Evolution and functions of SMC complexes: new SMC5/6 insights

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Čím se u nás zabýváme

- Proteomika/biochemie
- Proteinové (bílkovinné) komplexy (složení, funkce, patogeneze, evoluce)
- Zprostředkovány protein-proteinovými interakcemi
- Interakce SMC a NSE proteinů – utváří SMC5/6 komplex (a jiné SMC komplexy)

SMC complexes

SMC, kleisin and kleisin-associated proteiny (podjednotky)

Prokaryotes

Smc/ScpAB
ν-SMC   κ-SMC
Kleisin (short)
ScpB$_A$
ScpB$_P$
ScpA

Kleisin-interacting winged-helices

Eukaryotes

Smc5/6
Smc6   Smc5
Nse2
Nse3   Nse1   Nse4

cohesin
Smc3   Smc1
Pds5   Scc1
Scc3

condensin
Smc2   Smc4
Cap-H
Kleisin (long)
Cap-D2+Cap-G

Kleisin-interacting HEAT repeats
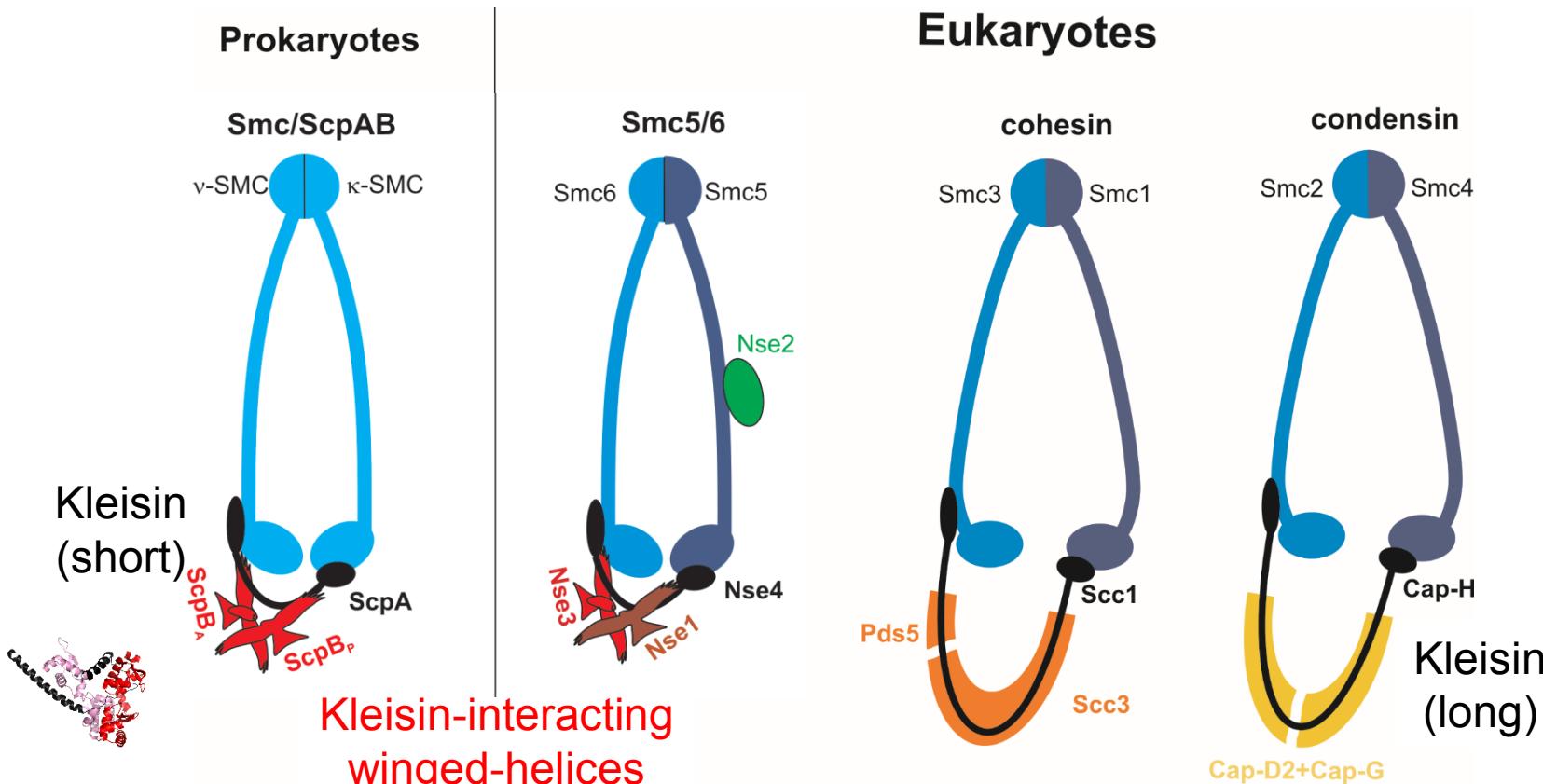
Konzervované od bakterií po člověka
Smc/ScpAB or MukBEF (plus MksBEF)
3 komplexy u člověka (cohesin, condensin, SMC5/6)
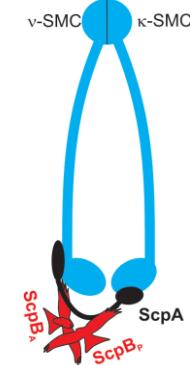
Bacterial KITE proteins shape kleisins

