Laboratory of Peptides

HEAD:

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GROUP MEMBERS:

Karolina Pułka-Ziach, PhD DSc;
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RESEARCH PROFILE:

Laboratory of Peptides is a research group focused on the development of structure activity relationship of novel peptides and peptidomimetics with desired biological activity. In this frame we possess vast expertise in design, synthesis and analysis of novel molecules with agonistic and antagonistic properties, which might be used in future therapeutic purposes. We have successfully designed potent peptidomimetics with antiangiogenic/antitumor activity and bifunctional peptides with antinociceptive activity as potential drug for the use in neuropathic pain.

The group is also actively working in the field of foldamers, developing their synthesis and performing the structural studies. Foldamers mimic the secondary structure of peptides, but the backbone is fully artificial. Our attention is focused on helical oligoureas and their analogues. We have successfully applied those compounds as mediators of electron transfer, what opens a possibility for the wider use of oligoureas in materials science or nanoelectronics.

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CURRENT RESEARCH ACTIVITIES:

- Design, synthesis and conformation studies of peptidomimetics with antiangiogenic properties
- Synthesis of bifunctional peptides with analgesic activity
- Synthesis and conformation studies of oligourea foldamers and their analogues
- Application of helical foldamers as mediators of a long-distance transport of electrons
- HPLC-MS stability studies of peptidomimetics in physiological fluids
- Immunoenzymatic and in vitro studies of potential antiangiogenic compounds
- Mass spectrometry based search for biomarkers of pathological states
- Synthesis of lipopeptides
- Catalytic peptides in prebiotic reactions
- Antiangiogenic peptidomimetics for the use as radiopharmaceuticals

SELECTED PUBLICATIONS:

1. A.K. Puszko, P. Sosnowski, F. Raynaud, O. Hermine, G. Hopfgaftner, Y. Lepelletier, A. Misicka, Does Cysteine rule (CysR) complete the CendR principle? Increase in affinity of peptide ligands for NRP-1 through the presence of N-terminal cysteine, Biomolecules. 10 (2020) 448.
2. A. Królikowska, J. Cukras, M. Witkowski, D. Tymecka, A. Hernik-Magoń, A. Misicka, W. Dzwolak, SERS and DFT Study of Noble Metal-Anchored Cys-Trp/Trp-Cys Dipeptides: Influence of Main-Chain Direction and Terminal Modifications, Journal of Physical Chemistry C. 124 (2020) 7097-7116.
3. K. Pułka-Ziach, A.K. Puszko, J. Juhaniewicz-Dębińska, S. Sęk, Electron Transport and a Rectifying Effect of Oligourea Foldamer Films Entrapped within Nanoscale Junctions, Journal of Physical Chemistry C. 123 (2019) 1136–1141.
4. A.K. Puszko, P. Sosnowski, D. Tymecka, F. Raynaud, O. Hermine, Y. Lepelletier, A. Misicka, Neuropilin-1 peptide-like ligands with proline mimetics, tested using the improved chemiluminescence affinity detection method, MedChemComm. 10 (2019) 332-340.
5. J. Juhaniewicz-Dębińska, D. Tymecka, S. Sęk, Diverse effect of cationic lipopeptide on negatively charged and neutral lipid bilayers supported on gold electrodes, Electrochimica Acta. 298 (2019) 735-744.
6. B. Fedorczyk, P.F.J. Lipiński, A.K. Puszko, D. Tymecka, B. Wileńska, W. Dutka, G.Y. Perret, R. Wieczorek, A. Misicka, Triazolopeptides inhibiting the interaction between Neuropilin-1 and Vascular Endothelial Growth Factor 165, Molecules. 24 (2019) 1756.
7. A.K. Puszko, P. Sosnowski, K. Pułka-Ziach, O. Hermine, G. Hopfgaftner, Y. Lepelletier, A. Misicka, Urea moiety as amide bond mimetic in peptide-like inhibitors of VEGF-A165/NRP-1 complex, Bioorg Med Chem Lett. 29 (2019) 2493-2497.
8. B. Wileńska, D. Tymecka, M. Włodarczyk, A.Sobolewska-Włodarczyk, M. Wiśniewska-Jarosińska, J. Dyniewicz, A. Somogyi, J. Fichna, A. Misicka, Enkephalin degradation in serum of patients with inflammatory bowel diseases, Pharmacological Reports. 71 (2019) 42-47.
9. D. Tymecka, A.K. Puszko, P.F.J. Lipiński, B. Fedorczyk, B. Wileńska, K. Sura, G.Y. Perret, A. Misicka, Branched pentapeptides as potent inhibitors of the Vascular Endothelial Growth Factor 165 binding to Neuropilin-1, Eur J Med Chem. 158 (2018) 453-462.
10. K. Pułka-Ziach, S. Sęk, α-Helicomimetic foldamers as electron transfer mediators, Nanoscale. 9 (2017) 14913-14920.