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Cell Biology: Endomembrane System

Printable Flashcards — Pre-Med Biology

Nuclear envelope, rough and smooth ER, Golgi apparatus, vesicle trafficking, protein targeting and signal peptides, lysosomes, endocytosis and exocytosis, and membrane topology.

189 cards — Print double-sided, flip on long edge, then cut along dashed lines.

189 cards — Printable Flashcards

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1

Endomembrane system = what idea?

2

Name the main players of the endomembrane system (pre-med level):

3

Trap: mitochondria are part of the endomembrane system. True or false?

4

Trap: chloroplasts are part of the endomembrane system. True or false?

5

Trap: peroxisomes are part of the endomembrane system. True or false?

6

Big reason the endomembrane system exists:

7

Endomembrane system is NOT one giant tube. It's mainly connected by...

8

If an exam asks 'where are secreted proteins made?', what organelle should pop into your head?

2

Nuclear envelope, ER, Golgi, vesicles, endosomes/lysosomes, and the plasma membrane.

1

A set of connected membranes that make, modify, ship, and recycle proteins/lipids inside the cell.

4

False.

3

False.

6

To move big molecules around without them floating randomly in cytosol.

5

False (usually taught as not part of it).

8

Rough ER (ribosomes on it).

7

Vesicles that bud off and fuse.

9

If an exam asks 'where are most lipids made?', what organelle should pop into your head?

10

If an exam asks 'where are proteins sorted and shipped to final destinations?', think...

11

If an exam asks 'where does cellular digestion happen?', think...

12

One super common exam trap: 'Golgi makes proteins'. True or false?

13

Endomembrane system is about moving cargo. Cargo can be:

14

Endomembrane core flow: {{c1::ER}} -> {{c2::Golgi}} -> {{c3::vesicles}} -> membrane / lysosome / secretion.

15

Organelle that modifies/sorts proteins after ER:

16

Nuclear envelope is basically... (membrane-wise)

10

Golgi apparatus.

9

Smooth ER (main site of lipid synthesis).

12

False.

11

Lysosome (in animals) / lytic vacuole (in plants).

14

Endomembrane core flow: ER -> Golgi -> vesicles -> membrane / lysosome / secretion.

13

Proteins and lipids.

16

A double membrane around the nucleus.

15

Golgi apparatus

17

The outer nuclear membrane is continuous with the...

18

Trap: the nuclear envelope is separate from ER. True or false?

19

What do nuclear pores do?

20

If a protein is made for the nucleus (like DNA polymerase), does it go ER->Golgi first?

21

Trap: all proteins enter ER right after being made. True or false?

22

One clean rule: proteins that end up in cytosol/nucleus/mitochondria are usually made on...

23

Outer nuclear membrane is continuous with the {{c1::endoplasmic reticulum}}.

24

Rough ER looks 'rough' because it has...

18

False.

17

Rough ER.

20

No. It stays in cytosol and gets imported through nuclear pores.

19

Control traffic between nucleus and cytosol (RNA out, proteins in/out).

22

Free ribosomes in the cytosol.

21

False.

24

Ribosomes attached to its cytosolic surface.

23

Outer nuclear membrane is continuous with the endoplasmic reticulum.

25

Rough ER is for making proteins that will end up...

26

Trap: ribosomes on RER make different proteins than free ribosomes. True or false?

27

So why do some ribosomes end up on RER?

28

What's the point of moving a growing protein into the ER while it's being made?

29

RER is important for cells that secrete lots of protein because...

30

Two classic RER modifications (high-level):

31

ER lumen is topologically similar to... (weird but useful idea)

32

Trap: secreted proteins are synthesized completely in cytosol then pushed into ER. True or false?

26

False.

25

Secreted, inserted into membranes, or sent to lysosomes.

28

So it can fold properly, get modified, and be shipped in the secretory pathway.

27

Because the protein being made has a signal peptide that sends it to the ER.

30

Protein folding + initial glycosylation (adding sugars).

29

They need lots of protein synthesis and packaging capacity.

32

False (main idea).

31

The outside of the cell (extracellular space).

33

If a protein is meant to be secreted, where will it be located inside the ER?

34

If a protein is meant to be a membrane receptor, where will it be in the ER?

35

RER is basically a factory for proteins that need to enter the cell's shipping network. True?

36

Rough ER has ribosomes attached because it makes {{c1::secreted}}, {{c2::membrane}}, and {{c3::lysosomal}} proteins.

37

Organelle most associated with protein secretion (start of pathway):

38

Smooth ER looks 'smooth' because it has...

