Electronic Supplementary Material (ESI) for Biomaterials Science.

(Supporting Information)

Personalized Protein Coronas: "Key" Factor at the Nanobiointerface

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Sample collection

The blood samples were collected from volunteer patients atShariati andSinahospitals andIran blood transfusion organization (ibto) (with permission). In this regard, we counseled with the patients and doctors to collect the blood samples from patients who had only one certain disease. We also checked the medical profile and followed the therapeutic history of patients (with permission).To avoid possible bias and to attribute the changes of protein corona to acertain disorder, the patients with similar, age, sex, healthy condition and even geographical locations were selected.Furthermore, the plasma of diabetic patients with same blood glucose level and pregnant women with same period of pregnancy were collected to evaluate the protein corona changes of individuals having same plasma alterations in terms of severity and period of alteration. Similarly, the plasmas of healthy subjects were collected to study the protein corona variations in different healthy subjects.To study the effects of simultaneous disorders(which occurred during diseases) on the protein corona formation, the plasma of hemodialysis patients with natural and low albumin concentration was collected. The condition of these patients were similar in all cases but in albumin concentration.

The sample collection was performed with high attention to thepatient's condition such as disease, age, sex, severity/period of disease, and geographical location.However it is possible that some patients may had simultaneous disorders, which were not be recognized by physicians.The sample collection procedure was performed with respect to ethical and medical laws and approved by Iran blood transfusion organization (ibto).

Evaluation of experimental bias

To check the accuracy of current method used for NP-hard corona preparation and to evaluate experimental bias (in general), the preparations of NP-hard coronas from several cases (for example healthy number one) wererepeated for three times. As it can be seen in Figure 4a and c, the pattern of protein corona composition and the intensity of proteins involved in the hard corona were similar in all NP-corona obtained from identical plasma (healthy number one).Therefore the protein corona composition and the amount (intensity) of bound proteins were similar, when the NPs were incubated with identical plasma. This result strongly indicated that the observed differences in the hard corona of different patient's plasmaswere notrelated due to the experimental bias.