ScpB (KITE = **K**leisin **I**nteracting **T**andem-winged-helix **E**lement) holds and shapes **ScpA** kleisin (PDB: 4I98; Gruber)
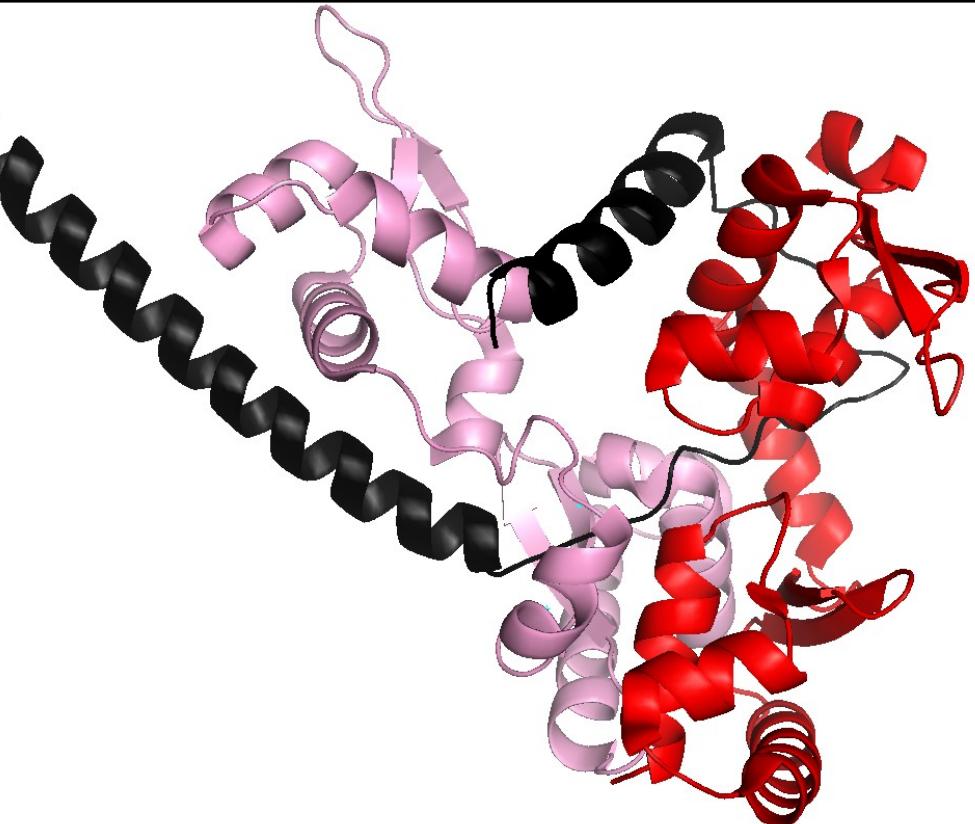
ScpB (KITE) proteins interact through their WHA (first WHD)

ScpB (KITE) proteins bind ScpA kleisin via second WH domain (WHB)

KITEs shape kleisin's middle part (regulate their binding to SMC ring?)