39

Smooth ER main jobs (pre-med level):

40

Steroid hormones are lipids. So cells that make lots of steroids have lots of...

34

Inserted into the ER membrane (not floating in the lumen).

33

In the ER lumen.

36

Rough ER has ribosomes attached because it makes secreted, membrane, and lysosomal proteins.

35

Yes.

38

No ribosomes attached.

37

Rough ER

40

Smooth ER.

39

Lipid synthesis, detoxification, and Ca^{2+} storage.

41

Detoxification role of SER is especially big in...

42

In muscle cells, a specialized smooth ER that stores Ca^{2+} is called...

43

Trap: rough ER makes lipids, smooth ER makes proteins. True or false?

44

If a question says 'cell with lots of SER', you should think the cell is busy with...

45

Smooth ER main jobs: lipid synthesis, {{c1::detoxification}}, and {{c2::Ca^{2+} storage}}.

46

ER region without ribosomes, important for lipids and detox:

47

Golgi apparatus is best described as the cell's...

48

Golgi has a 'cis' side and a 'trans' side. Cis side faces the...

42

Sarcoplasmic reticulum.

41

Liver cells (hepatocytes).

44

Lipids/steroids or detox (and sometimes Ca^{2+} handling).

43

False.

46

Smooth ER

45

Smooth ER main jobs: lipid synthesis, detoxification, and Ca^{2+} storage.

48

ER (receiving side).

47

Post office + packaging center.

49

Trans side of Golgi faces the...

50

Trap: cis and trans Golgi mean left and right. True or false?

51

Golgi does NOT make proteins. What does it do to proteins?

52

If a protein is headed for secretion, it usually goes...

53

If a protein is meant to live in the plasma membrane, it still goes through...

54

Golgi is made of stacks of flattened sacs called...

55

If an exam gives a cell that makes tons of secreted proteins, what organelle will look big/obvious?

56

Trap: Golgi is inside the nucleus. True or false?

50

False.

49

Plasma membrane / endosomes (shipping side).

52

RER -> Golgi -> secretory vesicle -> out of the cell (exocytosis).

51

Modifies them (like adding/editing sugars) and sorts them into vesicles.

54

Cisternae.

53

RER and Golgi, then gets delivered in a vesicle that fuses with the membrane.

56

False.

55

RER and Golgi will both be very developed.

57

One useful rule: ER = makes stuff, Golgi =

58

Golgi orientation: {{c1::cis}} face receives from ER; {{c2::trans}} face ships to membrane/lysosome/secretion.

59

Golgi receiving side (faces ER):

60

Vesicles are basically...

61

Two verbs you should always associate with vesicles:

62

What moves vesicles around the cell?

63

Vesicle transport is directional:
ER -> Golgi is called...

64

Retrograde transport means...

58

Golgi orientation: cis face receives from ER; trans face ships to membrane/lysosome/secretion.

57

Edits labels and decides where it goes next.

60

Small membrane bubbles that transport cargo between organelles.

59

Cis face

62

Cytoskeleton tracks + motor proteins (high-level).

61

Bud and fuse.

64

Moving cargo back (Golgi -> ER) or recycling membranes/proteins.

63

Anterograde transport.

65

Trap: vesicles are filled with cytosol and 'carry' cytosol to the outside. True or false?

66

Huge topology rule: when a vesicle buds and fuses, the 'inside' of the vesicle becomes...

67

So: proteins that are inside the ER lumen end up...

68

Exocytosis means...

69

Endocytosis means...

70

Trap: exocytosis removes membrane from the cell surface. True or false?

71

Trap: endocytosis adds membrane to the cell surface. True or false?

72

If a cell is doing lots of exocytosis, what must also happen to keep surface area stable?

66

The lumen of the next compartment (or the outside of the cell if it fuses with plasma membrane).

65

False.

68

Vesicle fuses with plasma membrane to release cargo outside the cell.

67

Inside vesicles and can be secreted outside without crossing a membrane.

70

False.

69

Cell membrane invaginates to bring material into the cell in a vesicle.

72

Endocytosis (recycling) often balances it.

71

False.

73

Regulated secretion vs constitutive secretion (simple):

74

Trap: all exocytosis is regulated. True or false?

75

Vesicle traffic basics: vesicles {{c1::bud}} from one membrane and {{c2::fuse}} with another.

76

Exocytosis {{c1::adds}} membrane to the plasma membrane; endocytosis {{c2::removes}} membrane from it.

77

Process where a vesicle fuses with the plasma membrane to release cargo outside:

78

Clean rule: proteins that end up secreted/membrane/lysosome usually have an...

79

Trap: proteins for mitochondria use the ER signal peptide. True or false?