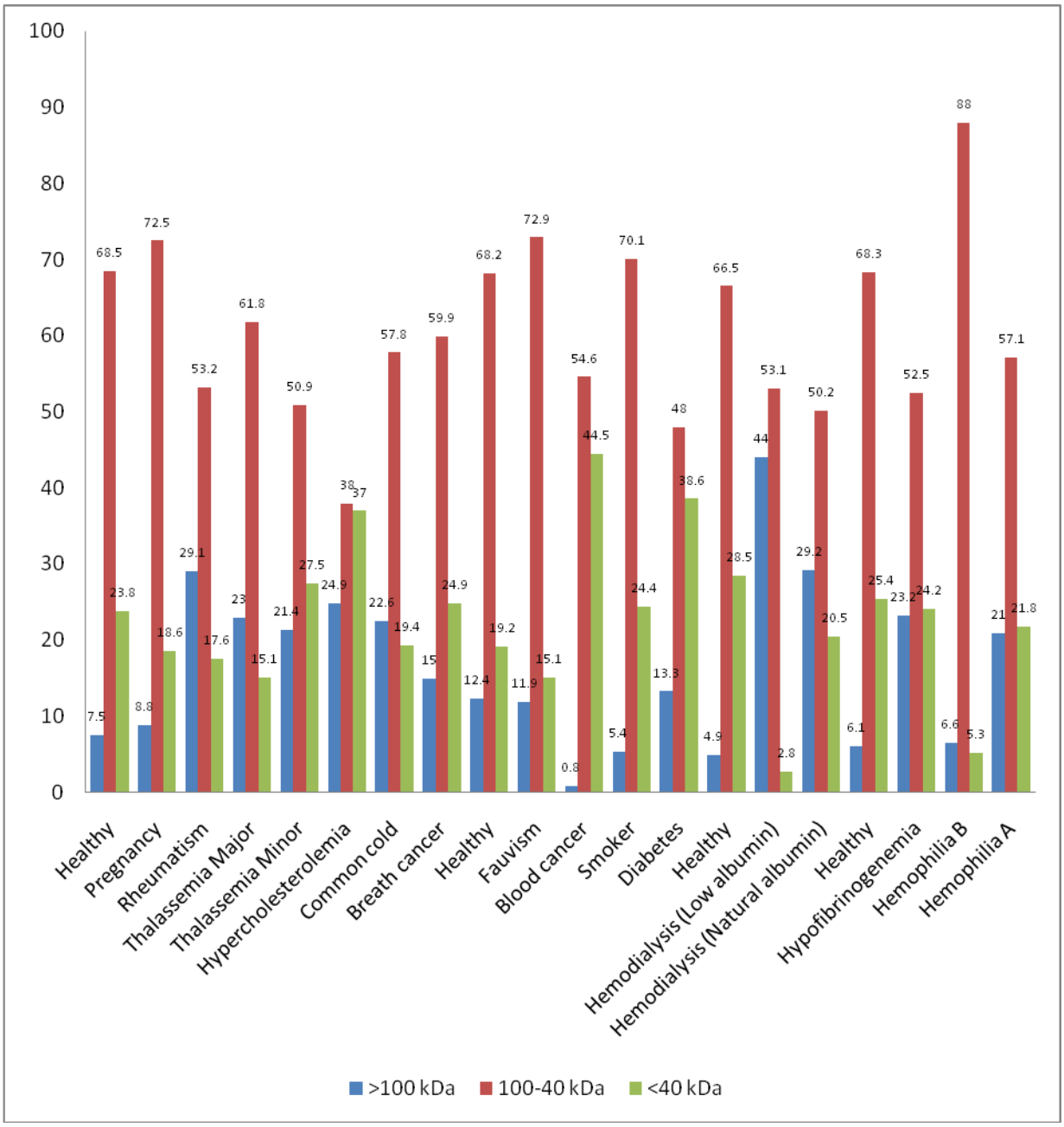

Figure S1: The percentage of corporation of plasma proteins within the formed hard corona during incubation of polystyrene NPs in altered plasma (50%) of different patients (healthy, pregnant, rheumatism, thalassemia major, thalassemia minor, hypercholestrimia, common cold, breast cancer, fauvism, blood cancer, smoker, diabetes, hemodialysis (low albumin), hemodialysis (natural albumin), hyperfibrinogenemia, hemophilia B and hemophilia A)

