Type 2 diabetes is a major health care concern, and more than 10 million people worldwide are currently afflicted with this disorder. Diabetes develops when the actions of insulin, produced and released by pancreatic beta-cells, fail to normalize blood glucose levels. A consequence of elevated levels of blood glucose is diabetic complications such as retinopathy and cataract. Exciting new findings suggest that endoplasmic reticulum (ER) stress contributes to the development of insulin resistance, and that small molecule 'chemical chaperones', which function to alleviate ER stress, might enhance insulin action in animal models of obesity and type 2 diabetes.

In this study, a rat model of type 2 diabetes was induced by feeding rats with high fat diet for 4 weeks then injected with streptozotocin. After one week of injection, a group of diabetic rats were treated with 4-PBA for 8 weeks. Slit lamp examination was done to detect the occurrence of cataract. At the end of experiment, rats were taken and the following biochemical parameters determined:

1. Fasting blood glucose.
2. Insulin level and insulin resistance.
3. Cholesterol and triglyceride.
5. GSH in blood, lens and retina.
6. Catalase in blood, lens and retina.
7. SOD in blood, lens and retina.
8. sFas in blood, lens and retina.
10. SDS electrophoresis of lens protein.

The observation and results obtained indicated the following:

1- A remarkable increase in glucose level and insulin resistance index with a great withdraw in insulin level in the diabetic rats. Using of 4-PBA caused an enhancement of insulin action that was proved by a significant decrease in glucose, insulin level and insulin resistance.
2- Treating the diabetic rats with 4-PBA cause a significant decrease in level of cholesterol and triglyceride. This could be due to the ability of 4-PBA to inhibit adipogenesis.
3- A progressive increase in the activity of superoxide dismutase and decrease in catalase activity in diabetic rats were observed but this changes were reversed after treating with 4-PBA.
4- The observed changes in the levels of reduced glutathione and malondialdehyde in blood, lenses and retinas of diabetic rats were modified in case of rats treated with 4-PBA. This could be due to its antioxidant activity.
5- The apoptotic marker sFas was increased in diabetic rats and this also happened in their lenses and retinas due to the prolongation of hyperglycemia state. Diabetic rats treated with 4-PBA showed a significant decrease in sFas level.
6- The activities of catalase and superoxide dismutase in lens and retina of diabetic rats were decreased significantly but these activities became closer to the normal value in rats treated with 4-PBA.
7- UV spectra exhibited changes in lens proteins of diabetic rats that indicate alterations in tertiary structure of crystallins while these changes disappeared in rats treated with 4-PBA.
8- SDS electrophoresis of lens proteins of diabetic rats showed obvious changes that indicate the occurrence of opacifications. These changes didn't appear in 4-PBA treated rats. This observation manifests the beneficial role of this chemical chaperone in prevention of diabetic cataract.
9- Slit lamp examination revealed the occurrence of mature cataract in diabetic rats while treated group appeared with normal and clear lenses.

In conclusion, 4-PBA can be identified as a new intervention that can effectively inhibit oxidative stress involved in diabetic ocular complications. 4-PBA provides protection via the regulation of ER stress. Although the precise mechanism should be explored in future studies and one must be cautious in applying animal models to human disease, these studies provide a theoretical basis for further study of the clinical prevention and treatment of diabetic cataract and retinopathy.