Digestion lab

Nutrition

Experiment #1: Carbohydrate Digestion - Tube 1 Digestion Lab — 3 ml water - Tube 2 — 3 ml 0. 2% amylase - Tube 3 — 3 ml 0. 2% amylase + 10 drops of 1. 0M HCl - Tube 4 1 2 4 3 — 3 ml 0. 2% amylase — place in hot water bath for 5 min Experiment #1: Carbohydrate Digestion - Add 5. 0 ml starch solution to each tube - Incubate in 37°C bath for 1. 5 hr - Divide contents of each tube evenly into 2 tubes — Lugol’s Test — Benedict’s Test Experiment #1: Carbohydrate Digestion - Lugol’s Test — presence of starch 2 1 1 2 3 4 - add a few drops of Lugol's reagent (iodine) 4 3 1 2 3 4 Experiment #1: Carbohydrate Digestion blue = - (none) green = + (a little bit) yellow = ++ (some) orange = +++ (lots) 3 4 or - Add egg white into each tube - Tube 1 — presence of maltose — — — — 2 Experiment #2: Protein Digestion - Benedict’s Test - add 5. 0 ml of Benedict's reagent - immerse in hot water bath for 2 min - rate the amt of maltose present 1 — if starch absent, transparent brown color — if starch present, opaque black-blue color — 10 drops of water + 5. 0 ml pepsin - Tube 2 — 10 drops of 1M HCl + 5. 0 ml pepsin 1 2 3 4 - Tube 3 — 10 drops of 1M HCl + 5. 0 ml pepsin — place in ice bath 1 2 3 4 5 - Tube 4 — 10 drops of 1M HCl + 5. 0 ml water - Tube 5 — 10 drops of 1M NaOH + 5. 0 ml pepsin 1 Experiment #2: Protein Digestion Experiment #3: Fat Digestion - add 3. 0 ml of cream to each tube - Tube 1 - Incubate tubes 1, 2, 4 and 5 at 37 C for 1. 5 hours - Observe any digestion of egg white — 5. 0 ml water + few grains of bile salts - Tube 2 — 5. 0 ml pancreatin - Tube 3 undigested — 5. 0 ml pancreatin + few grains of bile salts digested Experiment #3: Fat Digestion - Test pH of each solution w/ pH probe — rinse probe w/ detergent after each test - Place in 37°C bath - Retest pH at 20, 40 and 60 min Enzymes Protein Catalysts - speed up the rate of chemical reactions - are not permanently altered in the reactions - do

not change the nature of the reaction Digestion - Physical and chemical break down nutrients into absorbable unit 1. Physical digestion (chewing, mixing) 2. Chemical digestion (enzyme catalyzed) - - - polysaccharides â†’ monosaccharides proteins â†’ amino acids fats â†’ glycerol + fatty acids Factors Affecting Enzyme Activity - Temperature — â†‘ Temp, â†‘ kinetic energy, â†‘ reaction rate — high Temp changes structure of enzymes - â†"'s enzyme function 2 Factors Affecting Enzyme Activity - pH — 3D structure of enzymes changes at different pH — optimal enzyme function at specific pH — â†" function at higher or lower pH's Oxidation-Reduction Reactions Carbohydrate Digestion - begins with salivary amylase (ptyalin) - breaks starch (polysaccharide) into maltose (disaccharide) - Simple sugars = reducing sugars — Drive reduction reactions for other substances — Become oxidized Benedict's Test - oxidation reaction — reaction in which a molecule loses e-s - reduction reaction — reaction in which a molecule gains e-s - Example — NADH â†’ NAD+ = oxidation — NAD+ â†’ NADH = reduction — O2 + 4H+ + 4e- â†’ 2H2O = reduction Protein Digestion - Begins in the stomach - Gastric Epithelial Cells — Parietal Cells - Secrete HCl — Chief Cells - Secrete Pepsinogen - Low pH activates pepsinogen - Pepsinogen autocatalyzes self into pepsin - Cleaves proteins - Cu2+ + Maltose (reduced) â†’ Cu+ + Maltose (oxidized) - 4 Cu+ + O2 â†’ Cu2O (orange color) Protein Digestion - Continues in small intestine — chyme enters pyloric sphincter — intestine releases hormone (secretin), that stimulates the release of pancreatic juices — Chymotrypsin, trypsin, etc. - Enzymes activated in intestine - Digest small polypeptides into amino acids 3 Fat Digestion - Begins in stomach - Most in small intestine — (pancreatic and intestinal lipases) - Fats are nonpolar! - Digestion depends on the presence of bile from

the gall bladder — emulsification breaks up fat into small droplets - lipases break triglycerides into monoglycerides + fatty acids - form micelles in intestinal lumen Fat Digestion - absorbed by the epithelium - reform triglycerides in the epithelial cells - combined w/ protein to form chylomicrons which are secreted into lacteals - carried via lymph to the veins Fat Digestion - Triglycerides â†’ glycerol + fatty acids - Fatty acids lower pH of aqueous solutions — â†‘ fat digestion, â†“ pH 4