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☐ Initial submission ☐ Revised version ☒ Final submission

Life Sciences Reporting Summary

Nature Research wishes to improve the reproducibility of the work that we publish. This form is intended for publication with all accepted life science papers and provides structure for consistency and transparency in reporting. Every life science submission will use this form; some list items might not apply to an individual manuscript, but all fields must be completed for clarity.

For further information on the points included in this form, see Reporting Life Sciences Research. For further information on Nature Research policies, including our data availability policy, see Authors & Referees and the Editorial Policy Checklist.

Experimental design

1. Sample size

Describe how sample size was determined.

All reported experiments used at least 6 animals. No statistical methods were used to determine sample sizes.

2. Data exclusions

Describe any data exclusions.

No data was excluded.

3. Replication

Describe whether the experimental findings were reliably reproduced.

All experimental manipulations were carried out at least in triplicate.
The only exception ist the cdc20RNAi point in Figure 4B/C. The main point of this figure is that stem cells become rapidly depleted upon cdc20(RNAi). The very few remaining stem cells in the 1 replicate shown are supported by no remaining stem cells in replicates 2 and 3 (not shown), therefore also this conclusion is supported by multiple replicates.

4. Randomization

Describe how samples/organisms/participants were allocated into experimental groups.

Experimental animals were randomly selected from large laboratory populations.

5. Blinding

Describe whether the investigators were blinded to group allocation during data collection and/or analysis.

Blinding was not used in this study. However, the results in Fig. 4 are based on validated automated quantification routines, which rule out observe bias.

Note: all studies involving animals and/or human research participants must disclose whether blinding and randomization were used.

6. Statistical parameters

For all figures and tables that use statistical methods, confirm that the following items are present in relevant figure legends (or in the Methods section if additional space is needed).

n/a	Confirmed
☐	☒ The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement (animals, litters, cultures, etc.)
☐	☒ A description of how samples were collected, noting whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒ A statement indicating how many times each experiment was replicated
☐	☒ The statistical test(s) used and whether they are one- or two-sided (note: only common tests should be described solely by name; more complex techniques should be described in the Methods section)
☐	☒ A description of any assumptions or corrections, such as an adjustment for multiple comparisons
☐	☒ The test results (e.g. *P* values) given as exact values whenever possible and with confidence intervals noted
☐	☒ A clear description of statistics including central tendency (e.g. median, mean) and variation (e.g. standard deviation, interquartile range)
☐	☒ Clearly defined error bars

See the web collection on statistics for biologists for further resources and guidance.

Software

Policy information about availability of computer code

7. Software

Describe the software used to analyze the data in this study.	The assembler (Marvel) has been deposited in a GitHub repository. All other software packages and tools cited in the manuscript are referenced (either in main text or Supplemental Online Material section) and, where applicable, parameter settings are listed in the Supplemental Online Material section.

For manuscripts utilizing custom algorithms or software that are central to the paper but not yet described in the published literature, software must be made available to editors and reviewers upon request. We strongly encourage code deposition in a community repository (e.g. GitHub). *Nature Methods* guidance for providing algorithms and software for publication provides further information on this topic.

Materials and reagents

Policy information about availability of materials

8. Materials availability

Indicate whether there are restrictions on availability of unique materials or if these materials are only available for distribution by a for-profit company.	All material are available upon request from the Rink lab.

9. Antibodies

Describe the antibodies used and how they were validated for use in the system under study (i.e. assay and species).	Primary antibodies: anti-Histone H3 antibody (rabbit, phospho S10 + T11) [E173]; Abcam, Cat. No.: ab32107 Secondary antibodies: goat anti-rabbit IgG (H+L), Alexa Fluor 647; ThermoFisher Scientific, Cat. No.: A-21245 The primary antibody is an established tool in the field, as corroborated by the reference cited in the Supplemental Online Material section.

10. Eukaryotic cell lines

a. State the source of each eukaryotic cell line used.	Does not apply to this study.
b. Describe the method of cell line authentication used.	Does not apply to this study.
c. Report whether the cell lines were tested for mycoplasma contamination.	Does not apply to this study.
d. If any of the cell lines used are listed in the database of commonly misidentified cell lines maintained by ICLAC, provide a scientific rationale for their use.	Does not apply to this study.

Animals and human research participants

Policy information about studies involving animals; when reporting animal research, follow the ARRIVE guidelines

11. Description of research animals

Provide details on animals and/or animal-derived materials used in the study.	Individuals of clonal laboratory strains of the sexual and asexual lines of S. mediterranea were used in this study. Size and or feeding history of experimental specimens are listed as physiologically meaningful designators of experimental specimens. Research on planarians is not subject to any ethical regulations in Germany.

Policy information about studies involving human research participants

12. Description of human research participants

Describe the covariate-relevant population characteristics of the human research participants.	Does not apply to this study.