Palecek and Gruber, Structure, 2015

SMC komplexy

Structure **M**aintenance of **C**hromosome complexes form rings
Rings can embrace DNA/chromatin fibers

γ-H2AX   γ-H2AX

Cohesin   Cohesin

Mre11

50 kb   2 kb   2 kb   50 kb

Double-strand break

Mre11/Rad50/Xrs2

Cohesin   Smc5/6

Rad52/RPA

intra-chromatid
(cohesin & condensin)

centromere
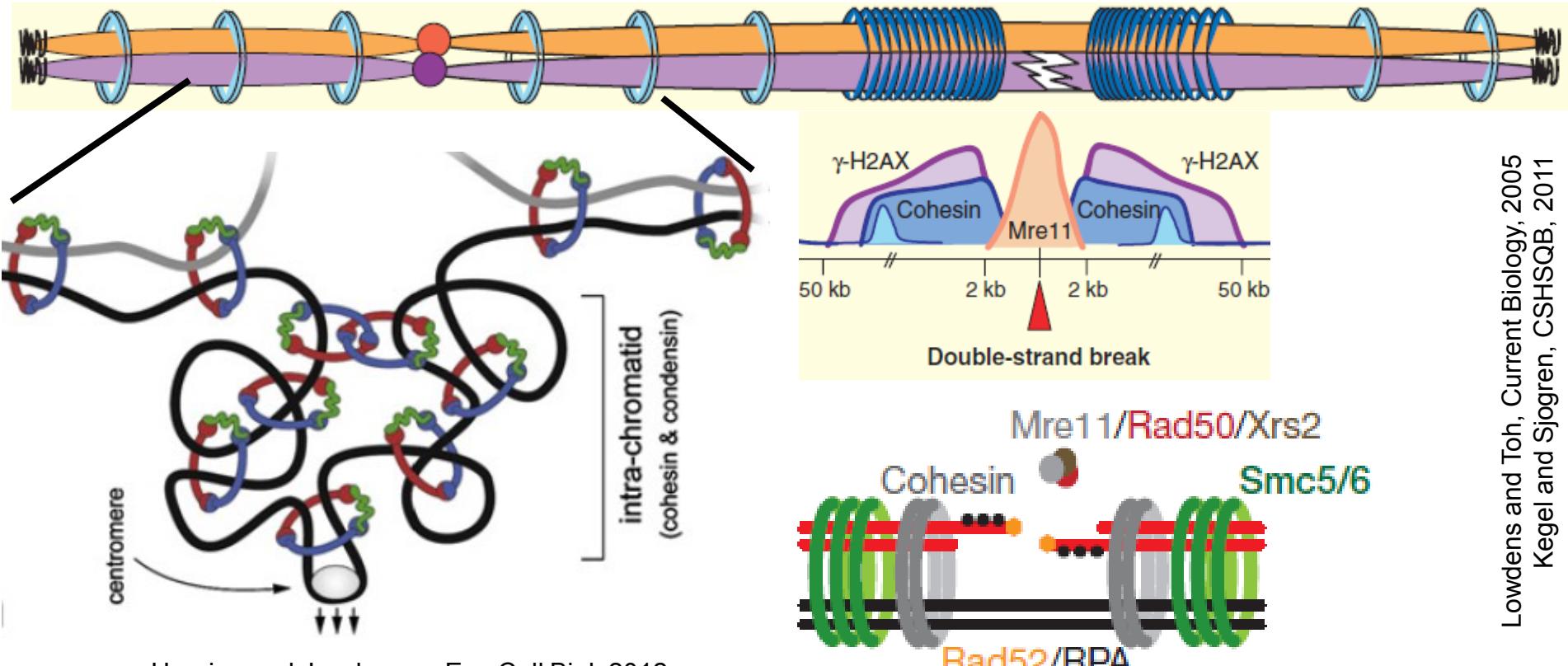
Haering and Jessberger, Exp Cell Biol, 2012

Lowdens and Toh, Current Biology, 2005
Kegel and Sjogren, CSHSQB, 2011

Form loops (higher order chromatin structure)
Hold two sister chromatids (segregation, homologous recomb.)
Assist in replication (fork progression and stability)