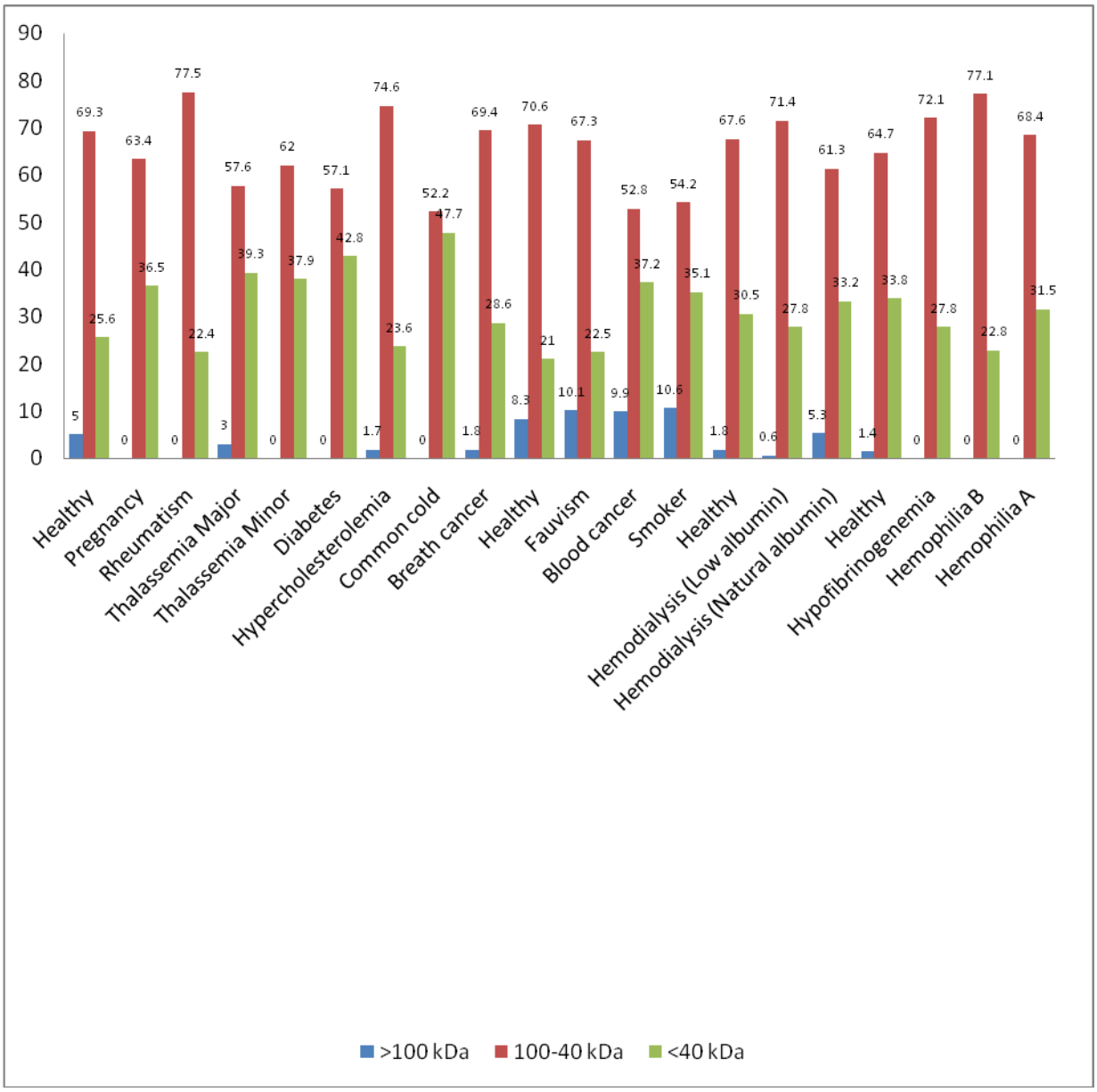

Figure S2: The percentage of corporation of plasma proteins within the formed hard corona during incubation of silica NPs in altered plasma (50%) of different patients (healthy, pregnant, rheumatism, thalassemia major, thalassemia minor, hypercholestrimia, common cold, breast cancer, fauvism, blood cancer, smoker, diabetes, hemodialysis (low albumin), hemodialysis (natural albumin), hyperfibrinogenemia, hemophilia B and hemophilia A)

