Intrinsically disordered proteins: Functionality of chaos

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Proteins that do not possess a fixed three-dimensional structure are known as intrinsically disordered proteins (IDPs). Protein regions with more than 30 aminoacids, which have no folded 3D structure, are called intrinsically disordered regions (IDRs). These proteins challenge the conventional structure–function paradigm and are often described as part of a dynamic, disordered system. Despite their lack of stable structure, IDPs have been shown to play vital roles in numerous biological processes. More than 50% eukaryotic proteins have long IDRs. We are studying the functional roles of the long disordered regions in HOX transcription factors. These proteins contain a conserved DNA-binding homeodomain and the rest of the proteins are disordered. Our studies reveal that the transactivation domain is intrinsically disordered and regulates function via protein-protein interactions and DNA-binding autoinhibition.