Biomarkers for Chronic Kidney Disease and End Stage Renal Disease

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End stage renal disease (ESRD), also called end stage renal failure, is the point at which human kidneys can no longer function on their own. ESRD is permanent and is the final stage of chronic kidney disease (CKD). Once a patient has ESRD, they must receive dialysis or a kidney transplant in order to survive[1].

It is estimated that 15% of the adult population in the United States has CKD. CKD does not always progress to ESRD, especially if diagnosed early, properly managed, and the patient does not present with additional risk factors. Some risk factors for the development of CKD and/or progression to ESRD are diabetes, high blood pressure, heart disease, drug abuse, urinary tract blockages, family history, inflammation, and certain genetic disorders[1]. Of these risk factors, diabetes is the leading cause of CKD. Approximately 40% of individuals with diabetes develop diabetic kidney disease (DKD), a subcategory of CKD. Of note, most patients with DKD die from cardiovascular diseases and infections prior to kidney failure[2].

Currently, the primary method for assessment of kidney function and prediction of future function and progression to ESRD is testing the glomerular flow rate (GFR). The GFR is estimated based on serum creatinine levels and demographic characteristics. Another marker for DKD progression is albuminuria, however it lacks in specificity and sensitivity for ESRD. Unfortunately, both of these markers only provide moderate prediction for future renal status[3].

Predictive and prognostic biomarkers that have a clear endpoint are needed in order to provide suitable treatment and meet the regulations needed to approve new drugs. Much of the current research has been geared toward utilizing single- or multi-plex ELISAs to assess candidate markers in the blood and/or urine. The markers that have shown the most promise are often part of the inflammation and fibrosis pathways; though there are also markers indicated in other pathways, including angiogenesis, endothelial dysfunction, mineral metabolism, and lipid metabolism[3,4,5]. Within the inflammatory pathway, attention has been heavily focused on the soluble tumor necrosis factor receptors (sTNFRs), specifically sTNFR1 and sTNFR2[4-7].

Circulating TNFR1 has been found to have strong association with ESRD and mortality. sTNFR2 has shown many of the same correlations, but to a less significant degree. sTNFR1 strongly correlates with the risk of ESRD in DKD patients, independent of the other clinically relevant covariates. Additionally, sTNFR1 concentrations predicted the time to progression to ESRD and outperformed all other clinical predictors[5,6]. The soluble TNF receptors have also been investigated in relation to mortality in advanced CKD irrespective of progression to ESRD. It was found that sTNFR1 in patients with CKD is significantly associated with increased risk of death and cardiovascular events, regardless of other clinical covariates[7]. sTNFR1 has displayed promise as a biomarker for risk of ESRD, time of ESRD onset, and mortality in patients with CKD[2-7].

Further research into biomarkers, particularly sTNFR1, for the progression of CKD, DKD, and ESRD is severely needed. As diabetes becomes more prevalent in the United States, the

number of patients presenting with DKD will continue to grow. With this risk on the horizon, proactive research is of utmost importance.

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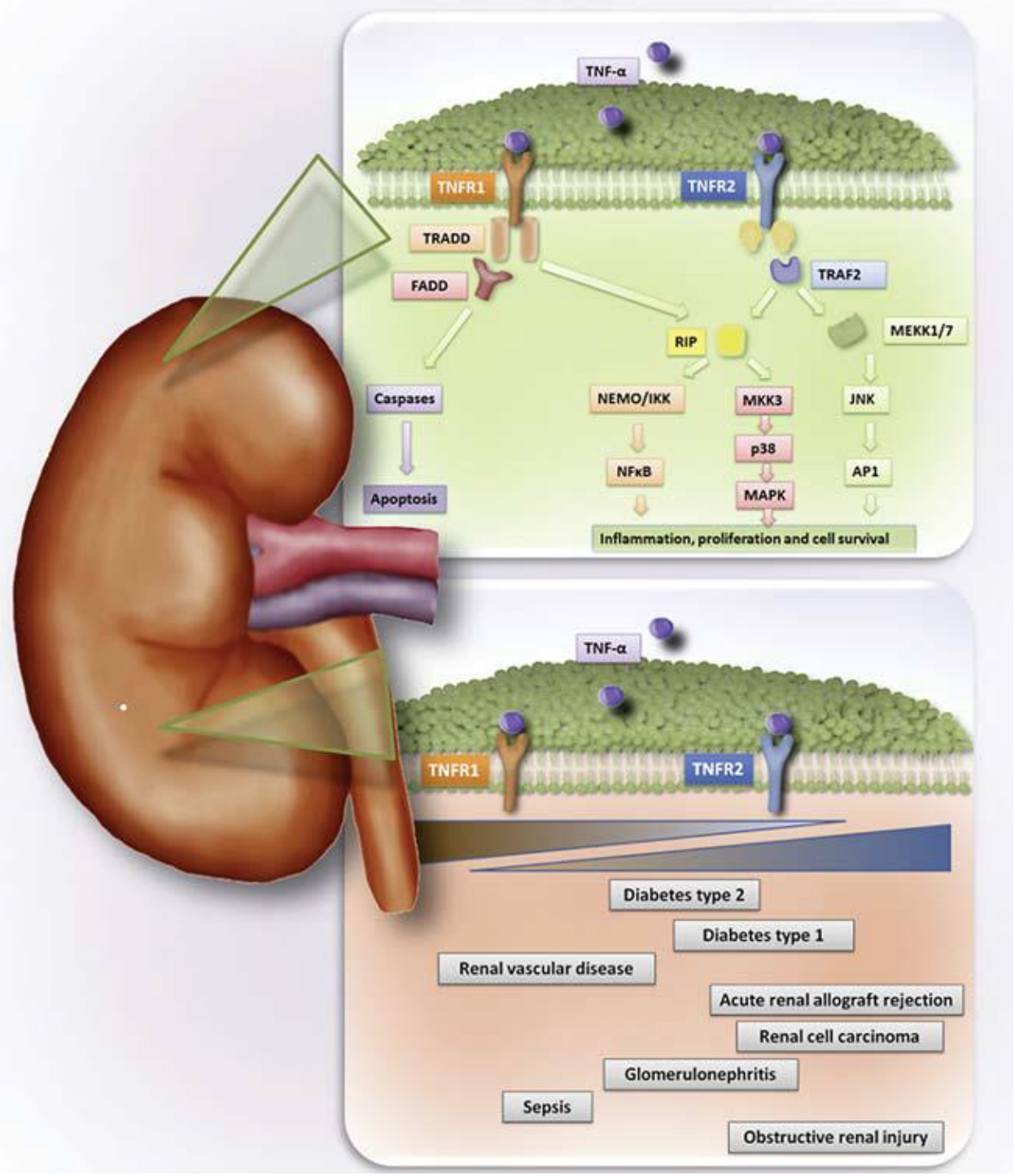

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Pulled Statistics:

15% of adults in the U.S. have Chronic Kidney Disease

40% of people with diabetes develop Diabetic Kidney Disease

5% is the rate at which ESRD is increasing in the U.S