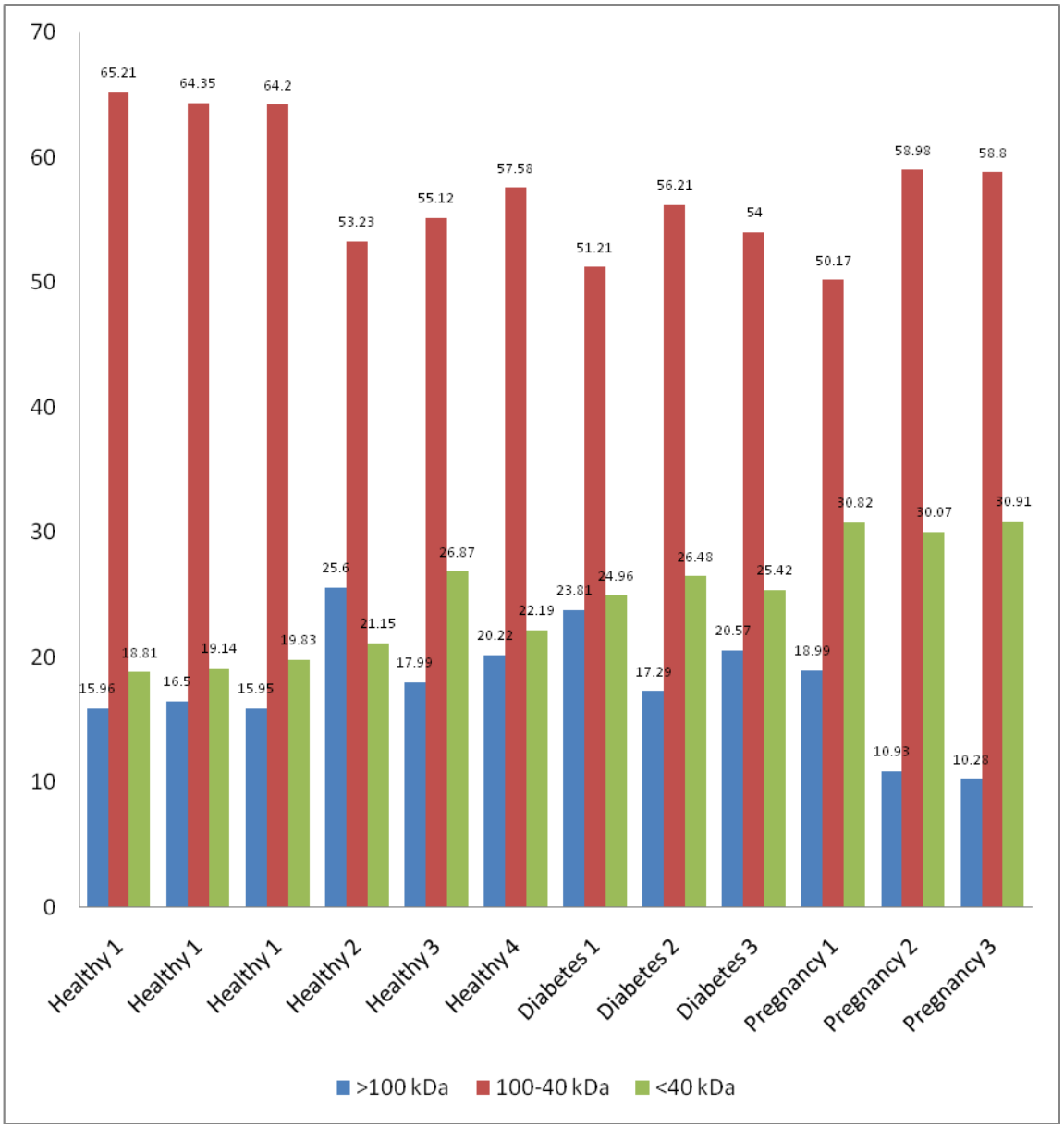

Figure S3: The percentage of corporation of plasma proteins within the formed hard corona during incubation of polystyrene NPs in altered plasma (50%) of different healthy, pregnancy and diabetic patients.

