							
Sample 1	34	29	31	–	–	31,33	2,52
Sample 2	55	48	52,5	–	–	51,83	3,55
Sample 3	35	35	31	33	–	33,50	1,91
Sample 4	89,28	91,15	80	84,4	90	86,97	4,67
Sample 5	31,1	32,55	31,4	33,7	30,53	31,86	1,27

Analysis by our Protocol Costs 40 X Less than the Quantimetrix Lipoprint® System

	Proposed protocol	Lipoprint® System
Instrument	645572 INR	693630 INR
Reagents and materials	2824 INR	190241 INR
Run time	2 hr	1hr
Sample analyzed per run	40 samples	12 samples
Cost per sample	120 INR	5000 INR

Potential Benefits

- Quantimetrix Lipoprint® System is presently used to analyze whole lipoprotein (for INR 800) and its subfractions (for INR 5000)
- Testing needs to occur frequently every year through lifetime
- Our proposed method can analyze for whole lipoprotein profile (VLDL, IDL, HDL, LDL and its subfractions) at INR 120 (vs. INR 5000 at present)
- We expect this could significantly improve affordability of cholesterol testing and aid in early diagnostics

Working with our partners to commercialize the kit



Contact: Ms. Mili Pathak (PhD. Scholar)/ Prof. Anurag S. Rathore
Bioprocessing and Bioseparations Laboratory
Block II, Room No. 94
Department of Chemical Engineering, IIT Delhi
011-26596242