80

Free ribosomes make proteins for...

74

False.

73

Regulated = release only when signaled (ex: hormones). Constitutive = constant default release.

76

Exocytosis adds membrane to the plasma membrane; endocytosis removes membrane from it.

75

Vesicle traffic basics: vesicles bud from one membrane and fuse with another.

78

ER signal peptide (targeting signal).

77

Exocytosis

80

Cytosol, nucleus, mitochondria, chloroplasts (plants).

79

False.

81

Bound ribosomes (on RER) make proteins for...

82

Trap: if a ribosome is attached to RER, it stays attached forever. True or false?

83

Signal peptide is usually at the... of a secreted protein.

84

If a protein has no ER signal peptide, where does it get translated?

85

Common confusion: 'RER makes proteins for inside the ER only.' True or false?

86

Why do lysosomal enzymes need special targeting?

87

Basic concept: targeting signals are like...

88

Secreted/membrane/lysosomal proteins usually enter {{c1::rough ER}} early because they have an {{c2::ER signal peptide}}.

82

False.

81

Secretion, membranes, lysosomes.

84

In the cytosol on free ribosomes.

83

Beginning (N-terminus) (high-level).

86

Because the cell doesn't want digestive enzymes released randomly.

85

False.

88

Secreted/membrane/lysosomal proteins usually enter rough ER early because they have an ER signal peptide.

87

Shipping labels on packages.

89

Ribosomes attached to RER are making proteins destined for:

90

Membrane proteins don't flip orientation randomly during trafficking. True or false?

91

Topological trick: the ER lumen is equivalent to the...

92

If a receptor has a sugar chain sticking outside the cell, where was that sugar added?

93

Trap: glycosylation happens on the cytosolic side of ER. True or false (basic)?

94

If a protein is secreted, it should never touch the cytosol as a finished protein because...

95

If a membrane protein is delivered to the plasma membrane, what happens to the vesicle membrane?

96

Trap: vesicles fuse by 'opening a hole' and dumping contents, without changing membranes. True or false?

90

True.

89

Secretion, membranes, or lysosomes

92

In the ER/Golgi lumen side
(then carried to the outside).

91

Extracellular space (outside)
in terms of membrane side.

94

It stays in the lumen of ER/Golgi/vesicles
until it's released outside.

93

Mostly false for the classic extracellular sugars.

96

False.

95

It becomes part of the plasma membrane.

97

If a protein is in the vesicle lumen and the vesicle fuses with plasma membrane, the protein ends up...

98

If a protein is on the cytosolic face of the vesicle membrane and vesicle fuses, it ends up...

99

Membrane topology: cytosolic side stays {{c1::cytosolic}}; luminal side stays {{c2::luminal}} (and becomes extracellular after exocytosis).

100

Lysosome = what's its job?

101

Lysosomal enzymes work best at...

102

What keeps lysosome acidic?

103

Endosome = what's its job (simple)?

104

Simple endocytosis route:

98

On the cytosolic face of the plasma membrane.

97

Outside the cell.

100

Break down macromolecules with digestive enzymes in an acidic environment.

99

Membrane topology: cytosolic side stays cytosolic; luminal side stays luminal (and becomes extracellular after exocytosis).

102

Proton pumps (H^+ pumps) in the lysosome membrane (high-level).

101

Low pH (acidic).

104

Plasma membrane -> early endosome -> late endosome -> lysosome.

103

Sorting station for stuff that came in by endocytosis.

105

Trap: endosome and lysosome are the same. True or false?

106

If a receptor is endocytosed but the cell wants to reuse it, where does it often go?

107

If a ligand is endocytosed and needs to be destroyed, it often ends up in...

108

Autophagy is basically...

109

Trap: autophagy means the cell is committing suicide. True or false?

110

Phagocytosis is basically...

111

Pinocytosis is basically...

112

Receptor-mediated endocytosis is basically...

106

Recycled back to the plasma membrane from early endosome.

105

False.

108

The cell digesting its own damaged/old parts by sending them to lysosomes.

107

Lysosome.

110

Cell eating big stuff (like bacteria) into a vesicle (phagosome).

109

False.

112

Selective uptake using receptors (like grabbing specific ligands).

111

Cell drinking: taking in small droplets of fluid.

113

If lysosomes malfunction, what kind of stuff tends to build up?

114

Endocytosis sorting route: plasma membrane -> {{c1::early endosome}} -> {{c2::late endosome}} -> {{c3::lysosome}}.

115

Organelle that digests macromolecules using acidic enzymes:

116

Endocytosis is for bringing stuff...

117

Exocytosis is for sending stuff...