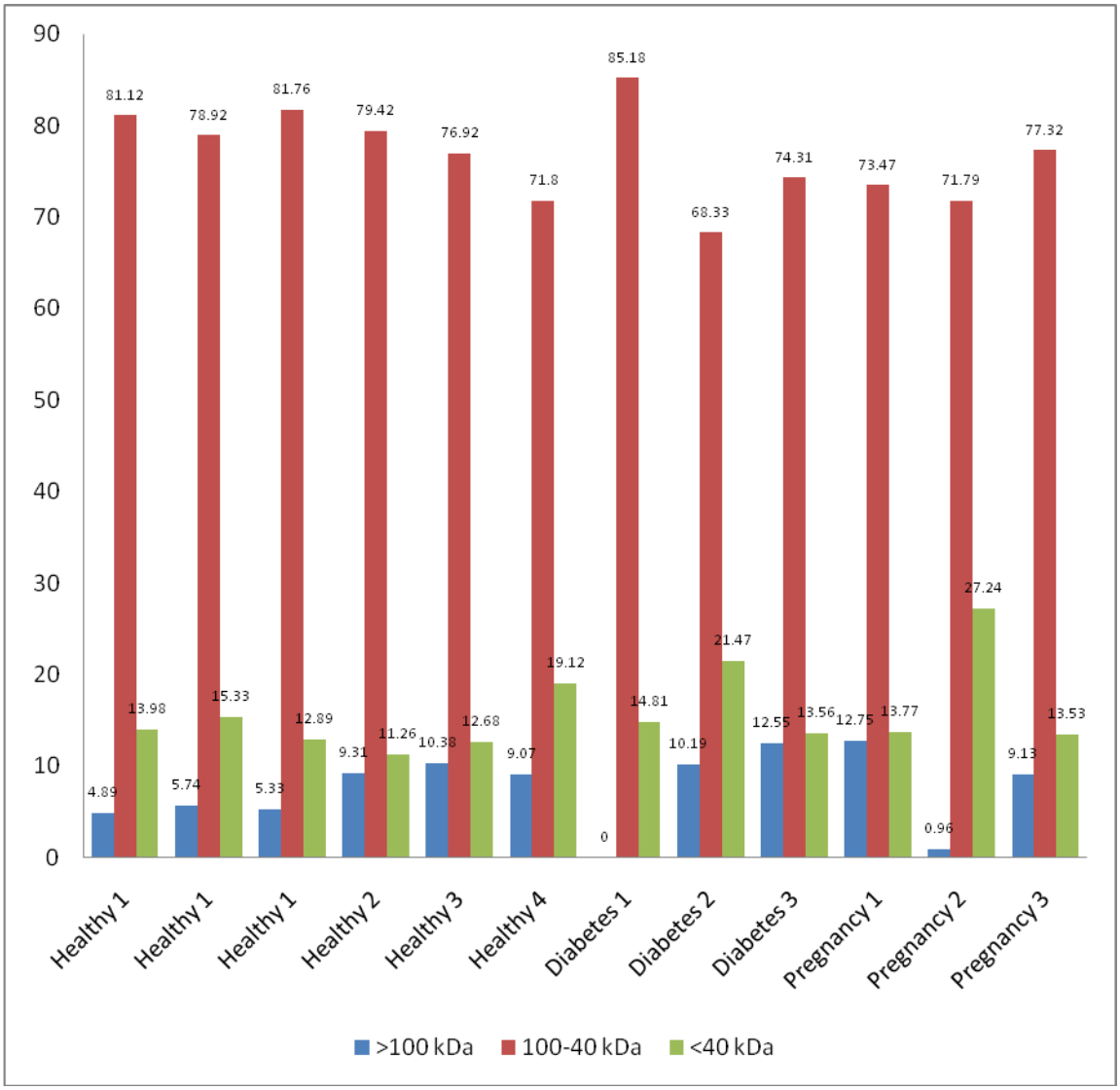

Figure S4: The percentage of corporation of plasma proteins within the formed hard corona during incubation of silica NPs in altered plasma (50%) of different healthy, pregnancy and diabetic patients.

Plasma protein content of different diseases

In order to study the plasma protein content of different diseases, the extracted plasmas were diluted (1%) and evaluated by 1D-SDS-PAGE. The results indicated that there are not significant differences in the general pattern of plasma protein from different disease (Figure S6), which is mainly happened due to the fact that the 1D-SDS-PAGE is not able to monitor the conformational changes of plasma proteins. It may be reasonable to suggest that the plasma protein alterations in terms of folding, stability and concentration mediated by different disease/situations may affect the affinity of plasma proteins for NP-surface and influence the protein adsorption/substitution on the NP surface and, consequently, their corona composition.

