University DJILALI BOUNAMA KM 1st Year LMD/CC/NLS ES Cell Biology 5 The cell types: All living organisms, with the exception of viruses, have cellular organisation and may consist of either simply one cell or multiple cells. Unicellular organisms consist of one cell, whereas multicellular organisms are composed of multiple cells. Cell types in cellular organisation can be classified as prokaryotic or eukaryotic, as proposed by Hans Ris in the 1960s. 5.1 Eukaryotic Cells: "The eukaryotic cells (Gr., eu=true, karyotic=nucleated) are larger and more complex than prokaryotic cells, feature a double envelope system encompassing the nucleus and other organelles. Characterized by extensive internal membranes like the endoplasmic reticulum, these cells are true cells found in both plants and animals, ranging from algae and angiosperms to protozoa and mammals. Despite varying in shape, size, and physiology, all eukaryotic cells are composed of a plasma membrane, cytoplasm with organelles such as mitochondria, ribosomes, Golgi apparatus, and a true nucleus. Within the nucleus, the DNA, RNA, nucleoproteins, and nucleolus are separated from the cytoplasm by thin, perforated nuclear membranes. It's beneficial to understand the general features of eukaryotic cells before delving into specific cellular components. 5.1.1 Cell Shape: The fundamental morphology of a eukaryotic cell is spherical; however, its particular function dictates its shape. Amoebae, white blood cells, leucocytes, and nearly all protists, plants, and animals exhibit variable or irregular shapes. The plasma membrane and exoskeleton provide structural integrity to unicellular organisms. Surface tension, protoplasm viscosity, the cytoskeleton's microtubules, microfilaments, and intermediate filaments, the mechanical interactions among adjacent cells, and the plasma membrane's rigidity all influence the shape of multicellular organisms. The morphology of cells can differ across various species and organs, including variations within the same organ. Cells exhibit a variety of shapes, including polyhedral, flattened, cuboidal, columnar, discoidal, spherical, spindle-shaped, elongated, and branched forms. The specialised shapes of glandular hairs on leaves, guard cells of stomata, and root hair cells exemplify how cell function influences cell shape in plants. 5.1.2 Cellular Dimensions: Eukaryotic cells typically exceed prokaryotic cells in size, with dimensions usually between 10 to 100 μm for eukaryotes and 1 to 10 μm for prokaryotes. In unicellular organisms, cell sizes are generally larger compared to those in multicellular organisms. For instance, Amoeba proteus ranks as one of the largest among unicellular entities. A particular species of Euglena may extend up to 500 μm in length, while diatoms can surpass 200 μm. Multicellular organisms, on the other hand, often exhibit cell sizes ranging from 20 to 30 μm. Among animals, the smallest cells measure about 4 μm in diameter (e.g., Polocytes), whereas human erythrocytes are typically 7 to 8 μm across. The largest animal cell is the ostrich egg, reaching up to 18 cm in diameter, and the longest is the human nerve cell, spanning up to a meter. 5.1.3 Cell Sise: The volume of a specific cell type remains relatively constant, regardless of the organism's size, adhering to the Law of Constant Volume. For instance, kidney and liver cells maintain similar