118

Phagocytosis is a type of...

119

Trap: phagocytosis is exocytosis because the cell 'moves stuff'. True or false?

120

Receptor-mediated endocytosis is a good exam favorite because it shows...

114

Endocytosis sorting route: plasma membrane -> early endosome -> late endosome -> lysosome.

113

Undigested macromolecules / cellular waste.

116

Into the cell.

115

Lysosome

118

Endocytosis (big particles).

117

Out of the cell.

120

Selectivity (not random gulping).

119

False.

121

If the question says 'membrane receptors are taken in and recycled back', which process is being described?

122

Trap: endocytosis always destroys whatever comes in. True or false?

123

If you see 'clathrin-coated pit' in a question, it's usually about...

124

Exocytosis is how cells do things like...

125

Endocytosis is how cells do things like...

126

Phagocytosis is {{c1::endocytosis}} of large particles; exocytosis releases cargo {{c2::out}} of the cell.

127

Classic secreted protein pathway (write it like a chain):

128

Classic membrane protein pathway (chain):

122

False.

121

Receptor-mediated endocytosis + recycling via endosomes.

124

Release hormones/neurotransmitters and insert membrane proteins into the surface.

123

Receptor-mediated endocytosis (high-level).

126

Phagocytosis is endocytosis of large particles; exocytosis releases cargo out of the cell.

125

Bring in nutrients, regulate surface receptors, and sample the environment.

128

RER membrane insertion -> Golgi -> vesicle -> plasma membrane insertion.

127

RER -> transport vesicle -> Golgi -> secretory vesicle -> exocytosis.

129

Classic lysosomal enzyme pathway (chain):

130

If a lysosomal enzyme got secreted outside by mistake, that would be... (conceptually)

131

Golgi sorting: where is the big 'sorting decision point'?

132

Trap: cis Golgi is the shipping side. True or false?

133

If a question shows a protein with a signal peptide and asks where translation begins:

134

If a question asks 'where do secreted proteins get folded?', best answer:

135

If a question asks 'where do proteins get most of their final sorting?', best answer:

136

Secreted proteins: {{c1::RER}} -> {{c2::Golgi}} -> {{c3::secretory vesicle}} -> {{c4::exocytosis}}.

130

Bad/dangerous, because it's meant to digest inside acidic lysosomes.

129

RER -> Golgi -> vesicle -> endosome -> lysosome.

132

False.

131

Trans-Golgi network (shipping side).

134

ER lumen (rough ER).

133

It begins on a free ribosome in the cytosol, then docks to RER.

136

Secreted proteins: RER -> Golgi -> secretory vesicle -> exocytosis.

135

Golgi (especially trans side).

137

Organelle that acts as the main sorting/shipping hub after ER:

138

Endomembrane vs mitochondria: which is about shipping and which is about ATP?

139

Endomembrane vs peroxisome: quick difference (pre-med style):

140

Lysosome vs peroxisome: which has acidic digestive enzymes?

141

RER vs SER: which is protein-heavy and which is lipid-heavy?

142

Golgi vs ER: who makes proteins and who sorts them?

143

Secreted proteins vs cytosolic proteins: which cross the ER membrane?

144

Trap: lysosomes are made in the Golgi. True or false?

138

Endomembrane = shipping.
Mitochondria = ATP/energy.

137

Golgi apparatus

140

Lysosome.

139

Endomembrane = vesicle traffic. Peroxisome = oxidative reactions (H2O2 detox, fatty acid stuff).

142

ER (ribosomes) makes/starts processing;
Golgi sorts and modifies further.

141

RER = protein-heavy. SER = lipid-heavy.

144

Misleading.

143

Secreted proteins enter ER lumen;
cytosolic proteins stay in cytosol.

145

If a question says 'organelle that contains its own DNA', that's NOT endomembrane. It's...

146

If a question says 'organelle with hydrolytic enzymes at low pH', that's...

147

If a question says 'stacked flattened sacs', that's usually...

148

RER = {{c1::proteins}} (secreted/membrane/lysosomal); SER = {{c2::lipids/detox/Ca^{2+}}}.

149

Plants have lysosome-like digestion mainly in the...

150

Trap: plants have no endomembrane system because they have a cell wall. True or false?

151

Plant cell wall materials (like cellulose components) reach the outside mainly via...

152

In plants, Golgi has an important job in making/secreting...

146

Lysosome.

145

Mitochondria (and chloroplasts in plants).

148

RER = proteins (secreted/membrane/lysosomal);
SER = lipids/detox/Ca^{2+}.

147

Golgi.

150

False.

149

Central vacuole / lytic vacuole.