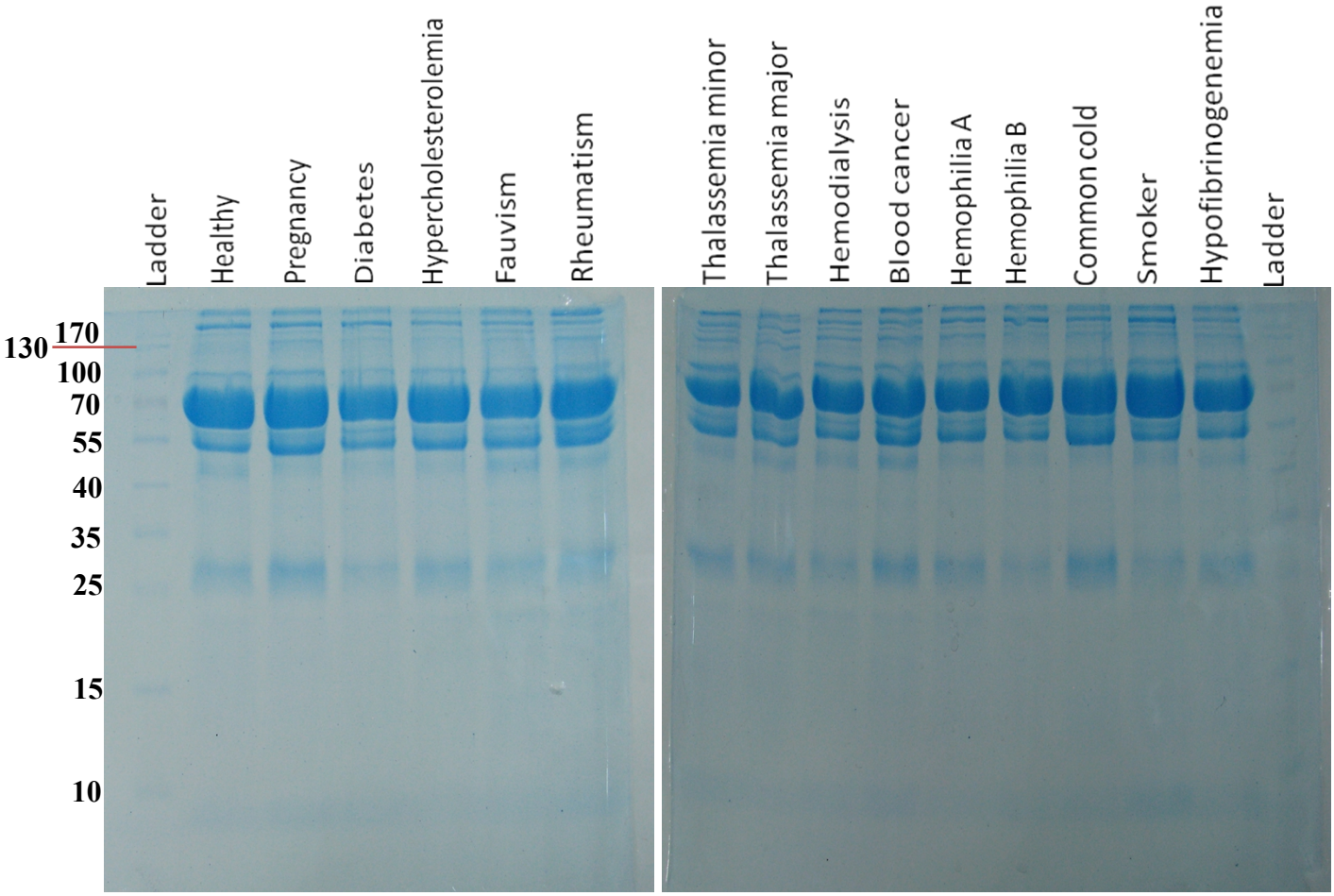

Figure S5. SDS-PAGE gel (15%) of human plasma proteins (1%) obtained from different patients (without NPs)