152

Cell wall polysaccharides (high-level).

151

Exocytosis (vesicles delivering to the cell surface).

153

Central vacuole also helps with...

154

Plant organelle that often plays lysosome-like digestive role:

155

A cell that secretes tons of antibodies: which organelles are huge?

156

A cell that makes steroid hormones: which organelle is huge?

157

A cell that detoxifies drugs: which organelle is huge?

158

A cell with lots of digestive breakdown of ingested bacteria: what's active?

159

If a receptor is being removed from the surface to reduce signaling, the cell uses...

160

If a cell is growing its surface area fast, what process is heavily used?

154

Vacuole (lytic vacuole)

153

Turgor pressure (keeping the cell rigid).

156

Smooth ER.

155

Rough ER + Golgi.

158

Endocytosis + lysosomes (phagolysosomes).

157

Smooth ER (plus others).

160

Exocytosis (adds membrane).

159

Endocytosis (often receptor-mediated) and sorting in endosomes.

161

If a cell wants to recycle old organelles for nutrients during starvation, it uses...

162

If you see 'stacked cisternae near nucleus' on a diagram, it's likely...

163

If you see 'membrane network with dots (ribosomes)' on a diagram, it's likely...

164

If you see 'smooth tubes, no dots' on a diagram, it's likely...

165

Secreted proteins are protected from cytosolic enzymes because they travel inside...

166

Trap: secreted proteins must cross the plasma membrane during exocytosis. True or false?

167

If a soluble protein is secreted, it ends up outside. If a soluble protein is sent to lysosome, it ends up...

168

If a membrane protein is delivered to plasma membrane, its extracellular domain was originally facing the...

162

Golgi.

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161

Autophagy -> lysosome.

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164

Smooth ER.

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163

Rough ER.

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166

False.

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165

ER/Golgi/vesicle lumen (not in cytosol).

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168

ER lumen.

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167

Inside the lysosome lumen.

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169

If a membrane protein has a cytosolic tail, that tail stays facing...

170

If a cell suddenly increases secretion, what organelles likely show up bigger over time?

171

Trap: vesicles are 'made of protein' only. True or false?

172

Trap: ER lumen is the same as cytosol. True or false?

173

Secreted proteins are made into the {{c1::ER lumen}} and stay in lumen/vesicles until released outside by {{c2::exocytosis}}.

174

Why is it smart that lysosomal enzymes work best at low pH?

175

If a lysosome's proton pump fails, what happens (simple)?

176

If a cell is constantly adding membrane by exocytosis but never endocytoses, surface area would...

170

RER + Golgi + secretory vesicles.

169

The cytosol the whole time.

172

False.

171

False.

174

If they leak, they are less active in the neutral cytosol (reduces damage).

173

Secreted proteins are made into the ER lumen and stay in lumen/vesicles until released outside by exocytosis.

176

Increase a lot.

175

pH rises -> enzymes work worse -> digestion slows -> waste builds up.

177

If a receptor is endocytosed and sent to lysosomes instead of recycled, what happens to signaling?

178

If a cell blocks ER^{-}>Golgi transport, what happens to secretion?

179

If Golgi is disrupted, proteins made in ER can still be made, but they often won't be...

180

Organelle that is the main 'entry point' for secreted proteins:

181

If you only remember one flowchart for endomembrane system, make it this:

182

If you only remember one 'not part of endomembrane system' list:

183

Quick trap check: where are ribosomes actually made/assembled? (not endomembrane, but often mixed)

184

If a question is about shipping membrane proteins to the surface, the best organelle pair is...

178

Secretion drops because cargo can't reach Golgi for sorting/packaging.

177

Signaling decreases because receptor numbers on surface drop.

180

Rough ER

179

Properly modified/sorted to the right destination.

182

Mitochondria, chloroplasts, peroxisomes (classic).

181

RER (make) -> Golgi (sort) -> vesicle (deliver) -> membrane / lysosome / outside.

184

ER + Golgi.

183

Nucleolus (rRNA + ribosome assembly).

185

If a question is about breaking down bacteria inside a cell, the key organelle is...

186

If a question is about detoxifying a drug, the key organelle is...

187

If a question is about Ca^{2+} storage for fast release in muscle, think...

188

Golgi does {{c1::modification}} + {{c2::sorting}}, not protein synthesis.

189

Endomembrane organelle that synthesizes most lipids and detoxifies:

186

Smooth ER.

185

Lysosome (after endocytosis/phagocytosis).

188

Golgi does modification + sorting, not protein synthesis.

187

Sarcoplasmic reticulum (special smooth ER).

189

Smooth ER